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The Experimenting Station at Lievin, France

Main Purpose of the Organization Is to Solve Problem of Coal Dust Explosions. The Equipment for Research Work Is Most Elaborate

BY TONY CALLOT*

The experimenting station of Liévin, France, was established in 1907 by the Comité Central des Houillères de France after the Courrières disaster, to study all the questions dealing with the safety in mining which necessitate experimental researches. Its main aim is to solve the problem of the inflammation of coal dust.

Before the fearful explosion of Courrières on March 10, 1906, no serious dust inflammations had occurred in any French colliery. All the efforts of the mining engineers had been confined to the study of preventing the accumulation of firedamp and its possible inflammation. Extensive experiments had led to the elimination of many of the so-called safety lamps and to the adoption of the Marsaulé lamp since 1890. Further experiments had provided for the specification of the types of explosives that would not cause the inflammation of firedamp, should this gas be present at the coal face or in underground workings.

The thorough application of the mining by-laws, which were the result of these experiments prevented any serious mine accident during a period of 14 years. The average number of workmen killed by firedamp explosion between 1892 to 1905 was 0.26 per 10,000 in France, 1.06 in Belgium, 1.49 in Prussia and 1.2 in England. French engineers were proud of the results achieved. Then came the Courrières disaster in a mine where no firedamp had ever been detected. As a matter of fact some inflammations of coal dust had been noticed, but never had they been of a serious character and no authority could have affirmed at that time that a dust inflammation was able to spread itself indefinitely. Now the Courrières accident has shown it was so, and the Monongah disaster, in West Virginia, has confirmed this fact.

It is a new danger, ignored in France before 1906, and the precautions taken against firedamp seem to make greater the possibility of a dust disaster. In fighting firedamp, ventilation was increased, causing dust to float in the air and to be spread all along the galleries, while the dust produced by the sorting and screening plants situated close to the pits, entered the mines with the aspirated air, thus producing a continuous deposit of coal dust throughout the workings and facilitating the extension of a local inflammation.

Solving the Problem

Several solutions of this problem were presented. The only one that was tried, consisted of spraying water in the galleries. It is an expensive process, which does not prove altogether efficient, for the principal cause of the Reden explosion in Germany was attributed to coal-dust inflammation, while the water-spraying process was used in that mine. Further, the production of a wet atmosphere in the mine increases the development of the ankylostomiasis and the presence of circulating water may cause breakdowns in a ground of moderate solidity. English and Belgian engineers who were early advocates of the dust danger have not yet decided to use water spraying as an accepted remedy.

Experience alone can answer the question. Some experiments were carried on in French laboratories by Mallard and Le Chatelier on the influence of the character of the coal, the fineness of the dust, the volume of the flame used for the inflammation, the percentage of inflammable gas mixed with dust, etc. Later on, Mr. Simon studied the inflammability of dusts by explosive shooting and determined some interesting data. But none of the French or other engineers had at their disposal a sufficient plant to study the possibility and the laws of the remote propagation of dust inflammation, as well as the possible causes of such an inflammation.

It was known that such a plant would be expensive, but, in face of its import-

FIG. 1. GENERAL VIEW OF THE EXPERIMENTAL GALLERIES AT LIEVIN. AUXILIARY GALLERY IS SHOWN IN FOREGROUND AT LEFT

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NOTE—Extracts from a pamphlet by Mr. Taffanel, manager of the station, and issued by the Comité Central des Houillères de France.

ance, the Comité Central des Houillères de France decided to erect it, at a cost of some $70,000 and to spend $15,000 yearly to carry on experiments. The research work proposed was along the following lines:

1. To study the inflammability of coal dusts, the conditions under which the propagation of the inflammation occurs and the means of fighting against the danger of dusts.

2. To study and control the safety of the explosives used in mines in the presence of firedamp or dusts, as well as the safety of the processes and appliances for shooting same.

3. To study and control the safety of the mining lamps and electric contrivances used underground.

4. To study the life-saving apparatus.

5. To establish a laboratory for scientific and practical researches relative to safety in mines.

6. To inquire abroad, especially after great mining accidents, and note particulars useful for the solving of the above problems.

Description of the Station

The experimenting station, as installed, includes the following appliances and buildings:

One main experimenting gallery and an auxiliary one; a house with offices, laboratory and sundry machinery; a coal-crushing plant; a coal store; two firedamp gasometers; a lodging for the guardian. The station is located at Liévin, in the Department of Pas de Calais, close to Lens and not far from Courriéres.

Main Gallery

Up to now, the gallery has been only 65m. long (213 ft.), but will be lengthened in 1909 up to 500m. (about 1600 ft.) and will include, according to the necessities, one or more branches.

The first section of 65m. consists of two parts, at the start a length of 30m. was built of reinforced concrete, the end being made with various materials, the resistance of which was tested in view of the future extension.

The whole gallery has a trapezoidal section and is fitted with usual timbering. There are no relief valves so that the pressure of the explosion may have its full effect as in underground galleries. The walls of cement of the first length of gallery are 18 to 22 cm. thick and are strengthened every 5 ft., at which intervals, the thickness is increased to 57 cm. The iron frames include 6 iron bars 30 mm. diam. and 3 bars 16 mm. diam. surrounding the gallery at each support, and many others in the walls between two consecutive supports. This part of the gallery is calculated for an internal pressure of 60 lb. per sq.in. with the usual coefficients of safety. The size of the gallery inside is 1.85 m. high by 1.4 m. wide at top and 1.6 m. at bottom. Ten observation windows 8x6 in. fitted with 1 3/16-in. reinforced glass have been provided at the middle hight of the wall facing the observation room located in the main building. They are placed close together, and are located at the head of the gallery to allow a thorough examination of the phenomena which take place at the start of an explosion.

As the observation of phenomena at the end of the gallery would not be easy from

FIG. 2. A VIEW OF THE STATION SHOWING THE GALLERY UNDER COVER AND ALSO THE CEMENT GALLERY

FIG. 3. MACHINE ROOM AT THE LIEVIN STATION

FIG. 4 SHOWING DUST INJECTOR

the main building, registering appliances are under erection to notice the progress of the flames. This will be rendered still more necessary when the extension of the gallery is completed.

Experiments were made on the best type of timbering for the second part of the gallery. It was found that wood frames

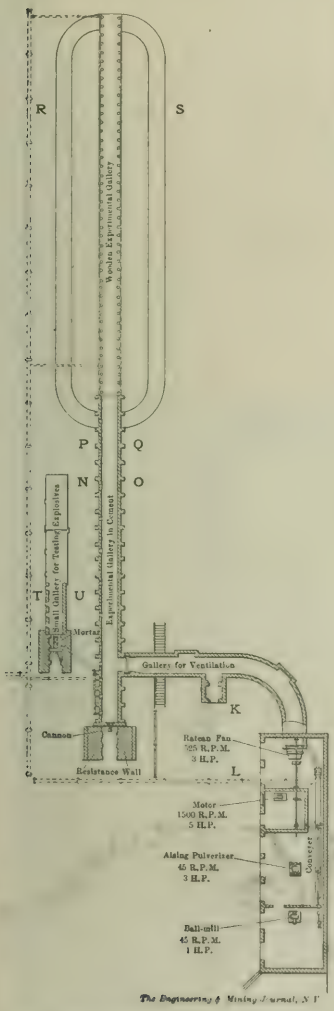


FIG. 5. SHOWING GENERAL PLAN OF THE VARIOUS GALLERIES

as used underground were soon dislocated even when strengthened by iron squares. Only strong I-beams placed close together could bear the effects of the explosions under 5 ft. of waste.

The gallery may be opened at one end or at both ends at will. One of the ends, instead of being made of concrete or masonry, as in similar plants, is formed by a number of big lumps of timber strongly tied together by wedges and tie rods.

Ventilation

Ventilation is effected by a Rateau helicoidal fan having a capacity of 8 to 9 cu. m. of air per second under a pressure of 15 mm. of water (⅝ in.) The ventilator is connected to the main gallery by a special passage which may be used as an entry to the main gallery for inspection. The fan serves to send fresh air after a test and to create a draft when it is desired to experiment on dust explosions in a current of air. To prevent breakage of the fan by an explosion, a strong valve has been provided, which was calculated to resist a force of 60 lb. per sq.in. with the usual coefficients of safety.

Coal Crushing Plant

Coal is crushed in a special room to produce the dust required for the experiments. At the rate of 450 grams (1 lb.) of dust per cu.m., about 600 kg. of coal will be necessary per test in the future 500 m. gallery.

Coal taken from the store is first broken by hand hammers and then fed to a ball-mill fitted with a 1.5 mm. screen, at the rate of 80 kg. per hour. The final crushing is done in an Alsing pulverizer, consisting of a cylinder fitted with a number of small 8x15 mm. steel bars and revolving at 45 r.p.m. The machine is fed from time to time with a charge of about 30 kg of coarse-crushed coal and allowed to revolve for some time, when one of the solid ends is replaced by a screen which prevents the escape of cylinders. The screen analysis made after 15 min. running gives an oversize of 35 per cent. on a 200 mesh screen and of 1.5 per cent only after a run of one hour.

Dust is distributed in the gallery by hand when it is desired to obtain the ordinary underground conditions. For other tests such as the study of phenomena of the propagation of the inflammation in a dust cloud made in advance, dust is fed regularly onto a belt conveyer at the rate required and thus delivered to a blast pipe which works as an injector. This pipe connects with the fan gallery close to the fan's outlet so that dust is spread in the air and brought into the test gallery. The valve is quickly closed down and an explosion may take place without damaging any machinery. A small 5-h.p. electric motor drives the crushing plants.

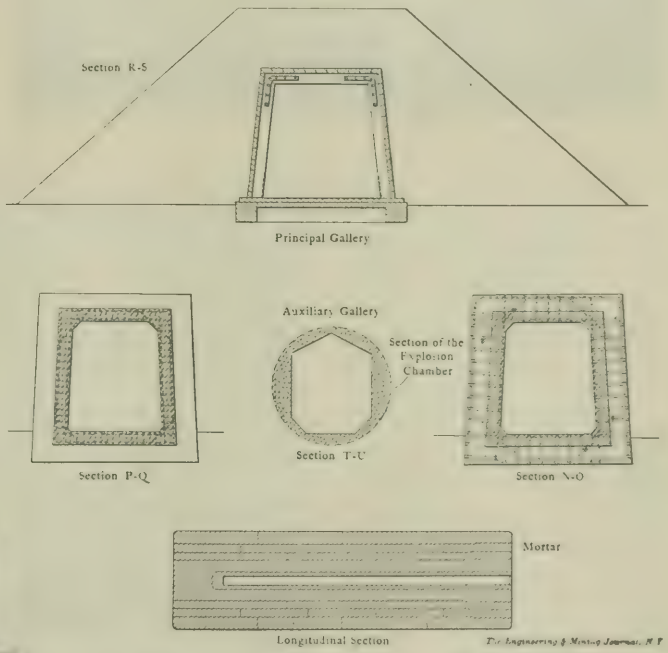


FIG. 6. SECTIONAL VIEWS OF THE EXPERIMENTAL GALLERIES AT LIEVIN

Cleaning the Gallery

After each experiment the gallery must be cleaned out. This is usually done by sweeping, while the fan is running, and the dust is thus transported to the ou-

side. When a more thorough cleaning is necessary, the men connect air hoses to an air main which is laid along the gallery, and they blow off, from every corner, the dust that might have deposited itself. The draft of the fan helps the dust out

Shooting

Shooting is done by explosives placed in shooting mortars with or without a firedamp explosion. The experimenting station at Liévin is equipped with two mortars, one with a hole 55 mm. diameter by 600 mm. long, able to bear an internal pressure of 48 tons per sq.in.; the other mortar has a hole 40mm. diameter by 1200 mm long, and is capable of resisting a pressure of 95 tons per sq.in.; this mortar weighs 1100 kg. The mortars may be placed anywhere in the gallery, or at the end of it amidst the timber beams which close it, being thus located to resemble a drill hole ready to shoot. In the case of firedamp explosions a special room is created in the main gallery by means of a diaphragm consisting of gas-tight packing paper on a wood frame. A proper mixture of air and gas is blown into the chamber through the top of the gallery, an outlet is provided in the bottom.

The firedamp used in the experiments is taken from the underground works of the No. 3 shaft of the Mines de Liévin at a depth of 520 m through a pipe 1000 m long. The average volume received per 24 hours is 75 cu.m. of gas assaying 85 to 93 per cent of CH_4 with a small percentage of oxygen and CO_2. The gas is stored in a 300-cu.m. gasometer and in a smaller one of 25 cu.m. capacity. This latter is fitted at the top with a water tank, which can be filled more or less, in order to give the gas any desired pressure. Firedamp is delivered at the rate required through a perforated pipe. The gas is delivered in due proportion to produce the mixture aimed at. The volume of the mixture is measured

Observatory; Recording Appliances

Detonations are always caused by an explosive with electric firing, the magneto being placed in the observation room. Horizontal glass slits placed at eye level are the only windows of this room facing the gallery. They allow a good examination through the windows of the gallery.

To measure the maximum pressure which takes place during an explosion, the compression of a small copper cylinder or "crusher" between a piston and a thrust is measured with an accuracy of 1/100 mm. For small pressures the copper cylinder is replaced by a lead sheet into which a steel ball penetrates. Standard tables give the corresponding pressures. A registering chronograph of Professor Weiss' system is under erection; this instrument will be used to measure the speed of the inflammation. It consists of a drum revolving at a uniform speed which registers the vibrations of a diaphragm, and a set of electric signals which will correspond to the time when the flame passes at known points of the gallery.

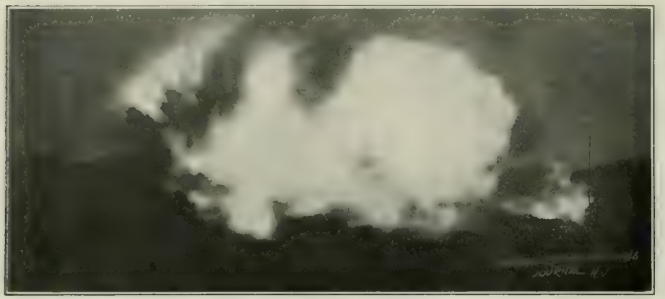


FIG. 7. SHOWING DUST EXPLOSION. THE FLAME EXTENDS FROM MOUTH OF MAIN GALLERY

Auxiliary Gallery

The erection of a second gallery was made necessary by the many experiments the station has to carry on, and the long time lost in cleaning the main gallery and spreading the fresh dust. In the present 65-m. gallery, three experiments can hardly be completed each day. When the 500-m. gallery is finished, the delays between two consecutive experiments will be still longer.

This auxiliary gallery is used mainly to study the safety of explosives in the presence of firedamp and dust. It is half underground and consists of the cylindrical bodies of three old boilers about 2 m. diameter, and has a total length of 15 m. The first boiler is still fitted with one of its ends which forms the end of the gallery. It leans against two strong, solid walls to prevent the drawing-back effects, and is fitted inside with reinforced cement to protect it against the explosions and to bring its cross section to an area of 2 sq.m.; this provides the same conditions

FIG. 8. INTERIOR VIEW OF THE GALLERY OF REINFORCED CEMENT

as exist at the experimenting stations of Frameries and Gelsenkirchen.

Lamp Tests

Lamps are tested in a pipe where the firedamp mixture is blown in, so that conditions will be similar to those obtaining in deep mines where the atmospheric pressure increases. It consists of a rectangular metallic pipe 12x6 in. which can revolve around a horizontal shaft. A mixing apparatus is fitted on the shaft and includes three valves. The intermediate valve is drilled with oblique holes which cause air and gas to converge. A blind valve moves upon the previous one and regulates the delivery. The back valve drilled with holes corresponding to the air holes of the intermediate valve regulates the percentage of air in the mixture. An outlet valve in the tube provides for the maintenance of a pressure higher than the atmospheric pressure. This apparatus is placed outside the observation room before a special window, while the valves are operated from the inside.

Sundries

A duplex-Rateau-turbo compressor supplies the whole plant with the necessary compressed air. It is actuated by a 20-kw. motor at a speed of 3000 r.p.m. When working in series the two turbines are able to give a pressure of 5 ft. of water. The capacity of the set is over 750 liters per second with 30-in. water pressure. An electric pump for the small gasometer and the gas and air mixer referred to above complete the machinery of the main building. A transformer and switchboard form the electric equipment to bring the 5000 volts tri-phase current down to 110 volts. A well equipped laboratory has been installed in the main building.

I would not close my article without thanking the Comité Central des Houillères de France and Mr. Taffanel for their courtesy in allowing me to make this extract of the pamphlet they issued about the Station d'Essai de Liévin, for the Engineering and Mining Journal.

Using Mine Water as Motive Power

By D. T. Pierce*

There are many mines with wet shafts, in which a considerable amount of water has to be collected and pumped out, but there are probably few cases in which the water falling down the shaft has been utilized for driving machinery underground. Under these circumstances the experience of the Bowhill Coal Company may prove interesting to those who have a similar set of conditions to contend with.

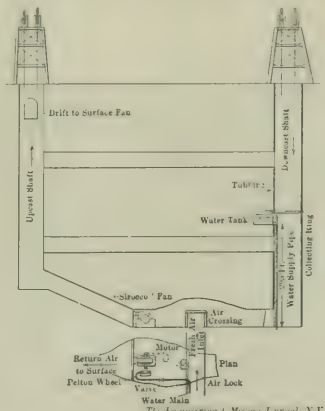
The circumstances leading up to the introduction of water as a source of power in the mine in question were these:

Some time ago R. A. Muir, the general manager of the Bowhill Coal Company, found that the surface fan was not capable of providing sufficient ventilation on the lowest of the three working levels, and on measuring the resistance at each level he discovered that the highest resistance existed in the bottom seam. He therefore concluded that if this could be reduced it would ease the drag on the surface fan.

Aiding Ventilation by an Auxiliary Fan

To meet the demands of the case, he decided to install an auxiliary fan to deal with the entire ventilation of the bottom seam, and to allow for development, a 60-in. diameter double inlet "Sirocco" fan was installed, capable of dealing with from 60,000 to 90,000 cu.ft. of air per minute at from 1 to 3 in. water gage.

To collect the water falling down the



The Engineering & Mining Journal, N.Y.

SHOWING GENERAL ARRANGEMENT FOR USING WATER AS MOTIVE POWER

downcast shaft, the tubbing was cut, and a ring fitted round the shaft, which conveyed the water to a tank placed in a lodgment especially made for the purpose. A pipe was then taken from the tank to the bottom of the shaft, giving a head of 295 ft. which was utilized to drive a Pelton wheel of 4 ft. 6 in. diameter, various sizes of nozzles being supplied to give the speeds required for the different duties.

As electric power is also available in the mine, provision was made for driving the fan by belt from an electric motor, in the event of the water supply failing for a time, but although the plant has been running for some little time, it has not yet been found necessary to use the electric motor, as the water supply has been quite sufficient.

Should it be necessary to stop the fan at any time, a by-pass valve is arranged, which allows the water to be discharged into the sump, from which the main pumps draw their supply.

The accompanying sketch shows clearly the general arrangement of this unique plant.

*Tribune building, New York.

Coalfields of Colombia

According to a recent report of the United States Consul-General at Bogota, the coalfields of the Republic of Colombia are well situated to take advantage of the markets which will be made available by the openng of the Panama canal. There are at present three routes by which the coal can be sent to the canal: 1. From the Rio Hacha and Santa Marta fields to Colon, across the Caribbean sea, 500 miles. 2. Darien to Colon, 200 miles. 3. Buenaventura, on the Pacific to Panama, 400 miles. When the mouth of the Magdalena is opened for steamers and the navigation of the river improved, coal may be exported by this additional route. No geological survey has ever been made of the Colombian coalfields, but the known measures are given as follows: 1. Bogota coalfield. 2. Tequendama, south of Bogota. 3. Zipacon, west of Bogota. 4. West side of the Magdalena. 5. Subachoque, near where the Pradero Iron Works are established. 6. Cajica. 7. Government mines at Yapaquira, where there are large beds of rock-salt. 8. Nemocan mines, private and government. 9. Sequile and Guatavita. 10. Sueboa. 11. Pacho Iron Works and coal deposits. 12. Outcrops at Ubate, Fuquene, and Valez. 13. Tunja, Sogamoso, Santa Rosa de Viterbo and Gambita. 14. Department of Santander. 15. Cucuta district. 16. Magdalena district. 17. Santa Marta district. 18. Llanos. 19. Popayan. 20. Cali, to be operated by the Pacific railway. 21. Between Cali and Cartago, and in the Cauca Valley. 22. Choco and Darien. The means of communication in Colombia are inadequate. There are twelve short railways, none of them over 70 miles in length, but several traverse coalfields. The navigable rivers are only suitable for vessels of light draft. The lower Magdalena is navigable for about 600 miles, and the upper river, at times, for about 100 miles.

The output of fluorspar in the United States during 1908, according to statistics collected for The Mineral Industry, was 39,389 short tons, valued at $212,647, which is to be compared with a production of 36,350 short tons, valued at $202,736, in 1907.

Only 17,000 flasks (75 lb.) of quicksilver, valued at $805,000, were produced in the United States in 1908. As usual California furnished the greater part of the total output. In 1907 the production was 20,932 flasks valued at $868,678. These are the figures of The Mineral Industry.

Coal Mining Methods at Gary, West Virginia

Mines of United States Steel Corporation Claim Distinction of Being Safest Operations in the World. No Explosion Fatalities in 18 Years

BY JOHN S. WALKER*

The United States Steel Corporation, in its search for a high-grade coking coal, to meet the constantly increasing demands of its numerous plants, some years ago leased 50,000 acres in McDowell county, at the southern extremity of West Virginia. These holdings are on the line of the Norfolk & Western railway, about 10 miles from Welch, and are in the Pocahontas field, along the Tug river and Pinnacle creek.

In 1902 prospecting and development were begun under the name of the United States Coal & Coke Company. The property was thoroughly tested with diamond core drills, to prove the thickness and continuity of the seam, and to determine the best location and method for openings. The town of Gary was established as headquarters and shipping point, and under the direction of Edward O'Toole, general superintendent, and H. N. Eaven son, chief engineer, a thriving community has been installed in this mountain wilderness.

There are now 12 mines in operation, all fully equipped with the most modern and efficient machinery. During April of this year the production averaged about 9000 tons per day. If this coal were all mined from one spot or working face, it would cover one acre in area per day.

At 8 mines, the company has erected large blocks of beehive coke ovens, numbering 2151 in all. About half the coal is made into coke at Gary, the remainder being shipped raw and coked at its destination. Most of the product is sent to the Illinois Steel Company's works at Joliet and South Chicago, Ill., while a portion goes also to Sharon, Pennsylvania.

System of Mining

The company mines the No. 3 and No. 4 Pocahontas seams, which range from 4½ to 8 ft. in thickness. The coal is medium hard, and nearly level, and is overlaid by slate, providing fairly strong roof. The mines are all worked from the outcrop, on the drift principle, except mine No. 1, which is reached by a shaft 180 ft. deep. The method of operation is practically the same in all the mines, with slight variations to suit local conditions, and is shown by the accompanying sketch of a part of No. 1 mine. The rooms are turned on 60-ft. centers, giving a 40-ft. pillar and a 20-ft. room. The entries, room necks and breakthroughs are 12 ft. wide. Props are set in the rooms from 8 to 10 ft. from the face.

The entries are usually driven in a series of four, but sometimes five parallel headings are driven to secure proper ventilation. All permanent overcasts and stoppings are built substantially of concrete, and heavy barrier pillars are left to eliminate danger. About one-third of the coal is at present mined by machines, or

FIG. 1. TOWN OF GARY, WEST VIRGINIA, SHOWING NO. 3 MINE AND COKE OVENS OF THE UNITED STATES COAL AND COKE COMPANY

*Huntington, W. Va.

70,400 tons out of the 210,400 produced in April, 1909; this percentage is being steadily increased by the installation of additional mining machines. The management first installed machines in the fall of 1906, to enlarge the production during a period of labor scarcity. Mining machines of various patterns were tested, and the Sullivan class "C E" continuous-cutting electric chain type was finally adopted as standard, owing to its high cutting capacity and ease of operation.

These coal cutters, of which the company has now over 30, make a cut 6 ft. 7 in. deep, and 5½ in. high. They are designed to mine from left to right or from right to left, depending on the location, in the room, of the track. The armatures are wound for the uniform underground current of 250 volts. The accompanying photographs taken in No. 3 mine, show these machines, and several stages in their operation. It will be noted that after the rib cut is made, the rear half of the frame is uncoupled, and the jacks set in opposite corners of the room. The machine then travels across the face like a longwall cutter, under its own power, making a continuous mining. This type occupies less than 6 ft. at right angles to the face of the coal, so that it is unnecessary to take down and replace props to permit its passage. The small space occupied by the machine also makes lighter work for the loaders.

These machines are used for driving entries, room necks and breakthroughs as well as for rooms. They are moved from place to place on self-propelling trucks, and perform all operations of loading, unloading, etc., under their own power. The cutting is all done at night and the loading during the day shift. This arrangement prevents interference of coal loaders with machines as they go from place to place, and at the same time gives both the machines and the electric haulage locomotives plenty of current at all times.

The average work during April for 27 machines was 7½ places, or about 120 tons per machine per 10-hour shift, although some individual records made were much in excess of this average. The coal not mined by the machines is undercut by hand pick. The standard mine car used is of wood or steel, holding 93 cu.ft., and running on 40 and 60 lb. steel rails on main haulage roads with a 48-in. gage. As stated above, haulage is by electric locomotives of several types.

FIG. 2. COKE OVENS AT THE NO. 1 MINE OF THE UNITED STATES COAL AND COKE COMPANY

FIG. 3. GENERAL OFFICE OF THE UNITED STATES COAL AND COKE COMPANY

FIG. 4. SHOWS THE "SUMPING" OR "RIB" CUT. IN THIS CASE THE CUT IS ABOUT TO BE MADE IN THE LEFT-HAND CORNER OF THE ROOM, PRIOR TO CUTTING FROM LEFT TO RIGHT

Surface Plant

Figs. 7 and 8 show the tipples at the No. 6 and No. 7 mines, which structures are typical of those in general use. The later tipples are built of steel, with modern devices for handling the coal as it comes from the mines. Coal for the ovens goes through crushers and then into large storage bins, from which the coke larries are charged.

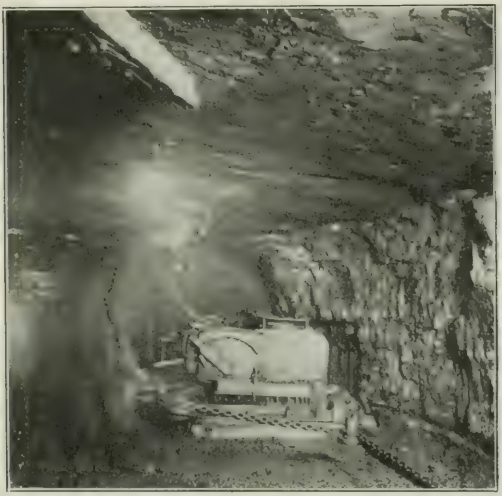


FIG. 5. SHOWS THE MACHINE PART-WAY ACROSS THE FACE, CUTTING FROM LEFT TO RIGHT

FIG. 6. THE MACHINE IS UNLOADED FROM THE POWER TRUCK, OR IS PUT ON IT, BY ITS OWN POWER

FIG. 7. NO. 6 TIPPLE AND CHUTE OF THE UNITED STATES COAL AND COKE COMPANY

FIG. 8. NO. 7 TIPPLE OF THE UNITED STATES AND COKE COMPANY

At each tipple there are also steel chutes for loading into the railroad cars. The ovens are equipped with large doors and wide yards to permit the use of coke drawing machines. Levels of these are used, pulling about 65 per cent. of the coke from the company's ovens.

Power Equipment

The central power plant from which all the 12 mines are operated is at Gary, adjoining mine No. 3. The boiler house contains nine horizontal water-tube boilers, giving a total horsepower of 3800. The furnaces are charged automatically by underfeed stokers, supplied from overhead steel bins.

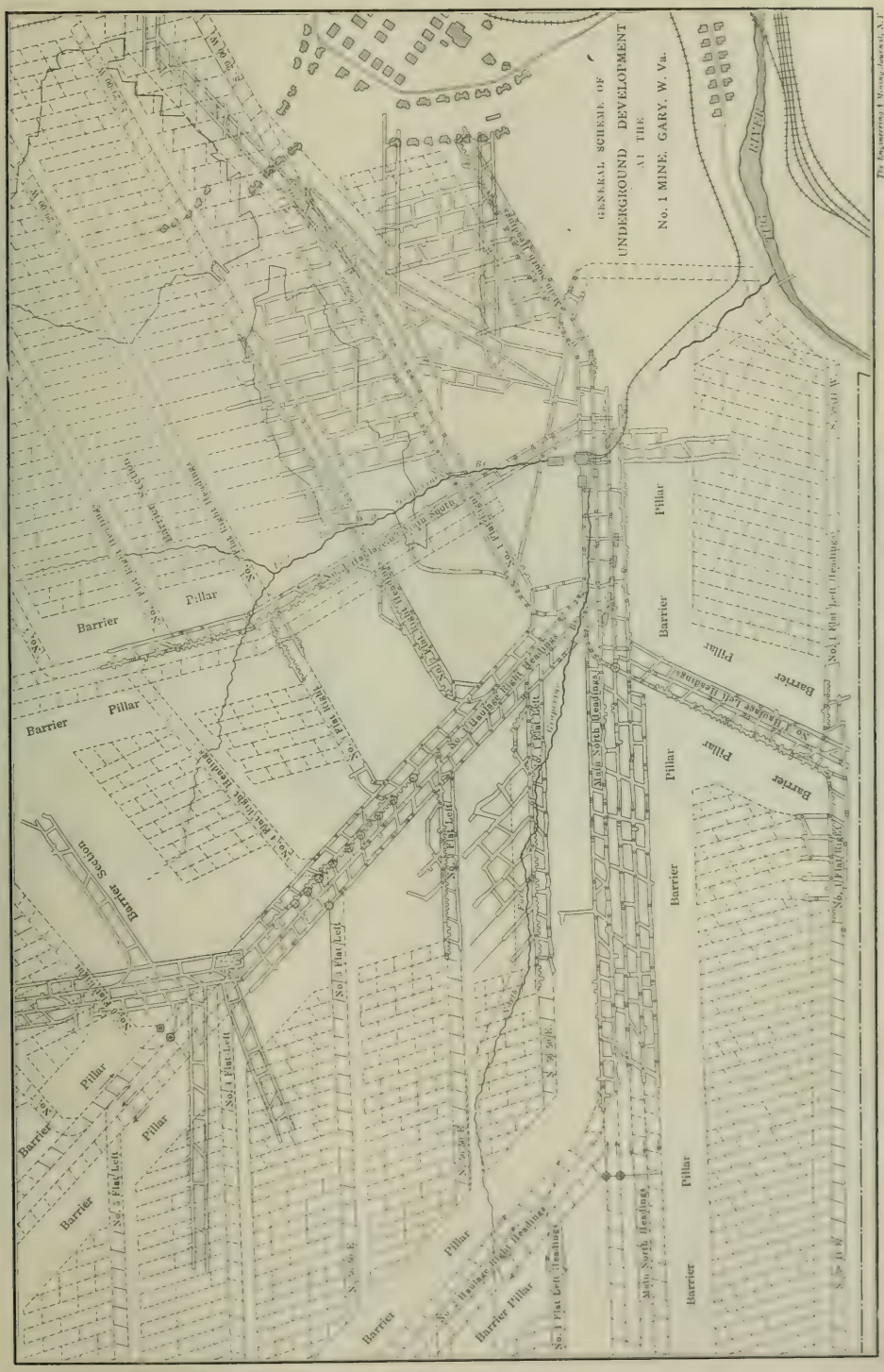
Generators

In the engine room are two 400-kw. generators, and two 750-kw. generators, direct-connected to cross-compound Harrisburg engines, and two 750-kw. generators, direct-connected to Corliss cross-compound engines, also one 1000-kw. low-pressure and one 1000-kw. high-pressure turbo-generators, the former taking its steam supply from the reciprocating engine exhausts.

These mines generate three-phase, 25-cycle alternating current at 6600 volts, which is transmitted to substations at each mine, and there altered to 275-volt direct-current for the mining machines, pumps and locomotives, by rotatory converters and transformers.

The machine and forge shops are well equipped with modern tools for electrical and machine repairs, insuring the rapid and economical work essential for a large industry such as this, far from a source of supply.

The company's offices, general store, power station and shops are large, permanent stone buildings, with ample provision for growth. About 3000 men are employed at the various mines, including a construction force of 300. The employees include Americans, foreigners of several nationalities and negroes, who live


GENERAL SCHEME OF
UNDERGROUND DEVELOPMENT
AT THE
No. 1 MINE, GARY, W. Va.
TUG RIVER
Barrier
Pillar
Barrier Section
No. 1 Flat Left
No. 1 Flat Right
No. 1 Haulage Left Headings
No. 1 Haulage Right Headings
Main North Headings
Main South Headings
The Engineering & Mining Journal, N.Y.

to a large extent in substantial houses built and owned by the company.

The town of Gary is well paved, lighted, and has excellent water and sewer systems and fire protection.

The U. S. Coal and Coke Company enjoys the distinction of being considered by the State mine authorities one of the best equipped and safest properties in West Virginia. It is interesting to know that under the administration of Thomas Lynch, president of this company as well as of the Frick Coal and Coke Company, a remarkable record of freedom from accident has been made. During the year 1907 the mining under his administration produced over 80,000,000 tons of coal, ranking them as first among the coal-mining industries of the world. In 18 years these mines have not lost a life by a gas or dust explosion.

At Gary all the properties are supplied with a carefully drawn set of rules regarding the ventilating and sanitary conditions of the mines. These are printed in seven or eight languages in large type, and posted in conspicuous places. Particular attention is called to the necessity for careful handling of powder. It is required that not more than a certain number of men shall work in any one air current, and that the current shall not fall below a stipulated velocity or a quantity of 10,000 cu.ft. per min. at any point throughout the entire mine workings. The mine foreman, assistant mine foreman and minor officials are paid premiums each month during which no one under their instruction is seriously injured. Since the adoption of this method accidents of all classes have been reduced more than one-half.

Premiums are also paid to the superintendents who keep their plants in the best and neatest order, also to householders for the best kept yards and gardens. In the main office at Gary a set of rescue apparatus is installed for use at the various mines in case of emergency. The records show that in spite of the fact that the country being developed is entirely new, and the subordinate officials are often strange to their positions, the number of accidents occurring, in proportion to the miners employed, is the lowest, not only in the State, but in any other State or in any foreign country. As was noted above, all the coal in these mines is undercut before being shot. No shooting from the solid is permitted and men are employed to see that the coal is properly mined before shooting, thus eliminating the great danger to life from shooting off the solid, to say nothing of the amount of smoke done away with.

The haulage roads are built with plenty of room on the right side for cars to pass, and the roads are kept perfectly clean and free of débris on both sides. One of the parallel entries is a traveling road, free of trolley wires and other equipment so that employees are not required to go to and from their work in the haulageway. Nevertheless, refuge stations are opened every few feet on the haulage road, together with openings, leading into the independent manway.

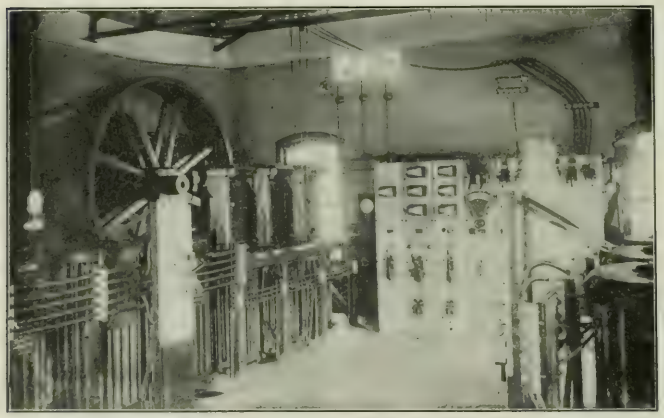


FIG. 9. POWER HOUSE TRANSFORMERS AND SWITCHBOARD AT THE GARY PLANT OF THE UNITED STATES COAL AND COKE COMPANY

Coal Mining in Alberta, Canada

SPECIAL CORRESPONDENCE.

The following are official statistics relating to coal mining in the province, in 1908, with those for 1907 in parentheses: Number of mines in operation, 112; new mines opened, 19 (35); old mines reopened, 2 (2); mines abandoned, 6 (6); coal mined, 1,845,000 (1,834,745) tons; coke produced, 75,057 (73,782) tons; coal briquets produced, 36,261 (40,585) tons; average number of persons employed inside the mines, 2681 (2700), outside, 1099 (900); number of fatal accidents, 11 (19), nonfatal, 51 (86). Of the coal produced, 584,334 (639,335) tons was lignite; 1,011,571 (939,295) tons was bituminous; and 249,095 (256,115) tons was anthracite. Coal used in making coke was 128,397 (112,887) tons.

THE PROVINCIAL INSPECTOR'S REPORT

The provincial inspector of mines reported: "The year 1908 has shown a steady development in the mining industry of the province. Trade conditions, which have been unfavorable all over the country, have had a considerable effect on the coal business. There is only a slight increase in coal production as compared with 1907, but the increase would have been much greater, judging from the development at the mines, had trade conditions been better.

"Coal is being mined in the south of the province, practically from the eastern to the western boundary. In the West we have extensive mines producing bituminous coal of both coking and steam varieties, while as we leave the mountains and come on the prairie, toward the East, we find high-grade lignite coals. On the main line of the Canadian Pacific railway west of Calgary we have the Canmore mines, producing a high grade of steam coal, and the Bankhead mines, producing a good grade of anthracite coal. In the Edmonton district there are numerous mines, which supply the local demand and also ship a considerable quantity of coal to the towns along the Canadian Northern and Canadian Pacific railways.

THE USE OF SAFETY LAMPS IS REQUIRED

"The policy adopted by the department requiring the use of locked safety lamps in mines where there is any danger of explosion from gas or dust has been enforced throughout the province, and the inspectors are finding less and less opposition to the introduction of safety lamps, as the operators in most cases are not slow to realize that the use of safety lamps tends to lessen the danger from explosions. . . . The past year shows a considerable decrease in the number of accidents."

It is noteworthy that production of coal has increased from 811,228 tons in 1905 to 1,845,000 tons in 1908. The detailed report of the inspector shows a considerable improvement in mining machinery and appliances. The official expectation is that "the increased railway mileage now in sight in the province coupled with the steady increase in population, will necessitate in the future a steady increase of tonnage produced, and this with the passing away of the recent financial depression gives a reasonable ground for the prediction that the coal output during 1909 will be much greater than it was during 1908."

Genesis and Development of the Coking Oven

Although Recently Much Skill Has Been Exercised in Perfecting Details the Main Features of the Modern Oven Were Used before 1860

BY W. GALLOWAY*

The preparation of coke from pit-coal appears to have been practiced for at least 250 years. It was probably first begun owing to the increasing difficulty of procuring supplies of timber for making charcoal for metallurgical, malting, and other purposes in which the more easily obtainable, and therefore cheaper, coke was substituted for the more expensive charcoal. To commence with, and for many years afterwards, in fact far into the last century, coke was for the most part made in exactly the same way as charcoal.

Large coal was stacked in circular or oblong piles in the open, partially or wholly covered over with a wet layer of fine coke-dust (Fig. 1), and with certain channels (*c*, Figs. 2 and 3) for the passage of air formed in them just above the level of the ground, and extending from their periphery to one or more vertical chimneys (*a*, Figs. 1, 2, and 3) or holes (*b*, Fig 3) in their center. The circular piles were from 15 to 20 ft. in diameter and 3 to 3½ ft. high; the oblong piles 12 to 18 ft. wide, 3 to 3½ ft. high, and 30 to 50 ft. long. The ends of the air-channels next to the periphery were sometimes formed with inverted cast-iron troughs with holes in them (Fig. 2 B); their ends next to the chimneys (*b*, Fig. 2) with the largest blocks of coal, and their intermediate parts (*c*, Fig 2 A) with "dry" bricks.

The chimneys had cast-iron lids with handles (Fig. 1) for closing them airtight when required. Ignition was effected at the bottom of the chimneys, or vertical holes, by dropping burning coal and pieces of wood down through them; and the fire gradually spread from the center towards the periphery, or in the opposite direction to the air-currents. Care was taken to keep the mantle of damp coke-dust as air tight as possible while this was going on, and when smoke ceased to issue from the chimneys or holes all openings were sealed up and the heaps allowed to cool. The whole operation lasted about a week or eight days; and, so far as one can gather, the yield of coke appears to have amounted to from 45 to 55 per cent. of the quantity of coal employed.

The First Ovens for Coking Coal.

Ovens for coking coal are first mentioned in the latter half of the eighteenth century. In 1773 Horne and in 1782 the Earl of Dundonald obtained patents for the recovery of the by-products obtainable from coal coked in closed vessels or chambers. The Dundonald patent provided for the admission of a restricted and regulated supply of air to the interior of the chamber for the purpose of creating sufficient heat to carry on the process of distillation by the partial combustion of the gases. From that time forward, ovens

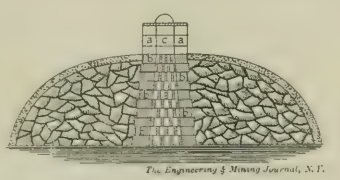


FIG. 1. EARLY METHOD OF STACKING THE COAL IN A CIRCULAR PILE

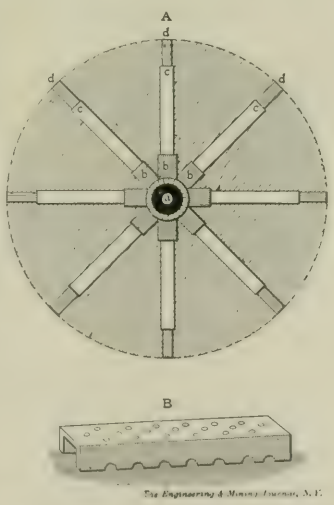


FIG. 2 SHOWING PLAN OF COAL PILE, AND INVERTED TROUGH

worked upon the Dundonald principle (but, except in rare cases, without arrangements for the recovery of the by-products) have been in constant use. The more ancient ovens were circular, elliptical, or ovoid in plan, with a dome or cupola for a roof, and were known as bakers' ovens; the more recent, square or trapezoidal, with a cylindrical arch for a roof.

One of the former, depicted by Scheerer, is shown in Fig. 4. It was provided with an air-passage, which entered the masonry on each side of the doorway *o' o'*, passed all round about the chamber as shown, and was connected with its interior by branches *o*; a circular outlet *b* for the products of combustion, which was probably also used for introducing part of the charge; and a cast-iron door *t*. Its vertical walls were from 2½ to 3½ ft. high, in some cases more; and its diameter or other dimensions varied from those required to accommodate a charge of 1½ tons up to those required for several tons.

Each oven was provided with a doorway at one side or one end, with an outlet for the gases in the top, and with one or more inlets for air. The charge was introduced through the doorway, or partly through the doorway, partly through a hole in the roof, and both of these openings were afterwards more or less completely closed.

The escaping gases passed into a short chimney and thence into the atmosphere Circular ovens of this class, known as Beehive, have persisted up to the present day. The coke was drawn out through the doorway by means of a long iron rod bent into the form of a ring at one end to serve as a handle, and at right angles to itself at the other to serve as a hook.

The time required for coking varied from 48 to 72 hours, according to the magnitude of the charge; and the yield of coke varied from 50 to 65 per cent., according to the quality of coal and other circumstances. Many of these ovens produced a very fine, much-prized, quality of coke. After a charge had been drawn out, the walls, as a rule, retained sufficient heat to ignite the following charge, which was introduced as soon as possible.

The work of drawing the hot coke out through a narrow doorway, in an oven of any shape whose diameter, or width, is greater than that of the doorway, is, as can be imagined, a most laborious and exhausting operation. This consideration led to the construction of rectangular ovens of greater length than width, with a doorway of the full width of the oven at one end, and later, as will be seen further on, with a doorway at each end. When ovens of this shape with a doorway at one end—some of which are still in use—are about to be charged, an iron frame—frequently made of two pieces of old permanent-way rail, one as long, the other nearly as wide, as the oven, one end of the longer bar fixed at right angles to the

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NOTE—A paper read before the South Wales Institute of Engineers, Jan. 20, 1909

*Mining engineer, Cardiff, Wales.

middle of the shorter bar, and its other end provided with a strong link—is pushed in along the floor until the cross-bar touches the back wall.

Methods of Drawing the Charge.

The charge is then introduced and coked in the ordinary way. When the coke is ready to be drawn out, the door is removed, the charge is cooled with water inside the oven, a hook, at the end of a chain which extends from a windlass at the opposite side of the coke-bank, is passed through the link at the outer end of the longer bar, and the charge is drawn out on to the coke-bank in one block. With longer rectangular or trapezoidal ovens, which have a door at each end, the charge is pushed out by means of a ram with a shield at one end, and cooled with water, partly as it emerges from the oven, partly after it has fallen in pieces on the coke-bank.

These appliances for drawing and pushing out the coke were introduced between the years 1850 and 1860. They are referred to by Hartmann, who wrote on the subject of coking in 1858, but not by Scheerer, who wrote in 1846. They are both still in use; but trapezoidal ovens with a door at each end are rapidly superseding those with only one door; and consequently the ram is coming into practically universal use, except, of course, in the case of beehive ovens.

Up to the year 1840 no attempt appears to have been made to apply heat generated by the combustion of the gases to the outside of the oven walls with the object of coking the charge in its interior. At that date Cox obtained a patent for an oblong rectangular oven, with two cylindrical arches over the coking chamber, one above the other, with an empty space between them. The lower arch extended from the back to near the front, where it terminated, leaving a communicating passage between the space below it and the space above it, and air was admitted through holes in the back walls into the space between it and the top of the charge.

The products of combustion thus passed from back to front under the lower arch, then up into the space between the two arches, then back over the lower arch into the flue, and so up the chimney. This appears to have been the first attempt made to increase the heat of the chamber by circulating the hot gases on the outer side of one of its walls.

It would be difficult to trace the exact course of events during the next 20 years, but the following extract, translated from the writings of a contemporary writer, will serve the purpose of throwing some light upon it.

Writing in 1858, Hartmann[1] says: "Improvements in the processes of coking have, during recent years, been the object of many experiments and investigations, in Belgium and Rheinland, which are not yet terminated. . . . . The object of these improvements has been to produce better coke, to reduce the time required in coking it, and to obtain a greater yield, so as to be able to compete with English coke, which is made of the best materials and is of exceptionally good quality.

"In the whole of these investigations one principle, whose practical application has been sought for in many different ways, has been steadily kept in view, namely, to employ the waste heat in order to effect the distillation of the charge. . . . . It stands to reason that this object can be effected only by means of more or less complicated apparatus.

"In all these improvements the main problem has been to prevent the consumption of coal through contact with air outside the oven, and to subject every part of the oven to a uniform temperature . . . This object was sought to be attained in Belgium by the construction of ovens of very small dimensions, and by associating a number of ovens together in one system, in which the waste heat of one oven could be employed in heating the coal newly charged into another oven . . . This was effected by conducting the gases through flues below and in the side walls of the ovens, and extracting as much heat from them as possible before allowing them to escape into the air.

"It must be remarked in this place that the actual *combustion* of the gases was not contemplated, except in the case of a few ovens. At first, apparently, the contact of the hot gases with the walls of the ovens was all that was thought of, although it is obviously in the combustion of these gases that their greatest heating power lies; and in the case of most ovens, even now, without this being the intention of their constructors, combustion takes place by the leakage of air through the open joints of the brickwork at the ends of the horizontal flues . . . The Talbot and Dulait ovens constitute an exception to this rule, as provision is made in both for the complete combustion of the gases.

"The construction of the flues in detail can naturally be carried out in many different ways: for instance, ovens have been placed one above the other, one alongside the other, or end to end, or two or three ovens, or a whole row, have been built in a range, and so on.

"This principle was obviously carried too far in Belgium, as is best illustrated by the greater simplicity recently introduced in the suppression of many of the flues whose useful effect upon the ovens did not appear to compensate for their great cost.

"Nevertheless, heating the floor and side walls of the ovens by means of the waste heat must continue to be the guiding principle in all cases."

After expressing himself thus, Hartmann proceeds to compare the results of coking coal in the newer with that of coking it in the older ovens, and draws the conclusion that the newer ovens are really cheaper in first cost than the older ones, since they occupy less space and yield a greater quantity of coke than is necessary to compensate for their higher first cost.

During the years of experiment and investigation spoken of by Hartmann, the

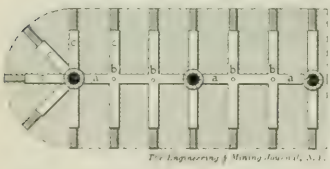

FIG. 2 GENERAL ARRANGEMENT OF OBLONG PILE, WITH AIR-CHANNELS

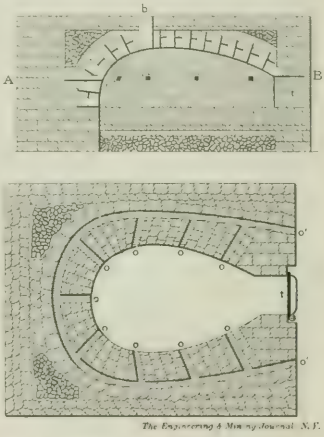

FIG. 4 GENERAL DESIGN OF ANCIENT OVEN WITH CUPOLA ROOF

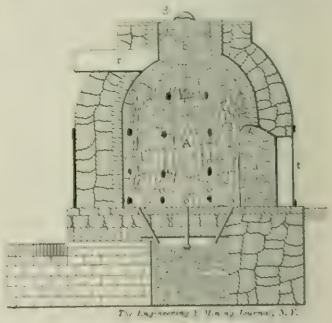

FIG 5. EARLY TYPE OF GERMAN OVEN WHICH RECOVERED THE VOLATILE PRODUCTS

[1] Hartmann *Die Aufbereitung und Verkokung der Steinkohlen* (1858), p. 137

retort-oven proper was thus evolved and brought into active use, and all the improvements that have been added to it since then have been simply modifications in its structure and dimensions.

An Early Type of Oven which Enabled the Recovery of the Volatile Products.

Writing in 1846,[1] Scheerer described certain coking ovens in use at that time at some of the ironworks in Germany (Gleiwitz in particular), from which the volatile products were led away in pipes to condensers for the purpose of recovering a certain quantity of tar from them, which could be usefully employed on the spot (Fig. 5).

Each oven stood alone, was cylindrical to about two-thirds of its hight, and was covered in by a hemispherical dome. It had a doorway *a* on one side, extending from the floor to about one-half of its internal hight; a second circular opening *b* in the dome, of a little less than one-half its diameter; an outlet-pipe *f*, say 9 in. in diameter, extending horizontally through its walls from the apex of the dome, on the side opposite to the door, to the condenser; five rows of holes *o o*, equally spaced radially round about its periphery, all the holes of each row being in the same horizontal plane, the lowest row close to the floor, the highest row near the apex of the dome, and the intermediate rows spaced equally between the highest and the lowest; and lastly some similar holes in its floor, communicating with a space excavated for this purpose below the latter, into which air could be drawn from the outside. Each of the holes *o o* in the sides and floor was formed by building a cast-iron pipe of 1½ in. internal diameter in the masonry.

The oven was charged, partly through the doorway, partly through the opening in the dome, with 35 to 40 cwt. of large coal. The largest pieces were placed next the floor and built together in such a manner as to enclose a hollow space into which fire could be introduced from the doorway. The charge extended up to the lower side of the outlet-pipe, and thus almost completely filled the oven. After the charge had been introduced, the doorway was then built up with masonry *t* to the level of the kindling hole, all the radial holes except those of the lowest row were closed with well-fitting plugs, and a cast-iron door *d* was placed on the hole in the dome and made air-tight. Soon after lighting the charge the upper part of the doorway was built up and luted with clay.

When the coal opposite the lowest row of holes showed an orange-colored glow, that row was plugged and the next higher one opened, and so on with the others. About 36 or 40 hours after ignition the time had arrived to plug the highest row. Then the oven was allowed to cool for 12 hours, the door was pulled down, and the coke drawn out and extinguished with water. The yield of coke is said to have been 53 per cent., but the quantity of tar obtained is not mentioned. This oven appears to have been a modification of Lord Dundonald's, and it would therefore be interesting to know whether it was in reality a survival from the closing years of the eighteenth century, when the patent for its use was granted.

In 1862 Pernolet[1] obtained a patent for an oven which he described as intended to "utilize the products of distillation of coal so as to reduce the price of coke," and in 1864 he read a paper on the subject before the Institution of Civil Engineers. It was a beehive oven into which no air was admitted; the heat was applied only underneath its floor; the volatile products were conducted in pipes to condensers and scrubbers, in which the tarry matters and ammonia were separated from the permanent gases; the latter could then either be used for lighting purposes or returned to the ovens and burnt in the flues beneath them—or partly one, partly the other. The quantity of gas thus obtained was obviously thought, or found by experience, to be insufficient to generate all the heat required, for each oven was provided, in addition, with a furnace and fire-bars underneath its floor, on which coke-breeze, waste coke, and, if necessary, small coal could be burned so as to supply the deficiency. Pernolet claimed that his ovens gave the following results:

Coke	69.3 per cent.
Tar	3.0 per cent.
Sulphate of ammonia (10 lb. per ton of coal)	0.44 per cent.

Mr. A. L. Stevenson[2] who employed thirty-six Pernolet ovens in the north of England for a number of years, and experimented with various modifications of ovens of the Pernolet type, says he found that the beehive shape, 11 ft. in diameter, gave the best results, namely:

Coke	68 per cent.
Tar	2.40 per cent.
Sulphate of ammonia (4.14 lb. per ton of coal)	0.185 per cent.

He remarks, further, that the coke was soft and the expense of repairs great, and that, as a consequence, the system was abandoned. He also states that he examined 120 Pernolet ovens employed at the Wigan Coal and Iron Company's works, and that they appeared to give somewhat better results than his own. A good many Pernolet ovens are said to have been erected on the Continent.

Not Many Improvements in Coke Manufacture Since 1800.

Enough has been said to show the genesis of the modern coking oven including its use as a retort and hence as a source of liquid by-products and gas; it would therefore serve no particular purpose, however interesting it might be from an historical point of view, to minutely describe the process of coking in circular and oblong heaps or piles. The Schaumberg kiln, Smet's, Appolt's, Talbot's, E. Jones's, and many other ovens now passed into oblivion, some of which have contributed one or more of the details of construction and methods of working embodied in modern practice. The long, narrow, high retort-oven, heated by the combustion of gas in its flues; the method of charging through holes in the top; the door constructed of fire-bricks held together in an iron frame, and raised and lowered by means of a chain; the ram for discharging the coke; the employment of the waste gases under steam boilers; and the condensation and collection of liquid by-products, were all in operation before the year 1860; and the last link in the chain—Pernolet's system of returning the noncondensable gases to the ovens, with the object of burning them in the flues beneath their floors, and thereby coking, or assisting to coke, the charge—was patented in 1862.

During the years that have elapsed since 1862 much skill and ingenuity have been exercised in perfecting the details of the modern coking oven, which is now gradually eliminating all its more ancient rivals from the field. The success of these efforts is best illustrated by the fact that in the most recent type of ovens the economy of heat is so great that after the tar and ammonia have been extracted only one-half of the permanent gas is required to coke the coal, and the other half is available for steam-raising or for use in gas-engines. The yield of these ovens per ton of coal coked is given by Mr Hann as follows:—

Coke	80.00 per cent
Breeze	1.75 per cent
Tar	1.63 per cent.
Sulphate of ammonia (19.5 lb.)	0.87 per cent

The first iron-blast furnace in South Africa was built at Sweetwaters, near Maritzburg, in Natal, some years ago, but was not successful on account of poor management. Now it is being repaired and is to be started up soon. Iron ore is found close by and limestone not far away. Coke made from Natal coal will be used as fuel.

In 1908, according to figures of The Mineral Industry, the United States produced 600 long tons of silicon worth $72,000. Statistics for earlier years are not available as the industry was in more or less an experimental stage.

The production of petroleum in Mexico in 1908 was about 4,000,000 bbl., compared to 2,000,000 bbl. in 1907.

[1] Lehrbuch der Metallurgie, Dritter Abschnitt: "Die Lehr von den Brennmaterialien" (1846), p. 325.

[1] Percy, Metallurgy—Fuel (1875).

[2] Transactions of the North of England Institute of Mining and Mechanical Engineers Vol. XXIV (1873), p. 6.

The Regulation of Gas in Mine-Air Currents

An Original Investigation, by Independent Interests, the Practical Results of Which Are Destined to Aid in Eliminating Coal-mine Explosions

BY JOHN G. SMYTH*

Probably the most important factor in operating coal mines successfully is the proper ventilation of the working places. In order to make the mine safe and to retain sufficient forces to keep up a large output, all working areas must be constantly supplied with fresh air in such quantities as to carry away all smoke, foul air and noxious and dangerous gases.

The mine laws of various States are specific in limiting the number of men that may work on each air current and the laws also state the minimum quantity of air per minute allowed per man employed. The fact is that while the majority of mines have greater total quantities of air circulating than the law requires, it is often the case that the total quantity is not distributed to the best advantage and certain splits carrying large quantities of gas may have the least air.

Wm. Hopton, an Englishman, claims the credit for originating the splitting of air currents to ventilate mines. Mr. Hopton writes that he understood the system of ventilating by separate currents of air as early as 1846. Before that time, air splitting was but little practised, if known at all. In 1857 an explosion occurred at the Lund-hill colliery, England, and 139 lives were lost. This mine had separate splits, but the system in use was crude. After this explosion Mr. Hopton published the plan of ventilation adopted at that colliery and also another plan showing how it might have been ventilated by separate currents or splits, and stated that if his scheme had been in use, the great loss of life would not have occurred. This statement and the published plan aroused the mining world. His system was ridiculed, he lost his situation as mine manager and it was not for several years that the merits of his system were recognized and put in successful operation.

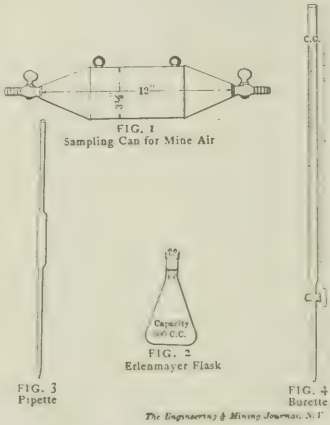

FIG. 1 Sampling Can for Mine Air

FIG. 2 Erlenmayer Flask

FIG. 3 Pipette

FIG. 4 Burette

Ventilating mines by separate splits is comparatively simple while there is plenty of air available and the individual splits do not have an excessive amount of territory to ventilate. But great care and attention are necessary after the mine workings become extensive. There is often a large abandoned area to keep ventilated in addition to the live workings, and in many instances so many splits are made that the quantity of air in each approaches the minimum quantity necessary to keep the territory in a healthy and safe condition. It then becomes advantageous to determine accurately which splits require the most air, so that a few thousand feet may be taken from one and added to another if necessary. In ordinary practice the amount of air in each split and in fact the entire ventilating system, is left to the judgment of the superintendent or mine foreman who often depends on the air dividing itself naturally.

If a mine gives off explosive gas, it is necessary to know the percentage carried in each split. If it is determined that one split having 12,000 cu.ft. of air carries 0.40 per cent. of gas, while another having 22,000 cu.ft. of air carries only 0.15 per cent., an adjustment can be made and more air turned into the split with the high percentage without seriously increasing the percentage of gas in the other. In certain mines in Europe, investigations covering the percentage of gas carried in the air currents have been made for years. In some mines the air from each split is analyzed daily and if the percentage of gas runs over 0.50 per cent. the quantity

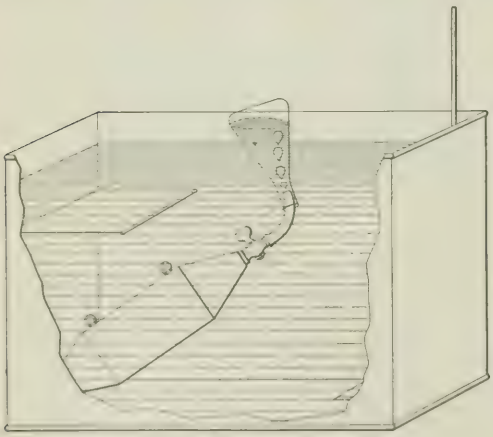

FIG. 5. METHOD OF FILLING FLASK WITH AIR

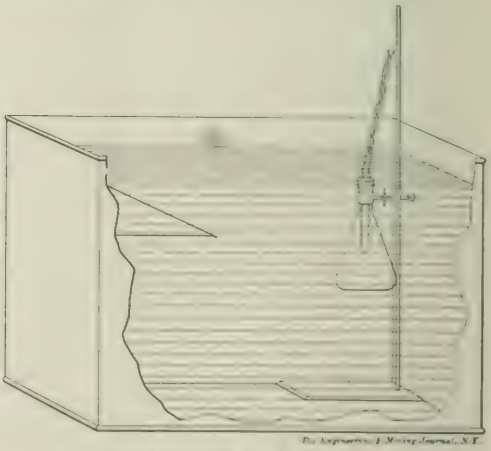

FIG. 6. BURNING CH_4 OF MINE SAMPLE

*Chief engineer, Fairmont Coal Company, Fairmont, West Virginia.

NOTE—Paper read before the West Virginia Coal Mining Institute, Elkins, W. Va., June 1, 1909.

of air is increased or some other means taken to reduce it.

Systematic Studies of the Fairmont Coal Company

Early in 1908 the Fairmont Coal Company began to make systematic studies of the air currents in its various mines and these have since become a useful and permanent feature of the operating department.

The investigations and reports cover the total quantity of air in circulation in each mine; the quantity in each split; the relative humidity of the outside atmosphere, the main intake, main return and the intake and return of each split; and the percentage of carbonic acid gas, CO_2, and methane, CH_4, in the main air currents and in each split.

The data are collected and the analyses are made by an inspector who is thoroughly familiar with the inside workings and the method of ventilation of each mine. Certain mines are visited weekly while others are inspected at less frequent intervals. It has been found practicable to visit a mine, take all air measurements, humidity readings and samples (in some instances there may be 10 or 12 splits), return to the laboratory and make the analyses and report in a day.

The instruments used in the mine are a water gage, anemometer, hygrometer and sampling cans. The first three are too familiar to need description; the sampling cans are hollow copper cylinders 3½ in. in diameter and 12 in. long, having stop cocks at each end, Fig. 1. Small rings are soldered on the sides by means of which a number of samples can be strung together and readily carried. These cans hold about four times as much air as is required for one determination so that duplicate analyses can be made from each sample if necessary.

Method of Securing Air Sample

The samples are taken at points selected in the return air courses, usually near the end of the return current in order to ascertain the maximum percentage of gas carried in the split. The volume of air passing is always measured at the same point. The can is full of water when taken into the current, and to take the sample both cocks are opened. The water runs out of one and the air enters the other; after all the water has run out the can is carefully sealed and labeled.

In making the analyses, Hesse's titration method is used to determine the percentage of carbonic-acid gas and methane, CH_4. The air from the can is introduced into an Erlenmayer flask of 300 c.c. capacity. This is a glass flask, Fig. 2, having a rubber stopper with two holes. The flask full of water is connected with a hose to the can containing the sample. The can and flask are immersed in a bath of water, the flask inverted, and the water in the flask is displaced by the air from the sample can (see Fig. 5). By means of a pipette, Fig. 3, exactly 10 c.c. of a freshly standardized barium hydroxide solution is introduced into the flask. A few drops of phenolphthalein are added to serve as an indicator. The phenolphthalein is an organic substance which has the property of becoming red in an alkaline solution, but in an acid solution it is colorless. The flask containing the barium hydroxide is allowed to stand until all the CO_2 is absorbed. This is then titrated by the addition of oxalic acid of known strength. The end point is shown by the reddish color disappearing and the solution becoming white or almost colorless. The exact quantity of oxalic acid used is read off the burette, and the difference between this volume and the volume required for 10 c.c. of barium hydroxide used, multiplied by its standard, gives the volume of carbonic-acid gas in the sample.

To determine the percentage of methane, CH_4, another 300 c.c. Erlenmayer flask is filled with the mine air and all the CH_4 is burned to CO_2 by means of an electrode, connected to an electric battery. The combustion takes place with the flask immersed in water, Fig. 6, to avoid breaking the flask. The platinum wire must be brought to a red heat and allowed to remain red hot for 10 min. to insure complete combustion. After the CH_4 is burned, the total volume of carbonic-acid gas is determined as before. The volume of carbonic-acid gas thus determined minus the volume contained in the mine-air sample originally, represents the additional volume of carbonic-acid gas formed from the combustion of the CH_4. Since the original volume of CH_4 equals the volume of CO_2 formed by the combustion, the percentage of CO_2 formed by the combustion represents the percentage of CH_4 in the sample. The combustion of the methane takes place according to the following volumetric proportions:

$$CH_4 + 2\ O_2 = CO_2 + 2\ H_2O.$$

The results of these inspections and analyses are furnished the operating officials daily on a regular form similar to the one here shown. These reports are carefully scrutinized for indications of any irregularities in the amount of air in circulation in each split; of the atmosphere becoming dry and dusty; or of any increase in the percentage of gas. As the workings advance the percentage of gas carried naturally increases, and whenever this percentage continues to show above a certain figure, the amount of air in that split is increased or a new split is formed.

Much valuable and interesting information has been brought out by these investigations. The uniformity in the quantity of gas given off is clearly illustrated by a

FAIRMONT COAL COMPANY.

Gas Report.

Weather, clear. Temp., 60. Humidity, 29.0. Bar, 29.0. Fan W. G., 1.5. Mine..... Date, May 17, 1909.

Location.	Time.	Split.	Area.	Vel.	Cu.Ft.	Dry Bulb.	Wet Bulb.	Dew Point.	Relative Humidity	Gal. per 1000 C. F.	Per Cent. CO_2	Per Cent. CH_4	Lab. No.
Intake	7:40	2 N.	68	1,040	70,720	63	63	63	100	0.109	....	....	.....
Return	7:50	2 N.	65	660	42,900	58	57	56	94	0.086	0.04	0.02	2,603
Intake	8:00	2 & 3	60	235	14,100	63	63	63	100	0.109	....	....	.....
Return	8:10	2 & 3	56	240	13,440	58	57	56	94	0.086	0.05	0.02	2,604
Intake	8:20	1	60	190	11,400	63	63	63	100	0.109	....	....	.....
Return	8:30	1	63	160	10,080	58	57	56	94	0.086	0.05	0.01	2,605
Intake	8:40	6	10	1,130	11,300	63	63	63	100	0.109	....	....	.....
Return	8:50	6	60	180	10,800	58	57	56	94	0.086	0.06	0.00	2,606
Intake	9:00	8	56	170	9,520	63	63	63	100	0.109	....	....	.....
Return	9:10	8	58	160	9,280	59	58	57	94	0.090	0.04	0.00	2,607
Intake	9:20	4	60	240	14,400	64	64	64	100	0.112	....	....	.....
Return	9:30	4	63	220	13,860	60	59	58	94	....	0.05	0.00	2,608
Intake	9:40	5	60	280	16,800	59	58	57	94	0.090	0.25	....	.....
Return	9:50	5	60	290	17,400	60	59	58	94	0.093	0.05	0.00	2,609
Intake	10:00	7	58	300	17,400	64	64	64	100	0.112	....	....	.....
Return	10:20	7	60	340	20,400	60	59	58	94	0.093	0.05	0.01	2,601
.....	.....	.....	65	860	55,900	..	..	..	..	....	....	....	.....
Intake	10:30	Main	63	800	50,400	69	65	62	81	0.107			
Intake	10:40	Main	65	760	49,400	69	65	62	81	0.107			
	7:30	Outside	..	....	..	60	53	47	63	0.062			
	10:50	Outside	..			68	56	48	47	0.060			

Split No. 8 = 3d right heading No. 2 north.
Speed of fan 60. Blowing. (Steam). Mine working.

series of samples taken from a certain split every 30 min. for 10 hours. The results obtained were:

RESULTS OF GAS ANALYSES

Time	CO_2 Per Cent.	CH_4 Per Cent.	Cu.Ft. Air per Min.	Cu. Ft. Gas Gen. per Min.
3.10 p.m.	0.080	0.335	33,320	112
3.40 p.m.	0.065	0.340	32,708	111
4:10 p.m.	0.095	0.325	30,396	99
4.40 p.m.	0.040	0.340	32,436	110
5:10 p.m.	0.080	0.350	31,416	110
5:40 p.m.	0.085	0.335	31,756	106
6:10 p.m.	0.090	0.335	31,892	107
6.40 p.m.	0.035	0.360	32,028	115
7:10 p.m.	0.065	0.325	33,932	110
7:40 p.m.	0.060	0.330	32,844	108
8;10 p.m.	0.055	0.355	34,408	122
8:40 p.m.	0.075	0.345	34,000	117
9:10 p.m.	0.065	0.335	35,632	119
9:40 p.m.	0.060	0.345	34,816	120
10:10 p.m.	0.080	0.315	35,156	114
10:40 p.m.	0.075	0.315	32,232	101
11:10 p.m.	0.065	0.330	33,048	109
11:40 p.m.	0.050	0.315	32,232	102
12:10 a.m.	0.065	0.325	34,408	112
12:40 a.m.	0.065	0.340	34,068	116

Another similar test showed:

Time.	CO_2 Per Cent	CH_4 Per Cent.
9:50 a.m.	0.040	0.230
10:20 a.m.	0.040	0.230
10:50 a.m.	0.040	0.240
11:20 a.m.	0.040	0.290
11:50 a.m.	0.040	0.250
12:20 p.m.	0.040	0.250
12.50 p.m.	0.040	0.230
1:20 p.m.	0.050	0.240
1.50 p.m.	0.050	0.240
2.20 p.m.	0.040	0.220
2.50 p.m.	0.060	0.210
3:50 p.m.	0.050	0.190
4:00 p.m.	0.040	0.190

Upon starting up a fan after it had been shut down for repairs for 45 hours, samples were taken at the main return at certain intervals during the day. On starting, the analyses showed the return to contain 0.40 per cent.; in three hours this had been reduced to 0.33 per cent.; in five hours to 0.25 per cent., in seven hours, to 0.17 per cent., and in 12 hours it had become normal for that mine, about 0.06 per cent.

The effect of increased quantities of air on the percentage of gas carried is illustrated by the following actual results:

The quantity of air in a certain split was increased gradually from 17,000 to 24,000 cu.ft. per min. The analyses taken showed:

With 17,000 cu.ft. of air the percentage of CH_4 was 0.37.

With 18,000 cu.ft. of air the percentage of CH_4 was 0.34.

With 20,000 cu.ft. of air the percentage of CH_4 was 0.29.

With 22,000 cu.ft. of air the percentage of CH_4 was 0.19.

With 24,000 cu.ft. of air the percentage of CH_4 was 0.16.

Another mine had a split carrying 32,000 cu.ft. of air per min., which showed 0.33 per cent. of CH_4. The volume of air in this split was increased to 37,000 cu.ft., and the percentage of gas decreased to about 0.22 per cent.

Gas was Given Off Practically the Entire Length of an Old Split

At another mine a certain split, near the main return, persistently showed from 0.34 to 0.38 per cent. of gas, CH_4. An effort was made to determine whether this gas was given off from one or two particular localities, or whether it was gradually accumulated. Samples were taken at certain advantageous points beginning at the intake which showed the following results:

1,700 ft. from the beginning of the split the percentage of gas was 0.018.

3,870 ft. from the beginning of the split the percentage of gas was 0.065.

4,920 ft. from the beginning of the split the percentage of gas was 0.184.

6,160 ft. from the beginning of the split the percentage of gas was 0.110.

7,190 ft. from the beginning of the split the percentage of gas was 0.273.

9,760 ft. from the beginning of the split the percentage of gas was 0.285.

10,610 ft. from the beginning of the split the percentage of gas was 0.334.

12,430 ft. from the beginning of the split the percentage of gas was 0.349.

17,710 ft. from the beginning of the split the percentage of gas was 0.361.

These results show clearly that gas in certain quantities was given off the entire length of the split, although practically all the entries had been driven for at least three years.

Two charts, Figs. 7 and 8, show graphically the results obtained on two splits in different mines during the last year. These charts show the percentage of gas, the quantity of air and the barometric reading, the data taken weekly from March, 1908, to March, 1909. The air measurements and gas percentages fluctuate considerably as must be expected, and an increased quantity of air does not always show a decreased percentage of gas, but as a general proposition it works out very well. In July, Fig. 7, there was 28,000 cu.ft. of air with 0.30 per cent. of gas, but in August and September the quantity of air was increased to from 34,000 to 36,000 cu.ft., and the percentage of gas was reduced to from 0.10 per cent. to 0.22 per cent. In October the quantity of air again decreased and the percentage of gas increased. In December and January the quantity of air again increased with a corresponding decrease in the percentage of gas.

In Fig. 8 the action of another split is shown. During the first six months, with about 19,000 cu.ft. of air, the percentage of gas was about 0.22; during the last six months, by increasing the air to 22,000 cu.ft., the percentage of gas was reduced to about 0.15.

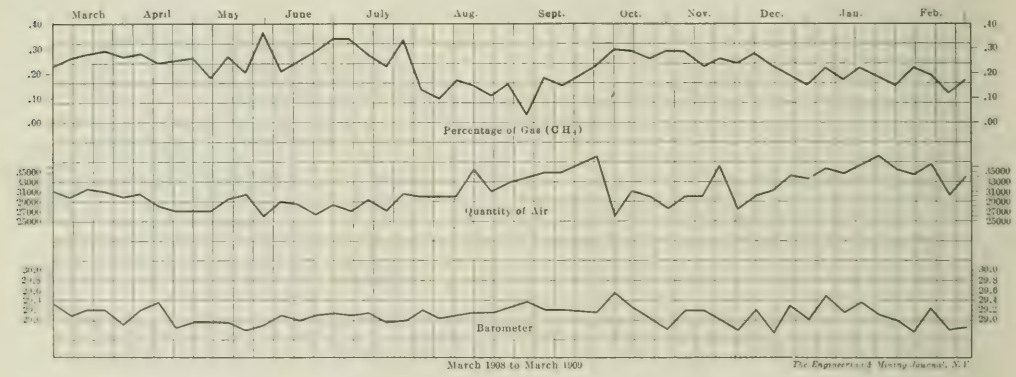

FIG. 7 SHOWING GRAPHICALLY THE RESULTS OBTAINED ON A SPLIT IN A MINE DURING THE PERIOD OF A YEAR

Investigations Are of Great Service

The net result of such investigations and reports, is to place before officials responsible for the safety of men and property, absolutely accurate and reliable figures showing the amount of air circulating in each section of the mine in relation to the quantity of gas generated in that district. It is then possible to distribute the total quantity of air produced by the fan to the best advantage and in such quantities as will do the most good. Such information is undoubtedly valuable and, if used intelligently, should be of material assistance in preventing explosions both of gas and dust, since by this method it is clearly shown that gas in considerable quantities is often present, although it cannot be detected by an ordinary safety lamp.

Since it has been determined that 2 per

cent. of gas present in a dusty mine under certain conditions is likely to be explosive, it is necessary that everything in human power be done to keep the percentage of gas down to a minimum.

The Coalfields of Alberta and Saskatchewan

By Phillips Thompson*

A great deal of valuable practical information in regard to the coalfields of Alberta and Saskatchewan is comprised in the report of D. B. Dowling, which appears in the summary report of the Canadian Geological Survey for 1908, recently issued. In addition to giving the results of an examination of the Cascade Basin, Alberta, and the lignite areas of Alberta, Mr. Dowling's report furnishes a general survey of the present condition and prospects of the coal-mining industry in the prairie provinces, as affected by the rapid settlement of the country and the progress of railroad construction.

Dealing with the steam coals of Cascade Basin, he states that at the time of his examination, the only mines in operation were at Canmore and Bankhead, but that prospecting carried on as far south as the Kananaskis river had resulted in the opening of several seams. On the Kananaskis slope and on the upper part of the measures near Ribbon creek, a branch of the Kananaskis, an examination was made, and analyses of outcrop samples were taken, showing that these coals can be classed with the Canmore product as steam producers.

A few of the former coals may prove harder, but none apparently go higher than semi-anthracite in grade. The result is gratifying, since on the main line of the Canadian Pacific Railway, the Canmore mine, capable of producing only 600 tons per day, was thought to be the only mine in the district that could supply steam coal. The number of seams discovered, as well as the undisturbed position of the measures, assure a large total of minable coal.

It is Estimated There are 60,000,000 Tons per Square Mile

Assuming that where the whole thickness of measures is present, there is an average of 90 ft. of coal capable of being mined, the available supply amounts to 150,000 tons to the acre, or 90,000,000 tons to the square mile. For the average of the area as mapped, allowing for dirty seams and coal left in the mine, approximately 60,000,000 tons per square mile would not be an excessive estimate. The largest and most important field is that lying north of Ribbon creek, where there is a natural terrace on which to erect the necessary mine buildings, and the coal seams being above the level of the river can be opened with drifts, affording natural drainage and easy haulage.

The total new area added to the steam-coal producing class may be roughly estimated at about 15 square miles, of which 6 or 8 square miles north of Ribbon creek is proved to have about 500,000,000 tons of available coal.

The principal mining center of Alberta for the production of lignite is at Edmonton, where the population is densest. Over a great part of the coal belt passing through this district there are numerous small mines from which statistics of output could not easily be obtained, as the market is purely local. The production of the Edmonton mines on both sides of the river, in 1907, is given at 112,558 tons, and is nearly all disposed of in the immediate vicinity. The mines, which will be called upon for a larger output to supply the towns outside the coal belt along the Canadian Northern and Grand Trunk Pacific railways, will naturally be those connected with the railway lines.

With the advent of these two roads, several companies have begun sinking shafts near the railways. Of these, the Parkdale in Edmonton was the first to begin shipping by car, raising the coal from a seam between 4 and 5 ft. thick, 200 ft. below the surface. A new mine, the Twin City, situated on the spur line connecting Strathcona with Edmonton had put down a shaft, and the Clover Bar mine was being connected with the railway. Numerous small operations in other parts of the province were being opened, mainly for local trade.

The general output of lignite for Alberta for 1907 is given in the provincial report as 639,335 tons, but this includes the product of the mines of Lethbridge, Taber and other localities, which I believe should properly be called lignite coal, and thus separated from the true lignites. As the principal mines at Lethbridge and Taber produced 350,000 tons, it is probable that there should be deducted from the total about 400,000 tons, leaving an output of lignite amounting approximately to 240,000 tons. The lignite production of Saskatchewan is considerably smaller, and it is of an inferior quality and mined merely for local consumption; efforts made by the provincial government to find a commercially valuable deposit have had little practical result.

Increase in Output Follows Increase in Population

The output of the coal mines of the two provinces of Alberta and Saskatchewan follows closely the increase in the population, and it is evident that if the present mines are working to their full capacity others must be opened in the near future. The need for domestic fuel is supplied mainly from mines in the lignite belt. The demand for railway facilities for the shipment of produce to market, means increased consumption of coal by the railways.

Following the increase in population comes the building of towns, and the establishment of factories, mills and other power using works, so that not only

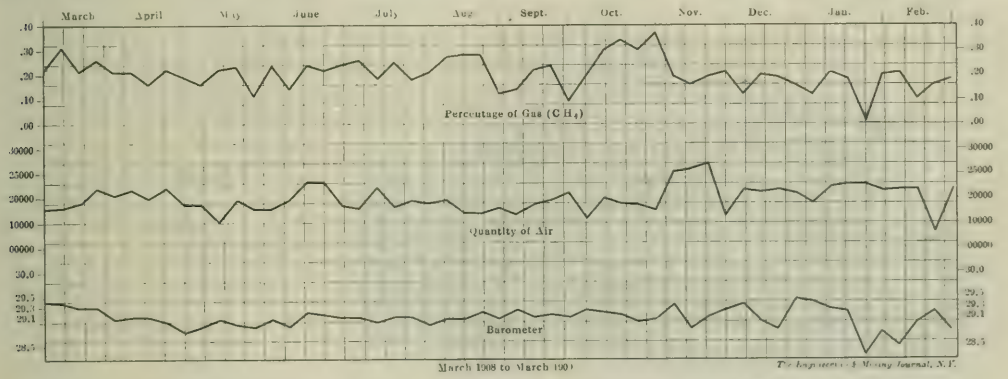

FIG. 8. CHART SHOWING RELATION OF BAROMETER AND QUANTITY OF AIR CIRCULATING, TO THE PERCENTAGE OF GAS PRESENT

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domestic fuel but coal for steaming and power will be in increasing demand. The output of anthracite has, up to the present, been confined to one locality, the Cascade Basin in the Rocky Mountains, and has risen from 23,303 tons in 1904 to 305,700 tons in 1907. The use of coal for steam power in railway transportation is divided between low-grade bituminous, lignitic coals, and the harder bituminous that are non-coking. The supply is delivered from all the Rocky Mountain mines, except the anthracite mines, as well as from those in the Lethbridge district.

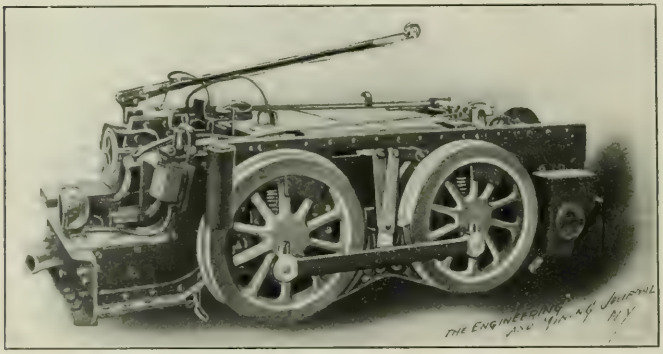
The complexion of the Grand Trunk Pacific Railway will call for a further advance in output within a year, to meet which it will be necessary to open up new mines. The coking coals are confined to the areas near the Rocky Mountains, the mines on the Crow's Nest branch and the areas to the north and south being the only producers of coke at present. Coking coal of the best grade has, however, been found north of the Saskatchewan, and when railway connection has been opened, British Columbia will be supplied from this source. The production of coke in Alberta was 71,202 tons in 1905, and 112,887 in 1907.

As a result of the rapid increase of population Mr. Dowling forecasts a considerable expansion in the production of lignite, basing his calculations on a comparison between the proportionate increase in the coal output and the growth of population in the past. The province of Manitoba which furnishes a market for lignite also imports coal and fuel wood from the East, and a portion of the coal supply of Alberta is brought in from British Columbia. However, making allowance for this, upon the assumption that the population of Alberta and Saskatchewan will equal in density that of Manitoba, it is within the bounds of probability that within a decade or two, a population of 4,000,000 may be found in the provinces between Ontario and British Columbia, to supply which, from coal sources, there should be a maximum annual output of 2,600,000 tons of lignite and the cheaper grades of coal.

Electric Mining Locomotive for the Clinchfield Corporation

The Clinchfield Corporation has recently placed in service 11 mining locomotives, which were built by the Baldwin Locomotive Works, and are furnished with electrical equipment supplied by the Westinghouse Electric and Manufacturing Company. Six of these engines are designed for a track gage of 3 ft. 8 in., while the remaining five are 4-ft. gage. The illustration shows one of the latter.

These locomotives are arranged for single-end operation, and are propelled by one No. 122 motor, which is geared to the rear axle. The two pairs of wheels are coupled by side rods. The frames are spring supported in the usual manner, and the wheels can adjust themselves independently to any inequalities in the track. At the same time, but one motor is required, all complicated gearing is avoided, and the driving mechanism is simple and positive in action. The side rods are arranged in accordance with steam locomotive practice, and are accurately balanced by counterweights cast in the wheel centers. It is believed that these are the first electric mining locomotives embodying these features.



ELECTRICALLY OPERATED LOCOMOTIVE FOR THE CLINCHFIELD CORPORATION

Gathering and Traction Reels

The equipment includes both gathering and traction reels. The gathering reel is of the usual type as built by the Baldwin Locomotive Works. It carries 400 ft. of single conductor cable, which is paid out over the front end of the locomotive. The traction reel is of the "Roan" type, and it is fitted with 300 ft. of ⅜-in. steel cable. The winding drum is mounted in a vertical position at the rear end of the locomotive, and is rotated by the propelling motor. By means of two clutches, suitably arranged, the reel can be operated while the locomotive remains stationary, or it may be thrown into gear while the locomotive is in motion. It is thus possible to haul cars out of sidings with the reel cable, and draw them up to the locomotive while the latter is proceeding along the main track, and this is accomplished entirely by the propelling motor.

The motor is placed between the axles and drives the locomotive through single-reduction gearing. It is spring-suspended from a cross-tie which spans the frames back of the first pair of wheels.

In accordance with the latest practice of the builders, the frames are of plate steel. They measure, in this case, ¾ in. thick, and are reinforced by 3x3-in. angles. The wheels have cast-iron centers with steel tires, and are placed outside the frames. The boxes are guided in cast-iron pedestals, which are riveted to the frames, and the weight is transferred to the boxes through coiled springs. The front and back bumpers consist of channel irons, to which are bolted suitable cast iron draw-heads.

The equipment includes a hand brake, sand boxes with spouts for all the wheels, one gong and two electric headlights. The principal dimensions are as follows:

Wheel-base	4 ft. 8 in.
Driving wheels, diam.	33 in.
Journals	4⅜ x 4 in.
Width	3 ft. 11⅝ in.
Hight	3 ft. 5 in.
Length	10 ft.
Approximate weight	12,600 lb.

Coal and Copper in Turkestan

A correspondent of the *Long. Prom Gazeta*, writing to the *Mining Journal* regarding the coal and copper industries of Turkestan, states that the actual production of coal in the area is 2,300,000 poods a year. There are three carboniferous areas, viz., Konine Saska, in the Samarkand district; the Ispahan area; and Margellan, in the Ferghana district.

Copper is being mined on the banks of the Syr Darya river, about 18 versts from the station of Melnikoff, and 36 versts from Khokand. Here the copper ore is found in masses and in the original strata. The deposit is operated by the Syr Darynsk Mining Company, which is engaged at present in blocking out ore. A concentrating plant and smelter will be erected. Copper also occurs in the Margellan district, where the mines of Antonovitch Palaschkoff & Co. are situated. Here the copper ore carries uranium, vanadium and radium. The deposit appears as a replacement in the limestone.

Safe Use of Electricity in Coal Mining

Brief Suggestions as to the Proper Voltage, Insulation of Electric Wires Underground, Automatic Trolley Switches and Return Circuits

BY GEORGE R. WOOD*

Commencing about the time of the Naomi, Darr and Monongah explosions, there has been a general house-cleaning regarding greater safety in mining operations, taking in not only the questions of gas, dust and rock-falls, but also the use of electricity with respect to danger of ignition of gas and dust, also the liability of electric shock to the men.

About this time it began to be definitely decided by a large number of practical mining men that dust was a large factor, if not the initial one, in some mine explosions, and the chain machine, which is almost universally motor-driven, was blamed for producing a large amount of dangerous dust. Some interesting figures have been obtained by Mr. Randolph, formerly with the Pittsburgh Coal Company, regarding various percentages of dust from hand, puncher machine and chain machine mined coal. The results found in each case have been reduced to the number of pounds of dust per square foot undercut, and the dust gathered was screened through a 40-mesh screen. At the mines of the Washington Coal and Coke Company, which are on the lower edge of the Connellsville region, the results obtained are as follows:

By hand mining, 1.80 lb. per sq.ft. undercut
By puncher machine, 4.58 lb. per sq.ft. undercut.
By chain machine, with pick-pointed bits. 1.48 lb. per sq.ft. undercut.

At the mines of the Westmoreland Coal Company the puncher machine gave 6.18 lb., and the chain machine, with the standard chisel bits, gave 2.43 lb. of dust.

At the mine of the Pittsburgh Coal Company, Midland No. 1, the chain machine gave 2.43 lb. and 2.51 lb. at two different trials, and the puncher machine gave 6.18 pounds.

There is no disputing, of course, that the puncher machine will cut more large coal, or in other words that the average coal cut by the chain machine will be smaller than that cut by the puncher or by hand, but the amount of coal cut out in undercutting by the puncher is so much greater than the amount taken out by the chain machine, that the actual amount of dust will be greater, as given above.

Igniting Fine Dust by an Electric Arc

It has been repeatedly attempted to ignite very fine coal dust by an electric arc. I have, no doubt, but that this can be done, but up to the present time it has not been done, so far as I know. I am inclined to think that if this ignition occurs, it will be with the distillation of gas from the dust by the heat of an electric arc. There is, of course, not the slightest doubt but that an electric spark of almost any potential will ignite gas in proper percentages, since we have an illustration of this in practically all automobiles. It is probable, to my mind, that an explosive mixture could be ignited from the minute spark from the ordinary signal wires where ten or more cells of battery are used. Electricity in itself will, of course, not explode and will not arc except when a circuit-carrying current is broken, and the requirement in the case of gas is simply to dilute the gas with air below the point of possible ignition.

In a mine generating explosive gas in large quantities, it is advisable to keep all electrical wires, and so far as possible, electrical apparatus on the intake air. It is only in most extreme conditions that an explosive moisture can be found in the return air, but it may be in case of falls of rock or in drawing pillars, that there would be a large quantity of gas liberated which might temporarily raise the percentage of gas in the return to a dangerous point.

The Danger of High Potential Electrical Currents

There has been a great deal of argument regarding the danger of high potential electrical currents, and during the past few years there have been a large number of plants installed, and in some cases changed over, from 250 to 500 volts. There can be no question to my mind but that 500 is very much more dangerous than 250 volts. There is also no question in my mind but that a large percentage of the electrical fatalities underground could have been, or can be prevented by proper methods of resuscitation after the shock. The paralysis of heart and lung action is similar to that in case of drowning, and some valuable results have been obtained by artificial respiration and other work which tends to restore circulation and to stimulate the heart action.

I know personally of one case in which a boy was shocked at a point about a mile underground. The body was placed on a pit car and brought out with a trip, and when outside, it was suggested to try artificial respiration and other remedies, as shown by an illustrated card, published originally by the *Electric World and Engineer* some four or five years ago. This was done and after 15 min. hard work, or a period of almost half an hour after the shock, their efforts were rewarded by bringing the boy back to consciousness and he was at work the next day. There is absolutely no question but that the victim would have died without this aid.

Nearly all cases of electrical shock have resulted from mometary contact with the wire, which stuns or knocks the man away from the wire, and in almost all such instances, I believe the subject could be revived. Cases are on record where persons apparently drowned have been revived after as much as an hour's work, without any apparent signs of life, until at the expiration of this time. I would earnestly recommend the placing of an illustrated chart, showing methods to be employed in case of electric shock, at and about all mines using electricity.

I notice on looking over a report of the Bureau of Mines for 1907 that there were 23 cases of death from electric shock. In every case this was received from the trolley wire, and in the majority of cases while crossing under the wire, either over cars or on the ground. The potential in all cases was 500 volts or over, and in one additional case, which is not rated as an electrical death, the man was knocked under a trip of cars by shock from a 250-volt wire. During the past year a commission appointed by the Governor of this State drafted a new mine law, and in connection with the electrical section of this law a committee was appointed, representing the operators and electrical manufacturers, to assist the commission in drafting an intelligent and effective electrical section of such law.

At the suggestion of Mr. Roderick, of the Department of Mines, we took the New South Wales electrical law as a basis on which to work, and made such amendments and changes as seemed to be called for by the conditions in Pennsylvania mines. I believe this proposed electrical section covers the ground completely, and I do not believe it would be at all burdensome to the operators of the State, with the possible exception of that part relating to the use of electricity in a gaseous mine. The entire effect of this part of the law depends on the construction of the words "a gaseous mine." If, as some claim, the mine should be classed as gaseous when gas can be found by the ordinary safety lamp, then nine-tenths of the

NOTE—Paper read before the summer meeting of the Coal Mining Institute of America, Punxsutawney, Penn., June 29, 1909.

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mines in Pennsylvania would be considered as gaseous mines, since this provision applies if gas is found but once under any circumstances, and this would place the mine on a gaseous basis for six months.

I cannot understand how there could be any objection to the use of locomotives on the intake air in any mine. If the mine was so gaseous that this would not be considered safe, I should not consider it safe to operate under any conditions. After every explosion, of which the cause is obscure, the natural tendency is to blame it on electricity, but so far as I am aware there has not been a single case where electricity has caused a serious explosion. It would, to my mind, show a poor system of ventilation and lax supervision of the electrical installation should such a thing occur. A properly wired mine is so connected and wired that any section, any room heading or cross-heading, or any point in the main heading beyond the last cross-heading, can be cut off should conditions become dangerous through falls or otherwise.

Safety of the Men

Returning again to the question of safety of the men, it has been considered useless for some years past to insulate electric wires underground, since there seemed to be no commercial insulation which was of value after a few years' use, or in some cases, a few months' use. It has, therefore, been preferred to use bare wires, even for machine lines in room headings, and depend on the miners' intelligence to recognize the danger of a bare wire. In some mines these wires have been protected by means of boards nailed to wooden plugs along the rib and the wires suspended behind these boards, also protected by wooden troughs where they cross over the heading. This protection is effective but very expensive and must be renewed at intervals of every two or three years in most mines.

At the testing station of the Geological Survey in Pittsburg the electrical department is making some experiments on various insulations subjected to extreme mining conditions. Cables with rubber and other insulations are submerged in acid mine water, readings taken of their initial insulation resistance, and these readings repeated at frequent intervals. The weakness of the insulation will be shown by the gradual or sometimes sudden drop in these values. This can be plotted on a curve, and the permanence of the insulation, commonly called varnished cloth or varnished cambric, will be effective under most conditions, and I have used it in [illegible] for over two years, without any sign of trouble. It does not seem to be affected by acid and is perfectly moisture proof. The cost of this insulation will, I believe, be considerably less than the best rubber, and if the results obtained at the testing laboratory measure up to those I have found in practice, I believe it will be only a short time until we can confidently recommend that all machine wires carrying 500 volts or over be insulated, where carried on room headings.

Bare wires can, of course, be used where the wires are carried through air courses or off the traveled roads. So far as the trolley is concerned, it is out of the question to consider protecting this for its entire length. The methods of operation are such in present times that the haulage-way is seldom the traveling road, and where it must be so used, it can be driven wide enough to give a clear traveling space on the opposite side of the track from the trolley wire. At all places, such as partings, turnouts, and where the traveling roads cross the haulage road, the trolley wire can be protected by means of a trough or a single board projecting below the level of the trolley and firmly supported from the roof. In a large number of mines, all branches from the main trolley, on which but one locomotive works at a time, are sectionalized by the use of automatic trolley switches, which

ALL BRANCHES FROM THE MAIN TROLLEY ARE SECTIONALIZED BY USE OF AUTOMATIC TROLLEY SWITCHES

cut the current off the branch except when the locomotive is working thereon. I think this is a valuable piece of apparatus, and recommend its adoption in all cases where it is possible to use it.

Mr. Clark, of the U. S. Geological Survey, has suggested an extension of the use of this device to the main headings, or long cross-headings of mines where but one locomotive is used. Mr. Clark's scheme involves the use of a feeder wire paralleling the trolley, but which may be placed, if desired, in the air course or parallel heading. This feeder and the trolley wire are divided into as many sections as desired, and one of these automatic trolley switches is placed in the trolley wire at each section point. The end of the feeder from the outside is connected to the center of this switch. The end of the feeder extending inward is connected to the end of the trolley of the same section. These connections are as shown by the accompanying sketch.

When the locomotive is inbound it will throw the trolley switch so that the next section of the trolley is connected, also the next section of the feeder, cutting out the section of the trolley which it has just left, but with the feeder, of course, continuously alive from the power plant to the section on which the locomotive is running. The result will be that the section of trolley on which the locomotive is running is alive, but no other, and on coming out not only the trolley but also the feeder is left dead behind the locomotive.

As noted above this arrangement would not be applicable where more than one locomotive is in use, since the trolley switches can only be operated in alternate directions. It would be possible to design a system so that a number of locomotives could operate in either direction and only have sections live on which they are operated, but this probably would not be satisfactory owing to the necessity for a number of feeders, whether required for carrying capacity or not.

Regarding the return-circuits in mines, there is a good deal of misunderstanding on the part of mining men who are not well versed in the principles of electricity. Mr. Harrison, the chief mine inspector of the State of Ohio, has issued instructions forbidding operators from connecting pipes carrying air or water to the tracks, in other words he wants to keep these pipes entirely separate electrically, from the return circuit.

Preventing Electrolysis of Air and Water Pipes

I do not exactly understand his idea in doing this, although at one time he wrote me that if these were connected, there would be danger of shock to the men standing on these pipes if they should touch the trolley. It would be absolutely impossible so to insulate air or water pipes as to prevent shock from the trolley if standing on them, since there will be capacity enough in these pipes, even if completely insulated from the ground return, to give one a severe shock. In the Pennsylvania mine law we strongly recommend the very connection which Mr. Harrison condemns, chiefly for the purpose of preventing electrolysis of these pipes, which is bound to occur if they are paralleled to the track without any electrical connection. Some of the current, seeking the path of least resistance, will leave the track and flow through the earth, and will select any metallic path traveling in approximately the same direction, the amounts of current in the different paths being inversely proportionate to the resistance.

It has been found by experiment that in many mines where the rails are in contact with the earth and the headings are wet with acid moisture, part of the return current, amounting in some cases to 60 per cent. is carried by the earth. Electrolysis in the pipes parallel and near to the track is caused by the current where it enters and leaves these pipes. In flowing through moist earth from the pipe to the rail it will carry part of the iron of which the pipe is composed into the earth toward the rail. This can be entirely prevented by using copper connections for the current from rail to pipe and back.

If the pipes are charged with gaskets be

tween the sections, each section should be connected or the pipe bonded around these gaskets. Mr. Harrison seemed to think that the operators would use these pipes to carry return current and thereby cheapen their return circuit, using smaller bonds or paying less attention to their maintenance. These pipes will, of course, assist materially in the return and I can see no particular objection to it. In disconnecting these pipes, there would be an arc if carrying the current at that particular time, but this arc would be of low potential, amounting only to the drop in that part of the return circuit, which would not likely be over 15 or 20 volts.

Use of Electric Lights

The use of electric lights in mines is strongly recommended, particularly at partings, turnouts, and all points where men must travel along or across the rails. In many cases these lights can be connected directly from the trolley and in connection with the use of automatic trolley switches, referred to previously, these lights will show when the current is on. It is advisable to have more than one circuit where lights are used as danger signals, to provide for burnouts of the lamps. In some of the mines, in the Connellsville region particularly, one or more red lights are installed at each danger point, in addition to the white lights which are connected back of these automatic switches. The white lights burn at all times, but the red lights show only when the current is on the wires at the parting.

It is surprising, with the large number of mining machines used, particularly in the western part of the State, that there have not been fatalities reported from contact with the machine cables. One explanation is, of course, that the men handling these machines and cables understand the danger from them and are on the lookout to avoid contact, whereas in the majority of cases of death reported by the inspectors, the victims walked against the trolley wire, or came in contact with it while climbing over a trip, at which time their attention was taken by something else.

275 Volts are Recommended

In all cases where large tracts of coal are to be developed I would recommend the use of 275 volts potential, using high-tension alternating-current transmission from the central plant, and locating sub-stations as close to the work as possible. Where the cover is excessive, these sub-stations can be located underground at the center of distribution. Such plants are in operation at Ehrenfeld, Penn., Kaymoor, W. Va. and Woodward, Alabama, in some of which the sub-stations are two miles underground. Wherever the cover is light, it would usually be preferable to have the sub-stations overhead and the direct current cables taken into the mine through bore holes.

Many mining men are possibly familiar with plants on the three-wire system, of which a number have been installed, chiefly in West Virginia. In these plants the current is generated by standard railway machines at 550 to 600 volts. The neutral tap is taken off these generators by means of proper connections to the windings from collector rings, and these taps by means of balancing coils furnish a neutral lead, between which and either main lead, the potential is one-half that of the generator. Apparatus in the mine is operated between either main lead and the rail, which is the neutral, and the maximum potential which can be received will be 300 volts. Stationary apparatus, such as fan motors, car hauls, large pumps, etc., can if desired be operated on full potential, or if a wide speed range is desired, motors may be operated first on 300 and later on 600 volts.

The wiring in the mine is so sectionalized that an approximate balance of load is maintained between the two sides of the system, and in the case of a perfect balance, the system is equivalent to a metallic circuit 600-volt transmission, using twice the copper as a grounded return system or one-half the copper as compared with a 300-volt grounded return system.

Where there are a large number of small units operated, such as locomotives, machines and pumps, a close balance may be maintained, and the efficiency of the transmission depends on the balancing, since with total unbalance it will be a straight 300-volt transmission. In actual operation at Ellsworth, Penn., and Minden, W. Va., the average balance is held within 15 per cent., with an occasional unbalance of 25 to 30 per cent.

An Alberta Coal Mine

Special Correspondence

The Alberta Railway and Improvement Company, one of the oldest and largest coal-mining companies in Alberta, operating the Galt colliery, is opening a new mine, known as No. 6, and situated in the northern section of the company's extensive coal area east of the Belly river and 2½ miles north of the No. 3 mine. The hoisting shaft is 20 ft. 2 in. by 21 ft. 2½ in., timbered with 10x10-in. square sets, backed with 3-in. plank; depth, 410 ft. The air shaft is 20 ft. 8 in. by 10 ft. in the clear, timbered similarly to the winding shaft. The railway, standard gage, has been extended from No. 3 to No. 6, and an electric power transmission line built 3½ miles to the new power house. In the boiler house are two batteries, each of two Babcock & Wilcox water tube boilers equipped with chain-grate stokers, and having a total capacity of 1000 h.p. The shafts and plant are being laid out with the object of developing 2500 acres of coal lands. The equipment is for a daily production of about 1600 tons of lump coal over a ¾-in. gravity bar, which will represent about 80 per cent. of the total run-of-mine output. The steel tipple will have cross-over pumps, screens, and a steel conveying-picking belt for hand picking the screened coal. An Ottumwa box-car cradle gravity loader is being put in. Hoisting will be in tandem cages, 2½ tons of lump coal at a hoist, with an average of three hoists a minute. Water supply is provided for by the establishment of a pumping station at Belly river, equipped with a turbine pump. Water is pumped through 6000 ft. of 6-in. water main to a 60,000-gal. water tower at the mine.

Co-operative Coal Mining in England

Special Correspondence

Copartnership between owners and employees has been brought to the front in England by a proposal made by Sir Christopher Furness, M. P., to introduce such a scheme at the Wingate colliery, County Durham. Some little time ago a similar scheme was introduced by Sir Christopher in the shipbuilding trade at Hartlepool, some particulars of which were referred to in the London letter published in the Journal Dec. 19, 1908. The coal-mining scheme provides that the men employed may obtain a quarter interest in the colliery. Every man has to agree to a deduction of 5 per cent. of his wages until his shares are paid for. It is hoped by the introduction of this schene to avoid strikes and lockouts.

To avoid disputes, a plan has been adopted, whereby all questions that might lead to friction shall be submitted to arbitration. The colliery will be managed by a council upon which representatives of the owners and of the men will sit, and a court of arbitration will consist of members of this body and will be presided over by a county court judge whose decision in the last resort will be final. The raising of the money to purchase the quarter interest in the colliery is a problem that has to be solved. It is hoped that the Miners' Union, which has accumulated capital, will be ready to make the investment on behalf of the men, but failing that, Sir Christopher Furness and his friends have intimated that they will provide the requisite amount, which will be gradually repaid by the 5 per cent. deduction from the workmen's pay.

The movement is one which must tend to minimize the danger of industrial storms, and it is to be hoped that the offer now being made will be accepted by the men, and that it will have a successful issue and lead other employers to introduce similar schemes all over the country.

Recovering Abandoned Coal Pillars

Early Operators in the George's Creek Field Left 60 Per Cent. of the Coal Seam Unmined. Efforts Are Being Made to Extract This Coal

BY W. L. HAMILTON*

The universal tendency of the present day is toward the conservation of the nation's resources, and vast areas of timber, coal, and low-grade ores, which were not thought worthy of attention two decades ago, are now being converted into wealth by a new generation of men who fully realize the importance of the complete utilization of all the earth's products. In years gone by, no serious attempts were made along the lines outlined above, and it devolved upon the managers, engineers and superintendents now in charge of the mines, forests and other industries, where reckless waste was prevalent, to avoid as far as possible, these previous extravagances.

In this connection, I will attempt to show what is being done in the way of reclaiming a large area of Georges Creek coal which was worked between the years 1850 and 1885, and in such a manner that 60 per cent. of the fuel beds was left unmined and abandoned. The property referred to is situated in the eastern end of the Georges Creek field contiguous to the town of Frostburg. In the early days of the region, it was owned by the McCulloh's, and I understand that it was at their instance that the first opening into the coal was made.

This early development is carried in the year 1850. It was a slope opening, and is being used today by the operating company as their main haulway. About the year 1870, the property passed into the hands of the Consolidation Coal Company, who worked it until 1885, when it was abandoned. In 1903, H. V. Hesse, now general superintendent for the Consolidation Coal Company, came into the region as chief engineer for that company, and under his direction, surveys were made as far as possible, of all the abandoned workings, and preparations made to recover the pillars which were left in the ground. Mr. Hesse's task was an arduous one, as in some localities the falls were so bad, that it was necessary for the engineering corps to work all the time on their hands and knees, and not infrequently lying flat down; but perseverance won out, and today we have accurate maps of the despoiled territory, and are in position to win a large tonnage of coal, which in the natural order, will give employment to quite a number of men, will mean additional resources to the common wealth, and to the nation, and will be a valuable incentive to future engineers and mine managers. In 1906, Mr. Hesse was appointed general superintendent, and was succeeded as chief engineer by L. B. Abbott, who efficiently took up the work where Mr. Hesse left off.

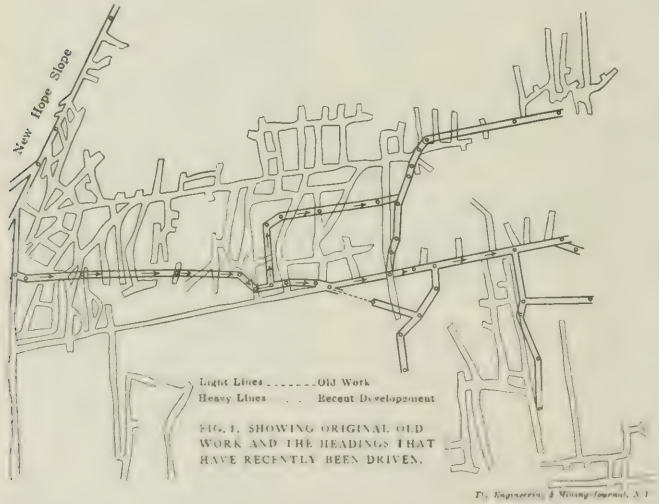

FIG. 1. SHOWING ORIGINAL OLD WORK AND THE HEADINGS THAT HAVE RECENTLY BEEN DRIVEN.

The Engineering & Mining Journal, N. Y.

The Present Work Was Started in 1907

In 1907 the Union Mining Company leased the property, and at once began to clean up the old slope, it being the most convenient way for them to reach the coal. Its length was 1300 ft., and there were bad falls throughout the entire distance. In some places large quantities of the big rock were down, and to get through this, forepoling and tunneling had to be resorted to. Selected hardwood timber was used, and notched sets were placed with 36-in. centers, down the length of the slope. In some of the more dangerous places, sets of 12x12-in. sawed oak were employed. When the bottom of the slope was reached, lyes for empties and loads were made on either side, to facilitate the handling of the output. The average pitch of the slope is 4½ per cent., and the coal is hoisted in trips of 10 cars, the gross weight of each car being 10,000 lb., and the hoisting is accomplished by a 75-h.p. steam engine, geared to a 48-in. drum.

Five months' time was necessary to complete the work described above. The services of 12 men were used, 6 working during the day, and 6 at night. Owing to the old heading being narrow, it was impossible for us to use a greater number advantageously. The total cost of the work so far, not including the hoisting engine or boilers, has been $3487. This work completed, it has been necessary for us to arrange a plan of action with regard to the removal of the pillars. To the left of the slope going down, a place was started in the coal, as shown in the map, Fig. 1. This ground was practically unknown to us, as it had fallen so badly that it was out of the question to survey it. However, we were convinced that some coal could be secured in this locality, and we determined to develop it.

For a time it was discouraging, as we were handling considerably more dirt than coal, and to make the matter worse, water was encountered, and it was necessary for us to install a 4-h.p. gasolene engine and pump, and to construct 600 ft. of ditch, in order that the section could be unwatered. For a distance of 720 ft. this unprofitable work continued, then we began to get into the pillars, which justified us for the extraordinary development expense.

At this writing no robbing has been done on this side. Four places are now working. They are all advancing, and it is our intention to keep them so until we reach a point where we are fully satisfied that the coal has all been extracted.

Details of Operations

To the right of the slope going down, the main heading shown by the long straight dotted lines in Fig. 2, was cleaned for a distance of 3000 ft., and was put in

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shape to be used as our main haulway. The rooms marked "B" and "C", Fig. 2, and an additional room further down were also cleaned and timbered, and good substantial track was laid in them, as it was our intention for them to be used as auxiliary haulways, for the sections of the coal contiguous to them.

Neither the main nor the auxiliary haulways were expensive cleaning, as the falls in them were not so bad as those encountered in the slope, or in the locality to the left of the slope. The room *B*, Fig. 2, was in shape first, and robbing was begun in this territory. The reader will understand from the accompanying maps, that all the work not shown in heavy lines was done years ago, and all of it contained falls more or less serious. The width of the old places averaged 15 ft., and the falls in them, about 9 ft. high. In the room *B* we advanced our cleaning to the point *E*, and the miners were started on a tonnage basis. After driving through the pillar *G* it was necessary to clean the gob *H*, to get across to the pillar *J*. This was done by the miners on a contract system, which will be explained, as it may be interesting.

Work Is Done on Contract System

When the place is "holed" the miners send for the foreman, who comes and measures the hight and the distance across the gob. We use a 48-in. track gage, and it is, therefore, necessary for us to carry a width of 8 ft. These three measurements are used, and the contents of the fall in cubic yards is thus arrived at. Thirty cents per yard is paid for cleaning away the dirt, laying the track and setting the necessary timber. Our miners have become very proficient, and make good wages at the work. Our system accomplishes two things. First, speed in the removal of dirt; second, it does away, to a large extent, with the services of an overseer, as it is to the miners' interests to do the work as expeditiously as possible.

FIG. 2. SHOWING 3000 FOOT MAIN HEADING OPENED UP, AND 3 ROOMS TURNED TO RIGHT FROM THIS HEADING.

At this juncture I will explain the system of timbering used when cleaning these old places. The plan is shown in Figs. 3 and 4. When the coal is all taken out of the face of the pillar *G*, Fig. 2, two long stringers are first used. They are inserted in holes made in the rib of the pillar *J* and supported by legs at each corner of the pillar *G*. Notched sets are then put at right angles to the stringers, and wedged to them. In some instances, where the rock is bad, props and caps are set on top of the large sets to support the cover. The sides are lagged, as shown, to keep back waste. Occasionally some of the dirt is stowed on top of the timber as shown at *X* in Fig. 4. This style of timbering has given us the best results, and when the crush comes, incident to the coal being removed, these crossings are the last points to be affected.

A Regular Line of Fracture is Maintained

In Fig. 5 is shown the methods used in attacking the pillars. Great care must be taken to avoid any abnormal crushing, as the pillars are small, and in all probability would be lost if this condition arose. To prevent happenings of this kind, we always endeavor to maintain a regular line of fracture, at about 45 deg. to the line of dip. The coal must be entirely removed, as a small pillar containing as much as 6 or 8 tons would act as a lever to hang the fall, and probably cause disastrous results.

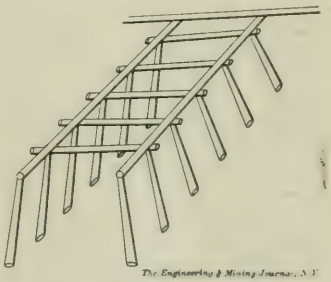

FIG. 3. ROUGH SKETCH SHOWING SYSTEM OF TIMBERING

Just as soon as a cut is taken off, we make it a point to get a good rock fall, close to our next point of attack. The heavy lines in the figure show the haulways; the small arrows in the haulways show the direction of the loaded cars to the bottom of the slope. In this work three extraordinary conditions are encountered: The first of these is the royalty; second, is cleaning old falls, and lastly, the excessive timber cost. The total charges against the tonnage produced for all three items, averages about 25c. per ton. We have to be especially careful with regard to the timber used. It must

be hardwood, and we require all props used in this work to be at least 4½ in. under bark on the small end. So far as we have gone, our recovery has been highly satisfactory, averaging 90 per cent. The underground work at the mine is in charge of S. J. Aldom, and he has handled the unusual conditions creditably.

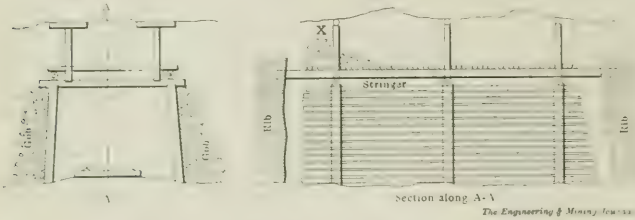

FIG. 4 A DETAILED VIEW OF THE SYSTEM OF TIMBERING OLD PLACES THAT ARE TO BE CLEANED UP

Mine Inspection with Respect to Car Allotment*

By H. B. Douglass†

During the year 1845, there was produced in the United States 2,500,000 net tons of bituminous coal. In 1907 the yearly production had grown to 360,000,000 net tons. There was also produced in this latter year 72,000,000 net tons of anthracite. Since 1885 the soft-coal industry has increased fivefold; and this by no means represents the growth of development. In the meantime railroads have not increased their equipment to meet the requirements of such rapid development; and while this restriction of output has doubtless been of great benefit to the producer, the question of car distribution has always caused more or less friction to all parties concerned.

About three years ago the necessity for some well defined method of car allotment became apparent, and, in point of fact, imperative. There was no concerted action in the matter, each road quite naturally preferring to work out the problem for itself. It was generally conceded, however, that mine capacity should be a factor in the result; and to this end a position, new to railroad operation, was created—that of inspector of mines. To fill this position men were selected of technical training; experience in mining and handling coal; and of approved personal and professional integrity.

Classification of Mines

It is the duty of the inspector to examine thoroughly all mines within the boundaries of his territory as often as circumstances require, and to pass on their capacities. For him mines are divided into three grand classes: 1. Mines in the early stage of rapid development. 2. Mines that have reached a maximum development. 3. Mines in which development has ceased. Mines in the second class have generally reached a capacity which may be maintained for years, and only occasional inspections are required. With class 1, in which the capacity is increasing, and class 3, in which the capacity is falling off, more frequent inspections are necessary. A mine's capacity is the amount of coal it can produce under favorable conditions with the means at hand. There are three factors which govern it, namely: development, haulage and tipple. As the speed of a fleet is that of its lowest vessel, so is the capacity of a mine determined by its weakest factor.

The developed capacity depends primarily upon the number of available working places, number of men to a place, and the tonnage rate per man. By available places we mean such as are working, or are in a condition to work without unusual delay. Headings and rooms drowned out, caved in, or with track lifted, are not considered available. Neither are rooms to the dip, in thin seams where the miner delivers the coal to the heading. With a string of pillars, only as many as can be practically worked under existing roof conditions are regarded as available. By tacit consent, the labor question does not enter the proposition at all. It is too elusive; and the inspector considers the mine under examination as being in the ideal state of having, at all times, a full quota of men. Equipment, drainage, and ventilation indirectly affect the result in that they influence the rate per man, as shown by the company's books. The number of men worked to a place in a given mine varies with the method of mining, and local conditions. Whether a mine has a full quota of men or not, there is always a certain number of places standing idle for this or that cause, and some roads take this into consideration in determining the developed capacity. One of the large trunk lines deducts 15 per cent. which is not unreasonable. The developed capacity with this deduction therefore becomes:

Number of available working places × men to a place × rate per man × 85 per cent.

FIG. 5. SHOWING METHOD USED IN ATTACKING THE PILLARS.

The Haulage Capacity

Aside from the kind of haulage in use,

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†Inspector of Mines, New York Central & Hudson River Railroad, Philadelphia, Penn.

its efficiency is affected by length of haul, gradient, weight of rail, condition of roadways, location of sidings, and number and capacity of mine cars. Whether the main haulage road is single or double tracked; and whether the working faces are scattered or concentrated, are also conditions entering the question of haulage capacity. With mechanical haulage it is customary to take the equipment as it stands and make an actual test under the most favorable conditions. With mules, however, the fact that the mine happens to be understocked at the time of inspection should not influence the result. Mule haulage is the most elastic we have. Its efficiency may be increased or diminished on short notice; and it remains only for the inspector to determine the maximum number of mules which may be economically worked, and the tonnage value of each, under such conditions as obtain at a given mine, in order to arrive at the haulage capacity.

Tipple capacity is governed by arrangement of tracks, grades, kind of dump and, if a shaft, length of hoist. It is sometimes necessary also to take into consideration the question of preparation. The logical place to clean the coal is, of course, at the working face, and this is, to a certain extent, done. But few coals come from the mine so clean as to require no further attention; and the inspector must determine the amount of time necessary to properly prepare the coal, as it is dumped into the railroad cars at the tipple. The railroad company is as much interested in the fair name of the coal it hauls to market, as the operator who mines and sells it. To each it spells revenue. As in the case of mechanical haulage, the tipple capacity is determined by actual test. One of the larger coal roads keeps on file outline sketch maps of each colliery, showing in color the development from year to year. These maps are of great interest, and, at times, of great value. As far as mine inspection is concerned, there is, perhaps, no material difference in the methods employed by the several railroads. The differences which do exist are rather of degree than of kind.

A Proper Method of Mine Rating

As to what constitutes a proper method of mine rating, this is, and probably will be for some time to come, a debatable question. The operators cannot agree upon it. It is impossible because so much depends upon the viewpoint; and the operators have many points of view. One operator prefers a rating based on tipple showing alone, and for obvious reasons. Suppose A, B, C and D are mining the same seam of coal. A has a pick mine. His coal is of good thickness, and is easily mined. On the other hand B, C and D are mining under adverse conditions. Their coal is perhaps thin and hard, and mining is done with the machine. A will have no trouble in filling his mine with the labor coming into the neighborhood; while B, C and D have to content themselves with what is left. Very frequently when labor is scarce—and it has been scarce the last few years—there is not much left for B, C and D. Under such circumstances the tipple showing of A is bound to exceed that of any of his neighbors, and might indeed be equal to their combined output. It is quite natural, therefore, that A should prefer a rating based on tipple results. At the same time the mine of B, C or D may show a larger development, a better equipment, and consequently a greater mine capacity. To base a mine rating on tipple showing under such circumstances would hardly be fair to B, C and D. This argument holds good with mines in different districts as well as with those in the same district. It is a discrimination against the thin-seam operator, regardless of his capital invested, which tends to drive him out of business.

Take the case of the operator who prefers to have the mine rating based on development alone. He advances the argument that the railroad company is unable to supply him with 100 per cent. of his car requirement when trade is flourishing; and considers it unjust, that, in order to get a rating equal to his development he is compelled to equip beyond the capacity of the railroad to handle his output. His contention seems reasonable enough, yet the argument against it condemns the method he advocates.

Let us suppose *A* and *B* to be operating the same seam of coal under like conditions. Each has a development of 1000 tons daily, and each plant is a duplicate of the other as to power, tipple facilities, haulage, equipment, etc. Apparently these mines have an equal value, and there seems to be no reason why each should not be rated at its developed capacity of 1000 tons daily. As far as the above description goes, it would be as fair for the one as for the other. But suppose A's development lies two miles from the tipple and B's a short half mile. Right here enters the question of haulage efficiency, and it cannot be ignored. It would be manifestly unfair to B to rate these mines on development alone. You might as well disregard development and rate the mine on haulage capacity alone, or tipple capacity alone, for the very nature of the case demands that these three factors have equal value. The careful manager will always keep his development well in advance. It is good mining practice thus to provide a surplus which is at once available for contingencies. Such practice needs and should receive no premium.

Viewpoint of the Railroad

The viewpoint of the railroad is purely impersonal. It recognizes the impossibility of devising a scheme of mine rating so flexible as to suit every case, and each road selects that which seems best suited to its needs. As a result the methods employed in rating for car allotment vary somewhat. This does not apply to anthracite roads which employ no inspectors, and rate on past achievement only. It is the practice of each of the bituminous roads to divide the territory covered by its lines into districts for the purpose of car distribution. The rated tonnage of the entire field having been determined, the percentage value of each district is calculated. In like manner is determined the percentage value of each mine in the district to which it belongs. The available cars are allotted to the various districts, and thence distributed to the mines in accordance with the percentage so found. During business depression when many mines are shut down, cars are plentiful; but when the coal market is normal they are scarce, and all districts and mines are placed on a percentage basis, which is rigidly enforced.

To establish a mine rating two methods are used by the several roads with more or less variation. One of these combines capacity with tipple results. The tipple showing for an equal percentage period, say three months, during two consecutive years, is added to the mine capacity as founded by the inspector, and the result divided by three. This forms the rating for the following year. At the end of each year the earlier tipple result is dropped and a new one substituted, covering the same percentage period for the year just passed. When advisable, a new inspection is made and any change in the mine's capacity substituted in the calculation. This method has many advocates.

Rating on Capacity Alone

With the other method the mines are rated by the inspector on capacity alone, governed by the minimum factor. This method is used by one of the originating carriers. It is the policy of this road to have a mine inspected at any time, on request of the operator, and, if necessary, to make a new rating which goes into effect the first of the month following. This feature has the advantage of stimulating development, improvements, etc., inasmuch as it gives the operator a quick return for money so invested.

A new mine opening into a large tract is not at first rated, but given all the cars it can load, over a period, the length of which is determined by circumstances. This permits the operator to develop his mine rapidly and put it, as soon as possible, upon a paying basis.

An operator who has several mines in one district receives his quota to be distributed as he sees fit. It frequently happens during dull market periods that he finds it more economical to bunch his men at one or two plants and let the balance lie idle. Work some roads such all mines are nominated at [illegible] the expiration of a given period of time. This road, however, allows the rating of all mines to

stand, and their car allotment is diverted to the active mines operated by the same company. It insists, however, that these idle mines be kept in such condition as to be able to resume work at once when trade conditions warrant. Mines allowed to fill with water or to cave in, or mines which have been dismantled are promptly nonrated.

It might be argued that a rule of this kind is pernicious, because it permits an operator to open mines in order to get increased rating; but the facts preclude such contention. No operator is spending money to open and equip mines, keeping them continually in a workable condition, and letting them lie idle for the sake of a few extra cars. Keeping such mines in constant repair is, at its best, expensive work; and the operator is willing enough to start them up when the market is again normal. Just so long as the idle mines are *bona fide* operations, and just so long as they are at all times workable propositions, it seems only fair that the operator should get some returns from them in the shape of rating.

It occasionally occurs that by reason of a breakdown in machinery or for some other cause incidental to mining, a full day is not worked and cars stand over. These cars are not taken into account in making up the quota for the day following. Toward the end of each month an effort is made to equalize the allotment, and, as far as possible, square the car account for that month.

No contention is made that this method is the best that can be devised; but it appears it gives general satisfaction. In my opinion that method of mine rating is the proper one which satisfies the greatest number of conditions on any given road. If such a method is adopted and adhered to rigidly and impartially, it will go a long way toward satisfying the operator, who, whatever else he may demand, expects, and is entitled to, a square deal.

This paper has been prepared in the hope that others may be induced to take up and discuss a subject of such vital interest to both operator and railroad.

Colliery Notes

European colliery managers seem to concur in the opinion that miners employed to do rescue work should be paid for their time and traveling expenses during the period of training. It is also stated that greater interest is created if certificates of efficiency are awarded, and bodges given to deserving men.

No information as to the relative advantages of turbines and reciprocating engines for unit of 1000 kw. capacity downward, resulted in favor of the reciprocating engine. The cost per kilowatt capacity and the steam consumption per kilowatt output, both appeared to be in favor of the reciprocating engine.

When operating in foul air, the leader of a rescue party should examine the pressure gages every 15 min., in order to detect any loss of oxygen. It is further suggested that any surplus cylinders of oxygen carried for reviving purposes should be the exact duplicate of the cylinders carried on the apparatus; provision should also be made so that an exchange of empty cylinders for fully charged cylinders can be effected.

The shafts put down at the New Wellesley mines in Scotland typify the latest European practice. The Wellesley shafts are elliptical, being 27½ ft. long by 14 ft. 10 in. wide, inside measurement. The walling is of brick in cement, 18 in. thick. The shafts are divided by center, and two side buntons, or steel joints, so as to give two winding spaces 11½x8⅓ ft., and two end spaces for pipes, ropes and cables. The shafts are 1650 ft. deep to begin with, but will be ultimately carried down to 2250 ft. The Wellesley mine commands an area of about 15 square miles of coal under the sea.

The idea prevails among many mine managers that quick-running engines "knock themselves to pieces." For this reason they go to great expense building massive foundations and installing heavy engines when a small high-speed plant of the same capacity would occupy only about one-fifth the space required by the larger engines. Furthermore, a number of units all of the same size and make, with spare parts interchangeable, are to be preferred to one large engine and dynamo. Practice has shown that the best method of driving electric generators is to couple the dynamo directly to a high-speed engine, working under forced lubrication, and having large gearing surfaces.

For the purpose of exploration, a diamond bore was recently put down in the coal measures of the mining districts in Scotland. In searching for the lower or limestone series of coals, the bore reached the great depth of 4534 ft. The core obtained at the finish of the bore was barely ¾ in. in diameter. The total cost was about $34,854, equal to an average of $7.65 per foot. The percentage costs of the various items entering into the expense of this bore were as follows: Diamonds used, 42.05 per cent of total cost; wages paid, 25.69; coals used, 4.44; carriages, cartages, repairs, etc., 1.80; core tubes, crowns, trap rings, nipples, plugs, etc., 1.87; tubes for lining, 5.56; ropes and stores, 2.14; contractor's gross profit, including depreciation of plant and material lost in bore, 16.45; total, 100 per cent.

In carrying on rescue work, those in charge should not overlook the temperature of the mines in which the work is being done, and the clothing of the men engaged in this work. Investigation has shown that it is impossible for a man to work in a place where the wet-bulb registers 85 deg. F., without suffering a rapid rise of body temperature, and consequent danger of heat-stroke. It does not matter what the dry-bulb temperature is, for the power of the body to regulate its temperature adequately depends almost entirely on the wet-bulb temperature. If the air is hot and wet, the rescuer cannot keep the body temperature down by the evaporation of sweat. It is, therefore, advisable that the leader of the exploring party should take the wet-bulb temperature in the mine, and if this temperature is over 80 deg. F., the men should not be exposed for more than 30 min.; the rescuers in such hot, wet atmospheres should be stripped of clothes as far as possible. The mouthpiece of the apparatus used in such a temperature should be of a kind that the man can detach with safety, in order to drink, so as to keep up the supply of water in the body for sweating. All men who are expected to do rescue work under such conditions as above described should be practiced in a chamber filled with hot, moist air, and observations should be made on their power to work, rectal temperature, need for drink, etc.

With reference to the problem of watering mines to prevent dust explosions, a number of engineers have lately condemned this system as inefficient, not only because of the increase in fatalities from falls of roof, but also because the explosions at the Reden, Radbod and other collieries in Europe and America, where the sprinkling system was in use, showed that this method of watering does not render dust innocuous. In dealing with this question, Mr. Frostmann, taking the case of the Reden mine in Germany, says that although the system of water did fail in the Reden mine, it must be admitted that this system was on account of the fact that sufficient attention had not been paid to the danger of the mine drying up through the large quantity of air passing in the cold season. The explosion at Reden took place on a Monday morning shortly after the descent of the miners. The mine had, therefore, not been watered for about 36 hours. The average temperature of the outside air was at that time about 20.6 deg. F. The air left the mine with a temperature of 78.3 deg. F. Each cubic meter of air, therefore, took up about 20 grams of water, if it left the mine saturated with aqueous vapor; and the total quantity of air, about 2200 cu.m., absorbed from the mine 44 kg. of water per minute, and, therefore, in 36 hours, about 95 cu.m. of water were absorbed. Under these conditions the mine would be quite dried up on Monday morning. The original firedamp explosion was thus extended by the coaldust and caused the loss of 150 lives. In order to avoid such accidents in the future, the mines are now watered during the night after they have been idle, and before the descent of the ordinary shift of miners.

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*Illustrated.

Speculation in Copper

We have at several times during the last year referred to the unusual speculation in copper that has been going on, and its effect upon the market. Speculation in copper is, of course, no new thing. The copper-selling agencies of this country that buy and refine crude copper habitually take advantage of the London speculative market to sell Standard against purchases here, if market conditions indicate this to be a wise policy; or, on the other hand, they may purchase Standard in London, take delivery and bring the material to this country for refining. The London Metal Exchange, which in effect is international, inasmuch as a large part of its business emanates from this country, serves, therefore, as a balance wheel, and the prices for copper at New York and London can never be for a long time out of joint.

The unusual feature of the last year in copper speculation has been the participation of outside interests that have no direct concern with the metal industry, just as they have previously done in grain and cotton. Another class of speculators has become interested in the copper market on the ground that it experiences a more active movement, and affords greater opportunities for profit than do the shares of the copper-mining companies; well known American brokerage houses have publicly stimulated this speculation. Still another class undertakes speculation in the metal in London for the purpose of influencing the stock market here. From this it has resulted that the copper market, both of New York and London—which, as we have previously pointed out, are practically the same—is swayed by many conflicting influences.

There is even some speculation in refined copper in the New York market, but this is generally discouraged by the selling agencies for obvious reasons. Copper sold to a speculator is destined to be put on the market again, and the resale may spoil the plans of the original seller. It is indeed conceivable that an agency might come into competition with speculative copper held in storage at its own refinery. Nevertheless there are apt to be some overtures looking toward speculation of this kind that the agencies cannot well decline, and, indeed, upon occasions such transactions have actually been inspired by them. There is, moreover, a constant speculation in refined copper by the smaller fry of the metal business, while now and then manufacturing consumers cannot resist the temptation to take a flyer, and buying for more than actual requirements may offer their surplus in the market under certain conditions.

All of this injects a gambling spirit into the business in a staple commodity, which tends to upset calculations. As is well recognized, a modicum of speculation is by no means a bad thing, serving to temper the natural fluctuations and generally steady the market. The speculative purchases of the man of large means, who reasons from good grounds that copper is cheap and is prepared to finance his purchases for the long pull are of that character. On the other hand, the transactions of the speculator who buys or sells upon a narrow margin with the expectation that copper is quickly going up or down, and otherwise with no particular consideration of conditions, are fraught with considerable danger. We saw in the early part of this year how the liquidation of such speculative commitments precipitated a sharp decline and lately there has been something similar. We have repeatedly been surprised by evidences of the extent to which this speculation in copper has lately been carried. It is a condition that is ominous for the stability of the market. The latter will be assured only when actual consumption begins to check the accumulation of supplies, and the large transactions in the metal signify more than the mere transfer from one hand to another. That there will be any restriction of production there appears to be no hope, the output having increased steadily on a 13c. level. We can, therefore, look only to an increase in consumption.

Vital Questions Affecting Coal Mining

In this special coal number of the JOURNAL various engineers have discussed some of the more important problems that now confront the coal industry. The progress toward the solution of such problems has been greater during the last two or three years than in the decade preceding. This awakening has been caused largely by the recognition of coal dust as a factor quite as dangerous to

miners as inflammable and explosive gases.

Great impetus was added to the examination of problems affecting the safety of coal miners by the Courrières disaster in France, the Monongah explosion in this country and similar accidents in other countries during recent years. As a result of this agitation the French government has established an experimenting station at Liévin, France, which installation is described in detail by M. Callot in this issue. The establishment of the French station was quickly followed by the installation of similar stations in other European countries and by one in this country, under the direction of the U. S. Geological Survey. If the work already accomplished at experimental plants can be taken as a criterion of what is to follow, there is no doubt that the final outcome will many times justify the steps that have been taken.

The work of these stations is of interest to all mine operators, and it is well that wide publicity should be given both to methods adopted and the results.

In addition to the experimental work being done by our Government, the larger coal companies and especially the Fairmont Coal Company are making independent investigations so as to be able to meet the local problems encountered at their mines. Mr. Smyth, chief engineer of the Fairmont Coal Company, presents in this number of the JOURNAL valuable results with reference to the regulation of gas in mine air currents. As is shown in the charts accompanying this article, an effort is being made to discover what relation, if any, exists between the flow of gases into mines and the variation of atmospheric pressure, as shown by barometric readings. It does not seem at the present time that any definite relationship of this kind has been established, but it is understood that future reports will give such corresponding readings in greater detail.

The question as to whether or not the use of electricity in gaseous mines should be permitted is discussed in this issue of the JOURNAL by Mr. Wood. This article is an able defense of those who believe that other causes than electricity are responsible for our many recent disasters. Other writers in this number have dealt with subjects of almost equal interest to those already mentioned, and the commercial as well as the technical side of coal mining has not been neglected.

Radium as a Commercial Substance

The value of radium is said to be about $21,000 for a gram. For the benefit of our readers who are not familiar with that metric measure of weight, we will say that the nickel 5-cent piece weighs five grams. In the presence of this remarkable substance, interest in diamonds, rubies and other precious things fades into insignificance. What wonder then that miners, metallurgists and scientists should be seeking to produce radium?

We have observed recently reports of the operations of two concerns abroad. In one of them, Sir William Ramsay, consulting chemist to the British Radium Corporation, Ltd., describes his work on pitchblende from Trenwith, in Cornwall, and the successful extraction, by his own process, of the first British radium. Out of 2240 lb. of high-grade pitchblende concentrates he expects to be able to obtain something like 196 milligrams of radium reckoned as bromide. Sir William recommends the immediate installation of a plant for the regular extraction of radium.

It looks, however, as if the British Radium Corporation, Ltd., might be outdone by a Swedish company recently formed under the name of "Kolm" to acquire the patents of Dr. Gustaf Helsing. This company bases its hopes on the mineral "kolm," a kind of coal which is said to occur in alum schists in Sweden. Its ash contains 2½ per cent. of uranium. It is anticipated that a ton of "kolm" will give five milligrams of radium sulphate.

The deposits of "kolm" are said to be extensive. Are we to look for a *debâcle* in the market for radium? We recently reported the purchase of 7⅛ grams at $150,000.

The Distribution of Coal Cars to Mines

In times past there has been much discussion over the system—or lack of system—in the distribution of cars to producing coal mines by the railroads which haul their product.

It is true that on the more important and better managed lines a close watch is kept, and means have been taken to reform abuses, and to check and prevent the misuse of authority by divisional and other officers. This has been supplemented by the adoption of systems by which mines can be fairly and equitably treated. In times like the early part of 1908, of course, there was plenty of cars for everyone; but as business improves there is no doubt that the demand will again exceed the supply of cars, and strict discrimination will again be needed to secure justice.

In this connection the paper by H. B. Douglas, given on another page, will be read with much interest. It describes the method of rating mines for car supply adopted by a prominent road, and shows the care with which adjustments are made. The system of inspection described cannot be deemed inquisitorial, when the object is considered, and coal operators cannot object on this ground. To be just the railroad officers must know the facts in each case. It is encouraging to see that such a system can be put in use, and there is no doubt that it will operate fairly. Of course, there will always be complaints from some shippers in flush times; but where all are assured of a "fair deal" all must be satisfied in the end.

Mr. Obalski's Retirement

The retirement of J. Obalski from the position of chief of the Mining Bureau of Quebec, will be a distinct loss to that Province, although it will still retain some of his services as technical adviser to the bureau. Mr. Obalski has been in charge of the geological and other mining work of the Province for about 30 years, and during that time has done some notable work. To him is due the geological exploration and mapping of the Province, and his work and his writings have done much to aid in its mineral development. In recent years, since the extension of the northern limits of the Province he has been indefatigable in the exploration of the new region to the eastward of the Cobalt country in Ontario, and his reports will be the basis of the extensive prospecting which is sure to follow the opening of the Quebec section of the Grand Trunk Pacific, which will make those regions accessible. Perhaps we may consider as his latest achievement the revision of the Quebec mining law, which will open the new country to prospectors on equitable terms and will go far to prevent the locking up of large mineral areas which was possible under the old law.

McGraw-Hill Book Company

The book departments of the McGraw Publishing Company and the Hill Publishing Company have been consolidated under the corporate name of the McGraw-Hill Book Company, with offices after July 1 at 239 West Thirty-ninth street, New York. This consolidation brings together two of the most active publishers of technical books in the United States. The new company takes over the book departments of both houses with a list of about 250 titles, both industrial and college text books, covering all lines of engineering. It will continue as well the retail, importing and jobbing business of the two houses

The officers of the new company are: President, John A. Hill; vice-president, James H. McGraw; treasurer, Edward Caldwell; secretary, Martin M. Foss. Mr. Hill is head of the Hill Publishing Company, which publishes the *American Machinist*, THE ENGINEERING AND MINING JOURNAL and *Power and The Engineer*. Mr. McGraw is head of the McGraw Publishing Company, which issues the *Electrical World*, *Electric Railway Journal* and *The Engineering Record*. Mr. Caldwell has been manager of the McGraw book department for several years and Mr Foss manager of the Hill book department

Chronology of Mining for June 1909

June 1—Frick Coke Company fired 1200 additional ovens in the Connellsville region.—Summer meeting of the West Virginia Coal Miners' Institute held at Elkins.—Hayden Stone & Co., purchased the Santa Rita mine

June 2—The Morris Coal Company, Zanesville, O., resumed operation; 500 men are employed.—Plans of the reorganization of the Newhouse Mines and Smelter Company issued.

June 4—Strike of 400 men at the Charleroi coal mine ended; operations resumed.

June 5—Dominion Copper Company's property sold under foreclosure at Vancouver, B. C

June 7—Annual meeting of the stockholders of the Amalgamated Copper Company

June 8—The Yukon Gold Company completed a 70-mile ditch from Twelve Mile river.

June 9—A steamer carried away the lower gate of the lock in the Canadian canal at the Sault.

June 10—John D Ryan elected president of Amalgamated Copper Company Benjamin B Thayer elected president of Anaconda Copper Mining Company

June 11—Fire started in the Jumbo mine of the Pittsburg Coal Company near MacDonald.—Strike at the Iola, Kansas, smelter of the Prime Western Smelter Company.

June 15—The Ontario Government sold 15 tracts of land on the Gillies Limit, Cobalt.—Plant of the Nevada Sulphur Company, Humboldt, Nev., burned. Loss, $100,000.

June 16—Jones & Laughlin Steel Company closed deal for coal land involving an expenditure of $4,000,000.

June 17—Jameson Coal and Coke Company closed deal for 7000 acres of coal land near Fairmont, W. Va. Consideration $2,000,000.

June 18—A shipment of gold valued at $3,200,000 arrived at Seattle from Alaska.

June 21—Thomas Iron Company, Easton, Penn., announced an increase of 10 per cent. in wages effective July 1.—The same action taken by several other iron companies.

June 23—Explosion in mine No. 4, Lackawanna Coal and Coke Company, Wehrum, Penn.; 17 killed.

Gold from the North

SPECIAL CORRESPONDENCE

On Friday, June 18, there was received at Seattle, Wash., consignments of gold totaling about 200,000 oz. in weight and valued at $2,200,000. Advices were received of further shipments to the aggregate value of $1,200,000, these to arrive in a few days. Thus, total placer gold receipts at Seattle within a week or 10 days were of an aggregate value of about $4,400,000. Reckoned by the ton, this means that nearly 9 tons, avoirdupois, of gold reached the Puget Sound city recently. The gold comprising the first-mentioned shipments was chiefly from creeks in the Fairbanks district, Alaska, with a small proportion from the Canadian Yukon. That contained in the later shipments was from Nome.

Advices received in Seattle from Fairbanks and Tanana are to the effect that the clean-up this year will be the largest in the history of those camps The dumps of pay dirt are the biggest yet accumulated fully one third larger than those of last season—and there is plenty of water for gravel washing. In other respects too, the season is favorable, including a richer pay average than in past seasons The total output of these camps for this season is estimated at $12,000,000 to $13,000,000. The output for the season from Nome is estimated at least at $2,000,000

In the Canadian Yukon six placer gold discoveries regarded as important, were made last year, beside several minor points The former are On Herbert and Log Cabin creeks, both in Forty-mile district, Glacier creek, in Sixty mile district; Barker creek in lower Stewart, and Matheson creek, in upper Stewart district and on Lower Thistle creek, along the Yukon. There is a distinct revival in the Klondike and the expectation is that from now on there will be a marked increase in its annual output of gold.

June Dividends

The accompanying table shows the total amount, and the amount per share, of a number of the more important dividends paid during the month of June, 1909, by mining and industrial companies in the United States, and by some foreign mining companies.

JUNE DIVIDENDS.

U. S. MINING COS.	Location.	A'mt. per Share.	A'mt. Paid.
Am. Smelters Sec., pf. A	U.S.	$1.50	$255,000
Am. Smelters Sec., pf. B	U.S.	1.25	375,000
Bunker Hill & Sullivan.	Ida.	0.15	45,000
Calumet & Hecla, c	Mich.	6.00	600,000
Champion, c	Mich.	2.00	50,000
Colorado, s.l.	Utah	0.08	80,000
Doctor Jack Pot, g	Colo.	0.00½	14,134
Doe Run, l.	Mo.	1.50	95,262
Elkton, g	Colo.	0.01½	37,500
Federal Sm., pf.	Idaho	1.75	210,000
Florence, g	Nev.	0.10	105,000
Granite Gold	Colo.	0.01	16,500
Homestake, g	S.D.	0.50	109,200
Iron Blossom, s.l.	Utah	0.08	80,000
Mary McKinney, g	Colo.	0.02	26,185
North Butte, c	Mont.	1.00	400,000
North Star, g	Cal.	0.40	100,000
Phelps, Dodge & Co.	U.S.	0.02½	1,123,365
Round Mtn. Min	Nev.	0.04	32,000
Sioux Con., s.l.	Utah	0.06	52,247
Snow Storm, s.l.	Ida.	0.03	45,000
St. Joseph, l.	Mo.	0.15	150,000
Utah Copper.	Utah	0.50	362,975

U. S. COAL AND INDUSTRIAL.	Location.	A'mt per Share.	A'mt Paid.
American Coal	Md.	0.375	17,187
Crucible Steel, pf.	Penn.	1.25	304,456
General Chemical, com.	N.Y.	1.00	74,103
Maryland Coal, pf	Md.	2.50	47,125
Sloss-Sheffield, com	Ala.	1.25	125,000
Standard Oil	U.S.	9.00	$730,000
U. S. Metal Selling Co	N.J.	50.00	2,500,000
U. S. Steel Corp pf	U.S.	1.75	6,304,919
U. S. Steel Corp com	U.S.	0.50	2,041,512

FOREIGN MINING COS	Location	A'mt. per Share	A'mt Paid
British Guiana, g	S.A.	0.08¾	17,500
Kerr Lake	Ont	0.30	18,000
McKinley-Darragh	Ont	0.05	100,000
N. Y. & Hond. Ros	C.A.	0.10	15,000

According to the *South African Min Journ*, March 13, 1909, since February, 1909, there has been a revival in the mining industry of the Zoutpansberg. During February 400 mica claims were staked in the Leydsdorp district, and 600 copper claims in the Magalakwin district

According to statistics of THE MINERAL INDUSTRY the 1908 production of borax in the United States was 33,500 short tons valued at $177,500 against 38,143 short tons for 1907. In 1908 3007 short tons of boric acid ($106,767) and 7,115 short tons of refined borax ($1,237,885) were produced.

Views, Suggestions and Experiences of Readers

Comments on Questions Arising in Technical Practice and Debatable Points Suggested by Articles in the Journal

CORRESPONDENCE AND DISCUSSION

An Independent View of a Recent Coal-mining Meeting

Having just returned from the summer meeting of the Coal Mining Institute of West Virginia at Elkins, it has occurred to me that the impressions of that meeting from the viewpoint of an independent engineer, not affiliated with any company or corporation might be interesting to your readers. The meeting was successful in every way; the time of year, the country, the clean-cut men, and the papers submitted combined to make it a most enjoyable occasion.

The most striking feature to the outside public was the maturity of the young men present, and one had but to listen to their papers and more especially to their answers during the discussions ensuing, to understand why such tremendous interests had been entrusted to them; alert, earnest, capable, it was a pleasure to hear them.

To illustrate what young "captains of industry" we have in this State, it is said that the oldest professional man upon the splendid corps of the Fairmont Coal Company is only 35, and that most of them are under 30.

These men were not dodging the issue of mine accidents or greater safety in their mines. It was plain to be seen that it was a living, vital question to them, and that they were seeking light and help from every conceivable source; also that they intended and were facing the situation with that manliness, courage and skill which will win out in the long run. It is evident that the mining companies are placing their interests in competent hands and that as the years go by, these hands and brains will accomplish greater results as they gain that maturity of judgment, which can come only with maturity of experience.

The State of West Virginia is squarely facing her responsibilities, and Governor Glasscock publicly stated that he was putting the question of proper inspection and competent inspectors up to the chief mine inspector.

Apparently this position of the Governor will give Mr. Laing the opportunity that has been denied his predecessor. He has started well by insisting upon the examination of prospective inspectors, and if he will see to it that these examinations are fair and concrete, and if he will divorce politics from the mining department, we shall hear in future quite a different story from "the office." We wish him every success, and admire the bold stand he has already taken; we hope that the executive and legislative branches of the State government will work with him, and we are convinced that if they will do so, they will find the operators fair and reasonable and anxious to safeguard the mutual interests of State and owners.

S. H. Brockunier.

Wheeling, W. Va., June 3, 1909.

The Price of Labor

Mr. Finlay's "Investigation of the Cost of Mining Coal" in the Journal of May 8, 1909, wherein he makes the startling—one might say, heretical—statement that the "rate of wages is an effect and not a cause," is to be commended.

The price of labor emphatically is determined by the natural factors. And the labor cost is not a direct function of the rate of wages, as is so commonly believed. More often, it is the reverse. Low wages may mean high cost per unit, owing to a corresponding lack of efficiency, which Mr. Finlay points out.

Supply and demand of labor regulate the cost of the labor unit as surely and absolutely as the labor cost of a unit of production is regulated by the factors of management, as between two managements with the same natural factors to contend with.

A labor unit in a given district is the average daily work of an average laborer at a certain price per day. To raise this average work without raising the price is generally not possible, supply and demand remaining unchanged, (1) because the average man cannot do more; (2) why should he? To secure more work per day per man it is necessary to pay a premium, and get above-the-average men. This is an essential in obtaining the choice of any commodity. The ability to do this depends on the natural factors and on the skill of the management.

The thrifty and economical management with favorable conditions can bid more for labor, and choose the best, and with the increased output pay a profit on the added investment. The cost of labor has apparently increased, but it is safe to say that the labor cost of the product has not increased, while the increase in product and saving of time pay the interest and profit on the added capital.

The same is true of replacing labor with machinery. This will cause a readjustment of wages only in so far as the balance between supply and demand is disturbed.

Some will accuse Mr. Finlay of having substituted "cost of living" for "rate of wages" in his factor *e* in the list of factors which enter into the cost of mining coal. While the cost of living determines the so-called "living wage," the law of supply and demand determines what shall be the margin between living wage and the paid wage. That the margin becomes a negative quantity at times, is because of abnormal disturbances of the balance between supply and demand. The same is true, of course, of abnormally high wages.

It may be said that the cost of living—therefore, the living wage—varies so much that it is only a quibble of terms for Mr Finlay to use "cost of living" and not "rate of wages" as his factor. The fact is that the living wage—a wage which will keep a man and his dependents alive, no more—varies little the world over. It is the margin between the living wage and the earned wage which varies with the variations of civilization and is the effect of natural local conditions.

Mr. Finlay's novel statement applies not only to the economics of mining but to the economics of all labor-consuming enterprises. When the products of the enterprises are not of the earth, but become manufactures, the "natural" factors become more or less artificial ones, but the rate of wages is none the less an effect, not a cause.

Walter Unzicker

Cruz, Tamaulipas, Mex., June 9, 1909.

Zinc Mining in Butte

As a result of my short article, published in the Journal of May 1, 1909, describing the conditions connected with the mining of zinc ores in Butte, I have received numerous letters from different parts of the United States, Canada and Mexico, inquiring as to how zinc ores occurring in those localities can be treated; also from purchasers of zinc ores, and from others who have patented processes for the treatment of them. Some of these processes are specially adapted to separating iron pyrite from zinc pyrite.

The secret of the success made here in the wet concentration of the ores, occurring in the properties of the Elm Orlu Mining Company and the Butte & Superior Mining Company which adjoin, lies in the fact that the ore coming from these two properties contains a very small percentage of iron. An average assay of a large number of samples of crude ore and

concentrates from these two properties is shown in the accompanying table.

ZINC ORE AND CONCENTRATES.

	Au.	Ag Ounces.	Cu Per Cent.	Zn Per Cent.	Fe Per Cent.	SiO_2 Per Cent.	S Per Cent.
Crude ore.....	$0.40	12.0	1.0	21.0	3.0	18.0	....
Concentrates.....	1.00	25.0	2.0	46.0	5.0	10.0	28.0

Perhaps this information will be of value to those readers who have zinc ores which approximately correspond in their assay contents to the above figures. If the ore here contained much iron pyrite, it would be impossible to concentrate it and bring the zinc in the product up to 45 per cent. or over. There are no plants in Butte equipped to reduce either zinc ore or zinc concentrates, and the concentrates are, therefore, shipped to the zinc smelters in Oklahoma and other points. These plants, after treating the concentrates for their zinc contents, ship the residue containing the copper, silver and gold, to other smelting plants treating this class of material.

The development of the zinc veins in the Elm Orlu and Butte & Superior properties is proving entirely satisfactory. The Elm Orlu veins are constantly increasing their output, which necessitates the enlargement of the plant at the Butte Reduction Works to accommodate them. The Butte & Superior company is in position now to mine from 500 to 1000 tons daily of this class of material, and will do so as soon as arrangements are made for the necessary means of concentrating it. We find from our experience in the concentration of the zinc ores that the ordinary jigs used for treating copper ores do not give satisfactory results, and it has become necessary to devise specially built jigs for this class of material.

A. H. WETHEY.

Butte, Mont., June 17, 1909.

Determination of Alunite

I have no intention of criticizing in the main R. B. Gage's interesting and instructive paper on the "Determination of Alunite," in the JOURNAL of June 5, 1909, for articles of this kind are of great value. Yet it seems to me that the remark, toward the close of Mr. Gage's paper, that if alunite be present, a prospector "may prepare to sink deeper with a reasonable expectation of finding gold also," might possibly create a false impression. Alunite results from various causes and thus at times has no connection whatever with gold, a point which F. L. Ransome, who first identified the mineral at Goldfield, has emphasized, both in his letter in the JOURNAL of Jan. 16, 1909, and in his paper[1] on the Goldfield occurrences.

[1]*Economic Geology*, Vol. 2, p. 667.

The general geology and the conditions under which alunite was formed, must be taken into account, for this mineral, *per se*, is no more an indication of gold than is kaolin, with which it is often associated at Goldfield, or gypsum, which, likewise, may be due to the same agencies which produce alunite, lime being involved in the one case and potash and alumina in the other.

In course of time the detailed study of mining regions and the researches into the various phases of rock alteration may possibly lead to the discovery of reliable indicators for gold, but it appears to be a melancholy fact that in general, the only sure sign now known is the presence of the metal itself. The difficulties of an inquiry of this kind are greatly enhanced, as compared to the more common metals, as only an infinestimal amount of gold is required to make a payable ore; hence it is small wonder that gold occurs under many and varied conditions and that while certain general principles apply more or less to all gold-mining regions, each is, at least to some extent, a law unto itself.

The alunite at Goldfield would probably have been formed, gold or no gold, and from what I can learn all that can be stated with certainty as yet is that in some occurrences alunite is associated with gold, and in other it is not. Because this mineral is characteristic of the Goldfield deposits I cannot see that it necessarily follows that such should be the case elsewhere, for a statement, based upon observations in one or two localities only, may by no means, be of general application to all districts of similar rocks.

GORDON SURR.

San Bernardino, Cal., June 11, 1909.

The Upper Coal Seams Should Be Mined First

Having at various times visited many sections where coal is mined on a large scale, I trust that a few remarks advocating conservation along somewhat different lines will be acceptable. In western Pennsylvania, I find that the Lower Kittanning seam of coal, the Upper Kittanning, and in some places the Lower Freeport are being mined out, leaving the Upper Freeport bed in a very unsafe position to mine in the future.

I have frequently called the attention of mine operators to this matter, and suggested that the Upper Freeport seam should be mined first; then follow with the Lower Freeport, the Upper Kittanning, and lastly the Lower Kittanning. In this manner, everything under the coal seam that is being mined, would be solid, and it would be possible to remove all of the coal. Also by this method, subsidence of the strata would not be prolonged but everything would settle more quickly, and become solid, which plan of operation would be desirable under farms.

It is true, however, that the unwise system of mining one, or both of the underlying seams still continues, simply to meet the requirements of the trade, and to supply to it, that which is supposed to be the best steam-raising fuel. If such a method is long pursued, the ultimate result will be the virtual destruction of a seam of coal, that on an average will yield from 6000 to 10,000 tons of excellent coal per acre. J. R. HECKMAN.

Johnstown, Penn., March, 27, 1909.

The Application of Alternating Current to Coal Cutting Machines

Although universally recognized as of great importance, the application of electricity in mines has been somewhat retarded because coal-mining machinery could be operated electrically only by direct-current motors. This limitation has prevented the generation and transmission of electricity by the more economical alternating current except when transformed to direct current by a rotary converter near the point of application.

Henceforth the use of electricity in coal mining will be more wide-spread because of the development of the alternating-current motor. Distant water powers and advantageously located generating stations can now be utilized to a greater extent, for it is no longer necessary to transform the alternating current. This far-reaching development in coal-mining machinery is made possible by the application of an alternating-current motor to the Pneumelectric coal puncher. As a direct-current machine it has already reached a high degree of perfection, in fact it has been so successful that the Pneumelectric Machine Company, of Syracuse, N. Y., is now equipping it with an alternating-current motor of two or three phase, for any voltage or frequency.

This is said to be the first successful application of an alternating-current motor to coal-mining machines, and, although announcement of this motor has been made quite recently, it is not in the experimental stage.

All previous attempts to use alternating-current motors for coal-cutting machines have failed because of the great weight of the machine and the enormous amount of power required. With the Pneumelectric, however, the principle of operation has been shown to be so efficient that the power is reduced to one-third that of many other types of coal-cutting machines, thus allowing such a light motor that the complete machine weighs only about 800 lb. Notwithstanding this great reduction in weight and power input, the Pneumelectric is in no way inferior in its capacity for work. D. T. R.

Boston, June 22, 1909.

Rock Temperatures and Deep Mining

SPECIAL CORRESPONDENCE.

In the report of the St. John del Rey Gold Mining Company in Brazil for 1908 Superintendent G. Chalmers gives some interesting information on the subject of deep mining. The lowest level—or horizon as the report calls it—is 4000 ft. below the main adit level. Owing to the poor provision of shafts the ventilation of the workings is a serious problem. The following statistics are given of the average rock temperatures at different depths, which are counted from the surface, in feet:

Depth.	Degrees.	Depth.	Degrees.
324 ft	76	2264 ft	80
624 ft	71	2524 ft	81
924 ft	74	2824 ft	84.5
1224 ft	75	3124 ft	82.5
1524 ft	77	3424 ft	86
1824 ft	78	3724 ft	88
2073 ft	78	4024 ft	95

Owing to the high elevation of the surface the 2824-ft. level is almost exactly at the sea level.

It will be seen that the rise in temperature is not proportional per unit of depth, but this is believed to be due to the holes in which the thermometers were placed being unsufficiently deep for the purpose. At some points the rock was exposed to a larger volume of air and was in consequence cooled to a greater extent than at others. Unless ventilation is provided, the workings will approximate in temperature to that of the rock, and, in order to make the mine fit for men to work in, large volumes of fresh air are required in deep mines.

It is estimated that if the St. John del Rey mine is worked to a depth of 6500 ft., as is proposed, the probable temperature of the rock at the lowest point will be some 10 deg. higher than at horizon 14, where it is 95 deg. With the present ventilation the miners can work with good efficiency, and it is anticipated that with adequate ventilation the workings down to 6500 ft. can be kept at a temperature very little in excess of that of the horizons now being worked.

The increased temperature of the rock demands also an addition in volumes of air. The power necessary to do this work does not vary directly as the volume, but as the cube, and directly as the length of airways. A large addition of fan power will therefore be required for the deeper working.

Cement Production in Canada

SPECIAL CORRESPONDENCE.

The Canadian Department of Mines has issued a statement based upon complete statistics received from the producers, showing the production of portland cement in 1908 and giving other information with regard to the industry. The total output from 23 operating plants for that year was 3,495,961 bbl. of 350 lb. net, as compared with 2,491,513 bbl. in 1907; an increase of 1,004,448 bbl. or 40.3 per cent. The total consumption of portland cement including both Canadian and imported cements was 3,134,338 bbl. in 1908, as compared with 3,108,723 bbl. in 1907, an increase of 0.8 per cent. The Canadian plants have a total daily capacity of 27,500 bbl. equivalent to about 8,250,000 bbl. per year of 300 days, or 10,000,000 if they were run continuously the whole year. Fifteen of the 23 plants are in Ontario, of which 12 use marl and three limestone. Of the total quantity produced in 1908 1,573,090 bbl. were made from marl and 1,922,871 bbl. from limestone and slag. The average price at the works, as returned by the manufacturers, was $1.39 per barrel. There is very little cement exported from Canada only $34,591 worth being recorded for 1908. Imports, which previous to 1904 were larger than the Canadian production, have been decreasing and were in 1908 but 14.9 per cent. of the total consumption. The total value of cement imports that year was $531,045, of which $283,899 came from the United States and $202,139 from Great Britain.

The Scotch Mineral Oil Trade

The mineral oil trade of Scotland, says the London *Economist*, has naturally suffered from the depression which exists all over the world, but, unlike most other industries, it has also benefited from that depression in respect of the lowered cost of production. The result of the depression, therefore, has not been so serious as at one time was contemplated, and, in fact, the profits of the companies increased, even though nearly all the products have fallen in value. Taking the prices ruling for the most part during the oil year just closed, in comparison with those of the previous year, the declines may be stated as ¼d. per gallon in burning oil, 3½d. per gallon in shale spirit, 2d. per gallon in motor spirit, 15s. per ton in lubricating and gas oils, 15s. per ton in sulphate of ammonia, and ¼d. per lb. in paraffin wax.

These declines do not apply to all the products sold by all the companies for the whole year, owing to the system of selling ahead and the contracts engaged early in the year. At that time prices of lubricating and gas oils and ammonia ruled higher, and at the higher prices large quantities of these were placed. These earlier sales minimized the reductions all-round at later dates, yet on the total of the sales during the year there was a considerable shrinkage compared with the previous year. On the other hand, the general depression of trade has enabled the companies to have a period of cheaper costs of production. The most important item in cost of production is labor, and shale miners' wages follow the sliding scale of the Coal Trade Conciliation Board, which made three reductions in the shale miners' wages during the year amounting to 1s. per day, bringing the average down to 6s. 3d. per day. The price of coal, too, declined, and also that of all the other materials needed in the carrying on of an oil works.

The profits and dividends, according to the companies' balance sheets just issued, including balances brought forward, we summarize as follows:

Company.	Total Profits.	Undivided.	Divided.	Dividends.
Pumpherston	£131,090	£69,840	£61,250	60%
Young's	120,500	60,071	60,429	7
Broxburn	88,880	47,924	40,956	17½
Oakbank	53,886	26,146	27,740	15
Tarbrax	21,824	9,220	12,614	15

Foreign Trade in Iron and Steel

Iron and Steel Exports—Exports of iron and steel, including machinery, from the United States for the five months ended May 31 are valued by the Bureau of Statistics of the Department of Commerce and Labor at $69,436,506 in 1908, and $61,202,259 in 1909; a decrease of $8,234,247, or 11.9 per cent. The leading items of export were, in long tons:

	1908.	1909.	Changes.
Pig iron	22,737	63,455	I. 40,718
Billets, ingots & blooms	58,100	40,245	D. 17,855
Bars	22,576	27,599	I. 5,023
Rails	67,217	99,831	I. 32,614
Sheets and plates	39,997	63,771	I. 23,774
Structural steel	52,423	61,779	I. 9,356
Wire	60,223	69,324	I. 9,101
Nails and spikes	18,252	19,060	I. 808
Pipe and fittings	48,407	61,376	I. 12,969

Increases are shown in a number of items, chiefly due to heavy exports in May.

Iron and Steel Imports—Imports of iron and steel and of machinery into the United States five months ended May 31 were valued at $8,460,535 in 1908, and $10,186,093 in 1909; an increase of $1,725,558, or 20.4 per cent. Leading items of imports were, in long tons:

	1908.	1909.	Changes.
Pig iron	37,107	48,979	I. 11,872
Scrap	1,621	2,200	I. 579
Ingots, blooms, etc.	3,878	5,269	I. 1,391
Bars	11,086	6,328	D. 4,758
Wire-rods	4,635	4,847	I. 212
Tinplates	28,341	24,174	D. 4,167
Sheets and plates	1,047	1,654	I. 607

The only considerable change was the decrease in tinplates.

Iron Ore Movement—Imports and exports of iron ore in the United States, five months ended May 31, long tons:

	1908.	1909.	Changes.
Imports	290,469	447,833	I. 157,464
Exports	40,468	83,416	I. 42,948

Of the imports this year, 291,082 tons were from Cuba.

Imports of manganese ore five months ended May 31 were 91,501 tons in 1908, and 77,642 in 1909; decrease, 13,859 tons.

Personal

Mining and metallurgical engineers are invited to keep THE ENGINEERING AND MINING JOURNAL informed of their movements and appointments

M. K. Rodgers, of Seattle, Wash., has gone to Alaska on mining business.

David C. Botting, of Black Diamond, Wash., has been reappointed State coal-mine inspector for Washington.

Adolph Lewisohn has been chosen a director of the British Columbia Copper Company in place of W. F. Crandell, resigned.

C. Christopher and W. S. Keith have left Seattle, Wash., for Los Angeles, Cal., to make arrangements for the erection of Catton oil-burning furnaces there.

J. Philip Furbeck, of Chicago, is located at Ophir, Colo., where he is engaged as assistant manager of the property of the Calumet Telluride Gold Mining Company.

William Green, for some time past mine manager of mine No. 2 of the Big Creek Coal Company at St. David, Ill., has been promoted to superintendent of all the company's mines in Fulton county.

A. K. Brewer, for several years in charge of smelter No. 2 of the American Smelting and Refining Company at Monterrey, Mexico, is reported to have resigned. He will go to California.

Frank A. Leach, director of the United States Mint, recently spent two days at Seattle, Wash., looking over the Treasury exhibit at the Alaska-Yukon-Pacific Exposition. He is now in San Francisco.

M. R. Campbell lately left Seattle for Denver, Colo., where he will remain for some time, directing the work of a number of survey parties engaged under him in the work of reclassifying the coal lands.

J. S. Diller, of the United States Geological Survey, leaves Seattle shortly for Coos Bay, Oregon, to make an inspection of coal lands in that district, which were withdrawn from location some time ago.

Richard B. Stanford, manager of the Siempre Viva mine at Cape Gracias, Nicaragua, is spending a few weeks in New Jersey. He will sail from New York about July 10, on his return to the mines.

J. Obalski, for nearly 30 years past in charge of the Mines Department of Quebec, has resigned, but will hold the position of technical adviser to the Province. He will also open an office as consulting engineer at Montreal.

R. L. Baker, who has been recently connected with the Department of Experimental Engineering of the University of Wisconsin, has entered the services of A. Bement, consulting engineer, Fisher building, Chicago.

Theodore Gross, who represents the London Venture Corporation and the Hirsch Syndicate in New York, has just gone to London in connection with some important negotiations in relation to mining property.

Dr. Reginald A. Daly, of the Institute of Technology, Boston, Mass., passed through Seattle, Wash., about the middle of June, on his way to Victoria, B. C., and thence to Hawaii, to examine the volcano Kilauea now in active eruption.

J. Vroomans, mining engineer to the government of the Dutch East Indies, has been visiting New York. He is on his way to the West where he will study the mining and milling methods at the Homestake mine in South Dakota, and also in some districts of Colorado.

Obituary

Albert Paulding Brayton, president and founder of the Pelton Water Wheel Company, of San Francisco and New York, died at his home in Oakland, Cal., June 25, aged 82 years. Mr. Brayton went to California in the early 50's and was conspicuous in the development of the industries of the Pacific coast, particularly in connection with the machine industry as applied to mining and hydroelectric development. For many years he was a member of the firm of Rankin, Brayton & Co., who operated the Pacific Iron Works, one of the pioneer concerns in the metal industry in San Francisco. He retired from this concern in 1888 and established the business of the Pelton Water Wheel Company, which under his wise and vigorous administration has since grown to be one of the most prominent concerns in the field of hydraulic power development.

Delos Van Alstyne Williams, whose death was briefly noted in a recent issue, was born in New York in 1854, and died in the California hospital, at Los Angeles, Cal., May 15, 1909, aged 56 years. His death followed an operation which was the result of a terrible experience in January, 1909, when Mr. Williams was lost for eight days in Death Valley without food or water. He was a member of the American Institute of Mining Engineers, a member of the British Club in Mexico City, and a member of the Sierra Madre Club, of Los Angeles, Cal. He was sole owner of the Sidney group of mines near Randsburg, Cal. His youth was spent in Joliet, Ill., where his body will be laid in the family burial ground. Mr. Williams was a pioneer of Leadville, Colo., and after many years spent in mining there he went to Mexico, where he remained 15 years, returning to the United States three years ago. Since then he has been very successful in his business in California. He leaves a widow and one son.

R. J. McPhee, who died at Spokane, Wash., on June 13, was born in Prince Edward Island, Canada, in 1840. In the early 70's he went to California, where his first mining was done on the Comstock lode. In 1875 he took charge of the Modoc mine, Panamint, owned by Senator Stewart, of Nevada, and went thence to Bodie, Cal., where for three years he managed the Stewart properties. In 1883 he assumed the management of the Minnie Moore lead mine at Bellevue, Idaho, owned by Palmer Brothers, of London. After a year's absence from this mine he again took charge, the orebodies having meanwhile been lost, and by careful management and skilful engineering opened up what has been described as one of the richest bodies of ore ever discovered in a lead mine in the United States. The tragic death of one of the owners of this mine led to its closing indefinitely, so Mr. McPhee went to the West Kootenay district of British Columbia, where, after acting for a time as foreman of the Blue Bell mine, opposite Ainsworth, Kootenay lake, then operated by Dr. Hendryx and some Minnesota and Connecticut associates, he did some successful mining in Jackson basin, Ainsworth mining division. Later—in 1900 and 1901—he was superintendent at the Enterprise mine, Ten-mile creek, Slocan. During recent years he was manager of the Ottawa mine, Springer creek, Slocan, owned by Thomas A. Noble and A. B. Coleman, of Pittsburg, Penn., and associates, and afterward of the Reliance Gold Mining Company's May & Jennie mine, near Nelson, which was under bond to the same syndicate at the time of Mr. Noble's death. During his long connection with the industry the late Mr. McPhee was generally regarded as a capable mining man, having almost unerring judgment and good executive ability.

Societies and Technical Schools

Southwestern Interstate Coal Operators' Association.—At the annual meeting at Kansas City recently the following officers were chosen: President, James Elliott, Haileyville, Okla.; vice-presidents, E. R. Sweeney, Kansas City, Mo.; John N. Hodges, Pittsburg, Kan.; William Bush, McAlester, Okla., and R. G. Rombauer, Novinger, Mo.; commissioner, W. D. Ryan, Kansas City, Mo.; secretary, J. H. Hibben, Parsons, Kan.; treasurer, W. S. Newcomb, Kansas City.

Michigan College of Mines.—At a meeting the the board of control held recently at Houghton, William Kelley, of Vulcan, was reelected chairman of the board. The resignation of Prof. L. S. Austin, head of the metallurgical and ore-dressing department, was accepted, to take effect Aug. 31, and Stuart Bruce, of Salt Lake City, Utah, was appointed as his successor. H. E. Gates, professor of chemistry, resigned, and John C. Fraser was appointed to fill this vacancy.

Special Correspondence from Mining Centers

News of the Industry Reported by Special Representatives at San Francisco, Butte, Denver, Salt Lake City, Goldfield, Colbalt, London

REVIEWS OF IMPORTANT EVENTS

San Francisco

June 25—There seems no abatement in the interest being taken in the mines at Alleghany and Forest in Sierra county where such rich quartz gold discoveries have been made. Many persons visiting these, who have been in many famous camps, are greatly surprised at the showing made in the mines already opened. There are about 250 men employed as miners at Alleghany, and a much larger number are prospecting in the vicinity. Most of these prospectors are developing their own claims. There is a ready sale for anything promising and numbers of investors have sought the camps for opportunities to purchase. In the Sixteen-to-one mine, thus far the richest found, they took out $50,000 from half a ton of ore, one day this month. In fact the mine looks better than when the discovery was made, notwithstanding its phenomenal yield in a short space of time. The ore now being mined is coming from a raise 20 ft. from the tunnel, and 40 ft. from the end of it. This is at a depth of 280 ft. The tunnel of the Rainbow mine is right in the midst of a wonderfully rich pay streak.

Butte

June 24—The Federal district court has recently adjudicated the Kimberly-Montana Gold Mining Company a bankrupt. The action was brought about by Chicago creditors. The matter has been referred to the United States referee in bankruptcy at Livingston.

It is reported that the Butte Electric and Power Company of this city has recently acquired one-half of the capital stock of the Great Falls Water Power and Townsite Company, recently organized. The latter company has the contract to furnish the Amalgamated properties in Butte with electric power. Since the Butte Electric and Power Company already owns all of the capital stock of the Madison River Power Company it will now be practically in control of the electric power supply of the State.

The State railway commission recently held a hearing to consider the advisability of compelling the Chicago, Milwaukee & Puget Sound railway to connect with the Billings & Northern railway at Lavina and to compel the Montana Central railway to connect with the Billings & Northern at Judith Gap. The departments at the respective county mountain City have contended that under cheaper freight rates the hearing the railways took the position that they were entitled to manage their own affairs without interference on the part of the commission. A decision will not be rendered for several weeks.

Denver

June 26—The San Juan region is at last emerging from the effects of the severe winter, and Ouray, Telluride and Silverton are beginning to ship heavily. The output of the first named camp is headed of course by the Camp Bird, which, according to the London report, crushed in April 6684 tons of gold ore of a bullion value of $232,434; and the concentrates from this mine are keeping the teams busy between the Sneffels district and Ouray. The May shipments from this camp are given at 3000 tons, 75 per cent. of which were concentrates. The Savage Bear company, the Mickey Breen mine, an old producer, the Happy Jack, the Highland Chief and Fredonia, the Uncle Sam on Bear creek, and others are starting up again.

At Central City, the Fifty Gold Mines Company has encountered the Gregory vein in a crosscut from the Bobtail at the 1300 level, and is in fine gold ore. Marshall Draper, the manager, is sending bullion to the local bank regularly. The Egyptian group, on Quartz hill, has found both smelting and milling ore in the 250 level on the East side. The Newhouse tunnel is being slowly advanced, making about 200 ft. per month, and it is reported that the California, the workings of which are about 2200 ft. deep, will resume operations as soon as connection is made with the tunnel. Many other idle mines, including the Hidden Treasure and the Indiana, will be re-opened as soon as they are drained by this tunnel.

S. T. Lockwood, of Buffalo, N. Y., in company with Thos. F. Walsh and Dr. Victor C. Alderson, of the Colorado School of Mines, and their assistants, have been making an extended inspection of Gilpin county pitchblende and carnotite veins, with the result that it is believed that Colorado will soon be able to produce radium. Mr. Lockwood it is said has come here at the instance of Mr. Walsh, who has provided a research fund for the above purpose. The work is to be carried on at the Colorado School of Mines at Golden.

Denver people are no longer to be in the clutches of a coal combine, which hitherto has been able to charge what it chose for the lignite (or more properly, soft bituminous) coal from the field north of the city. As high as $4.50 and $5 per ton has been the ruling price until this winter, when an independent mine broke into the market and reduced the price for a time to $3.50. The average cost of this northern coal is about $1.03 per ton f.o.b. cars, and the railroad has been charging about 4c. per ton mile for hauling it, so it will be seen that there is ample margin for a reduction, at the same time giving the producers a fair profit.

An independent firm known as the National Fuel Company, of Denver, with Harry Van Mater as president, has been formed, and with two producing mines and five others under option of purchase, this concern expects to soon have six mines in full operation. This means strenuous competition with the Northern Coal and Coke Company, which has hitherto had a monopoly of Denver business in this class of coal. With the high grade bituminous coal also now coming into Denver from the Yampa coal field, via the Moffat road, its citizens will from now on be certain of a cheap and abundant fuel supply. The anthracite of the Yampa field is now only twenty miles distant from the Moffat road, and this coal can be laid down in Denver at an advance cost over the bituminous of not to exceed $1 per ton.

In the Cripple Creek district, an important strike is reported in the Vindicator mine at a depth of 1300 ft. The width of the orebody is given at 8 ft., and the values at $70 in gold per ton. In view of the fact that the drainage tunnel will open up a new existence for the camp, these strikes showing the presence of rich orebodies at great depth are especially important and interesting. The Dante Company will install powerful machinery at the No. 1 shaft, and develop the mine at the 700 level. The Deerhorn mine, of the Stratton estate, is shipping again, having blocked out such orebodies as will insure its producing steadily. This is the mine which was worked on the surface with scrapers, giving rise to the expression, "shipping the scenery."

Stratton's Independence dump mill has been running along steadily since starting up on the first of April, and evidently with success, as it is generally understood here in machinery circles that arrangements are under way to add the second unit of the plant this summer. The dump averaged as sampled $3.60 per ton, and the successful treatment of sulpho-telluride ores of that low grade makes a new mark in Cripple Creek ore treatment.

Indianapolis

June 22—In this State the greatest activity is shown in the Jasonville and Sullivan fields where the Queen Coal Company is operating several mines on a year's contract for the output, working every day. These mines have been working only half time, but now the company promises every day work so long as the miners load clean coal.

The Green Valley and the Bogle mines are working five days a week, and will continue to do so as long as their contracts last. The Lattas Creek, Island Valley and Northwest are working every day, and the companies say they have enough contracts to furnish their men work all summer.

The Blackhawk mine in the north part of the Jasonville field, which started to work May 1, has been working full time and is still unable to fill its contracts and a large number of orders were recently parceled out to other mines in the field. This mine employs over 300 men and is considered one of the best equipped and safest mines in the State.

With verification of the report that the Letsinger mine is to begin work July 1, and the all-summer's contract for the entire output of the Pea Fry mine, the adjoining Jasonville and Sullivan fields will be doing an encouraging and prosperous business. There are about 2000 men employed in each field, within a radius of 12 miles.

Many of the miners are buying their own homes or already own homes with garden spots, and the demand for purchasable houses on payments is so great that it is impossible to build them as fast as sold. This condition among miners is largely due to the fact that saloons have been voted out of the two counties constituting the districts.

Salt Lake City

June 25—Jesse Knight has returned from New York, where he went in connection with negotiations for the sale of the Colorado and Iron Blossom mines at Tintic and the smelter at Silver City, to the Cole-Ryan or International Smelting and Refining Company interests. The negotiations were not successful and it is now reported the matter has been taken up with the United States Smelting, Refining and Mining Company, and also with other interests. There have been persistent rumors that negotiations have been resumed looking to the consolidation of the Boston Consolidated Copper Company with the Utah Copper Company; local officials, however, deny that there is anything new in this connection.

The Western Utah Copper Company's shares were listed on the Salt Lake exchange last week. The company operates the Gold Hill mines in the Clifton section of the Deep Creek district and promises to become an important producer. W. S. McCormick is president of the company and Duncan McVichie is general manager. The company is capitalized for $2,500,000, and has 31 claims, 20 of which are patented, and owns the Redding Springs ranch of 320 acres, with water rights. The development work includes a shaft 443 ft. deep, 1500 ft. of tunnels and drifts and 1687 ft. of winzes, raises and crosscuts. A force of 18 men is employed at the mine at present and $11,218 has been spent on mine equipment.

The Seven Troughs Mining Company held its annual meeting at Provo during the week. John Dern, of Salt Lake, president of the Consolidated Mercur, was elected to the board of directors. General Manager L. A. Friedman gave his report showing that during the last year the company has been freed from debt and has a good working surplus. The mine in the Seven Troughs district in Nevada was reported to be in good condition. The option on the Nevada Hills mine at Fairview, Nev., has not been exercised by George Wingfield and associates of Goldfield. A counter proposition for a consolidation of various Fairview properties with the Nevada Hills, involved in which was an offer to put $250,000 cash in the holding company's treasury, has been rejected by the Nevada Hills company. Since the failure of the negotiations the directors of the Nevada Hills have decided to carry on an energetic campaign of development.

A 99 per cent. copper product was made last week in the experimental plant of the Fink smelter, and this demonstration was later followed by the making of blister copper in the same furnace. This was accomplished mainly on a feed of concentrates from the Boston Consolidated mill. A company to handle the new smelting furnace is to be formed in the near future.

Goldfield, Nevada

June 22—The production of the Tonopah mines for the week ending June 19 was: Tonopah Mining, 3350 tons; Belmont, 1000 tons; Montana-Tonopah, 900 tons; MacNamara, 150 tons; Midway, 100 tons; West End, 100 tons; total, 5600 tons, valued at $140,000.

Tonnage of the Goldfield district for week ending June 19 was, approximately, as follows: Consolidated, 4445 tons; Combination, 700 tons; Florence, 900 tons; Nevada Goldfield Reduction Company, 650 tons; Western Ore Purchasing Company, 900 tons; total estimated value, $279,000.

Summer tourist rates have been granted Goldfield for the Mining Congress to be held here in September. Under this schedule, tickets will be on sale September 20 to 25; the round trip rate being from Denver, $50; Texas points, $60; St. Louis, $67.50; St. Paul, $71.25; Chicago, $72.50 and other points in proportion.

The property of the Nevada Scipio Company, at Humboldt, Nev., was totally destroyed by fire June 15. The loss, which includes 1,000,000 lbs. of sulphur, will exceed $100,000.

At a meeting of the Johnnie Consolidated Mining Company, held in Los Angeles, June 15, A. D. Myers, president; T. A. Johnson, secretary, and Carl Anderson, superintendent, resigned their respective offices and severed their connection with the company. P. E. Mitchell succeeds Mr. Myers and also acts as general manager; C. E. Wells as treasurer, and W. E. Babcock, secretary.

At a directors' meeting of the Mayflower Mining Company held in Rhyolite, June 16, John T. Overbury tendered his resignation as secretary, being succeeded by S. R. Mason, formerly secretary of the Little Florence Mining Company, of Goldfield. A. Sydney Additon also resigned as general manager and Allan Chickering from the directorate; Mr. Additon severs all connections with the company. H. S. Stark, of Goldfield, was elected general manager and also a director. Resolutions were adopted complimenting Messrs. Overbury and Additon upon the efficient manner in which their several duties had been performed in the past. A motion was also passed stating that as the Mayflower Bullfrog Consolidated Mining Company had purchased the Mayflower Mining Company and the Starlight Mining Company, the holders of stock in the latter-named companies can, upon surrender of their certificates, receive share for share in the Consolidated Company.

Cobalt

June 25—The sale of the Gillies Limit, by the Ontario government turned out to be rather a farce. Only 283 acres were disposed of at a price amounting to $75,643. In all there were 116 tenders, but many of them were not considered as the department thought the price was too low. The nonsuccess of the sale is not much to be wondered at when the methods pursued by the government are considered. Its men had been prospecting the Limit for the last two years, and there had been absolutely no information given to the public. The short time that elapsed between the notice of the sale and the dates of its closing, also made people suspicious. Another important factor has been the failure of the Provincial mine, which lies in the center of the territory sold, to make good.

The following new companies were incorporated during the week ending June 19: The Gold Pyramid Company, Ltd., of Larder lake; capital, $1,000,000; headquarters, Ottawa. The Merida Mines Ltd., capital, $500,000; headquarters, Toronto. The Canadian-American Silver Mines, Ltd.; capital, $40,000, headquarters, Toronto; the Sutherland Cobalt Silver Mines, Ltd.; capital, $1,000,000, headquarters, Toronto.

Chihuahua

June 17—The Santa Eulalia mining district is about 16 miles southeast of the City of Chihuahua, Mexico. The mines now shipping are the Mina Vieja, Velardeña, San Antonio and Santo Domingo, operated and owned by the American Smelting and Refining Company. The Mina Vieja is at present shipping about 100 tons per day, but this will be quadrupled when the overhead tramway, which is now nearly completed, is in operation. The Velardeña is producing ore that runs 50 per cent. lead and from $50 to $100 silver per ton.

The Chihuahua, El Potosi, Coronel, Los Mercedes and Promontorio are owned and operated by the Chihuahua Mining Company and shipping about 5000 tons per month of silver-lead ore and 7500 tons of zinc ore to the Kansas smelters. The largest shipper of these is the Potosi. The Goldeno, Central and Juarez are operated by the San Toy Mining Company. The latter properties are now shipping about 100 tons per day.

A large body of high-grade ore has been recently developed in the Juarez. C. O. Callahan owns and operates the Santander mine as well as several others. His property is a shipper of high-grade silver ore. An English syndicate owns the Reina de Plata from which regular shipments of high-grade ore are being made.

Santa Eulalia is taking on new life, as there are said to be a number of deals being consummated on land and mining property. An English company has already purchased one property and it is reported that another has about completed a deal for four other claims. Santa Eulalia is connected with Chihuahua by two narrow-gage railroads, the Mineral and the Chihuahua Mining Company Railway. The Mineral railway operates two passenger trains daily each way and from two to three ore trains, at times it is unable to handle all the ore shipments in spite of the fact that a large amount of ore is shipped on the Chihuahua Pacific Railway. The greater part of the ore is now smelted at the Chihuahua plant of the American Smelting and Refining Company which is about five miles east of the city, but as the plant consists of only three furnaces its capacity is limited. It is reported that the furnace capacity is to be increased.

Water is pumped from the river near Chihuahua. At certain seasons of the year the water question is rather a serious proposition. Tanks of water are brought from Chihuahua on the train daily and there are a number of wells which produce water, though not so for domestic purposes, as said by stock.

London

June 23. The debenture holders of the Sunderland Iron Ore Company are now considering whether, with the help of some new process, the property can be made to pay. An enormous amount of money has been spent on this property in the northern part of Norway, and the ordinary shareholders have a very remote chance of seeing their money again. The debenture holders, who now control the property, have been seeking a suitable process, and have come to the conclusion that the dry process of magnetic separation as originally proposed, will not work. Manager Bremner has advised that the dry separation plant should be abolished and that a wet process, known as the Gröndal process, should be given a trial. Difficulties have been met with in getting a good extraction, owing to the ore consisting partly of hematite and partly of magnetite, which could not be mined separately. Under the new scheme of working it is proposed to roast the hematite ore in a furnace designed by Doctor Gröndal, of Stockholm, and thereby render it magnetic and amenable to the same wet magnetic separation treatment as the magnetite receives. It is estimated that on an annual production of 400,000 tons of concentrates, there would be a profit of £100,000 per annum.

In order to carry out this program additional capital to the extent of £500,000 is required, partly to pay the prior lien bonds and to provide a working capital of £80,000. The committee of debenture holders propose to proceed cautiously and install a plant to treat 20,000 tons of briquets per annum. As to the value of the ore deposit, there seems to be no doubt and if the process now proposed is successful, there is still hope that the debenture holders and perhaps the preference shareholders, will eventually get a return on their money.

The directors of El Oro Mining and Railway Company, Limited, have issued a report, announcing that the totad realized profit for the year ending June 30, 1909, from all sources, and including an estimate of the profit for the month of June, will amount to £207,000. Adding the amount carried forward from 1908, the disposable profit amounts to £289,530. From this sum income tax and expenditure on improvements will absorb £41,630. A dividend of £86,062 was paid last January and a further dividend of the same amount is now declared. The balance carried forward to next year's account will amount to £75,776. It is further announced that R. M. Raymond, who has been the general manager for the last six years, has resigned that position and will, in the future, act as resident managing director in Mexico. A. F. Main has been appointed to fill Mr Raymond's place as general manager.

The Mexico Mines of El Oro, Limited, has issued a circular, announcing dividend of 7s 6d per share free of income tax. The total realized profit for the year ending June 30, 1909, will be approximately £132,143.

Paris

June 20. The report of the board of directors at the general meeting of shareholders of the Bône-Guelma railroad gives some interesting particulars on the development of the narrow-gage railroad, which runs through the principal Tunisian mining camps. The branch line from Djerissa to Slata is now in operation and ores reach La Goulette harbor. Work is progressing on the line from Kairouan to Henchir-Souatir, which will be connected with the phosphate deposits of Ain-Moularès and with the Sfax-Gafsa line which serves the important deposits of Gafsa. The standard-gage railroad system is under development in the northern part of Tunisia. Two lines starting from the iron mines of Nefzas and of Nébeur will connect at Mateur on the Tunis-Bizerte line and are under construction. They will prevent the exploitation of these large iron deposits which are under the control of the Mokta-el-Hadid company.

The Russian government is said to have abandoned its reserved right of redemption on the Sosnowice collieries. Germany will probably levy an export tax on coal. This will cause an increased output of the coal seams in Russian Poland.

The Huanchaca company, which distributed a dividend of $1 in 1907 did not declare any for the fiscal year 1908. Profits dropped from 606,269 bolivianos in 1907 to 216,927 in 1908. The directors report that this is due to the fall in prices of metals, since the output of ore increased from 70,362 tons to 97,302. However, it must be pointed out that this included mainly low-grade ores for the concentrating mill. Some profits are derived from a special reserve fund constituted in 1907 to counterbalance the fluctuations in the prices of metals.

The Société des Charbonnages de Vimy, controlled by the Forges de Chatillon Commentry, which owns the coal concession of Fresnoy, 3180 hectares, and the Société des Recherches de Souchez controlled by the Aciéries de France, which owns the coal concession of Vimy, 1920 hectares, have made an arrangement for working their mines together. They are at the Southern end of the Pas-de-Calais coal seams. The new mines will be of great depth, and as this extension of the Pas de Calais basin is not yet well known, large financial advances will have to be made. In view of this, the two companies will join in a third one with a capital of 14,000,000 fr. As the Vimy concession is of greater value, it will be brought into the new company for a sum of 3,000,000 fr., while Fresnoy will receive 1,000,000 only. Work will be started first on the Vimy seams which may be found at a depth ranging from 750 to 1000 m., while the Fresnoy seams are over 1100 m. It will be the first attempt made to work the deep beds.

Mining News from All Parts of the World

New Enterprises, Installations of New Machinery, Development of Mines and Transfers of Property Reported by Special Correspondents

THE CURRENT HISTORY OF MINING

Alaska

KUSKOQUIM

A stampede has started for Kuskoquim, owing to the tales of a rich strike made there by Andrew Svenson, a former Nome miner. He and George Murphy left for Kuskoquim, while John Weatherly and Fox Ramsay have chartered a gasolene boat and left for the scene of the rich strike.

FAIRBANKS

Shipments of gold from the camps tributary to Fairbanks are expected to aggregate $12,000,000 for the season, according to reports to S. F. Rathbun, cashier of the Washington Trust Company at Seattle.

DAWSON

Surveys—Messrs. Baldwin and Craig, head engineers of the International Boundary Survey, which will run a line between Alaska and Canada from the Yukon river to the Arctic ocean, have left in small boats for the boundary. They will spend much of the season exploring Black river.

VALDEZ

La Touche—The steamship "Bertha" arrived at Seattle with 350 tons of copper ore from this and the Beatson mine. The larger part of the cargo went to Tacoma.

Arizona

COCHISE COUNTY

Junction—Sulphide orebodies have been opened in three drifts during the past week, one on the 1400-ft. level and two on the 1500-ft. level.

GILA COUNTY

Old Dominion—The estimated output for June is 3,250,000 lb. as compared with 3,088,000 lb. for May. By building a dam to bedrock in Pinal creek to divert the creek water, the flow of water in the mine has been reduced from 5,500,000 gal. to 4,000,000 gal. daily.

GRAHAM COUNTY

Arizona Copper—Cable advices from London state that the stockholders voted at Edinburgh, June 21, on a resolution to reorganize the capital by consolidating the deferred ordinary and preferred ordinary 5s. shares into ordinary shares of 5s. each, leaving the capital 150,000 A preference shares of 5s. each and 1,620,000 preferred stock and 1,580,000 ordinary shares of 5s. each. It was also proposed to give directors power to pay interim dividends.

YAVAPAI COUNTY

Big Stick—The new 20-stamp mill recently started. The mine is equipped with steam and gasolene hoists, a compressor and six drills. There is also a 2600-ft. tramway from No. 9 shaft to the mill.

California

AMADOR COUNTY

Mills—The mills of the Zeila Mining Company and the Kennedy Mining Company, at Jackson, and that of the Bunker Hill Company at Amador City, are again mining as before the recent labor troubles.

BUTTE COUNTY

Phoenix—At this quartz mine, near Hurleton, Doctor Burke, owner, rich quartz has been found, some nuggets taken out being valued at as high as $1100.

Big Blue Lead—This mine, at Magalia, N. Lambert, superintendent, has resumed operations with a full crew. A new ditch is almost completed to the company's land.

CALAVERAS COUNTY

Copper—About 50 men have been set at work at the copper mines in Campo Seco, and the full regular force will soon be employed.

Kelly Gulch—This mine, two miles from Vallecita, has been purchased by Joseph A. White, of that place.

Calico Camp—The 450-ft. incline shaft on this gravel mine, near Vallecita, has tapped a fine body of gravel. It is owned by Jos. A. White & Brothers.

EL DORADO COUNTY

Encinal Mining Company—A force of men has been set at work on this property, near Fairplay. It has been idle for some time.

INYO COUNTY

New Coss—In the Lucky Jim claim of this company, near Darwin, the shaft is run down 450 ft. The shoot will be cut in another 100 ft. An air compressor has been put into service to run three Ingersoll-Sergeant drills.

KERN COUNTY

President Gold Mining Company—This company, which has been operating the old Amalie gold mine, at Amalie, for the past four months, has found the lost orebody in the east drift. The capacity of the reduction plant is to be increased, the mine being now put on a profitable basis.

Yellow Aster—At the old mill a new 500-ton ore bin has been put in for this mine at Randsburg; John Singleton, president.

MODOC COUNTY

Bidwell Consolidated—At this property, near Fort Bidwell, Hoag district, they will be unable to get the new mill on the ground before Aug. 1, when the snow will have disappeared.

PLACER COUNTY

Three Stars—This mine, near Auburn, has been closed down indefinitely. It is being reopened under the supervision of A. Waltman, of Nevada City.

PLUMAS COUNTY

Tunnel—E. W. Musgrove, of Greenville, has interested capitalists in his project to run a crosscut tunnel from Dixie cañon, below Crescent hills, to Greenville. The proposed company has 25 claims under control.

SANTA CLARA COUNTY

Quicksilver Mining Company—The annual meeting in New York last week resulted in the defeat of the management and the election of an entirely new board of directors. The report for the year ended April 30, 1909, shows: Total earnings $100,594; total expenses $98,388; net profits $1206; cost of production quicksilver per flask $40.98; tons mined 29,462; tons reduced 29,955; flasks sold 2257; flasks produced 2115; price quicksilver sold $41.42; tons of ore on hand 4368; value of ore on hand $14,851; supplies consumed $21,737.

Colorado

GILPIN COUNTY

Smuggler—A strike of gold ore is reported in this mine, near Rollinsville. Manager Ashmore recently sent a $3000 bar of bullion to the Denver mint, and concentrates are also being shipped.

LAKE COUNTY—LEADVILLE

Cleveland—The fissure vein at the 600-ft. level, in the Cambrian quartzite, is now 8 ft. wide with the hanging-wall not caught. On the footwall there is 3 ft. of solid mineral, then comes [illegible] of low-

grade ore and a 6-in. streak that runs better than $40 per ton. Development is slow on account of the loose nature of the ground and the heavy flow of water.

Valley Shaft—A new electric plant has just been installed at this property in South Evans gulch. The next important move will be the sinking of the shaft to greater depth. The shaft is now 320 ft. deep. Sulphide ore is being shipped from this level and oxide ore from the upper level, the daily output being 50 tons.

Coronado—In addition to working this property the lessees are also working the Hibschle from the Coronado and shipping 50 tons daily of a good grade of iron ore.

Carbonate Hill—The Morning Star is shipping regularly and the Yankee Doodle is sending out daily a carload of good ore. The lessees on the Waterloo are also shipping regularly.

Sunday Tunnel—Development work is being pushed on the vein to the south on the tunnel level; at the 570-ft. level the vein of copper ore is being worked; the daily shipments from the property are 50 tons, averaging $20 per ton.

Buckeye Gulch—The Hope Mining and Milling Company is doing the most extensive work in this section, driving three tunnels to cut the 17 claims on Gold hill One tunnel is in 100 ft., and another 50 ft. should reach the solid formation. The other tunnels have been only recently started.

Dinero Tunnel—Regular shipments of ore are now being sent from this Sugar Loaf property, and development work is being pushed. The owners of the Virginius are developing their claim from the Dinero tunnel and expect to reach the vein by the end of the month. Considerable work will be carried on in this section during the summer.

Yak Tunnel—This company has decided to lease out some of its territory and the first to be placed on the market will be the Belgian-Frenchmen group of claims on Iron hill The breast of the tunnel is now alongside of the New Monarch shaft, and by the first of the month it is understood that a 1000 ft. lateral will be driven to this property When completed the New Monarch will sink and connect with the tunnel level

Ouray County

Camp Bird Report for May Mill ran 30 days, and crushed 6620 tons of ore, yielding 15,516 oz. of bullion and 600 tons of concentrates Amount realized from sale of bullion, $25,000; from 303 tons of concentrates, $26,800, less expenses, $52,180 Profit, $25,083 Development work 780 ft The directors have authorized W I Cross, general manager, and R I Trebilcoll, director, to examine an important operating mine in Mexico, with the view of purchasing it for the Camp Bird

San Juan County

Leland The mine and mill are being put in shape for permanent operation. Five new power drills have been installed.

Esmeralda—The work of unwatering the shaft has been begun on behalf of the New York purchasers of this property. The driving of a tunnel and erection of a cyanide plant is under contemplation.

Teller County—Cripple Creek

Delmonico—The Consolidated Copper Creek Company, operating this Bull Hill mine, has installed a 100-h.p. boiler preparatory to using machine drills. Two to three cars per week are being shipped, but the tonnage will soon be increased from recently developed orebodies. Lessees operating on the north block of the Delmonico are also obtaining a fair grade of ore.

North Star—On Raven Hill, Hassell, Bradley & Mahoney, operating one of the eastern blocks, have encountered a 3½-ft. vein.

Lucky Gus No. 2—Moore & Seeley, of Victor, leasing on this Stratton Estate property, on Bull hill, have shipped a car of coarse rock and one of screenings from the oreshoot under development.

Deep Drainage Tunnel—On June 21 a blast in the south heading of the intermediate shaft of the Roosevelt deep drainage tunnel broke through into the portal heading and connected the two workings. The alinement and grade of the two bores had been carefully maintained by both crews. The total distance covered in the two headings is 7975 ft. In addition the north heading from the intermediate shaft has been driven 1875 ft., making a total distance of 9850 ft. Work was begun on this tunnel in May, 1907.

Florida

Alachua County

Two more of the phosphate mines have been closed down on account of the low prices now being obtained for the rock in the markets. The Central Phosphate Company decided upon this move after operating during the dull season for the past year or more. This leaves only a very few of the mines now being run, such as Dutton, Cummer, Williams and a very few others of the independent companies

Idaho

Shoshone County

Snowstorm—Manager Greenough states that the May shipments amounted to 10,000 tons of ore, and he estimates the June output as 13,500 tons. The ore is shipped to the Garfield smelter, Salt Lake City, and the Balaklala smelter, Coram, Cal One hundred and twenty-five men are employed at the mine.

Illinois

La Salle County

Lone Star Company The decision to close the mine at Streator has been reconsidered, and work will be continued.

Vermilion County

Preparations are being made to start work again on the Deering and Kelly mines at Westville, which are now under lease to the Brazil Block Coal Company.

Williamson County

Spillertown Coal and Coke Company—This company is opening a new mine on lands recently bought near Spillertown. The coal is said to be a good gas coal.

Indiana

Clay County

A company is being organized by George Pell and other coal men of Brazil, for the purpose of sinking a shaft on Pell's land, east of the city. This shaft will be sunk 100 ft. below the first vein, which has long been worked in this district. A second vein of coal is known to exist under this land.

Coincident with the beginning of a damage suit for $20,000 by a miner against the Miami Coal Company for injuries sustained by a fall of slate in mine No. 3 in 1907, a heavy fall of slate in Mine No. 1 occurred June 23, burying two miners and injuring both.

Sullivan County

The Bellevue Coal Company, of Sullivan, which operates the Bellevue mine in Haden township, has settled its financial difficulties by floating a loan of $25,000 and will pay off the miners' liens against it. The mine will resume operation.

Representatives of Chicago capitalists are endeavoring to obtain options on 10,000 acres of coal land in Hamilton and Turman townships

Vigo County

The mine workers' officials had a controversy with the Vandalia Coal Mining Company over the top coal question during the past week. The men say they should be permitted to remove the coal at the top in order that they may earn fair wages, but the company insists it is not safe to do so and that the mine inspector has ordered that it not be removed

Vermilion County

The cage in Klondike Mine No 4, near Clinton, became unmanageable and dropped from the pit opening to the bottom of the shaft, a distance of 315 ft. Twelve miners were in the cage, all of whom were injured seriously, some fatally The accident is being investigated

Michigan

Copper

Wamona Work has begun for the foundations of the new stamp mill which is to be erected jointly by this and the King Phillips Company.

Quincy—No 2 shaft has reached the

950-ft. level and is cutting a station preparatory to crosscutting to open the Kearsarge lode. No. 1 shaft will open the formation before No. 2 shaft

Mass—The new lode that was first opened by means of a crosscut from the 17th level of "A" shaft has been exposed at two points at the 13th and 15th levels Another mill test is to be made as soon as some adjustments can be made at the mill in view of eliminating the large loss in the tailings. The rock is to be sorted, and barren ground will not be stamped as in the case of the first test when the full face of the formation was taken

Michigan—A drill core, well charged with copper, was taken from the drill hole at a depth of about 90 ft, that is going down on the hanging wall side of the Evergreen lode. As the estimated distance to this lode is much greater than this, the identity of this strike is as yet undetermined.

Superior—This company is shipping about 100 tons of rock daily to the Atlantic mill. The average production of refined copper per ton of rock handled since the beginning of the mill run has been 22 pounds.

Missouri

Joplin-Zinc-lead District

Don McRuer—This company at Spring City has purchased the Delta mill and is moving it to the lease where the Alladin mill burned. Rich ore has been found in drilling and also in the old Alladin shaft No. 8.

Charter Oak—The 40-acre lease on this ground at Carterville has been taken by Mr. Goodlet, of Kansas City, and will be developed.

Missouri Hills—Bud M. Robinson, of Joplin, recently organized this company with a capital stock of $100,000

Nowata—W. U. Squires, Joplin, manager, has about completed the mill on the Luke land near the Gibson mine at Porto Rico.

Neck City—Two new mills are nearly completed in this camp and will soon be producing.

Belle Center—Drilling is being done for sheet ore west of Joplin and rich strikes have been made. The Louisville Zinc and Lead Company and Sampson Mining Company have nearly completed their mills.

Mattes Brothers—While drilling virgin ground near the head of Gordon hollow 14 ft. of rich sheet ore was encountered.

M. I. & O.—This old mill near Jackson hollow has resumed operations.

Old Dominion—The mill in Gordon hollow southwest of Joplin is about completed.

Emperor—The mine has resumed operations in Gordon hollow

Cambria—The 250-ton mill and 40-acre lease in the sheet-ground district west of Joplin has been sold and the new company will take hold at once.

Montana

Chouteau County

August—It is reported that Philips & Witcomb, owners, have leased and bonded the mine to a syndicate, represented by John Edgerton, of Helena, for the sum of $3,000,000. The mine is in the Little Rockies district near Zortman. It is stated 35 men are now employed in the mine.

Deer Lodge County

High Grade—The property is in the Blue Eyed Nellie district about 10 miles from Anaconda, and is being worked through a shaft now down 120 ft. Some rich carbonate ore has recently been discovered. Sigurd Renblom is in charge of operations which at present consist of installing machinery preparatory to sinking to the 400-ft. level.

Jefferson County

Boston & Corbin—Raising in the three-compartment air shaft has been finished, and the new 14-drill air compressor has arrived on the property. Work is being pushed on the 700-ft. level.

Calumet-Corbin—A new two-compartment shaft has been completed and development work is now being carried on at the 200-ft. level The company employs 85 men at the property

Madison County

Pioneer Gold—At the company's property, in the Big Hole basin, a 30-ton Chilean mill will be installed, for which power will be furnished by a 12-h.p. gasolene engine. W H. Rideout is in charge of operations.

New Mine—This property is in the Rochester district and has recently been optioned to E. M. Hand. It is reported that gold ore running from $200 to $300 per ton has been discovered.

Nevada

Esmeralda County—Goldfield

St. Ives—A 12-ton shipment of ore will be sent out this week The bulk of the ore, it is estimated, will run from $150 to $200 per ton.

Florence Goldfield—Connection will be made this week between the bottom of the main shaft, now 320 ft. deep, and the raise from the crosscut on the 500-ft. level of the old Engineer's lease. The old and new shafts will be enlarged to three compartments May production was 3350 tons which produced $33,500 in bullion

Red Top Consolidated—This property has closed down and the lease has been surrendered to the Consolidated Company

Esmeralda County—Gold Mountain

Goldfield-Granite Mountain—George Mayer, superintendent, reports that the crosscut tunnel, now in 700 ft., should cut the ledge within the next 20 ft., where a depth of 400 ft. will be obtained. The ledge shows from 30 to 40 ft. in width on the surface and carries a 10-ft. vein of ore from which assays range from $10 to $40 per ton

Esmeralda County—Hornsilver

Great Western—It is generally admitted that this property has recently changed hands. No details concerning the transaction are to be had. The property has shipped 1254 tons of ore to date, having a total value of $119,557 and has a large quantity of shipping ore still blocked out. In addition to this there is a large amount of milling ore in reserve.

Esmeralda County—Lucky Boy

MacCormack—A strike was made in this property last week, 7 ft. of ore being disclosed while cutting a station at the 110-ft. level. A shipment of 25 tons was made on June 17. The property is equipped with a 25-h.p. hoist and a compressor plant is to be installed during the summer.

Esmeralda County—Lunning

Joseph L. Giroux, of Ely, is now excavating ground for a 75-h.p. hoist on his property near Lunning.

Old Dunlap—It is reported that this mine 12 miles east of Sodaville, has been financed again. The mine now has a long tunnel that is to drain all the workings. This tunnel is to be cleaned out and the mine opened

Esmeralda County—Montezuma

Gold King—J. A. Burton, of Anderson, Indiana, stopped in Goldfield last week *en route* to the company's property at Montezuma, and stated that work was to be resumed Mr Burton will have charge of the mine.

Esmeralda County—Rawhide

Grutt Balloon Hill—A 30-ton shipment of ore was made last week, having an average value of about $200 per ton.

Marigold—This lease, on the Coalition estate, has a 30-ton shipment of high-grade ore in transit. The management has leased the Knight Conlon mill and will treat its low-grade milling ore on company account in the future

Gordon Coalition—A 16-in. vein of gold ore has been encountered on the 150-ft level

Rawhide Western Railway—It is reported that the road has passed into the hands of a large bank in San Francisco. There are many signers to the articles of incorporation to pay in large sums of money and the bank may force these collections

Salt Lake-Rawhide—This new incorporation is now operating three claims and sinking a shaft.

King-Heisner—The mill is expected to be in operation by August 1. The delay in starting has been on account of not receiving the material and supplies on time.

HUMBOLDT COUNTY—NATIONAL

Combination—A shipment of eight sacks of ore, valued at $30,000, was made last week. The ore came from the face of the tunnel which has been driven on the ledge a distance of 350 feet.

New Mexico

GRANT COUNTY

Chemung Copper—The directors have called an assessment of $1 per share on the company's 200,000 shares, making the stock $9 paid. The mine is opened down to the 800-ft. level, and to date 32,000 ft. of openings have been made underground. The mine has recently cut into new orebodies which will average between 3 and 4 per cent. copper. A survey for a railroad to the mine is being completed.

SOCORRO COUNTY

Magollon Gold and Copper—Robert Brownell, of Nova Scotia, is reported as having bought this property in the Cooney district. Operations are to begin in the near future.

Oklahoma

OTTAWA COUNTY

Ottawa—Prospecting with drills is being carried on at this property, near Miami. F. H. Knoche, of Kansas City, is president; J. P. McNaughton, of Miami, vice-president. Capital stock, $100,000.

Pennsylvania

BITUMINOUS COAL

James E. Roderick, chief of the State Bureau of Mines, has made the appointments of inspectors to the districts in the bituminous field. There are 21 in all, one new district having been made. The names include some reappointments and some transfers. Under the new law all had to pass an examination. The names of the inspectors and their headquarters are: First district, Alex. McCanch, Monongahela; second, C. B. Ross, Greensburg; third, T. K. Adams, Mercer; fourth, Elias Phillips, DuBois; fifth, Isaac G. Roby, Uniontown; sixth, I. D. Williams, Johnstown; seventh, Arthur Neale, Craft[illegible]; eighth, Joseph Knepper, Phillipsburg; ninth, T. J. Welsh, Connellsville; tenth, Joseph Williams, Altoona; eleventh, Daniel Blower, Scottdale; twelfth, Roger Hampson, Punxsutawney; thirteenth, John T. Bell, Dravosburg; fourteenth, David Young, Freeport; fifteenth, Alex. Monteith, Patton; sixteenth, William [illegible], Brownsville; seventeenth, John I. Pratt, Pittsburg; eighteenth, Thomas Lowther, Tyrone; nineteenth, Charles T. McGreegor, Irwin; twentieth, Nicholas Evans, Somerset; twenty-first, F. W. Cunningham, California.

Tennessee

MARION COUNTY

Tennessee River Coal Company—This company has been incorporated for the purpose of developing 5000 acres of coal land to which it has secured title. It purposes opening a mine which will have a daily output of 2000 tons. The work is to be directed by Crozier F. Kilpatrick, engineer-in-charge, whose office is at 33 Wall street, New York.

Utah

BEAVER COUNTY

King David—Both the King David and Indian Queen properties have arrived at an interesting stage of development with definite results in the opening of orebodies likely to appear at any time. The drift sent northward from the King David shaft to cut the Horn Silver contact vein has been driven 170 ft. and mineralized ground has been encountered. The drift on the 300-ft. level is also in a favorable formation. David Evans, manager, Beaver, Utah.

Horn Silver—The old Horn Silver mine is now shipping a car of ore per day and much prospecting is being done in the mine. A force of 70 men is now employed.

BOX ELDER COUNTY

Humber—An extensive bed of graphite has been discovered on the property in Box Elder county. A. G. Burritt, manager, Perry, Utah.

JUAB COUNTY

East Tintic Development—A carload of high-grade ore was shipped from this property last week, and two more cars are to go forward before the end of the month. The ore is being taken from the 230-ft. level. Ralph Kellogg, Eureka, Utah, is manager.

Zuma—The shaft being sunk on this property is in the limestone, and on reaching the 200-ft. level a drift will be started northward to catch the outcrop near the Iron King property. John Endlund, superintendent, Eureka, Utah.

Tintic Production—The output of the mines during the last week, follows: In 20-ton cars, Sioux Consolidated, 14; Mammouth, 5; Centennial Eureka, 46; May Day, 2; Eureka Hill, 1; Eagle & Blue Bell, 1; East Tintic Development, 1; Uncle Sam, 4; Grand Central, 5; Victoria, 1; Carisa, 1; 20-ton cars, Beck Tunnel, 3; Colorado, 25; Dragon Iron, 33; Iron Blossom, 9; Swansea, 3.

West Virginia

MARION COUNTY

Jamison Coal and Coke Company—This company, which has its main office in the Frick building annex, Pittsburg, has purchased 6800 acres of coal land on the Pittsburg vein, near Barrackville, from the Barrackville Coal and Coke Company and the Philadelphia & Reading Coal and Iron Company. The purchaser intends to develop and will sink two shafts for a large output as soon as engineers can prepare plans. It has also acquired surface lands for four or five plants.

Wyoming

BIG HORN COUNTY

Frannie-Garland Oilfield—Quite an interest is being manifested in this district with reference to the possibilities of developing oil in paying quantities. The oil sands are 16 to 20 ft. thick and the field extends north into Montana. The Montana-Wyoming Oil Company has drilled three wells, which are producing from 300 to 500 bbl. per day. A refinery is being built at Cowley. Oil men from Oklahoma, California, and the East are becoming active in the district.

Canada

ALBERTA—BLAIRMORE DISTRICT

Head Syndicate, Ltd.—This company has been organized in London to acquire and develop the Head & Martin coal lands, situated a few miles from Blairmore in southwest Alberta. The lands run for practically eight miles on the coal measures, overlapping for two miles those of the International Coal and Coke Company, which during the last five years has developed its property into a productive coal mine. There are known to occur on the Head & Martin property five workable seams of coal, the biggest of which is 43 ft. 6 in. thick, there being first 24 ft. 8 in. of clean coal, then 13 ft. in which there is some shale, and then 5 ft. 6 in. more of clean coal. This seam has been opened about two miles south of the International Company's southern boundary line, and, where cut by a 60-ft. tunnel through solid rock, is undisturbed, and has the mountain rising 700 ft. above it. Leslie Hill, Nelson, B. C., is manager.

BRITISH COLUMBIA—NELSON DIVISION

Nugget Gold Mines, Ltd.—Last shipment of bullion was valued at $0585, being for 430 oz. recovered from plates of a four-stamp prospecting mill during run of three weeks. Since work was commenced about 18 months ago there have been shipped to the smelter 530 tons of crude ore of an average value of $110.50 per ton; 2750 tons of second-grade ore, averaging about $17 per ton, have been milled.

Queen Mining and Milling Company—The 20-stamp mill at the Queen mine, Salmo, is crushing an average of 65 tons of ore per day, running generally between $12 and $14, with some as high as $28 per ton. Most of the gold is recovered by amalgamation. W. B. Dewitt, Salmo, is superintending operations.

BRITISH COLUMBIA—SLOCAN

Van Roi Mining Company—Shipment of concentrates has been resumed. Smelter returns from seven cars, total dry weight 272,527 lb., are $11,027.31, after payment of freight and treatment charges. This gives an average of about $81 per ton. Concentration—about 7 into 1—is effected at the Wakefield mill, near Silverton, Slocan, leased by this company.

ONTARIO COBALT DISTRICT

Ore Shipments—Shipments of ore from Cobalt for the week ended June 12 were: Buffalo, 49,300 lb.; Crown Reserve, 60,390; Chambers-Ferland, 60,000; City of Cobalt, 53,000; Drummond, 200,000; Kerr Lake, 58,900; La Rose, 65,000; McKinley-Darragh, 58,500; Nipissing, 320,150; Right-of Way, 85,729; total, 1,010,969 pounds

Shipments of ore from Cobalt for the week ended June 19 were: Buffalo, 46,900 lb.; City of Cobalt, 65,000; Cobalt Central, 55,000; Coniagas, 61,700; Crown Reserve, 223,413; La Rose, 195,691; McKinley-Darragh, 59,362; Nipissing, 397,688; Temiskaming, 52,800; Temiskaming & Hudson Bay, 60,400; total, 1,217,954 pounds.

British-American—This mine, below the Gilles Limit, is putting in a small steam plant.

Gifford Extension—Arrangements have now been completed with the Ophir mine to purchase air. The pipe line is being laid. The main shaft, down 86 ft., is to be continued to the 200-ft. level. A small boiler and hoist will shortly be installed.

John Black—A small compressor and an 80-h.p. boiler has been ordered. New buildings will also be erected to meet the growing needs of the mine.

O'Brien—The No. 3 vein of the La Rose has been encountered. The vein has a width of about 7 in. The mine will shortly double the output of the high-grade ore. Arrangements are also being made to double the output of the Thorald plant, which is also under the control of M. J. O'Brien.

Badger—A vein of good ore, about 5 in wide, has been encountered.

Kerr Lake—A new vein 17 in. in width has been found. It is claimed to be better than the Crown Reserve vein.

Cobalt Lake—One of the shaft houses of this company was destroyed by fire on June 21.

Coniagas—During the summer the capacity of the mill will be doubled. The new machinery will consist of 30 stamps, 1250 lb each, and the necessary tables. An extension will be built to the east of the present mill to house the addition. No changes will be necessary in the crushing and jigging end.

Eastern Townships—A 30-h.p. boiler and 6x8 hoist are being installed, and it is expected that they will be running in June.

Empire Mines—At their meeting June 14 the directors decided to sink the shaft from the 125-ft. to the 200-ft. level. A new compressor will be purchased.

La Rose Consolidated—A quarterly dividend of 3 per cent. with bonus of 1 per cent. has been declared. A financial statement covering the first fiscal year of the merger, ending May 31, has been issued, showing total production of ore, 6164 tons; of silver, 3,010,831 oz., net value at mine, $1,364,372. Operating and marketing expenses were $481,925, and the net operating profit $1,093,572. On construction account $23,574 was expended. It costs the management about 16c. per oz. to recover silver and develop the several properties, leaving about 35c. per oz. profit.

Little Nipissing—It is expected that a shipment will shortly be made from the Peterson Lake lease, as there is almost a carload of ore already bagged.

Silver Cliff—This mine has been sold to Pittsburg capitalists. Captain Jeffrys, formerly of the Chambers-Ferland, mill assume the management.

Temiskaming—At a meeting held in Haileybury, June 12, the directors decided to pay no dividend for the current quarter. In a statement issued to the shareholders they say that they think it advisable to build up a large cash reserve. Up to date no revenue has been obtained from low-grade ores, of which the company has at a conservative valuation $500,000 worth on the dumps, while 100 tons per day of concentrating ore of an average value of $15 per ton are being produced. A concentrating plant is to be installed with a capacity of from 75 to 100 tons daily at an estimated cost of over $75,000. This is expected to be in operation before the end of the year and should add at least $400,000 yearly to the net revenue.

ONTARIO—ELK LAKE DISTRICT

Elk Lake Discovery—The shaft is now the deepest in the district, being down 154 ft. Drifting has been commenced at the Bottom toward No. 4 vein.

Mother Lode—Work has been commenced on a shaft which will be put down 150 ft to catch a vein believed to carry silver.

ONTARIO—MONTREAL RIVER DISTRICT

Ottosee—The first of the mine veins to be opened up at the 75-ft. level has been reached by the crosscut. The whole orebody is over 30 in. wide and consists of a calcite vein 6 in. wide carrying smaltite and native silver, 2 ft. of fissure filling interspersed with leaf silver making good milling ore and a calcite band rich in silver.

ONTARIO—STURGEON LAKE

St. Anthony—This mine, the pioneer gold mine of the district, which has not been worked for 18 months, is being pumped out by the owners, Colonel Ray and A. L. McEwen, of Port Arthur, for inspection by the representatives of a Boston company, which has an option on it.

Mexico

DURANGO

Mexico Consolidated—From Dec. 1 to June 1, there were mined and milled 379 tons of high-grade ore and 4213 tons of mill ore. From this ore $104,333 have been realized, and from custom ore $80,990, or a total of $187,232. The cost of operations has been reduced from $12.25 to $7.25 per ton. President Stallforth states that the net ore reserves Jan. 1 were $372,000, and that on June 1 they were $850,000. Total liabilities $210,000.

GUANAJUATO

Guanajuato Consolidated—Production for May: Bullion, $65,250; concentrates, $51,250; working expenses, $53,100; estimated profits, 43,400 pesos. Of this amount 9400 pesos have been expended on development account. The mill ran 30½ days and crushed 7383 tons of dry ore. The amount of development done was 231 feet.

MEXICO

Esperanza—Report for May: Mill ran 29 days; crushed 11,118 tons of ore; estimated profit for the month, $34,928. New development work aggregated 325 feet.

Africa

TRANSVAAL

The labor return from the mines shows that on May 31 there were 158,279 Kafirs 7717 Chinese employed. This is a decrease during May of 17 Chinese and of 4022 Kafirs the first decrease in Kafir labor shown for two years

Production other than gold for the three months ended March 31 was: Silver, 100,882 oz., an increase of 14,069 oz. over last year, copper ore 515 tons, an increase of 336 tons; tin ore, 443 tons, an increase of 167 tons; galena, 512 tons, a decrease of 187 tons

WEST AFRICA

Gold output in May is reported at 25,104 oz. bullion, being 3013 oz more than in April. For the five months ended May 31 the total was 120,250 oz. bullion in 1908 and 114,001 oz in 1909, a decrease of 12,258 oz. The bullion reported this year was equal to $2,233,824, or 108,171 oz. fine gold

Metal, Mineral, Coal and Stock Markets

Current Prices, Market Conditions and Commercial Statistics of the Metals, Minerals and Mining Stocks

QUOTATIONS FROM IMPORTANT CENTERS

Coal Trade Review

New York, June 30—The coal trade in the West shows a continuance of about the same conditions as were reported last week. Business in steam coal at most of the principal centers is improving; but at the same time any increase in prices has been prevented by the tendency of shippers to hurry coal to market in quantities exceeding the demand. This results in some forced sales to avoid demurrage, which keeps down prices.

The bituminous trade in the East begins to show an improving demand, and business is better than for some time, especially in the manufacturing cities where mills and other establishments consuming coal are showing a disposition to take on supplies.

The anthracite trade is quiet and steady. The heavy stocks which were accumulated last April have been worked off for the most part and the collieries are running more evenly, though work is not being pressed.

The coke trade shows the greatest improvement. The railroads serving the Connellsville region report large increases in tonnage over last year, and the production reports from the region have shown a gain each week for some time.

Coal Rate Troubles—A petition has been filed with the Ohio Railroad Commission by operators on the Pittsburg vein in that State, who claim that rates charged by the Wheeling & Lake Erie road to Cleveland and Huron—85c. per ton with 5c. extra for terminal charges—are unreasonable. A hearing has been had, but no decision rendered.

The Interstate Commerce Commission has refused the petition of a number of coal operators in Colorado for a revision of the rates on coal from the Walsenburg field in southern Colorado. The commission holds that rates are not unreasonable and must stand.

Coal Traffic Notes

Tonnage originating on Pennsylvania railroad lines east of Pittsburg and Erie, year to June 19, short tons:

	1908.	1909.	Changes.
Anthracite	2,757,880	2,606,321	D. 151,559
Bituminous	15,089,930	16,387,541	I. 1,297,611
Coke	3,137,420	4,589,487	I. 1,451,997
Total	20,985,230	23,583,349	I. 2,598,049

Total increase this year to date was 12.5 per cent.

Coal receipts at Boston, five months ended May 31, reported by Chamber of Commerce:

	1908.	1909.	Changes.
Anthracite	731,598	718,818	D. 12,780
Bituminous	1,350,691	1,261,517	D. 89,174
Total domestic	2,082,289	1,980,335	D. 101,954
Foreign	119,435	196,600	I. 77,165
Total	2,201,724	2,176,935	D. 24,789

Total decrease this year, 1.1 per cent. The foreign coal is chiefly from Nova Scotia.

Coal shipments of Monongahela River Consolidated Company, half-year ended April 30, short tons:

	1908.	1909.	Changes.
River shipments	2,578,674	2,529,439	D. 49,235
Rail shipments	675,381	339,695	D. 335,686
Total	3,254,055	2,869,134	D. 384,921

The total decrease this year was 11.8 per cent.

New York

Anthracite

June 30—The market is quiet, business in fact being rather dull. There was a little spurt of orders to save the June discount, but it did not amount to much. In fact matters have settled down into the usual hot-weather dullness.

With tomorrow—July 1—the 10c. comes off the discount and list prices will be $4.55 per lump, and $4.80 for egg, stove and chestnut, f.o.b. New York harbor. For steam sizes quotations are $3.10@3.25 for pea; $2.35@2.50 for buckwheat; $1.70@2 for buckwheat No. 2, or rice, and $1.25@1.50 for barley, f.o.b. New York harbor points. Some individual and washery pea and buckwheat have been offered at 10 or 15c. less.

Bituminous

Trade has been a little better. The far East seems to be waking up to the fact that it needs coal, while trade along the Sound has been better. New York harbor also is buying some coal, but there has been no advance in prices. Fair grades of steam coal can be had at $2.40@2.50, f.o.b. harbor points, with $2.60 up asked for better grades.

All-rail trade is in fair shape, better in fact than the Coastwise business. Car supply is good, but transportation is a little irregular.

In the Coastwise trade vessels are in good supply and rates are the same as they have been for some time. From New York cargoes are taken at 60@65c. to points around Cape Cod, and 45c. to Providence and the Sound.

Birmingham

June 28—More coal is being mined now in Alabama than has been reported in several months and indications point to a sharp demand for labor before the end of the summer. Much of the coal-mine labor has left the State or gone into other lines. Contracts for fall delivery are beginning to come. Dr. G. B. Crowe and associates have purchased several thousand acres of coal lands in the lower part of Jefferson and in Shelby county and are beginning operations on a large scale. The Louisville & Nashville railroad will build a track to the properties and three entries to the coal are to be made.

Chicago

June 29—The coal market continues quiet, with steam coals generally in fair demand and the market strengthening somewhat by reason of the beginning of the harvesting trade, which is already demanding heavy supplies. Fine coals are strong; lump is weak, as regards the great bulk of the trade, that in western bituminous. Eastern coals are in general languid; the market for them is steady, but prices are kept up only by rigid restriction of shipments and this it is difficult to maintain. Domestic coals in general are very weak, no retailers caring to lay in any considerable supplies, even of anthracite.

Illinois and Indiana lump brings $1.75@2.15; run-of-mine, $1.60@1.75 and screenings, $1.50@1.70. The lessening of output from the mines of these States has done much to keep the market steady, but must be continued to be of effect for any considerable time.

Smokeless is somewhat stronger as a result of general restriction of supplies following the depression in prices of the last few weeks. The result will be temporary unless this restriction is continued, for shipments of smokeless have been in flood waves. Lump and egg from Pocahontas and New River mines brings $3.05@3.30; other smokeless lump, $2.95@3.20; run-of-mine smokeless is on the market at $3.05 for Pocahontas and $2.95 for lower grades. Hocking coal is somewhat overplentiful at $2.90@3.15; Pittsburg No. 8 is plentiful at $2.65 for ¾-in lump, and Youghiogheny is a light seller at $3 for ¾-in lump.

Cleveland

June 29—Demand is steadily improving for steam coal, especially for slack. The quotations for Middle district coal are

Lump, $1.85@2; run-of-mine, $1.65@1.75; slack, $1.25@1.35. For No. 8 district lump, $1.90@2.05; run-of-mine, $1.70@1.80; slack, $1.40, all f.o.b. Cleveland.

Lake shipments are steady, and there is little trouble about boats.

Indianapolis

June 29—There has been no special incident in the coal market during the week. There is a continued improvement in the demand for steam coal.

The Indiana Coal Operators' Association, with headquarters in Terre Haute, has asked State Mine Inspector Epperson for a conference in regard to the alleged variance in the rulings of deputies at mines when complaint is made of dangerous places. The operators say that in some instances one inspector will accept conditions and soon after another deputy will order a mine closed until changes have been made.

Pittsburg

June 29—Coal shipments up the Lakes continue light, but will be considerably heavier after July 4. There is quite an accumulation of coal at the docks and railroad shipments are not likely to increase materially. The market continues quiet and not overstrong, as consumption is rather light, so many manufacturers using slack where formerly mine-run was used. Nominal prices remain at $1.10 to manufacturers and $1.20 to retail dealers for mine-run, but these prices are shaded 5 or 10c. Slack is firm at 60@65 cents.

Connellsville Coke—The market continues dull, with only occasional transactions involved in the starting of additional blast furnaces. The market has certainly shown remarkable apathy to the efforts which are being made to consolidate most of the independent producers. The appraisement in connection with the merger is about completed, but no additional information has come out. The market remains quotable at $1.55@1.60 for prompt and $1.65@1.75 on contract for Connellsville furnace coke, and $1.80@2 for prompt and $1.00@2.25 on contract for Connellsville foundry coke.

The *Courier* reports production in the Connellsville region in the week ending June 19 at 307,014 tons, an increase of 8000 tons in a week. Shipments are reported at 4361 cars to Pittsburg, 6165 cars to points west of Pittsburg and 887 cars to points east of Connellsville, a total of 11,413 cars, this being a gain of 300 cars in a week.

Foreign Coal Trade

United States Coal Exports. Exports of coal and coke from the United States, with coal bunkered or sold to steamships in foreign trade, five months ended May 31, long tons:

	1908.	1909.	Changes.
Anthracite	1,047,427	1,097,588	I. 50,161
Bituminous	3,033,308	2,860,568	D. 172,740
Total exports	4,080,735	3,958,156	D. 122,579
Bunker coal	2,482,240	2,447,412	D. 34,828
Total	6,562,975	6,405,568	D. 157,407
Coke	296,893	405,270	I. 108,377

Canada took this year 2,999,512 tons of coal, or 75.8 per cent. of the total. The coke went chiefly to Mexico and Canada.

United States Coal Imports—Imports of coal and coke into the United States, five months ended May 31, long tons:

	1908.	1909.	Changes.
Anthracite	15,023	3,115	D. 11,908
Bituminous	706,381	454,113	D. 252,268
Total coal	721,404	457,228	D. 264,176
Coke	52,181	76,644	I. 24,463

Canada sent this year 396,483 tons of coal and nearly all the coke; Australia, 44,048 tons of coal. Imports are chiefly on the Pacific coast and on the northern border, into Montana and Washington.

Nova Scotia Coal Shipments—Shipments of coal from Nova Scotia mines, five months ended May 31, long tons:

Companies.	1908.	1909.	Changes.
Dominion	1,122,516	825,746	D. 296,770
Nova Scotia Steel	221,505	178,556	D. 44,949
Cumberland	169,238	152,515	D. 16,723
Acadia	131,904	100,393	D. 31,511
Inverness	98,120	73,115	D. 25,005
Intercolonial	112,678	92,294	D. 20,384
Total	1,857,961	1,422,619	D. 435,342

The total decrease this year was 23.4 per cent.

Welsh Coal Prices—Messrs. Hull, Blyth & Co., London and Cardiff, report current prices of coal as follows, on June 19: Best Welsh steam, $4.26@4.32; seconds, $4.08; thirds, $3.96; dry coals, $4.14; best Monmouthshire, $3.60; seconds, $3.48; best small steam, $2.70; second, $2.58. All per long ton, f.o.b. shipping port. There has been another advance in Cardiff coals.

Iron Trade Review

New York, June 30—While conditions in the iron and steel markets continue good, something of the usual quiet of midsummer begins to settle down, as might naturally be expected. This does not alter the fact, however, that the degree of business activity prevailing is very encouraging.

The pig-iron market shows orders more freely placed than for some time. In the Central West business has been rather quieter, though prices remain firm. In Seaboard, and especially in New England territory, inquiries are coming freely from manufacturers and it is to be noticed that many of these cover the requirements for the fourth quarter of the year as well as the third. The furnaces are correspondingly encouraged and are inclined to hold to their views as to prices. No great advance is expected, but there is an absence of the tendency to shade prices on good orders, which was so common a couple of month ago. Southern furnaces are asking 50c. a ton more, and one or two of the larger companies are out of the market for the present.

In finished material the business in structural steel continues good and the same may be said of plates, bars and several other branches. The railroads are coming forward more freely and several large orders for rails are understood to be pending besides those placed last week.

Baltimore

June 29—Included in the exports from this port for the week were 44,400 lb. tin scrap to Antwerp; 1,105,200 lb. steel billets and 653,600 lb. pipe to Glasgow; 4662 tons steel billets and 404 tons rail joints to Guaymas, Mexico; 2410 tons structural steel and 933,345 lb. pipe to Panama. Included in imports were 896 tons ferromanganese and 782 tons manganese ore.

Birmingham

June 28—The Southern pig iron market is active. Three companies are practically out of the market and two others are not anxious to sell at prevailing prices. The quotations have advanced to $12 per ton, minimum for No. 2 foundry, with $12.25 asked for last quarter's delivery. There is a large quantity of iron being sold right now. The stocks of iron on hand are being reduced steadily. The make is being held up as well as possible. The Tennessee company will put in blast three furnaces in the next week or two, one of them to go on basic iron. The Republic Iron and Steel Company will have to blow out a furnace for repairs. The Birmingham Coal and Iron Company will blow in No. 1 furnace to take the place of No. 2, which is undergoing repairs. The larger cast-iron pipe concerns in this section of the country are in the market for their fourth-quarter supply.

The steel demand is picking up. The receipt of the Harriman system order for 10,000 tons of rail at Ensley will mean much for the district.

The foundries and machine shops in Southern territory report an improvement in conditions.

Chicago

June 29. The iron market shows signs of general strengthening, but pig iron is still selling chiefly in small lots to melters that are not looking far ahead of their immediate needs. Some sales and many inquiries are being made for 1910 deliveries, but most business is in the fourth quarter, with some third quarter requirements remaining unfilled. Southern iron is firmer, with some interests holding to $12@12.25 for last quarter delivery, which means $16.35@16.60 Chicago. From a carload to 300 tons may be said to be the tonnage of nearly all sales, with here and there a heavier requirement, and with the number of sales large, showing general distribution among the melting industries. Northern iron is $16.50 for No. 2

with furnace agents very confident of the future and of firmer conditions continuing.

Sales of iron and steel products continue heavy and are increasing in almost every line, the most notable being railroad buying. Structural material and plates show large demand by the building interests using them, and machine supplies are increasing. Coke is in better demand, for last half delivery, with the price of first-class Connellsville $4.70 per ton.

Cleveland

June 29—Iron ore is moving freely, and there are plenty of vessels in commission. The results show that the strike has practically failed. Sales of ore continue to be made.

Pig Iron—There is rather a lull in the buying. Some small sales for quick delivery constitute about all the business for the week. Prices are firm at about $16 for bessemer; $15.50@15.75 for No. 2 foundry and $15 for gray forge.

Finished Materials—New sales have been rather light, but specifications on contracts are coming in well. Some trouble is expected at local rolling mills in the readjustment of the wage schedule, the present agreement ending with June.

Philadelphia

June 30—Interest has been developed in the pig iron market within the past few days, owing to the strong probabilities of heavy ordering by large consumers for late delivery. It has been upward of two years since large consumers felt it to their interest to anticipate pig iron requirements. A number of them have been doing so in a moderate way. There is an undertone to the market which may develop into an active and a heavy demand for all kinds of iron but especially basic, which may develop at any time. This is the view taken by the pig iron makers and their representatives. There has been an advance in asking prices of 25 or 50c. a ton. Forge iron has improved as much as any other kind except in basic. Basic for early delivery is hard to get. Basic is quoted today at $15.50, gray forge at $15.25; and No. 2X foundry $16.50.

Steel Billets—A strong and healthy demand has forced billets up nominally 50c per ton.

Bars—A general improvement has taken place and prices have been nominally advanced, though 1.45c. is still the quotation on iron bars and soft steel bars. Common iron is in demand on a basis of 1.35c. Enough mill iron to fill business has been at a loading from that figure.

Sheets—The summer stillness in manufacturing much for the moment, but prices are in pretty good shape.

Pipes and Tubes—The tone is decidedly firm. Still there is a large amount of business from all over the country and there is an absence of any concessions.

Merchant Steel—Merchant steel is also active in a small way and small consumers are ordering more liberally.

Plates—The plate mills are having the time of their lives. An immense amount of car-building work is being booked. The retail demand for plate is also better.

Structural Material—The undertone of this market is stronger. Estimates for large requirements will soon be submitted. The retail demand in lots from 50 to 500 tons, is better.

Scrap—All kinds of scrap are stronger this week. Nearly all kinds are moving more freely. The best demand is for heavy steel melting scrap, No. 1 yard wrought and railroad. The yard men are elated with the prospects of cleaning out their yards in the next 30 days.

Pittsburg

June 29—At this writing the prospects are that there will be some closing of mills on account of certain interests failing to sign the Amalgamated Association scales, all of which expire June 30. These scales cover the iron mills, sheet mills and tinplate mills, but in none of the three branches does the union control all the mills. As to the sheet and tinplate scales, the American Sheet and Tin Plate Company, the subsidiary of the Steel Corporation, posted notices some time ago that after June 30 it would operate all its mills on the open shop principle, which leaves it that the men will quit work on the night of June 30.

As to the iron scale, a settlement was reached last Friday at Cambridge Springs, Penn., between the Western Bar Iron Association, comprising most of the independent iron mills, which have been union, and the Amalgamated Association. The manufacturers signed last year's scale, with two modifications favorable to the men, one to the effect that all men shall be paid direct at the company's office, and the other that the manufacturers will coöperate with the union in having all employees members of the union in good standing. A continuous operation feature was also adopted, whereby pending scale settlement the mills may run during July.

The general iron and steel market is quieter as to new transactions, but has lost none of its strength or optimism. The total of specifications in June, received against old contracts will easily exceed those for May. A quiet time is expected in the market in July and August, as is usually the case in these months, but the mills are practically assured of full operations.

Pig Iron—The Jones & Laughlin Steel Company has bought 35,000 tons of bessemer iron for September and October delivery at $15.25, Valley, or $16.15, Pittsburg, the following the purchase of 5000 tons of prompt iron by the Republic company at the same price. There is an inquiry from another steel interest for 10,000 tons. The market is now quoted at $15.50, Valley. Occasional sales of basic iron have been made at $15, Valley, and the market is firm at that price. Inquiry for foundry iron has been lighter this week than last, but the market shows an advancing tendency, the minimum being $15, Valley, with some furnaces quoting $15.25@15.50. Malleable is nominally quoted at $15.25, Valley, although no sales have been made recently. Forge is quotable at $14.25, Valley.

Steel—Billets are $23, Pittsburg, and sheetbars $25 to $25.50, delivered, Pittsburg, with premiums on open-hearth material.

Sheets—Production has continued to increase slowly. Should all the union sheet mills be closed the production of the non-union mills would tide over for a time. The market remains quotable at 2.20c. for black and 3.20c. for galvanized, these prices being shaded less frequently than formerly.

Ferromanganese—The market has been rather quiet, and prices are unchanged, on the basis of about $41, Baltimore, or $42.05, Pittsburg, for prompt, with a slight advance for contracts for next year.

Foreign Iron

Belgian Iron—Pig-iron production in Belgium in May was 111,500 metric tons in 1908, and 139,570 in 1909; an increase of 27,980 tons. There were 36 furnaces in blast this year.

Metal Markets

New York, June 30—The metal markets are quiet for the most part, though there is some speculative activity in copper. No important changes in prices are noted.

Gold, Silver and Platinum

UNITED STATES GOLD AND SILVER MOVEMENT

Metal.	Exports.	Imports	Excess.
Gold:			
May 1909..	$11,171,266	$ 2,263,721	Exp. $ 8,907,544
" 1908..	26,555,913	3,101,002	Exp. 23,464,911
Year 1909..	55,487,891	17,767,857	Exp. 37,720,034
" 1908..	44,891,267	22,958,223	Exp. 21,933,034
Silver			
May 1909..	4,428,448	3,857,388	Exp. 571,060
" 1908..	4,028,334	3,389,568	" 638,766
Year 1909..	23,854,629	18,532,453	" 5,322,176
" 1908..	21,077,185	17,688,150	" 3,389,037

Exports from the port of New York, week ended June 26: Gold, $1,020,500, chiefly to Argentina; silver, $806,335 to London and Paris. Imports: Gold, $100,961; silver, $108,362 from South America and Mexico.

Gold and silver movement, port of San Francisco, five months ended May 31:

	Coin	Bullion	Total
Imports			
Gold	$12,100	$1,282,040	$1,294,140
Silver	94,209	1,039,487	1,133,696
Exports			
Gold	5,000	500	5,500
Silver	171,970	2,729,770	2,901,740

The imports are chiefly from Mexico and South America.

Foreign commerce of United States, five months ended May 31, as valued by the Bureau of Statistics, Department of Commerce and Labor:

Merchandise.	1908.	1909.
Exports	$ 762,428,233	$ 670,587,509
Imports	430,344,227	593,327,531
Excess, exports	$ 332,084,006	$ 77,259,978
Add excess of exports, silver		5,322,176
Add excess of exports, gold		37,720,034
Total export balance		$ 120,302,188

The gold and silver movement in detail is given in the table at the head of this column.

Gold—The demand for gold in the open market in London was not pressing. Some of the metal arriving went to the Bank of England and some to Germany. The price remained at 77s. 9d. per oz. for bars. In New York some gold went to South America and $2,000,000 to Holland.

Platinum—Prices remain unchanged, dealers still quoting $22.50@$23 per oz. for refined platinum; $25 for hard metal and $18@$20 for good scrap. Business is improving, being unusually active for summer.

Silver—Operations have been confined chiefly to Indian bazar buying, with China both buying and selling. The tendency and the result of these couple of operations has been to cause some decline in the price of silver. But although stocks are large, favorable crop conditions can easily cause a change in the situation with improvement in price.

SILVER AND STERLING EXCHANGE

June.	24	25	26	28	29	30
New York	52½	52⅜	52⅛	52⅜	52	52¼
London	24⅛	24⅛	24	24⅛	23½	24
Sterling Ex.	4.8815	4.8816	4.8810	4.8810	4.8810	4.8810

New York quotations, cents per ounce troy, fine silver; London, pence per ounce sterling silver, 0.925 fine.

Exports of silver from London to the East, Jan. 1 to June 17, as reported by Messrs. Pixley & Abell:

	1908.	1909.	Changes.
India	£ 3,825,658	£2,599,400	D. £1,226,258
China	516,400	1,075,100	I. 558,700
Straits	90,510	82,800	D. 7,710
Total	£ 4,432,568	£3,757,300	D. £ 675,268

Imports for the week, £1000 from Chile, £5000 from the West Indies, £87,000 from New York; total, £93,000. Exports, £1500 to Egypt, £287,500 to India; £289,000 in all.

Exports of minerals from New Caledonia for the two months ended Feb. 28 are reported as follows by the *Bulletin du Commerce*, of Noumea, in metric tons:

Nickel ore	8,778
Cobalt ore	274
Iron ore	11
Chrome ore	679

Shipments, except those of nickel ore, have been light this year.

Copper, Tin, Lead and Zinc

June.	Copper. Lake, Cts. per lb.	Copper. Electrolytic, Cts. per lb.	Copper. London, £ per ton.	Tin. Cts. per lb.	Lead. New York, Cts. per lb.	Lead. St. Louis, Cts. per lb.	Zinc. St. Louis, Cts. per lb.
24	13⅜ @13⅝	13 @13⅛	59⅛	29⅛	4.35	4 27½ @4.32½	5.27½ @5.32½
25	13⅜ @13⅝	13 @13⅛	59⅜	29⅛	4.35	4 27½ @4.32½	5.27½ @5.32½
26	13⅜ @13⅝	13 @13⅛	....	29⅛	4.35	4.27½ @4.32½	5.27½ @5.32½
28	13⅜ @13⅝	12⅞ @13⅛	59⅛	29¼	4.35	4 27½ @4.30	5.27½ @5.32½
29	13⅜ @13⅝	12⅞ @13⅛	58⅞	29⅛	4.35	4 27½ @4.30	5.27½ @5.32½
30	13⅜ @13⅝	12⅞ @13⅛	59	29⅜	4.35	4.27½ @4.30	5.27½ @5.32½

London quotations are per long ton (2240 lb.) standard copper. The New York quotations for electrolytic copper are for cakes, ingots and wirebars, and represent the bulk of the transactions made with consumers, basis, New York, cash. The price of cathodes is usually 0.125c. below that of electrolytic. The quotations for lead represent wholesale transactions in the open market. The quotations on spelter are for ordinary Western brands; special brands command a premium.

Copper—A short-lived spurt of activity the beginning of the week, occasioned by a rally in London, and a subsequent drifting into utter lifelessness, characterizes the copper market of this week. Prices at the close are again at 13⅜@13⅝c. for Lake copper; 12⅞@13⅛c. for electrolytic in cakes, wirebars or ingots. The average of the week for casting copper has been 12¾@13c.

Some large orders of American origin appeared in the London market in the early part of the week, bringing about a sharp rally. Since then prices have lost about half of the advance, and the close is cabled steady at £59 for spot and £59 7s. 6d. for three months.

For refined and manufactured sorts we quote: English tough, £62 10s.; best selected, £61 10s.@£62 10s.; strong sheets, £73 10s.@£75 10s.

The activity that characterized the end of May extended into the early part of June, and an outburst of speculative buying in all the European markets carried prices farther upward, the basis of 13½c. for electrolytic being reached. About the middle of the month speculative selling led to a decline, and later on the market became deluged with offerings from these sources which precipitated a decline to a basis of 13c. Some of the agencies, having disposed of their current output, refused to follow the decline and withdrew from the market, but the majority were free sellers at the lower level, and in certain quarters there was considerable pressure to sell. As a whole, the month was characterized by the influence of speculative transactions which were conducted upon a large scale. During the last week there was pronounced dullness, the closing prices being on the basis of 13c. for electrolytic and 13½c. for Lake. The unusual disparity in price between the two kinds during the latter part of June was owing to the absence of pressure to sell Lake, which is now very closely held.

Exports of copper from New York and Philadelphia for the week were 7948 long tons. Our special correspondent gives the exports from Baltimore at 1176 tons copper.

Imports and exports of copper in Germany, four months ended April 30, reported by Aron Hirsch & Sons, in metric tons:

	1908.	1909.	Changes.
Imports	56,533	49,323	D. 7,210
Exports	2,723	2,703	D. 20
Excess, imports	53,810	46,620	D. 7,190

Of the imports this year 45,026 tons were from the United States.

Tin—The London market dragged along in a listless fashion, with a weak tendency, and closed at £132 2s. 6d. for spot and £133 15s. for three months.

Large arrivals of tin brought about a weaker tone in the domestic market, where holders of spot material were anxious to realize. The business transacted was insignificant and the close is steady at 29⅛ cents.

Exports of tin from the Straits, four months ended April 30: United States, 6134; Great Britain, 10,197; other Europe, 1820; China and India, 702; total, 18,853 long tons, or 644 tons less than in the corresponding period last year.

Tin output of Federated Malay States, five months ended May 31 was 10,033 long tons in 1908, and 18,196 in 1909; decrease, 837 tons.

Lead—The market is dull and the tendency somewhat easy at 4.27½@4.30c. St. Louis and 4.35c. New York.

The London market again comes lower, the close being cabled at £12 17s. 6d. for Spanish and £13 for English lead.

Spelter—Business in this metal has also been of small volume, but prices have been holding firm at 5.27½@5.32½c. St. Louis, and 5.42½@5.47½c. New York.

New York quotations for spelter were 5.42½@5.47½c., June 24 to 30, inclusive.

The London market is firm at £22 for good ordinaries and £22 5s. for specials.

Other Metals

Antimony—Business is dull. Prices are rather nominal at 8⅛c. for Cookson's, 7¾c. for U. S., and 7½@7⅝c. for outside brands.

Aluminum—No. 1 ingots are quoted 22@24c. base; wire, 31@32c. base; sheets, 33@34c. base.

Quicksilver—There has been no change in prices. New York quotation is $44.50 per flask of 75 lb. San Francisco, $44 for domestic and $42 for export. London price is £8 7s. 6d. per flask, but tobbers offer at 5s. less.

Nickel—Large lots, contract business, 40@45c per lb. Retail, spot, from 50c. for 2000-lb. lots, up to 55c. for 500-lb. lots. The price for electrolytic is 5c higher.

Cadmium—Current quotations 75c. per lb., in 100-lb. lots, at Cleveland, Ohio. In Germany, 450@475 marks per 100 kg. at factory.

Magnesium—Quotations for this metal are $1.25 per lb., New York, in 100-lb. lots; for 5-lb. lots, $1.40 per pound.

Imports and Exports of Metals

Exports and imports of metals in the United States, five months ended May 31, are reported as follows, in the measures usual in the trade:

Metals:	Exports.	Imports.	Excess.
Copper, long tons	149,323	59,622	Exp. 59,701
Copper, 1908	139,793	30,461	Exp. 109,332
Tin, long tons	188	18,329	Imp. 18,141
Tin, 1908	130	14,693	Imp. 14,563
Lead, short tons	39,254	47,551	Imp. 8,197
Lead, 1908	33,313	47,429	Imp. 14,116
Spelter, sh. tons	2,127	1,289	Exp. 838
Spelter, 1908	1,555	338	Exp. 1,217
Nickel, lb.	4,838,123	8,633,910	Imp. 3,795,787
Nickel, 1908	5,388,855	6,089,531	Imp. 700,676
Antimony, lb.	4,032	4,047,018	Imp. 4,042,986
Antimony, 1908	.....	3,261,495	Imp. 3,261,495
Platinum, oz.	.....	46,385	Imp. 46,385
Platinum, 1908	.....	15,412	Imp. 15,412
Quicksilver, lb	149,858	.....	Exp. 149,858
Quicksilver, '08	83,874	.....	Exp. 83,874
Aluminum, value	$223,892	.....	Exp. $223,892
Aluminum, 1908	162,681	.....	Exp. 162,681
Ores, etc.:			
Zinc oxide, lb.	12,282,000	.....	Exp. 12,282,000
Zincoxide, '08	10,464,879	.....	Exp. 10,464,879
Zinc dross, lb.	9,118,977	.....	Exp. 9,118,977
Zinc dross, '08	10,599,983	.....	Exp. 10,599,983
Zinc ores, lg. tons	6,060	44,176	Imp. 38,116
Zinc ores, 1908	12,669	14,134	Imp. 1,465
Antim'y ores, lb.	504	3,428,498	Imp. 3,427,994
Ant. ores, 1908	.....	416,747	Imp. 416,747
Chrome ore	.....	17,741	Imp. 17,741
Chromeore, '08	.....	.....	.....

Copper, lead and nickel include the metal contents of ores, matte, bullion, etc. The exports given include reëxports of foreign material. Imports of zinc ores in 1909 included 34,863 tons calamine and 10,313 tons other ores, against 7362 and 6772 tons, respectively, in 1908. Chrome ore was not reported separately last year.

Zinc and Lead Ore Markets

Platteville, Wis., June 26—The base price paid this week for 60 per cent. zinc ore was $44 per ton; no premium price is reported. For 80 per cent. lead ore, $57,500.58 was paid.

SHIPMENTS, WEEK ENDED JUNE 26.

Camps.	Zinc ore, lb.	Lead ore, lb.	Sulphur ore, lb.
Platteville	73,000	.....	164,200
Hazel Green	300,800	.....	.....
Cuba City	143,000	103,010	.....
Galena	308,000	.....	.....
Dodgeville	261,000	.....	.....
Benton	227,000	.....	.....
Hanover	79,420	.....	.....
Shullsburg	176,000	.....	.....
Mineral Point	160,000	.....	.....
Linden	80,000	.....	67,700
Mineral Point	80,000	.....	.....
Linden	48,000	.....	.....
Total	2,979,220	103,010	231,900
Year to June 26	57,774,925	2,495,090	4,854,000

In addition to the above there was loaded to the American Zinc Oxide Company, 317,100 lb., and to the Joplin Separator Works, 147,000 lb. zinc concentrates.

The year's shipment of zinc ore to June 26 shows an increase of 7434 tons over the first six months of last year. A late wet Spring and heavy wagon roads curtailed production and shipment.

Joplin, Mo., June 26—The highest price paid for zinc sulphide ore was $47.50 per ton, the assay base being quoted at $44@45 per ton of 60 per cent. zinc. Zinc silicate sold as high as $23 on a base of $17 per ton of 40 per cent. zinc. The average price, all grades, was $40.78. The highest price paid for lead was $59, a decline of $1, but the bulk of ore sold at the high price, averaging, all grades, $57.96 per ton.

Heavy buying characterized the zinc market, a large tonnage of the Chicago-Joplin company and the Oronogo-Circle company being purchased this week. The shipment was an increase of a little over 1000 tons. Continued rain has reduced the output of silicate, a water spout last night washed out many water reservoirs; the Alba-Neck output is largely curtailed by excessive water in the ground. With the increased shipment there is a very close margin of purchasable ore. The stock is, approximately, 7000 tons, of which 2800 tons are not on the market and about 3100 sold, but not delivered.

SHIPMENTS, WEEK ENDED JUNE 26.

	Zinc, lb.	Lead, lb.	Value.
Webb City Carterville	3,486,520	446,620	$ 87,620
Joplin	2,307,010	161,520	54,920
Miami	917,120	122,160	19,591
Galena	741,480	55,840	17,558
Duenweg	561,260	60,170	14,810
Oronogo	597,810	6,870	13,756
Alba-Neck	446,180	...	10,688
Prosperity	368,640	40,210	9,091
Zincite	340,230	2,310	7,719
Granby	417,040	66,670	7,331
Aurora	475,030	26,100	7,277
Spurgeon	317,460	99,290	7,275
Quapaw	299,430	9,540	6,415
Carthage	270,040	.....	6,075
Sarcoxie	334,270	.....	5,003
Badger	222,220	.....	4,888
Carl Junction	85,490	....	2,000
Saginaw-Shoalsburg	92,760	11,540	1,943
Totals	12,286,360	1,098,830	$282,290
Six months	293,631,420	46,709,640	$6,608,626

Zinc value, the week, $250,436, 6 months, $6,413,643
Lead value, the week, $3,854, 6 months, 1,254,983

MONTHLY AVERAGE PRICES

Month.	Zinc Ore. Base Price. 1908.	1909.	Zinc Ore. All Ores. 1908.	1909.	Lead Ore. All Ores. 1908.	1909.
January	$47 60	$41 25	$45 56	$38 46	$46 88	$52 17
February	46 63	46 94	44 92	44 37	49 72	50 50
March	46 19	47 40	44 19	44 71	49 93	50 82
April	45 40	48 63	44 08	47 01	52 47	55 63
May	44 19	49 06	43 49	47 44	56 05	56 59
June	44 06		42 07		60 48	....
July	44 35		31 67		59 90	...
August	46 34		43 42		60 34	..
September	47 63		44 44		64 59	...
October	45 95		43 28		52 63	.....
November	39 14		45 62		54 53	.....
December	42 75		39 63		49.68	.....
Year	$46 83	.....	$44 31		$53 93	.....

NOTE—Under zinc ore the first two columns give base prices for 60 per cent. zinc ore, the second two the average for all ores sold. Lead ore prices are the average for all ores sold.

Petroleum

On June 25 the Standard Oil Company announced a reduction of 5c. per barrel in the price of crude petroleum. The new quotations are: Pennsylvania, $1.63; Mercer Black, $1.10; New Castle, $1.07; Corning, 93c.; Cabell, $1.17; North Lima, 89c.; South Lima, 84c.; Indiana, 84c.; Somerset, 75c.; Ragland 55c. per barrel.

Chemicals

New York, June 30—Business generally continues fair, but dealers look for the usual quiet through July and August.

Copper Sulphate—Quotations are unchanged at $4.22½c. per 100 lb. for carload lots, and $4.32½@$4.35 for smaller parcels. Sales have been light.

Nitrate of Soda—Prices are firm at 2.15c. for spot and 2.12½c. for futures. A good amount of business is being done.

Arsenic—Prices are a little firmer at 2⅞@3c. for white arsenic. The market has improved and sales are larger.

Imports and Exports—The imports and exports of chemicals and raw materials in the United States, five months ended May 31, were as follows:

	Imports.	Exports.	Excess.
Copper sulph. lb.	1,954,388	E.	1,954,388
Bleach, lb.	35,905,319	10,007	I. 35,895,312
Potash salts, lb.	167,001,772	1,671,812	I. 165,329,960
Soda salts, lb.	5,923,908	274,152	I. 5,649,756
Acetate lime, lb.	38,168,797		E. 38,168,797
Nit. of soda, tons	134,001	3,270	I. 130,741
Phosphates, tons	5,586	446,571	E. 440,985
Sulphur, tons	11,819	9,828	I. 1,991
Pyrites, tons	280,481	....	I. 280,481

Estimating sulphur contents of pyrites the total imports of sulphur this year were 124,011 tons.

Mining Stocks

New York, June 30—The recession on the Stock Exchange has been less marked during the past week, and prices have been rather uncertain, on a much smaller volume of business than has been the case for some weeks. The net result of the week has shown advances in a few stocks, but declines in a number of others. The extreme hot weather and the beginning of the vacation season have had some effect upon the market. It has been for the most part professional, and in the absence of some of the larger operators it has been without any particular direction.

On the Curb trading in the copper stocks was rather dull and irregular, with business on a moderate scale and some declines for the week. There was some activity in the Cobalt stocks with a disposition to trade more actively than in the coppers. Other stocks were rather neglected.

Boston, June 29—It has been a dull and monotonus market for mining shares, yet prices have held fairly well. American Zinc, Lead and Smelting has been the exception and has shown a steady advance, due to the fact that the commodity will receive favorable attention in the new tariff bill. The price has risen from $27.12½ in the week's time to $30.75. As there are but 80,0000 shares of Osceola outstanding it has been an easy matter to advance the price on light dealings.

A trifle more animation today caused a better feeling, although as yet mining shares are neglected. Osceola directors declared a $4 semi-annual dividend today, which is the same as the last payment. Calumet & Hecla will benefit to the extent of close to $130,000 by this declaration as its ownership is over 32,000 shares of Osceola stock. This, by the way, is the first dividend declaration made by the new board of directors.

The Shannon mine's $500,000 bond issue was practically all subscribed for by stockholders. The rights sold as high as 30c. and as low as 10c. The stock in the meantime has done nothing. A $1 assessment now seems likely by the Adventure within a short time to carry on development work. The Quincy company has made final payment to the Franklin for the latter's old mill site. The total amount involved was $170,000.

Vulture has been conspicuous on the Curb with an advance of almost $1 to $8.37½. Raven was irregular on the announcement of a 25c. assessment.

STOCK QUOTATIONS

NEW YORK June 30		BOSTON June 30	
Name of Comp.	Clg.	Name of Comp.	Clg.
Alaska Mine	.15	Adventure	7⅛
Amalgamated	82¾	Allouez	42
Anaconda	49⅛	Am. Zinc	30⅝
Balaklala	‡7¾	Arcadian	4
British Col. Cop	7⅛	Arizona Com	39¾
Buffalo Mines	3½	Atlantic	19½
Butte Coalition	20¼	Boston Con	14½
Colonial Silver	.30	Calumet & Ariz	104
Cum. Ely Mining	8	Calumet & Hecla	650
Davis-Daly	6¾	Centennial	33
Dominion Cop	7	Copper Range	82¼
Douglas Copper	2⅜	Daly-West	8½
El Rayo	2	East Butte	12½
Florence	3½	Franklin	17¾
Foster Cobalt	.32	Greene—Can	10
Furnace Creek	06	Hancock	9½
Giroux	7⅜	Isle Royal	26
Gold Hill	⅛	Keweenaw	4½
Goldfield Con	7⅞	La Salle	13
Granby	101	Mass	9
Greene Gold	⅛	Michigan	10¾
Greene-G. & S	9	Mohawk	65½
Guanajuato	1⅛	Nevada	23½
Guggen. Exp	196	North Butte	57½
Hanapah	‡15	Ojibway	10¾
Kerr Lake	7⅞	Old Colony	‡.60
McKinley Dar	.92	Old Dominion	[illegible]
Miami Copper	16	Osceola	136
Micmac	¾	Parrot	31
Mines Co. of Am	⅛	Quincy	90
Montezu. of C. R.	30	Rhode Island	14¾
Mont. Sho. C	1	Shannon	15⅛
Nev. Utah M. & S	1⅞	Superior	42
Newhouse M. & S	1¾	Superior & Bost.	15⅛
Nipissing Mines	10⅝	Superior & Pitts.	14⅛
Old Hundred	⅝	Tamarack	70
Silver Queen	.35	Trinity	‡12
Stewart	[illegible]	U S Smg. & Ref	49⅝
Tennessee Cop'r.	38¾	U.S. Sm. & Re., pd.	50
Tri-Bullion	[illegible]	Utah Con	42½
United Copper	10⅝	Victoria	14⅝
Utah Apex	6¾	Winona	15¾
Utah Copper	49⅝	Wolverine	152
Yukon Gold	4⅝	Wyandotte	‡2⅝

†Ex. Rights. ‡Last quotation.

N. Y. INDUSTRIAL	
Am. Agri. Chem	44¾
Am. Smelt. & Ref.	92
Am.Sm. & Ref., pf	1 07¼
Colo. Fuel & Iron	42¼
Federal M. & S., pf.	‡88¼
National Lead	8 7⅞
National Lead, pf	‡107
Pittsburg Coal	11 ¼
Republic I. & S.	31⅝
Republic I. & S., pf.	104⅛
Sloss-Sheffield	82⅝
Standard Oil	‡68
U. S. Steel	69
U. S. Steel, pf	126¼
Va. Car. Chem	54⅝

BOSTON CURB	Low.
Ahmeek	170
Chemung	13
Chino	8⅝
Corbin	7
Globe Con	4
Helvetia	5⅛
Ray Central	2⅜
Ray Con	16⅞
San Antonio	9

Furnished by Hornblower & Weeks, N. Y.

ST. LOUIS June 26		
N. of Com.	High.	Low.
Adams	.40	30
Am. Nettie	.08	05
Center Cr'k	2 00	1 50
Cent.C.&C.	82 00	80 00
C.C. & C. pf.	80 00	80 00
Cent. Oil	110 00	100 00
Columbia	8 00	5 00
Con. Coal	20 00	19 00
Doe Run	110 00	100 00
Gra. Bimet.	35	.27
St. Joe	12 00	11 00

LONDON July 3			
Name of Com.	Clg.		
Dolores	£1	5s	0d
Stratton's Ind.	0	3	1½
Camp Bird	1	8	6
Esperanza	2	15	0
Tomboy	1	2	6
El Oro	1	6	3
Oroville	0	13	6

Cabled through Wm. P. Bonbright & Co., N. Y.

NEVADA STOCKS. June 23.

Furnished by Weir Bros. & Co., New York.

Name of Comp.	Clg	Name of Comp.	Clg.
COMSTOCK STOCKS		Silver Pick	10
Belcher	48	St. Ives	10
Best & Belcher	40	Triangle	.01
Caledonia	.22	BULLFROG STOCKS	
Challar	18	Gibraltar	02
Comstock	30	Homestake King	01
Con. Cal. & Va	88	Mont. Shoshone C	1.50
Crown Point	.47	Tramp Cons	.06
Exchequer	27	MISCELLANEOUS	
Gould & Curry	20	Cumberland Ely	7.87½
Hale & Norcross	26	Giroux	7.62½
Mexican	1 00	Greenwat'r Copper	05
Ophir	1 47	Nevada Con	23.12½
Overman	32	Nevada Hills	87½
Potosi	27	Nevada Smelting	1 00
Savage	24	Nevada Wonder	.40
Sierra Nevada	30	Nevada-Utah	1 87½
Union	48	Penn-Wyoming	..
Utah	05	Pittsburgh S. Pk	47
Yellow Jacket	51	Ray Central	2 43¾
TONOPAH STOCKS		Ray Con	16.75
Belmont	85	Round Mt. Sphinx	10
Extension	48		
Golden Anchor	‡ 51		
Jim Butler	.09		
MacNamara	.24		
Midway	.20		
Montana	60		
North Star	02		
Tono'h Mine of N.	6.62½		
West End Con	.20		
GOLDF'D STOCKS			
Adams	01		
Atlanta	10		
Blue Bell	02		
Booth	.11		
C.O.D. Con	.11		
Columbia Mt	10		
Comb. Frac	.60		
Con. Red Top	‡ 57		
Cracker Jack	02		
Dia'dfield B. B. C.	03		
Goldfield Belmont	04		
Goldfield Daisy	26		
Great Bend	05		
Jumbo Extension	10		
Kendall	02		
Lone Star	03		
May Queen	03		
Oro	06		
Red Hill	05		
Sandstorm	08		

COLO. SPRINGS June 25	
Name of Comp.	Clg.
Acacia	.07
C. C. Con	03⅛
Dante	‡.05½
Doctor	.09¼
Elkton	.63
El Paso	.51¼
Findlay	.14⅝
Gold Dollar	.11
Gold Sovereign	.03
Isabella	.23½
Jack Pot	.07
Jennie Sample	.07¾
Jerry Johnson	.06
Lexington	‡.02
Mary McKinney	.38
Pharmacist	‡ 02¾
Portland	.85
Prince Albert	.02
Vindicator	.68¼
Work	‡ 06¼

Assessments

Company.	Delinq.	Sale.	Amt.
Alpha, Nev	July 15	Aug. 6	$0.05
Best & Belcher, Nev	July 20	Aug. 10	0.10
Black Jack, Utah	June 15	July 8	0.01
Brunswick Chol., Nev	July 10	Aug. 2	0.01
Brunswick Potosi, Nev	July 10	Aug. 2	0.01
Bullion, Nev	June 14	July 13	0.05
Challenge con., Nev	June 22	July 13	0.05
Mexican, Nev	June 28	July 14	0.10
Mountain Bell, Utah	July 19	Aug. 5	0.01
N. Y. Bonanza, Utah	July 10	July 31	0.03
Potosi, Nev	July 30	Aug. 20	0.10
Progressive, Utah	June 23	July 14	0.01
Scorpion, Nev	June 14	July 6	0.02
Scottish Chief, Utah	July 7	Aug. 4	0.01
Seg. Belcher, Nev	July 7	July 29	0.03
Seven Troughs Min., Nev	June 23	July 10	0.05
Sierra Nevada, Nev	July 15	Aug. 10	0.10
Silver King Con., Utah	July 6	July 17	0.10
Union Con., Nev	June 28	July 19	0.10
W. Con Va., Nev	July 16	Aug. 10	0.10
Yellow Jacket, Nev	July 13	Aug. 5	0.25

Monthly Average Prices of Metals

SILVER

Month.	New York.		London.	
	1908.	1909.	1908.	1909.
January	55 678	51 750	25 738	23 834
February	56 000	51 472	25 855	23 706
March	55 365	50 468	25 570	23 227
April	55 505	51 428	25 133	23 706
May	52 795	52.905	24 377	24 343
June	54 464	52 508	24 760	24.166
July	54 115	.....	24 514	.....
August	51 683	.....	24 858	.....
September	51 520	.....	24 377	.....
October	51 443	.....	24 725	.....
November	49.647	.....	22 933	.....
December	48.766	.....	22.493	.....
Year	52 864	.....	24.402	.....

New York, cents per fine ounce; London, pence per standard ounce.

COPPER

	NEW YORK.				LONDON.	
	Electrolytic		Lake.			
	1908.	1909.	1908.	1909.	1908	1909.
January	13.726	13 893	13 901	14 280	62 386	57.688
February	12.905	12 949	13 098	13 295	58 786	61 198
March	12.704	12 387	12 875	12 826	58.761	56.231
April	12.743	12 566	12 928	12 932	58 361	57.363
May	12.598	12.803	12.788	13.248	57 387	59.398
June	12.675	13.2.4	12 877	13.548	57 842	59 627
July	12.702	.....	12 933	.....	57.989	.....
August	13.462	.....	13 639	.....	60.500	.....
September	13.388	.....	13 600	.....	60 338	.....
October	13.354	.....	13 646	.....	60 139	.....
November	14.130	.....	14.386	.....	63.417	.....
December	14.111	.....	14 411	.....	62 943	.....
Year	13.208	.....	13.424	.....	59.902	.....

New York, cents per pound. Electrolytic is for cakes, ingots or wirebars. London, pounds sterling, per long ton, standard copper.

TIN AT NEW YORK

Month.	1908.	1909.	Month.	1908.	1909.
January	27 380	28 060	July	29 207	.....
February	28 978	28 290	August	29 942	.....
March	30 577	28.727	September	28 815	.....
April	31.702	29.445	October	29.444	.....
May	30.015	29.225	November	30 348	.....
June	28.024	29 362	December	29 154	.....
			Av. Year.	29.465	.....

Prices are in cents per pound.

LEAD

Month.	New York.		St. Louis	London.	
	1908.	1909.	1909.	1908.	1909.
January	3 691	4.175	4 025	14 469	13 113
February	3 725	4.018	3 866	14 250	13.313
March	3.838	3.986	3 835	13 975	13.438
April	3.993	4 168	4.051	13.469	13.297
May	4 253	4.287	4.214	12.938	13.225
June	4.466	4.300	4 291	12.600	13.031
July	4.744	.....	.....	13 000	.....
August	4.580	.....	.....	13.675	.....
September	4.515	.....	.....	13.125	.....
October	4.351	.....	.....	13 375	.....
November	4 330	.....	.....	13 588	.....
December	4.213	.....	.....	13 156	.....
Year	4.200	.....	.....	13.439	.....

New York and St. Louis, cents per pound. London, pounds sterling per long ton.

SPELTER

Month.	New York		St. Louis.		London.	
	1908.	1909.	1908.	1909.	1908.	1909.
January	4.513	5.141	4 363	4 931	20 562	21.426
February	4 788	4 889	4 698	4.739	20 875	21.563
March	4.665	4 757	4.527	4 667	21 075	21.436
April	4 645	4.865	4 495	4 815	21 344	21 831
May	4 698	5 124	4 458	4.974	19 906	21 975
June	4.543	5 402	4 393	5.252	19 000	22 000
July	4 485	.....	4 338	.....	19 031	.....
August	4.502	.....	4 356	.....	19 350	.....
September	4.769	.....	4 619	.....	19 563	.....
October	4 801	.....	4 651	.....	19 250	.....
November	5 059	.....	4.909	.....	20 875	.....
December	5.137	.....	4.987	.....	20 625	.....
Year	4.726	.....	4.578	.....	20 163	.....

New York and St. Louis, cents per pound. London, pounds sterling per long ton

THE MINING INDEX

The editors of this paper read all the important publications of the world that relate to mining and the treatment of minerals. This index is published as a reference for all interested and to make it impossible for readers of the ENGINEERING AND MINING JOURNAL to miss any important article published anywhere.

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No accounts can be opened for these small amounts, but remittance must be sent with order. For the convenience of those making small but frequent remittances, coupons are furnished at the following prices: 20 cents each, six for $1.00, thirty-three for $5.00 and one hundred for $15.00. This arrangement will be especially appreciated by foreign readers and men in distant mining camps. Where remittances are made in even dollars we will return the excess over an order in coupons upon request.

ALUMINUM

9638—LATERITE Report on Laterites from the Central Provinces Wyndham R. Dunstan. (Rec. Geol. Surv. India, Vol. XXXVII, Part 2, 1908; 8 pp.) The author gives a number of chemical analyses of various samples of laterites with some notes on the possibility of using them as a source of aluminum

9639 — PRODUCTION of Bauxite and Aluminum in 1908. W. C. Phalen. (Advance Chapter from Mineral Resources of the U. S., 1909; 13 pp.) Gives statistics of the production of bauxite and aluminum for several years, with notes on the present status of the industries.

ARSENIC

9640 OCCURRENCE, USES, ETC.—Arsenic. E. B. Wilson. (Mines and Minerals, June, 1909; 1¾ pp.) Notes on the uses, occurrence and tests for arsenic. Methods of analysis, metallurgy and antidotes for poisoning. 20c.

ASBESTOS

9641—AMALGAMATED ASBESTOS CORPORATION, LIMITED, The. J. J. Harpell. (Can. Min. Journ., June 15, 1909; 3 pp.) The author in this article analyzes the claims set forth by the Asbestos Corporation and also the figures advanced by Mr. Cirkel. 20c

BAUXITE

9642 — PRODUCTION of Bauxite and Aluminum 1908. W. C. Phalen. (Advance Chapter from Mineral Resources of the U. S., 1909; 13 pp.) Gives statistics of the production of bauxite and aluminum for several years, with notes on the present states of the industries

CALCIUM CARBIDE

9643 — MANUFACTURE of Calcium Carbide. (Engineering, May 28 and June 11, 1909, 5 pp.) Illustrated description of the works of the Northwestern Cyanamide Company at Odda giving notes on the manufacture of nitrolim and the extraction of nitrogen from the air Conclusion of article previously indexed 40c.

CEMENT

9644 COLORADO—Portland Cement Material in Colorado. A. Lakes. (Min. Sci., June 3, 1909, 1¾ pp.) Describes the geology of the region pointing out the occurrence of limestone and shale capable of making portland cement Discusses the requirements for cement material Illustrated 20c

9645 MILLS of the Cowell Portland Cement Company (Eng Rec May 8, 1909, 2½ pp.) A description of the cement plant and its equipment recently installed near San Francisco by the Cowell Portland Cement Company Capacity of plant 1000 bbl daily Illustrated 20c

9646—PLANT—Description of the Allentown Portland Cement Company's Plant (Chem Engr, May 1909, [illegible] pp.) Description of a new plant located at Evansville, Penn., which when fully completed will have a total capacity of 5000 tons per day 40c

9647 — PORTLAND CEMENT — Critical Economies in Portland Cement Production E. A. Richmond (Eng Rec, May 15 1909, 2 pp.) Notes on the cost of various operations in the manufacture of portland cement, together with some observations on the effects of fine grinding of the raw material Illustrated. 20c.

9648—PRESENT STATUS and Technology of the Portland Cement Industry. (Chem. Engr., May, 1909; 4½ pp.) This subject is covered in a general manner, all the salient features being enlarged upon. Illustrated. 40c.

9649 — TESTING—Standard Methods of Testing Cement. Carney Hartley. (Min. Sci., May 20, 1909; 2½ pp.) An article dealing with the importance of a proper test of the cement prior to use, giving specifications and the method of determining quality. 20c.

COAL AND COKE

9650 COAL BRIQUETTING. C. Scholz. (Journ. Western Soc. Engrs., April, 1909; 17 pp.) Notes on the manufacture of briquets from fine waste coal producing a fuel of high efficiency. 40c.

9651—COAL CUTTING—A Novel Coal and ties. John Gibson. (Trans. Min. Inst. Scot., Vol. XXXI, Part 5, 1909; 11 pp.) Describes Stone-Cutting Process. Alfred Gradenwitz. (Eng. and Min. Journ., June 19, 1909; 2⅜ pp.) Describes a system based on the use of driven cables carrying tempered steel cutting points whereby a 50 per cent. saving is possible. Drawings and halftones of the machine are given. 20c.

9652—COAL DUST—The Method of Dealing with the Danger from Coaldust in the Westphalian Coal District Forstmann (Coll. Guardian, June 11, 1909; 1¾ pp.) First instalment of an article treating in detail the methods employed in the district. Statistics are given for a number of years 40c.

9653 COAL DUST QUESTION in Great Britain. Henry Hall. (Eng. and Min. Journ., May 29, 1909; 5⅔ pp.) Reviews the efforts of the early investigators showing how present legislation has reduced the number of gas and dust explosions. Illustrated 20c.

9654 COKE Metallurgical Coke Made from Illinois Coal. C. H. Vannier. (Black Diamond, May 22, 1909; 1¾ pp.) The author maintains that all coals will coke and describes experiments performed with Illinois coal A description is given of the Moss oven Illustrated 20c.

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9661—CULM PILES—Reclaiming Coal from the Culm Pile. Warren O. Rogers. (Power, June 15, 1909; 5½ pp.) Description of the operation of washeries in the anthracite region, by means of which immense quantities of fuel are recovered. Details of plants are given. Illustrated. 20c.

9662—ELECTRICITY in Coal Mines. Robert Nelson. (Iron and Coal Tr. Rev., May 28, 1909; 3⅓ pp.) A discussion of the dangers in the use of electricity underground in coal mines, owing to the danger of shock and the liability of ignition of explosive gas and coal dust. This articles also describes the Merz Price protective system. Paper before Brit. Instn. Min. Engrs. 40c.

9663—EXPLOSIONS—Effect of Humidity on Mine Explosions. Carl Scholz. (Bull A. I. M. E., June, 1909; 13 pp.) Discussion of paper previously indexed, presenting data collected from mines throughout the United States. A great number of specific instances are cited.

9664 — FIRST-AID MOVEMENT in the Anthracite Region of Pennsylvania. H. H. Stoek. (Eng. Mag., June, 1909; 16 pp.) This article describes the first aid remedies employed in Pennsylvania, and the efforts through which an efficient first-aid service has been perfected. Illustrated. 40c.

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COPPER

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9693 — SMELTING — Combined Roasting and Smelting Processes for Copper Ores and Fires. (Electrochem. and Met. Ind., June, 1909; 1½ pp.) Compares the Fink and Catton processes bringing out similarities. Illustration of both types are given. 40c.

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9696—WEST AUSTRALIA—A Report upon the Mount Malcolm Copper Mine, Eulaminna, Mount Margaret Goldfield. Harry P. Woodward. (W. A. Geol. Surv., Bull. No. 32, 1908; 10 pp.) This article sets forth the results of a special investigation of the largest and greatest producing mine in the State. Mine maps.

GOLD AND SILVER

9697—ALLUVIALS — Nature of Gold in Alluvials. F. Lynwood Garrison. (Min. and Sci. Press, May 29, 1909; 3 pp.) A short review of the literature of placer deposits together with notes by the author describing various types of alluvial deposits. 20c.

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9699—AUSTRALIA—The Long Tunnel Mining Company. L. W. Grayson. (Aust. Min. and Eng. Rev., May 5, 1909; 7½ pp.) A review of the company's operation to date. A description of the mines and plant with notes on the future prospects. Illustrated. 20c.

9700—COBALT in 1908. Arthur A. Cole. (Can. Min. Journ., June 1, 1909; 6 pp.) Abstract of a report on the Cobalt district in which the milling system of a number of the companies is shown briefly, together with notes on the cost of marketing and the price obtained for silver ores. Illustrated. 20c.

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9703—CYANIDING OPERATIONS in Mexico. M. R. Lamb. (Industrial Prog., May, 1909; 8 pp.) A brief description of the operations of a number of the principal cyanide mills in Pachuca, Guanajuato, El Oro and Chinipas, Mexico. Illustrated.

9704—DREDGING and Hydraulic Sluicing, Victoria, 1908. E. H. Goodenough. (Aust. Min. Stand., May 5, 1909; ¾ p.) An abstract from the annual report of the dredge mining and hydraulic sluicing in Victoria for the year 1908. 40c.

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9708—HYDRAULIC MINING OPERATIONS in California. Al. H. Martin. (Min. Wld., June 19, 1909; 2¼ pp.) An article descriptive of placer mining operations in Siskiyou and Trinity counties, Cal., treating the general conditions in the industry in this region. Illustrated and gives map of the locality discussed. 20c.

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9710—MEXICO—El Tigre Mine. R. L. Herrick. (Mines and Minerals, June, 1909; 5 pp.) A short historical review of mining in Sonora, Mexico, with a detailed description of the El Tigre mine, its early history, geology, ore deposits and mine development. Illustrated. 20c.

9711—MEXICO—History of the Native-Silver Mines of Batopilas. Walter M. Brodie (Min. Wld., June 12, 1909; 5½ pp.) A description of the district and of the occurrence and mining of the ores. This district has produced large quantities of native silver. Illustrated. 20c.

9712—MEXICO—The Silver Mines of Mexico. A. H. Bromley. (Trans. A. I. M. E., May, 1909; 5 pp.) A discussion of the paper by A. F. J. Bordeaux which appeared in Bi-Monthly Bulletin, A. I. M. E., Sept., 1908.

9713—MILL FOUNDATIONS—Foundations of the Goldfield Consolidated Mill. Percy E Barbour. (Eng. and Min. Journ., June 12, 1909; 3¾ pp.) A detailed description of the methods of construction employed, with complete data as to cost. The article is illustrated and sectional drawings are given. 20c

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un District, Nevada. W. A. Root. (Min. Wld., June 5, 1909; 2 pp.) A description of the Austin and Reese river districts with special reference to the Austin Manhattan Consolidated Mining Company and its plant. Illustrated. 20c.

9718—ONTARIO—Preliminary Report on Gowganda Mining Division District of Nipissing, Ontario. W. H. Collins. (Canada Dept. of Mines Geol. Surv. Branch, 1909; 46 pp. and map.) A general description of the district, its topography, drainage system, general geology and the distribution of the mineral deposits, with special reference to silver, copper and iron ore. Illustrated.

9719—PERU—Mining in Morococha, Province of Yauli, Peru. Alberto Jochamowitz. (Min. Journ., May 22, 1909; 1 p.) Notes on the geology and ore deposits of Cerro San Ignacio, San Marcelo, San Francisco, Alpamina, San Florencio and other minor districts. 40c.

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9721—PLACER MINING INDUSTRY of North Carolina. R. Kemp Welch. (Min. Wld., May 22, 1909; 2½ pp.) Deals with the topography of the mining districts in Franklin, Nash, Halifax and Warren counties. Notes on the gold output in former years, together with a description of the present economic conditions governing mining. Illustrated. 20c.

9722—PRECIPITATION—Notes on Precipitation. Mather Smith. (Journ. Chem., Met. and Min. Soc. of South Africa, Mar. and Apr. 1909; 3 pp.) The object of this paper is to disprove the generally accepted principle that 1 cu. ft. of zinc shavings is required to precipitate a ton of solution in 24 hours. Briefly discussed by J. H. Johnson. $1.

9723—SLIMES TREATMENT—Further Notes on the Utilization of Waste Heat in Slimes Treatment. A. Salkinson. (Journ. Chem., Met. and Min. Soc. of South Africa, Mar., 1909; 2 pp.) Additional data is given on this process as worked at the Simmer & Jack East, Ltd. 60c.

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GYPSUM

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9731—AMERICAN IRON AND STEEL INDUSTRY. [illegible] (Min. May, 1909; [illegible] pp.) The industry is discussed from [illegible] and the author gives [illegible] the production of pig [illegible] United States [illegible] and also exports from England and the United States. 40c.

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Refined, crystals " 5.50@6.00

SILICA—
Ground quartz, ord'ry lg. ton. 10.00@15.00
Silex, ground " 13.00@15.00
Silex, floated " 35.00@40.00
Lump quartz 5.00@5.50
Glass sand 2.75

SILVER—Nitrate, crystals oz. 33¼@.36¾

SODIUM—Acetate lb. 04½@.05
"Alkali," per 100 lb., 58@48% " 80@.87½
Bicarb. soda, per 100 lb 1.00@1.30c.
Soda, caustic, per 100 lb., 78@60 1.90@2.00
Soda, caustic, powdered 02¼@ 03¼
Salt cake, per 100 lb., bulk. .40 up
Salt cake, bbl .65@.85
Soda, monohydrate, per lb 1.40@1.75
Bichromate lb. 06½@.06¾
Bromide .20
Chlorate, com'l " 08½@.09½
Cyanide ("100% KCN") 18c.
Carloads (30,000 lb. 18c.
5-ton lots 18½c.
Less than 5 tons 19c.
Hyposulphite, Am. " 1.30@1.50
German " 1.60@1.70
Phosphate 100 lb. 2.00@2.50
Prussiate " 08¾@ .09
Sal soda, f.o.b. N. Y. " 65@ .75
Foreign, f.o.b. N. Y. " 80@1.00
Silicate, com'l " .65@1.50
Sulphate, com'l (Glauber's salt) 100 lb. 60@ .80
Sulphate, com'l, calcined " 65@ .85

STRONTIUM—Nitrate lb. 07½@ .08

SULPHUR—Louisiana (prime) to New York lg. ton 22.00 up
To Boston, Philadelphia or Baltimore 22.50 up
Roll 100 lb 1.85@2.15
Flour " 2.00@2.40
Flowers, sublimed " 2.20@2.60
Sicilian, extra qual., unmixed seconds, crude brimstone to New York lg. ton $22.00
Other ports " 22.50

TERRA ALBA—Fr. & Eng. 100 lb. 80@1.00

TALC—Domestic sh. ton 15.00@20.00
French 18.00@25.00
Italian, best 30.00@40.00

TIN—Bichloride 30% lb .09
Crystals 20½@ .23
Oxide, lb 32½@ .35

URANIUM—Oxide 3.50

ZINC—Chloride, sol., com. 20° " 02¼
Chloride, granular 05@ .06
Dust 05@ 05¼
Sulphate 02¼@ 02½

NOTE—These quotations are for ordinary wholesale lots in New York unless otherwise specified, and are generally subject to the usual trade discounts. In the cases of some of the important minerals, such as phosphate rock, pyrites and sulphur, in which there are well established markets, the quotations fully represent the latter. But in the cases of some of the minor mineral products, the quotations represent what dealers ask of consumers and not what producers can realize in selling their output as matters of private contract.

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Wallaroo and Moonta Copper Mines and Smeltery

These South Australian Mines Have Been Profitably Worked for 50 Years; Moonta Mine Now Nearly Exhausted. Hancock Jig Developed Here

BY GERARD W. WILLIAMS*

The mines and reduction works of the Wallaroo & Moonta Mining and Smelting Company are situated in Yorke peninsula, on the seaboard of the state of South Australia. The mines were discovered fifty years ago and they have been worked for half a century without intermission. The reduction works are situated on the shores of Wallaroo bay but the mines at Wallaroo and at Moonta are distant 7 and 10 miles respectively from the smeltery with which they are connected by rail. Originally worked as separate mines the two companies were amalgamated in 1889 and placed under the management of R. H. Hancock, father of the present general manager, Lipson Hancock. As the two mines are entirely different both as regards the nature and occurrence of the ore it will be well to consider them separately.

The Wallaroo Mines

At the Wallaroo mines the country rock is a metamorphic mica schist of Cambrian or pre-Cambrian age. There are several ore-producing bodies which run in a general east and west direction and which are connected in the western portion of the mines by oblique veins. These more or less continuous lodes of altered schist, impregnated with quartz carrying pyrite and chalcopyrite, were proved in the upper levels for a length of nearly 10,000 ft., but the bulk of the veins cut out in depth and at 2000 ft. the length of the pay shoot is only 1300 ft., with a further 600 ft. of mineralized lode which does not pay for extraction at present metal prices. The ore averages about 4 per cent. copper and this content has been well maintaned over the whole of the lower workings of the mine. With depth, however, the orebody has become less clearly defined and the lode matter carries pyroxene minerals to a greater extent than in the upper levels.

The entire surface of the district is covered with recent deposits of clay and limestone and the gently undulating country now cleared of scrub and covered with wheatfields, gives no hint of

WALLAROO MINES—LOOKING EAST

ORE SORTING PLANT AT THE WALLAROO MINE

SMELTING AND REFINING PLANTS OF THE WALLAROO AND MOONTA COMPANY ON WALLAROO BAY, SOUTH AUSTRALIA

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the lodes which lie beneath the surface, for South Australia since the advent of superphosphate manures promises to become the Australian Manitoba. The pioneer shaft sinker of this field was a kangaroo rat, and a shepherd on what was then an "out-back" sheep run noticed the copper stained stones cast up on the mound of earth produced by the excavations of the little marsupial. The Moonta mines were discovered in a similar manner. As previously stated the country rock is an altered mica schist. This rock swells when exposed and unless special precautions are taken heavy falls of ground are inevitable.

Mining Methods

Stoping is on the overhand system, but owing to the swelling of the country rock the filling has to be kept close up to the working faces. Heavy stulls are used in the smaller stopes (3 to 8 ft.) but in stopes of 9 ft. or over in width, heavy pigsties filled with waste are used. The latter are carried up from a hitch in the footwall in inclined stopes or from the drive timber in vertical stopes until they brace against the hanging-wall or roof of the stope. The size and shape of these pigsties varies according to the requirements of the stope, some being 6 ft. square, others oblong and of larger dimensions. When tightly filled with waste and firmly braced against the hanging wall they are capable of withstanding great pressure.

A stope is worked by taking off a few feet of thickness at one end and immediately building a sty to carry the new roof. At frequent intervals new sties are erected as the stope works along. In very bad ground the sties are almost continuous. This system, costly as it undoubtedly is, is the only safe method for working the ore. The sties are not removed, being buried in the filling which is sent down to the stope from the mullock (waste) passes. In the levels no form of timbering can withstand the pressure from the walls and in consequence the drives are framed between continuous rows of solid timber sties. The formation of the latter are well shown in the illustrations which accompany this article, for which the photographs were specially taken. Machine drills are used in development work only; all actual ore winning is done by hand labor.

Pumping Installation.

The Wallaroo mine is very wet, 250,000 gal. being raised daily. There are two pumping installations, one for regular and one for emergency use. In the former there are 3 stations, at the 750-, 1230- and 1830-ft. level, respectively. The pumps are of the Worthington vertical, 3-throw, plunger type, fitted with a 3-speed Baker's change-gear by which they may be worked at 24, 31½ and 40 r.p.m. The capacity and other details of the pumps are given in the accompanying table.

PUMPS AT WALLAROO MINE.

Level	Motors H P	Size, In	Gallons Per Minute.		
			Slow.	Intermediate	Fast.
1830	25	5½x9	55	72	90
1230	40	7 x12	112	150	190
750	40 (2)	8½x12	170	220	275

The pumps are driven by British-Westinghouse constant-speed, 3-phase motors, direct connected. In the emergency scheme, pumps are at two stations, the 1830- and 1230-ft. levels. The pumps are similar in design to the regular pumps and each is coupled to a 60-h.p., 3 phase, variable speed motor by double spur gearing. At 40 r.p.m., each pump delivers 220 gal. per min. and stops and starts automatically, being controlled by a float attachment in the sump which actuates a liquid starter. The shaft pipes are of cast iron, 6 in. in diameter and tested to 2240 pounds.

Ventilation of the deep levels is effected by means of a Waddell fan at the surface which supplies the 1350 level and downward. The shafts follow the footwall of the lode. Near the surface the dip averaged 70 deg. to the south but at 300 ft. the dip increases and becomes practically vertical. At 1800 ft. the orebody began to trend to the north and down to 2300 ft., the lowest level, a slight dip to the north is maintained.

Sorting and Concentration

The ore which consists of pyrite and chalcopyrite in a gangue of schist and quartz varies in copper content from 3.5 to 4 per cent. With copper at last year's prices it is not profitable to mine ore of less value than 4 per cent. At the surface the ore is passed over grizzlies and then sorted on picking belts, passed through breakers and re-sorted. About 55 per cent. of the total copper is contained in 22 per cent. of the ore mined and is sent direct to the smelters; 12.7 per cent. by weight is returned underground to be used for stope filling and the balance is sent to the concentrating plant. The ore which goes to the concentrating plant varies from 2.3 to 4 per cent. copper averaging about 3.3 per cent. and constituting 32 per cent. of the total copper in the ore mined. The waste used for filling carries 0.5 per cent. copper or 4.5 per cent. of the total copper. The direct smelting ore as sorted averages 9.8 per cent. copper.

The product sent to the concentrating plant is passed through two sets of cornish rolls which reduces it to ½ in. size and the product from the rolls, together with the finer portion removed by prior screening, passes to a Hancock jig. The jig effects a 55 per cent. recovery and the concentrates after draining are sent to the smelters. The tailings and mid-

LEVEL STIES IN THE WALLAROO MINES—SWELLING GROUND NECESSITATES UNUSUALLY HEAVY TIMBERING

dlings from the jig are sent to Krupp ball mills for reduction to 1.5-mm. size, after which they are elevated to spitzkasten for classification. The classified sands are further concentrated on Wilfley tables and the thickened slimes are treated on vanners and buddles. At present some accumulated sands are being fed to the ball mills and are retreated with the current jig tailings.

The Hancock Jig

The Hancock jig developed here by R. H. Hancock is extensively used in Australia and is also being installed in other parts of the mining world. The machine consists of a jig tank or hutch filled with water, in which a horizontal screen 16 to 20 ft. in length works with a combined vertical and horizontal movement, such that the ore upon it is not only subjected to a jigging action which stratifies it, but also to a progressive longitudinal movement which carries it along the screen toward the tail very much faster than is possible where this movement is produced only by the flow of water.

The richer portion of the material being treated makes its way downward through the "ragging" (course pieces of ore or other heavy material held in place by small crossbars of wood) and through the screen into the hutch, which is divided by cross partitions into a number of compartments for different grades of concentrates and middlings. The lighter waste remains on top and is quickly passed over the tail of the machine.

The operating mechanism consists of an arrangement of levers and supporting rods worked by a cam below the hutch, together with a device near the top of the hutch for giving the horizontal part of the motion.

The advantage which this machine possesses over other types of jigs is its great capacity, and its ability to handle successfully an unsized feed (from ½ in. down, in many cases) and thus obviate the expense and complication involved in installing a series of jigs and trommels. Apart from first cost, there is a notable saving in running expenses, through reduced maintenance and supervision.

At Wallaroo the waste which is sorted on the picking tables is sent to a separate crushing plant and is broken down to 1⅛ in. before it is sent underground for filling. Most of the various plants are electrically driven. Eight Babcock & Wilcox boilers (2000 h.p.) supply steam to three Bellis-Morcom direct-connected generating sets, three powerful compressors and a ventilating engine. The boilers are fitted with chain stokers, economizers and superheaters. A few years ago a serious fire in the mine destroyed the upper portion of the main shaft and a new shaft was sunk 840 ft. to join the main shaft below the fire area.

The Moonta Mine

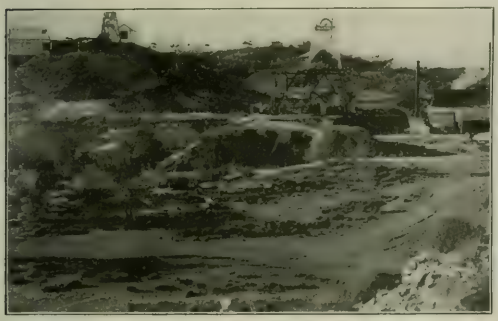
The country rock at Moonta consists of an intensely hard felsite-porphyry. The ore bodies are fairly regular and are often marked by a well defined band of quartz on the footwall. The mineral, chalcopyrite, occurs in the quartz and also in the country rock itself, as at the Wallaroo mines, the ore here appears to be deposited along parallel stress planes in the rock. Within a width of about half a mile several lodes were discovered, of which five were of importance. These lodes strike north and south and dip to the west at angles varying from 49 to 65 degrees.

As most of these lodes have been worked out it is not necessary to go into any detailed description of their individual characteristics. Although characterized by exceptional richness (for many years the mine raised nothing but 20 per cent. ore), none of the lodes persisted below 2000 ft. The mine has been explored to 2500 ft. but there is practically no payable ore below 2000 ft. A peculiarity of the Moonta lodes was the occurrence of bonanza or "wallows" as they are termed locally, in the foot- and hanging-walls of the lodes. These pockets of ore were at times of phenomenal richness and varied in size from a few score to many hundreds of tons.

The orebodies proper ranged up to 40 ft. in width and were in many cases of considerable extent; thus, Beddome's lode was worked for 2500 ft. in length and to a depth of 1200 ft.; Greene's lode was worked successfully for a length of 1200 to 1500 ft. and to a depth of 1000 ft.; Taylor's lode was worked for 3000 ft. in length in the upper levels and for 2000 ft. at 1600 ft. This lode has been followed down for 2500 ft., but below 2000 ft. it narrowed and the chalcopyrite being replaced by pyrite, it became of no value. The lode is characterized by the presence of a persistent band of quartz on the footwall side varying in width from a few inches to three or four feet.

Although very hard, both the lode matter and the country rock stand well and give no trouble in stoping. The lode matter is much softer than the country and in consequence of this the shafts are mostly sunk in the lode and not in the country rock. Wheel skips are used for hoisting. In the old days the ore was mined by underhand stoping and, to save timbering, pillars of ore were left in. These pillars run from level to level and vary in width from 20 to 40 ft. With the exception of a small amount of low-grade ore won from a short lode known as Treuer's lode, these pillars of ore form the sole source of supply for the mine which is now but the skeleton of its former self.

As stated previously the country stands well but of recent years the mine has been subject to what are locally known as "earth shocks" due to slide movements of the entire hanging-wall. These movements, the natural outcome of the method of working in former days when little or no filling was used in the stopes, have rendered the task of removing the remaining pillars one of considerable difficulty. Massive sties of solid timber round sticks about six inches in diameter



MOUNT ELLIOTT COPPER MINE—SOUTH AUSTRALIA

MOUNT CUTHBERT COPPER MINE—SOUTH AUSTRALIA

notched and joggled, are built up alongside of the bridge of ore which is to be removed and as the ore is broken out small sties filled with waste are built at frequent intervals and the whole space is packed with waste sent down from the surface. This is a costly operation but absolutely essential for safe working. In many cases the bridges of ore are strained and crushed as a result of the movements of the hanging-wall previously referred to. All ore is broken by hand labor.

General Mining Costs

All mining work is by contract and the prices are based on a sliding scale, being set to return approximately the weekly wage shown in the accompanying table.

WAGE BASIS AT WALLAROO AND MOONTA.

Price of Copper, Per Ton (2240 lb.)	Bonus, Per Cent.	Total Weekly Wages of Hand Miners.		Weekly Wages of Machine Miners, Both Mines.
		Wallaroo	Moonta.	
Under $300...	nil	$10 56	$9.60	$11 52
Between $300 and $325...	10	11 52	10 56	12 48
Between $325 and $400	15	12 00	11 04	12 96
Between $400 and $475...	20	12 48	11 52	13 44
or $475	25	12 96	12 00	13 92

Prices are set at so much per linear or running fathom and the price includes explosives, timbering, tramming and mullocking. The contractors are also responsible for the selection of the necessary timber at the surface and for its conveyance under ground. The distribution of the miner's working time is about as follows:

Getting timber, erecting sties and other timber work, 47 per cent.; actual breaking, 36; filling depleted stopes, 8; tramming, 9. At Wallaroo 276 men in the stopes broke 106,180 tons during 1908 so that the rate of breaking after allowing for work other than mining is 3.3 to 3.4 tons (2240 lb.) per shift of eight hours. From lodes averaging about 10 ft. this is good work for hand miners and compares favorably with the work done on any Australian field.

For the year ending December, 1907, the cost of mining exclusive of development and maintenance was $6.14 at Wallaroo and $5.36 at Moonta, but development at Wallaroo is in the neighborhood of $1.40 per ton. During this period wages were higher than they were during 1908 so that a substantial reduction in mining cost was effected in 1908. Incidentally a reduction of hands employed during 1908 has resulted in the elimination of the least efficient and today, despite greatly reduced tonnage, costs are lower than during the period of high metal prices. Australia possesses no reserve of labor, consequently periods of high metal prices which naturally means increased output throughout the country are characterized by low efficiency on the part of the workers, who practically can command their own price and increase the working cost.

Wallaroo and Moonta have been singularly free from those labor troubles which are almost endemic in Australia and which do so much to retard progress. For many years the townships which surround the mines were virtually a Cornish village preserving intact the clannish feeling and innate conservatism that characterizes the Cornish mining community. Under the almost patriarchal rule of "Captain" R. H. Hancock the camp remained free from external interference and though of later years the district has lost its essentially exotic appearance, the spirit remains and the men have retained full confidence in the present general manager. Nothing impressed me more during my visit than the good relationship existing between the men and the mine officials and it is due to this that the camp has so far remained free from those labor troubles which have been so prominent on other fields during the last few years.

Concentration at Moonta.

The ore raised from the various shafts is trammed to the central sorting plant. Passing through a Gates breaker which reduces it to 2½-in. size, the material is then elevated, automatically sampled and trommeled, the fines falling into bins for direct smelting if rich enough. The oversize passes over sorting belts where a small quantity of ore is sorted for the smelter. The concentrating ore is passed through Blake crushers, rolls and trommels to a Hancock jig. The jig tailings are not further treated but are sent to the cementation heaps. The jig recovers 60 per cent. from a product crushed to ½-in. size. On a finer product the Wallaroo jigs recover 55 per cent., the difference being largely due to the difference in specific gravity of the two gangues which is 2.95 at Wallaroo whereas the Moonta felsite porphyry is 2.67. The fines from the trommels are passed over Wilfley tables.

The Moonta ores now average about .4 per cent. copper, and after passing over the sorting table, smelting ore assaying 15.5 per cent. copper is obtained, this product being about 5 per cent. of the total mined. The waste amounts to 6.2 per cent. by weight and the balance, 88.5 per cent., is sent to the concentrator. The concentrating ore averages 3.5 per cent. and contains 79.1 per cent. of the total copper content of the mine product. The ore-breaking and sorting cost amounts to 17c. per long ton and the total dressing and concentrating cost is $1.20. The capacity of the jigs on 4-mesh feed at this plant is 25 tons per hour. The Wilfley table capacities average about 0.5 tons per hour.

Cementation

The tailings from the concentration works at Moonta are stacked in large heaps standing on specially prepared ground, drained and graded to effect rapid collection of all liquors percolating through the heaps. The heaps vary in hight from 30 to 60 ft. and cover an area of 20 acres. The surface is divided by irrigation furrows arranged in 12 ft. squares so that only a portion of each heap is irrigated at one time. Exposure to air and moisture converts the copper-iron sulphides into soluble sulphates which are removed by the percolating water. The presence of soluble salts of iron in the circulating water accelerates the action.

The circulating water contains about 100 grains per gallon of ferrous sulphate and a trace of free sulphuric acid. It is pumped to the top of the heaps by Worthington duplex acid-resisting pumps which deliver 30,000 to 40,000 gal. per hr. as required through over two miles of cast-iron, wood-lined pipes. The mine water is supplemented by sea water pumped from Moonta bay, a few miles distant. The drainage liquors are conveyed through earthenware pipes to six wood-lined masonry tanks each 60 x 30 x 3½ ft. deep. The first two serve as clarifying tanks; the others are filled with scrap iron for precipitation.

From the vats the liquors gravitate through 3000 ft. of wood-lined canals 2 ft. 8 in. wide and 8 in. deep. At the end of the canals the water is practically free from copper and is returned to the heaps. The latter contain 1,300,000 tons, estimated to assay 0.3 per cent. copper at the start, but about 50 per cent. of the total metal has been recovered. Last year's yield was 500 tons of fine copper recovered at a cost of $200 per ton for smelted tough pitch metal, or approximately 9c. per pound. The ore at Wallaroo is not very amenable to this form of treatment and only about 50 tons per annum are recovered from this source. In consequence of this, closer concentration is resorted to in order to increase the recovery. Naturally the output from any heap decreases every year but so far the heaps are all producing copper at a remunerative price.

The accumulated slimes are treated by agitation with dilute sulphuric acid in wooden vats. The agitated pulp is returned to the dams and the copper-bearing solutions are sent to the precipitating canals. The slimes require several treatments before complete extraction is obtained. By draining off the dams, drying the surface and ploughing it over so as to expose fresh surface to the air, the slimes so treated give a better recovery when agitated with acid. The method is

costly but profitable with good metal prices.

Smelting and Refining

The smelting and refining plants are situated on the shores of Wallaroo bay and are connected with the government railway system. In order to produce a 45 to 50 per cent. matte the ores and concentrates from the mines are partially desulphurized. The ore is roasted in nests of brick cells, strongly cased in cast iron, which are each capable of treating 350 tons per week. The ore is elevated to hoppers and is dropped through gates to the burning ore beneath. The charge rests on square grate bars which are turned every 24 hours, the roasted ore falling into the pit beneath. About 70 per cent. of the sulphur is removed and the gases are drawn through the sulphuric acid chambers on their way to the stack. The acid works has a capacity of 120 tons per week of 65 deg. acid. This is used about the plant and the balance sold to a phosphate factory which adjoins the smeltery.

The fine ore is desulphurized in cast-iron pots holding about 8 tons each. A mixture of fines and concentrates is elevated, wetted and charged on a small fire in the pots. The blast is gradually increased as the charge is fed until a maximum of 12 oz. is attained. When the top of the charge is red hot the pots are tipped and the sintered mass falls on cones which break it up. The sinter contains about 25 per cent. of the total sulphur in the crude ore. The sintered ore, together with raw ore, limestone and ironstone, is smelted in two blast furnaces. The matte runs from 45 to 50 per cent. copper and the slag 0.5 per cent. The latter is granulated, elevated to railway trucks and used for filling stopes in the mines.

The matte is "bottomed" in reverberatory furnaces, about 8 per cent. of the copper being thrown down to act as a collector for the small quantities of gold and silver which occur in the matte. The regulus is brought to tough copper in another set of furnaces and then sent to the refinery. The "bottoms" and roaster slags are treated in the "foul-copper" department. A rough copper, produced by melting the slag and roasting the matte so obtained, is melted with the "bottoms" and cast in anodes containing about 99 per cent. copper. These are treated in the electrolytic refinery and the electrolytic copper sent to the refinery. The refinery mud is boiled with sulphuric acid in lead vats, washed, dried and smelted with lead. The product is cupelled, parted electrolytically and cast into ingots.

The flue dust produced during matte concentration is treated with acid and the copper converted into sulphate, which is refined and crystallized. It is sold to the telegraph department of the government. In the refinery the copper from the reverberatory, from the electrolytic department and from the cementation works is melted and finally cast as Wallaroo Tough Pitch copper. This has for many years been one of the brands used by the British and French ordnance departments. It is also used for coinage in India and China.

Smelting Costs

Smelting, including refining, costs between $90 and $100 per ton of metal, according to the rate of wages which are on a sliding scale according to metal prices. For the year 1907 the cost of production was $330 per ton of metal, inclusive of all production and selling costs. Owing to the price of metal the company was enabled to work up lower-grade ore than is at present practicable. For the year 1908 the cost was reduced to $275, the crude ore averaging 4 per cent. The accompanying table shows the annual work done by the company as obtained from the average of several recent years. At present the grade of ore mined has been raised to 4 per cent. in order to cope with copper at $300 per ton.

DATA OF YEARLY OPERATIONS.

	Wallaroo.	Moonta.
Tons of crude ore raised	129,000	58,000
Per cent. copper in crude ore	3 65	3.9
Tons of dressed ore from above	43,000	12,000
Per cent. copper in dressed ore	9.1	13.4
Per cent. recovery by sorting and concentration	85.8	73.6
Tons of precipitate from cementation	59	800
Per cent. copper in precipitate	72 5	78 5

Other data of interest regarding the annual production are as follows: Ore smelted, including precipitate, purchased ores and mattes, 61,000 tons; refined copper produced, 7300 tons; electrolytic copper included in above, 780 tons; copper sulphate, 275 tons; sulphuric acid, 5200 tons; fine gold, 2000 oz.; silver (996 fine), 5800 oz.: development during year by shafts, 620 ft.; by levels and crosscuts, 2700 ft.; by winzes and raises, 1900 feet.

General Conditions

The average number of employees is 2300. An area of 4137 acres is held under mineral lease for a term of 99 years of which 70 are to run. The rental is 24c. per acre per annum and a royalty of 2½ per cent. on the declared profits. During the fifty years of operation, dividends amounting to $10,300,000 have been paid, this profit being derived from the treatment of 1,758,083 tons of dressed ore, averaging 15 per cent. copper. The Moonta mine, prior to amalgamation with the Wallaroo, was the first mine in Australasia to pay one million sterling ($5,000,000) in dividends.

The mines lie rather out of the track of the average visitor to the Australian mining fields and in almost every respect the local conditions of mining, metallurgy and labor are different from those obtaining on other fields. The company is sometimes accused of perpetuating old and wasteful methods, but having in view the comparatively small reserves of ore, for Moonta is practically a dead mine, it is not easy to see how any considerable capital outlay at the mining plant would be justified. As far as the actual mining methods are concerned they are the outcome of wide experience in the mine and, although costly, there is no possibility of altering them without grave risk both to the mine and the workers. It seems probable that the installation of a converter plant would prove more profitable than the present method of producing tough pitch copper and such a plant may be installed. I desire to record my thanks to Lipson Hancock and his staff for the courtesy extended to me during my visit to the mines and for the data and photographs which were supplied for the purpose of this article.

Asbestos in Japan

Special Correspondence

A recent report from the Canadian Trade Commission says that asbestos is produced at several places in Japan, especially in Kiushiu, but the quality does not compare favorably with the production of foreign countries. The local product should perhaps be classed as a kind of serpentine. Although good material was once produced in Nagasaki in the Kiushiu district, the mine seems to be exhausted now. As the Japanese asbestos is not suitable for manufacturing purposes when taken alone, foreign material is imported for the purpose of mixing with the local product. It is difficult to get exact figures as it is not specified in the customs returns. Asbestos sheets, a manufactured article, were imported in 1907 to the amount of 428,671 lb., valued at 41,843 yen ($20,921). Germany being the leading country of supply. Under the item "packing for engines," which contains a large quantity of asbestos, the value of imports for 1906 is given at $302,863 yen ($106,481), and for 1907 at 295,501 yen ($147,720). The principal customer for asbestos sheeting or packing is the navy; large manufacturing establishments also use it. There is an encouraging future for this business on account of the general expansion of the industries which use asbestos materials and there will also be a good market for the raw material. The most important manufacturer of asbestos articles in Japan is the Japan Asbestos Company with headquarters at Osaka.

The addition of about 5 per cent. of quicklime to sour, soggy clays and soils will, to a large degree, prevent the corrosion of imbedded iron or steel

The Gowganda Region in Ontario

SPECIAL CORRESPONDENCE

An intersting report[1] on the new Gowganda district in Ontario has just been issued by the Geological Survey of Canada. This district, about which a great many reports from prospectors and others have been heard lately, is in the Montreal river region, in the extreme western part of the Nipissing district in the neighborhood of north latitude 47.45 deg., and about 85 miles north of the town of Sudbury. It includes an area of 350 square miles, most of which lies between two large branches of the Montreal river which empties into Lake Temiskaming on the west side. During the past season a prismatic compass and tachymeter survey was made of both branches of the Montreal river and the adjoining navigable waters. The geological work in connection with the survey was performed by W. H. Collins, assisted by T. Firth, and in addition to a thorough examination of the surveyed routes, the intervening country was examined so far as time and opportunity would permit. As a continuation of the work is anticipated the results are submitted as incomplete and subject to revision.

CHARACTERISTICS OF THE MONTREAL RIVER REGION

The Montreal river district does not differ essentially from the Cobalt or other neighboring districts. The surface has the same rugged monotony of the pre-Cambrian peneplain, relieved somewhat by ridges of Huronian, standing from 300 to 500 ft. above the general level. The country is well watered and offers exceptional facilities for canoe travel. Pleistocene deposits are thin, and nearly everywhere the rock formations are well exposed. The entire region is underlaid by a basement complex, either appearing at the surface or hidden beneath areas of Huronian sediments. This basement consists largely of Laurentian biotite and hornblende gneisses, with patches of vertically foliated Keewatin schists caught up in the former; the intervening contacts forming indefinite zones, in which intrusive action is manifested. The basement complex, referred to throughout the report as the Archean, possesses a peneplaned surface, not greatly different from the present one which is well preserved where overlain by erosion remnants of Huronian sedimentary rocks, but has elsewhere been further denuded. The Lower Huronian rocks are of clastic nature, consisting in descending order of conglomerate, greywacke, slate and quartzite, which pass conformably into an upper conglomerate; while a granite-like arkose member is believed, from its similarity to rocks of the same character in the Cobalt area, to be possibly of later, Middle Huronian age. A later intrusion of quartz-diabase has developed a system of dikes in the Archean and large tongue-shaped areas in the Huronian, believed to represent sills of several hundred feet thickness, lying in the bedding planes of the Huronian sediments. The diabase magma has been notably differentiated, giving rise to forms ranging from gabbroid to syenite in composition, and to younger aplite dikes. With the diabase is associated a group of veins, containing an association of cobalt and silver identical with that of Cobalt and vicinity. The veins cut both diabase and aplite as well as the Huronian, and are, therefore, younger, but probably not much younger than the aplite, since they contain some of the minerals found in them. So far as known, the distribution of the veins is confined to the larger diabase areas, the dikes and smaller bodies, being undifferentiated and unmineralized; but the Huronian adjacent to the diabase also contains veins, somewhat more silicious, yet evidently of the same age as the others. Alteration and impregnation of the country rock has taken place to an unknown but, presumably, limited extent. Some of the veins are remarkably rich and many of them occupy persistent well-defined fissures. Though the cause of these fissures is not known, they appear too large and continuous to have resulted from contraction alone.

SURFACE CHARACTERISTICS

The general surface of the region may be characterized as a comparatively low relief, the hills not often rising over 200 ft.; but here and there are conspicuous elevations. Structurally they appear to be in a few cases resistant knobs of Keewatin projecting well above the general level, but more commonly they are tilted ridges of Huronian. Within Huronian areas there is a distinct tendency toward the development of parallel ridges. The post-Huronian diabase is an equally potent factor, peculiarly distinctive features marking its contacts with the Huronian. These contacts appear to be zones of low erosive resistance and are commonly coincident with ravines, walled on one side by diabase and on the other by Huronian. The diabase with which the silver deposits are associated penetrates both the Archean and Huronian, but is ordinarily distinguishable by its unusual freshness, dark color and crystalline appearance. In certain cases it is liable to be confused with other diabase types. Magmatic differentiative processes have resulted in differences in appearance and mineralogical composition, one type being a pink aplite occurring in dike form. Olivine diabase dikes are also present, but in far less abundance. The intrusion of the quartz diabase into the Huronian was gently accomplished at most points, and the beds of the latter, both above and below the intrusives, are inclined only a few degrees more steeply than in localities where no diabase can be found. Ordinarily contacts occur in low ground, especially in ravines, the bottoms of which are filled with soil, and consequently unfavorable for geological observation; but at some points where the contacts are exposed the Huronian is seen to be much fractured across a zone extending many feet from the diabase. In the neighborhood of these contacts the Huronian is well supplied with quartz veins, whose "comb" structure and chalcopyrite-galena mineralization identify them with similar veins in the diabase.

CHARACTERISTICS OF THE DIABASE

Quartz diabase bodies are not restricted to any one formation or locality, but occur with various dimensions over the whole area with the exception of the country lying northwest of Duncan lake. Virtually all the large areas are inclosed by Huronian, the bodies within the Archean being numerous but small. In the Archean practically all of the observed diabase bodies are dikes, in approximately vertical positions, seldom 100 ft. in width and of undetermined length. In some cases those in the Huronian are sills, whose greater exposed dimensions are parallel to the bedding planes of the inclosing sedimentaries. It is fortunate for the easy recognition of the diabase that it is more or less continuously exposed, and that there are not many other igneous rocks of similar character in its proximity, for it presents a variety of types showing great petrological differences. The common type is a dark green massive diabase, ranging in texture from one in which the individual minerals are barely distinguishable to others containing amphibole crystals an inch in length. In the dikes the mineralogical composition is tolerably constant, specimens selected from different points showing no notable difference except that they are usually less decomposed than the coarse-grained varieties.

DIKE FORMATIONS

Diabase is most abundantly exposed in the area between Gowganda lake and the portage route connecting Forth and Eckhorn lakes where it forms three parallel tongues of approximately equal dimensions. Coarse-grained types prevail, in which the differentiations of acid phases are pronounced. Aplite dikes up to 10 ft. in width, fairly coarse-grained and sometimes tolerably rich in dark constituents, are abundant. Diabase dikes are probably numerous and widespread, but this can be determined only by closer examination. They are most frequently seen in the Laurentian, probably not so much because they are more numerous there, but be-

[1] Preliminary Report on Gowganda Mining Division, District of Nipissing, Ontario. By W. H. Collins. Pp. 47. 9 x 6½ in. Paper; illustrated. Ottawa, 1909. Geological Survey of Canada.

cause they are more conspicuous in the granite than in the Keewatin schists and Huronian, from which they differ less in color. They attain widths of 60 ft., 100 ft., or more. With the knowledge acquired from the exploitation of James township and other recently discovered silver camps, prospectors in the Montreal river district gave exclusive attention to the diabase formation. The first discoveries of native silver in the Gowganda region were made on Aug. 4, 1908, in the diabase just west of Gowganda lake, and the remarkably rich surface showings at once arrested the attention of prospectors. The known silver-bearing area of that district is stated as being restricted to about 10 square miles lying between Gowganda lake and the portage route from Elkhorn to Forth lake, commonly known as Gowganda. As extensive prospecting only commenced in September last, about the close of the field season, only the earlier discoveries were known to the author of the report which is necessarily incomplete as regards the present status of the Gowganda camp.

Conditions of Exploration

Conditions in the region are such as to demand exploration of the closest order, for the indications of mineralization are negative rather than positive in character. In addition to forest vegetation and moss, glacial material is sometimes thick enough to render surface exploration arduous and expensive. The veins are also eroded more deeply than the country rock and the crevices filled with soil and rendered inconspicuous. Were the country flat the difficulties in the way of prospecting would be more serious, but fortunately it is rugged, especially near the diabase, the sides of the ridges being bare or easily exposed. The first silver discoveries were made in the sides of rock walls. The pink bloom found at the surfaces of the veins and the adjacent country rock is also a valuable indication. The deposits are in the form of well-defined veins occupying fissures in the diabase. In September last a few had been traced for distances of 300 or 400 ft., so that they may be said to occupy persistent fissures. The diabase shows no signs of extensive deformation, all geological evidence indicating that since its solidification its history has been uneventful. Besides the strong veins there are others of the gash type, but the latter are small, not very continuous and poorly or not at all mineralized. From comparison of veins at Gowganda, Duncan lake and Wapus creek, a general uniformity of structure, though not of mineralization, is found to obtain. The whole mineral association is not found in any one vein, nor are the relative proportions either of ore or gangue at all constant. The gangue materials are quartz and calcite, always mutually arranged in definite manner. The sides of the veins are composed of white quartz which may form an insignificant coating on the walls, or may occupy the whole space, but in all cases there remains a central cavity into which the pointed ends of quartz crystals projects freely. Veins with predominant quartz filling seem especially abundant in the Huronian adjacent to the diabase. The rich veins near Gowganda, so far as ascertainable, are poor in quartz. Practically all of them carry chalcopyrite either as diffuse grains or in considerable amounts. Pyrite is equally abundant but less constant and galena is not uncommon.

Gowganda and Cobalt

Present knowledge of the Gowganda area indicates it to be highly mineralized and the number of discoveries is steadily increasing. The area and character of the mineral association and the richness of the surface showings are comparable with those of Cobalt. There is a general similarity in the geological conditions. The mineralized veins in Gowganda occur in the diabase, as do some of the good Cobalt veins. There are local differences, but the resemblances are more pronounced than the differences and lead to the hope that exploitation will reveal similar underground conditions. The well mineralized veins are sufficiently long and uniform on the surface to suggest similarly persistent vertical dimensions. While there are grounds for hoping that the veins will persist in depth, this has not been proved, nor if this is the case, that the mineralization and values are also persistent.

The relative importance of Gowganda is, therefore, a matter of uncertainty, but it may be confidently affirmed that for its state of development the outlook is very favorable, and the number of veins, area of mineralization and rich surface showings afford good ground for hoping that some, at least, of the veins will be found to be commercially important.

Other Minerals

The report concludes with references to the other valuable minerals of the region. The chalcopyrite is confined to veins a few inches in width and so scattered as to render them valueless. Specimens of specular and kidney iron ore found a short distance east of Nest lake proved of excellent character with little admixture of silica or foreign matter, but the extent of the deposits is not known. Specular ore also occurs in other localities. Magnetite occurs half a mile to the north east of Gowganda lake, but the percentage of iron is small. Asbestos occurs in two localities in the Keewatin area between Firth and Obushkong lakes, but whether it exists in commercial quantities is not known.

Statistics collected for The Mineral Industry show that the production of asbestos in the United States for 1908 was 1350 short tons, worth $24,000.

A New Pyrometer

A new pyrometer for the measurement of high temperatures, known as the Féry spiral pyrometer, has been brought out by the Cambridge Scientific Instrument Company, Limited, Chesterton Road, Cambridge, England. The new instrument is simple in principle and construction. Instead of the heat rays being concentrated on a thermo-electric couple, as in earlier instruments, they are focused on a small bi-metallic strip made of two metals rolled into the form of a spiral, which unrolls when heated, owing to the largely different coefficient of expansion of the metals used.

In order to eliminate errors which may arise through change in the actual temperature of the instrument, an adjustment is provided by which the center rods supporting the spiral may be turned and thus the needle set to the zero on the scale. Extreme precision is not claimed for the new instrument, but an accuracy of between 1 and 2 per cent. is readily obtainable.

The Exploration Company

The directors of the Exploration Company, of London, have issued a report for the year 1908, showing a net realized profit of £60,000 in round figures. This is a great improvement over the results obtained in the previous year when a heavy loss was sustained, owing to unfortunate investments in copper and kafir shares. The directors give no detailed particulars of their investments, but state that they continue to hold a large interest in Mexican mining companies, which are earning satisfactory profits. The chairman of the company, R. T. Bayliss, has recently returned from an extended visit to Mexico, and as a result of his investigations, it is intended to undertake the development of mining properties in that Republic on a larger scale than heretofore.

As shown by reports collected for The Mineral Industry the production of tungsten concentrates in the United States fell off heavily in 1908, amounting to only 497 short tons ($126,284) against 1468 short tons ($715,031) in 1907.

There was 110,225 long tons ($220,225) of manganese residuum produced in the United States in 1908 according to figures of The Mineral Industry U. S. Geol survey figures for 1907 give the output for that year as 277,163 long tons ($463,089).

The Mount Bischoff Tin Mining Company recently paid its 383d dividend, according to the *New Zealand Mines Record*, April 6, 1909. The amount paid is £3000, which brings the total disbursements to date to £2,166,000, or £180 10s. per share.

Revival of Mining in the Mogollons, New Mex.

A Remote Mining District; Discovered in the Early 80's; Low-grade Gold and Silver Ore at the Surface, Becoming Richer with Depth

BY E. GYBBON SPILSBURY*

The Mogollons consist of a series of detached mountain ranges in New Mexico and Arizona having a general southeast and northwest direction, and distinct from the main ranges of the Rocky Mountains whose general course is more to the north and south. They form the northerly water shed of the Gila drainage basin, and the Gila river itself takes its source from the eastern end of the range in Grant county, New Mexico.

Taken as a whole, the Mogollons have so far not been proved as great mineral producers. While a great deal of early prospecting was carried on throughout their extent, the only real discoveries of value appear to have been concentrated on one line of fissuring which occurs along the western escarpment of the range in Socorro county, New Mexico, where it is cut by the San Francisco river, a tributary of the Gila.

The extent of the mineralized area is not large, its known length being not much over 10 miles, while its width is about 3½ miles. It is roughly bounded by Mineral creek on the north and Whitewater creek on the south. Between these two creeks, which cut through the range in deep cañons, is a third, almost parallel, creek known as Silver creek. All of these streams flow into the San Francisco river.

The town of Mogollon, the center of the Cooney mining district in which all the principal mines are located, is situated in Silver creek cañon about six miles above its junction with the San Francisco river. The nearest available railroad connection is at Silver City, the terminus of the Rincon Branch of the Atchison, Topeka & Santa Fe Railroad. The distance between Silver City and Mogollon is ninety miles over very indifferent roads. There is daily communication between these two points by stage, the trip taking from 14 to 18 hours depending on the condition of the road. Recently telephonic communication has also been established between both places.

The Cooney mining district is quite an old one for this territory, the first mines having been discovered in the early 80's, but regular mining only dates back to the time when the Indian troubles were terminated about 17 years ago. The first deep mining was carried on in Mineral creek cañon, at the Cooney mine, which was opened and worked for copper and silver. For many years this property proved remunerative when worked under lease by Thomas F. Cooney, but so far it has not proved a financial success under corporate management. The ores consist of copper and iron sulphides carrying small percentages of gold and silver. The main orebody has been followed down 650 to 700 ft., at which depth the iron sulphides appear to predominate to the almost total exclusion of copper, but are claimed now to carry fairly high amounts

BRIDGE FOR PIPE LINE

THE WHITEWATER ROAD

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of gold and silver. If this should prove to be the fact, the method of treatment, which is now by concentration, may require to be changed by the addition of a cyanide plant.

There is only one other active mine in this cañon, the Enterprise, and that is now passing through the development stage.

The real center of the mineral deposits of the District lies over in Silver creek cañon and west of Mogollon. In this area several properties have been opened and operated sufficiently to warrant the erection of milling facilities of one kind and another.

LITTLE FANNY MINE, MOGOLLON, N. M.

Geology and Ore Deposits.

The general formation of the district is eruptive, chiefly rhyolite and andesite, and apparently there has been more than one flow of each of these rocks. The andesite is overlaid by a highly silicious rhyolite on which again we find what is probably a more recent andesite. There are two general lines of fracturing through these measures, along which the subsequent mineralization of the material in the fissures has taken place. The most prominent of these fractures has a north and south direction, and can be traced by its bold outcrop for over ten miles. It is known as the Queen vein and has a width of from 100 to 150 ft. dipping about 80 deg. to the east. The other fractures have an east and west trend, and are only mineral bearing in the western side of the main dike. As a rule, the fissuring occurs along the contact planes between the rhyolite or porphyry, and the andesite flows, but it is by no means uncommon for the fissure to cross entirely from one eruptive to the other, with no change of vein characteristics excepting that of its walls. This fact renders it necessary to exercise great care in driving so as not to lose the ore-bearing portion of the vein whenever it leaves the contact plane. Evidences of mistakes of this kind are common in all the old mines of the district. The shibboleth of the miner in this camp appears to have been an andesite footwall, and a so-called quartz porphyry hanging-wall, and his persistence in following these indications often resulted in long stretches of barren ground, where later on, cross cutting has shown the continuity of the original orebody on the footwall side of the vein.

CRAIG'S MILL AND BOARDING HOUSE

The filling of the footwall or westerly side of the "Queen" vein, consists of quartz, generally massive, and much cross fissured, carrying silver sulphides, chlorides, and gold, in varying percentages. Next to this footwall quartz seam occurs a filling of calcite, or calcite and quartz, which attains a width in places of over 60 ft. This hanging-wall calcite deposit carries no values except sporadically, in fact the same may be said of the footwall quartz vein, although this latter generally shows from a trace to $2.00 per ton in gold and silver. While the Queen vein itself has not been proved to carry pay ore over any length, it is by no means improbable that rich orebodies will be found in depth on the footwall quartz seam, at or near the point of junction with the east and west system of fissuring. So far, all the workable deposits have been found in the crushed zone west of the Queen vein, in fissures having a general east and west course, but with varying dips, and all of them apparently emanating from the Queen vein.

The principal properties opened in the District and provided with milling facilities are: The Silver Creek Mining and Milling Group; Confidence; Maud S.; Deepdown; Little Fannie-Champion; Last Chance; and the Deadwood group.

With the exception of the last named, which is a new mine, all the above mentioned properties have been through the various vicissitudes of most mining camps situated so remote from cheap transportation and cheap fuel and depending mainly on the high-grade ores when operated on a large scale. Mismanagement and ignorance of the proper methods of treatment played their part also and, while the total output of the camp has reached several millions, the Last Chance mine and the Little Fannie-Champion are the only two which have not been entirely closed down and practically abandoned.

Last Chance Mine.

Until the summer of 1908 the Last Chance mine was really the only producing property in the district, and it is still the largest individual producer of gold and silver in the whole Territory of New Mexico, its yield being nearly half a million dollars a year.

At present the most active operations in the camp are being carried on by the Socorro Mines, a strong financial corporation which has acquired the Little Fan-

nie, Champion and Consolidated groups of claims, and is now pushing the development of these properties with the utmost energy.

To appreciate the reason for the apparent decay of the rest of the camp so soon after its discovery, and notwithstanding its large initial production of silver and gold, the history of the Last Chance mine will be useful.

It dates back about 17 years, when the strong outcroppings were discovered and the locations made. The ores were found to consist of quartz and calcite carrying gold, silver sulphides, traces of copper and lead, and iron pyrites. Some of this surface rich ore was shipped and milled at the old Sheridan mill in Cooney cañon. The property was sold to a Nebraska company under whose management the mine was really opened and a 20-stamp mill with Boss process pan-amalgamation was erected. The records show that this company mined and milled about 10,000 tons of ore averaging by assay $10 per ton, but only yielding by pan-amalgamation $53,000. These disappointing returns resulted in closing down the plant. Later on a bond and lease on the property was taken by the superintendent and some local miners, who did considerable prospecting, and made a further run of several thousand tons with similarly disappointing results. The property was then closed down and remained idle about 8 years.

In 1899 an English mining engineer, E. Craig, examined the properties and, bringing to bear the experience he had gained in other parts of the west on similar ores, took a bond and lease on the property and commenced milling the ores produced from the development of the mine in depth. He soon satisfied himself of two facts: That the ores were gradually but surely increasing in richness as greater depth was attained, and that no form of pan-amalgamation would ever be made to yield over 60 per cent. of the assay value of these refractory ores.

By the installation of concentrating machinery he soon proved that he could extract practically the same percentage at a much less cost in his concentrates, and then the question of the further treatment of the resulting tailings was all that remained to be solved. At that date, the extraction of silver from a sulphide ore by cyanide was still an unsolved problem, and the establishment of a plant for this process was pioneer work. How correct his judgment was, is demonstrated by the remarkable results he obtained after two years of experimenting.

The mine development during this period had been continued to a depth of over 1000 ft., and the average value of the ores had increased from the original $10 per ton to over $18 per ton. At the present time the mill is treating about 60 tons of ore per day and obtaining an extraction of over 89 per cent.

Fuel.

The chief drawbacks to the whole Mogollon mining field are, the high cost of fuel, and the scarcity of water for milling purposes. Situated, as it is, within the limits of the Gila forest reserve, it is not likely that the price of wood (the only fuel available) will be lowered. The restrictions regarding the cutting of cord wood are becoming so onerous, that it will not be long before its use for fuel will become prohibitive. Stumpage has been raised during the last few years from 15c. to 50c. and even in some cases to 75c. per cord, so that wood delivered at the mills in Silver creek cañon costs from $7 to $9 a cord, depending on their location.

Water Supply.

The only water supply available, outside of the small amount pumped from

MONK'S HEAD ROCK

the mines, is obtained from Silver creek and its branches and for four months each year this creek is practically dry. It is evident therefore that the Mogollons is by no means a poor man's camp. But notwithstanding all these drawbacks, the extent of the known orebodies and their great uniformity throughout the district are bound to make it a successful one. Water for milling purposes can be obtained from higher up in the mountains, and Whitewater river, running almost parallel, and south of Silver creek, is a stream of sufficient volume to generate along its course a very appreciable amount of cheap power.

Socorro Mines.

Having these points well in view, two of the early pioneers of the district, Messrs. Cooney and Weatherby optioned the Little Fannie, Champion and Consolidated properties. They then located and preempted water rights and mill sites on Whitewater creek, which will yield about 800 h.p. They also purchased a ranch higher up in the range, on which large springs had been developed. After several years of hard work, gathering all these essentials together, they disposed of their properties to a company known as Socorro Mines, which is now actively at work developing these resources and putting into effect the comprehensive scheme devised by Messrs. Cooney and Weatherby.

The mining properties owned by Socorro Mines are generally conceded to be the best in the camp. The Little Fannie and Champion are on an east and west vein more or less parallel to that of the Last Chance, while the Consolidated group is on the north and south Queen vein, into which the Champion is expected to merge. The principal work has been and continues to be on the Fannie location, where the vein has been opened to a depth of 500 ft., and over a length of 1250 ft. The average width of the vein down to the 300-ft. level is about 6½ ft.; but on the 500-ft. level the width has increased to nearly 30 ft. in places, the average being probably 10 feet.

The same gradual increase in gold and silver contents, as determined in the Last Chance mine, is also apparent in the Fannie. From the surface down to the 200-ft. level the average (at the present low price of silver) is about $10 a ton; at the 500-ft. level the average will be from $15 to $17 a ton, with bunches in it between $35 and $40.

Equipment

The amount of preliminary work required to put these properties on a producing basis, has been very extensive, entailing not only the ordinary mine development and mill construction, but in addition the installation of the electric generating plant for the utilization of the water power on Whitewater creek, together with the transmission line across the mountains, and the laying of a four-mile water supply pipe from the ranch in the mountains to the mill site. It also meant the building of a new village for the accommodation of the workmen; over two miles of mountain railroad to connect the different mines with the new mill, the opening of a limestone quarry and building of a lime kiln; and the construction of many miles of mountain roads over which to transport the heavy machinery. The entire plant now approaching completion was only started last August. The main three-compartment shaft was sunk to the 500-ft. level by the former owners, but the present equipment of hoisting engine, cages, and air compressor, all operated by electricity, is new.

Mill.

The mill now being constructed will have an initial capacity of 150 tons per day, and is so arranged as to be extended from time to time as necessity may require, without interfering with its operation. The treatment will be by concentration and cyaniding. The ore is delivered to the crusher direct from the shaft. From the crusher it is conveyed by belt to a Vezin automatic sampler; and thence, also by belt, is distributed over the ore bins. The rejections from the sampling mill are elevated and returned to the original ore in the bins. The stamps, of which there are thirty, 1050 lb. each, crush to 20 mesh, and the pulp, after dewatering, flows to six Wilfley concentrators. It is intended to make a product on these machines having a value of from $750 to $900 a ton, but not to make very clean tails.

The tails from the concentrators flow into two Dorr classifiers which separate the slimes from the coarser sands. These latter are fed to two tube mills for regrinding. The oversize from the mills is returned to the Dorr classifiers while the slimes are fed to the slime treatment tanks, and thence direct to two Burt pressure filters. The treatment tanks are of the Pachuca type, with air agitation. The zinc boxes are of the improved El Oro type, and the precipitates will be melted and refined in an oil-burning Harvey-Steele tilting furnace. The tailings from the filters will be discharged and handled by a stacker instead of being flushed out by water. The ore will be stamped in cyanide solution, and every care taken to reduce the consumption of water to the very lowest possible point. The plant also has a very well equipped machine shop, and blacksmith shop; assay office and general store room.

The Power Plant

The main feature is the introduction of cheap electric power instead of steam for the operation of the entire plant. The power generating plant is situated on Whitewater creek and when fully completed will have a capacity of over 800 h.p. The plans contemplate the installation of a dam across the creek about 14,000 ft. above the site of the power plant. The water will be conveyed through a 30-in. steel pipe the effectual head being 555 ft. As considerable variation in the amount of water available is naturally to be expected, the generating machinery has been put in in two units, and a supplementary steam plant erected to be used during the times of low water. There are two 300-kw. generators, each direct connected to a Pelton wheel, and so far one of these generators is belt connected to a Ball, high-speed, compound engine, of 400 h.p. Steam is supplied from two 400-h.p. boilers of the Babcock & Wilcox type, thus insuring power enough for a second engine in case it should be found necessary to further increase the installation.

At present the auxiliary steam plant, only, is in service, the hydraulic part of the system not being yet completed. The current is alternating, 60-cycle, 2300 volts to the transformers and reduced to 440 volts on the distributing lines for power and 220 volts for the lighting system. The construction of the dam, and laying of the pipe to the power plant will not be undertaken till the low water period this summer.

The construction work by the Socorro Mines has been carried through with remarkable energy and rapidity considering all the difficulties they had to encounter. Five miles of heavy mountain road, blasted out of the solid rock, had to be built before any machinery could be delivered at the power plant. Every piece of machinery, and supplies of all kinds had to be hauled in 90 miles from Silver City. From the middle of July, 1908, when the work was inaugurated, till the middle of April, 1909, over 1600 tons of freight had been hauled. Grading for the power plant commenced only in October, and the plant started running April 7.

With the reopening of these mines, a new era of prosperity seems assured for the Mogollons. The pioneer work done on the Last Chance mine has shown what can be done with these ores and the introduction of cheap power by the Socorro Mines, an example that the other mines in the district will have to follow, will enable the utilization of the large deposits of low-grade ore known to exist in the camp, but which could not be profitably treated under the old methods.

Sulphate of Ammonia in Great Britain

The report of the British Alkali Commissioner gives the production of sulphate of ammonia in Great Britain for two years as follows, in long tons:

From	1908.	1909.	Changes.
Gas works	165,474	165,218	D. 256
Iron works	21,024	18,131	D. 2,893
Shale oil works	51,338	53,628	I. 2,290
Coke ovens	53,572	64,227	I. 10,655
Producer gas and carbonizing works	21,873	24,024	I. 2,151
Total	313,281	325,228	I. 11,947

While the gasworks continue the largest source of supply there was an important increase last year from the coke ovens, owing to the greater number of by-product ovens in use. The decrease from iron furnaces was due to the smaller number of furnaces in blast in Scotland, where alone raw coal is used in making iron.

Alluvial gold ground has been discovered (*Queen. Gov. Min. Journ.*, May 15, 1909), near Einasleigh, in Northern Queensland, and a rush has started for the field.

The Manufacture of Nitric Acid from Air*

At a recent meeting of the Association of Austrian Chemists, Dr. F. Russ, of Vienna, described the process employed by the Salpetersäure-Industrie Gesellschaft, for the production of nitric acid from air. All the practical processes may be divided into three classes: (1) Processes making use of disrupted discharges (such as the Bradley and Lovejoy process). (2) Processes utilizing a "moving arc." The motion may be produced either mechanically, or by the aid of a magnetic field (Birkeland and Eyde). (3) Processes based on the use of stable arcs (Badische Anilin und Soda Fabrik, Schönherr's process).

The process of the Salpetersäure-Industrie Gesellschaft is of the second type, the change in the position of the arc being produced by mechanical means. This process is in use in a plant at Patsch in Tyrol, and was worked out by Pauling. The electrodes are stationary, and hornshaped, diverging at their upper end. They are made of iron, and have a life of 200 hours. The arc first forms at the lower end of the electrodes, where the gap between them is narrowest, and is driven upward along the diverging electrodes by the blast of air which is admitted from below with a high velocity. In this way a permanent arc of about one meter length is obtained, a new arc being formed at the bottom of the electrode once in every half-cycle of the current, to take the place of the arc which has been driven to the upper end of the electrodes, and which there breaks down.

The air fed to the arc is preheated. A separate air blast, introduced at lower pressure, serves to effect the requisite "chilling" of the reaction gases. On a technical scale the process gives a 1.5 per cent. yield of nitric oxide. The plant at Patsch is run by water power obtained from the river Sill, and comprises 24 furnaces. Each furnace has two arcs, and every three furnaces are built together in one block. One man can attend to six furnaces. A mica window in the wall of the furnace renders the interior accessible to observation.

The gases issue at a temperature of 800 deg. C., and their waste heat is utilized for concentrating the nitric acid and nitrite solutions obtained. The plant manufactures 30-, 40- and 60-per cent. nitric acid, and nitrite. The yield is about the same as that claimed by Birkeland and Eyde. At the Patsch works the current is used at 4000 volts, obtained by stepping down from 10,000 volts. The capacity of the plant is 15,000 h.p. Two more factories are in course of erection, one in Milan, the other in Southern France, with a capacity of 10,000 h.p. each

*Translated from *Zeit. fur Angew. Chem.*, May 7, 1909, No. 19, p. 906.

The Proper Design of Cams

By Mark R. Lamb*

There is a problem in stamp mill construction the answer to which is apparently not known to all mill builders. Some one who does know should write a treatise for machinery manufacturers and call it "Cam design, or Why Cam Shafts Break." Quite a number of mill men believe that cam shafts are broken by one of two causes—either by too light a feed or by loose mortars.

The first of the accompanying sketches shows the exact condition of a light stamp battery, which is of course unusual but which makes the first point clear. The cam was actually on the wrong side of the stem and the cam shaft was set so far away from the stamp that the cam lifted the tappet at its edge and with only part of the face of the cam. The result was that the edges of both the cam and the tappet were rounded off smoothly, while the guides were badly worn after only a short run.

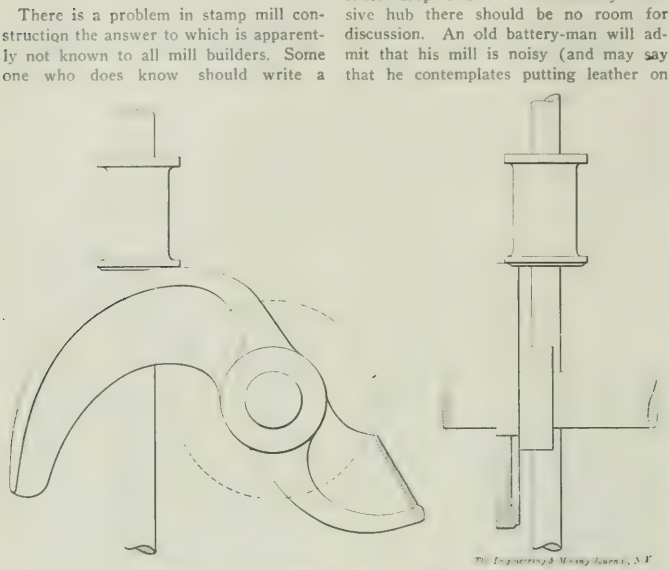

FIG. 1. IMPROPER CAM CONDITIONS IN ONE MILL

Important Features of Cam Design

The important points in cam design are that the best material should be used so as to get the necessary strength without unduly increasing the weight and hub dimensions, and that the length of cam should be proportioned to the desired length of drop. It would hardly seem to be necessary to call attention to this latter point, yet many mills with 10-inch cams are running with a 6-inch drop. An important point in the erection of the battery is that a vertical line intersecting the line of contact of cam and tappet should be tangent to the inscribing circle of the cam. Between the condition of the mill shown in Fig. 2 and a proper arrangement are all grades of cam conditions.

Regarding the use of a long cam for a short drop and an unnecessarily massive hub there should be no room for discussion. An old battery-man will admit that his mill is noisy (and may say that he contemplates putting leather on his tappet faces) but he would be really surprised to note the difference in noise in his mill, as compared with a mill with proper cams, properly used. He would not admit that his cams raised the stamps by a series of blows rather than by a continuous push, yet many cams are operating in just this way.

It is easy to arrange an indicator to draw diagrams which will plainly show the facts. I have in mind a 40-stamp mill provided with 9.5-inch. cams used for a 6-in. drop of stamp. The length of cam governs its curve, of course, but should also govern the speed at which it runs. In this case the cam shaft turns 55 r.p.m. and the stamp stems are lifted with two or three terrific blows of the cam—the first blow at a velocity of 90 ft. per min. instead of half that, if the cam had been designed for a 6-in. drop and could begin its lift close to the hub. And the smaller the hub the smaller the inscribing circle can be made, with a consequent reduction in starting speed of the stamp.

Further, if this 9.5-in. cam were used for a 9-in. drop as intended, the speed of the cam shaft would be less with still lower starting velocity for the tappet. The strain on all parts of a battery is much increased when the drop is shortened (while using a long cam) as, for example, when the battery is overfed; and tappets, bossheads and shoes are much more liable to loosen than at other times. At such times the cam strikes the tappet with double the velocity during normal operation. Indeed, in a properly operated mill, it is possible to detect one such overfed battery in a 100-stamp mill, merely by the sound.

Crystallization of Cam Shafts

As an example of proper cam construction and battery operation, one of the Homestake mills suits my particular ideas best. The space between the tappet and the cam, at the instant the stamp comes to rest, would not accommodate a lead-pencil. There is no unnecessary loss of time between this instant and the engagement of the tappet by the cam. This 300-stamp mill is not nearly so noisy as the 40 stamps above mentioned, and the noise

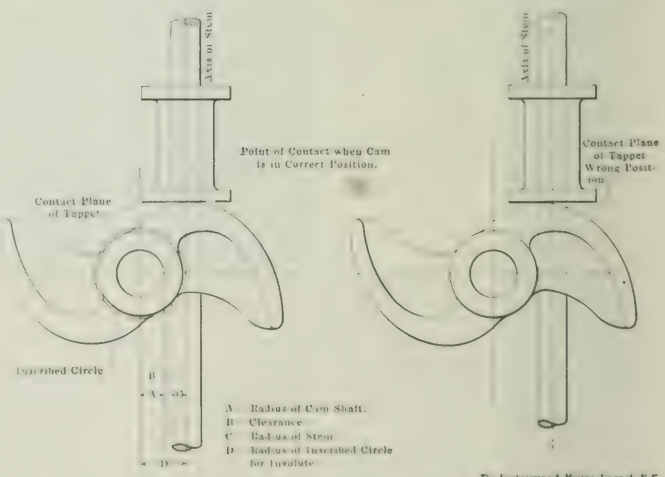

FIG. 2 CORRECT AND INCORRECT POSITION OF CAM

*Mining and consulting engineer. Allis Chalmers Company, Milwaukee, Wis.

might be taken as an index of the relative troubles experienced. These unnecessarily heavy blows are what cause the so-called crystallization. This crystallization, like "rusty gold," is charged with much which should be blamed to ignorance. The "crystallized" cam shaft, if examined after breaking will generally be found to have cracks started, other than the one which caused the rupture.

When cams are provided with fasteners which require holes in the shaft, quite a few of these holes will show a crack starting both ways around the shaft. When ordinary keys are used, similar cracks will start from the corners of the keyseat. The crystallization of stamp stems amounts to the same thing. A stem broken near the bosshead generally shows a multitude of fine cracks around the lower end and for several inches up the stem. For this reason, after the stem is broken once, it breaks with comparative frequency thereafter unless the lower several inches are cut off, since merely pointing the end in a forge or lathe does not remove these cracks. The design of mill using extra long bossheads and low-set lower guides prevents to a large extent the constant strain on the stem near its point and to this extent is to be preferred to the usual construction.

A cam shaft under the improper conditions above mentioned has not an instant of peace, and is either bending to a blow or recovering therefrom hundreds of times per minute. The size of cam shaft is out of all proportion to the actual foot-pounds transmitted and must be so in order to resist the unavoidable blow of starting the stamp upwards, even when this blow is made as light as possible. The actual strain due to lifting the stamp is relatively unimportant as compared with the strain of the instant of starting the stamp. The aim should be, then, to have as small a hub as possible, consistent with proper strength, a cam designed for the desired lift and a practically vertical lift of the stamp. Thus would the strain on the cam shaft be reduced, and the size of the shaft could be reduced, which would in turn reduce the starting velocity of the stamp.

Accessory Strains

All these strains are transmitted by the cam shaft through bearings and battery posts to foundations. In one new mill the frame is going to pieces for no other apparent reason than can be found in these excessive, undue strains. The foundation is of concrete and the battery posts are provided with bolts which under ordinary circumstances would be considered amply large, yet these latter break continually, and there seems to be no way to hold the posts to their bearings. The cams are unusually long and seem to be of ordinarily good material, and on account of soft ore the drop is short. The mill is worse than a boiler-shop for noise and the cams are already battered flat at a point about half way of their length, at which point the tappet is caught. The pile of broken cams is quite large, with occasional cam shafts showing through it. The tappets have three keys but slip frequently though keys are driven to the limit with a sledge.

Valuable information should be obtainable from steel and iron manufacturers regarding the relative value of iron and steel as material for cam shafts. The consensus of opinion among those who have the pleasant job of changing broken shafts, is that iron is better than steel for the same reason that copper would be better than glass. The glass and steel are much more rigid, yet would break more quickly. Wrought iron seems to be the favorite, though when this is ordered soft steel is often furnished instead. It is difficult to distinguish between these materials when the shafts are new and bright, but a slight coating of rust reveals the irregular grain of the iron and will sometimes reveal the welded cam shaft which is occasionally furnished.

This question of material of cam shafts is of at least equal importance with discussions of comparative efficiencies of the various sequences of drop. As the latter is largely a matter of opinion and screen size, as well as of the characteristics of the ore and the battery-man, the discussion can easily get top-heavy. For example, not long ago a learned paper was read comparing the efficiencies of the several drops and giving the scientific reasons for same; and the relative merits of 1-4-2-3-5 and 1-5-2-4-3 were gravely compared, though these two sequences are exactly the same. Similarly, I have recently seen a letter in which the writer asks, in all seriousness, for the best drop for a 3-stamp battery, and there is only one possible drop.

Some remarkable specimens of zinc blende are furnished by the Calumet & Sonora mine near Cananea, Sonora. Specimens of this blende show wonderfully distinct crystal and cleavage faces. In appearance it somewhat resembles smoky quartz, interspersed by streaks of brilliant amber yellow. A specimen 1 in. thick is so transparent that objects half a mile distant may be discerned through it on a murky day.

The total 1908 production of zinc oxide, in the United States, including a small quantity made from spelter, was 65,100 short tons worth $5,876,342, as compared to 85,390 short tons worth $7,731,100 in 1907. These figures are from statistics of The Mineral Industry.

Only 1,000,000 lb. of antimony worth about $4,095,000 were produced in the United States in 1908.

St. John Del Rey, Ltd.

Special Correspondence

The seventy-eighth annual report of this British company operating a Brazilian gold mine, deals with the financial year ended Feb. 28, 1909. The result of the year's working is satisfactory, increased returns over those of the previous year having been obtained. From the Morro Velho and Cuiabá mines, gold to the value of £370,201 was produced, which, after deducting gold charges, realized £357,585. Excluding a small amount of gold won from what is classified as low-grade material, the average recovery from the 170,200 tons of ordinary ore crushed realized $9.96 per ton. Working costs are given at £236,442, or $6.665 per ton, classified as follows: Mine department, $2.975 per ton crushed; reduction, $2.35; mechanics and general, $1.34. The balance of profit from the Morro Velho Estate working account shows a credit of $88,595. The preference shareholders received the usual 10 per cent. dividend, while the ordinary shareholders received 1s. 2d. per share for the year, as compared with 1s. in the previous year. The directors transfer a considerable sum from the profits, meeting new capital expenditure, this policy commending itself to them rather than that of issuing fresh shares.

Reference is made to some experiments with an electric furnace for converting the company's iron into steel at a cost below the price of imported steel. The power required to generate the electric current is, however, more than can be spared by the requirements of the mine. The directors quote a paragraph from the message to the National Congress sent last May by the President of the Republic of Brazil, which is as follows: "The center of Minas Geraes, between the cities of Queluz, Marianna, Ouro Preto and Sabara, may be considered eminently the ironfield of Brazil, and its area has been computed at 11,580 square kilometers. Both for extent and quality this may be counted among the richest of the world's deposits."

The report of the superintendent, G. Chalmers is, as in former years, an exhaustive review of the company's position, giving full particulars of what has been done and what is proposed for the future. It is no mere string of technical statistics, such as is so frequently the case in the reports of many important mining companies. The report given by Mr. Chalmers is of general interest and one that can be followed and understood by anyone and it is not necessary to have technical or mining knowledge to master its contents. The great depth to which mining has reached—now over 4000 ft. from surface—and the absence of a good shaft calls for special attention to the provision of adequate ventilation. Mr. Chalmers' re-

marks on this subject are of exceptional interest, containing statistics of rock temperatures and observations on the limits of deep mining generally. It may, however, be noticed here that mining to a depth of 6500 ft. is contemplated, a depth at which mining can be carried on if sufficient artificial ventilation is provided.

On the subject of the sanitary condition of the mine Mr. Chalmers laments the uncleanly habits of the miners and their refusal to make use of the dust protectors and water-spray apparatus, which are provided. In consequence of this recklessness pneumonia and lung diseases are much more common than they should be. There have been seven fatal accidents during the year from "blistering" stone. The "blistering" is due to the great pressure that the rock is under. Danger from this source can, however, be largely avoided by leaving the stopes for a few days until the "blistering" is over, but this calls for a large number of working places, or in other words, increased development. The accident rate is high also on account of the poor labor available. The force of skilled miners is small and the greater number of men employed are badly fed agricultural laborers.

As regards the condition of the mine horizon 15, the deepest at present, has been better than horizon 14, and on this account the explorations of horizons 16 and 17 are looked forward to with much interest. The ore reserves are given at over 1,000,000 tons.

As to the life of the mine, it is calculated that if the lode continues in width and value to a depth of 6500 ft., the life at the present rate of mining will be about 18 years. The Morro Velho self-supporting hammer drills have done splendidly when the air pressure was sufficient. Under a pressure of 68 lb. they give high results. It is a pity that more particulars of these drills are not given.

The report contains ample information about the reduction plant and ore treatment, upon which much experimental work has been conducted. The average extraction for the year under review was 91.28 per cent., as against 91.06 in the previous year. The mill is under-powered and it has been a struggle to get the 16,000 tons a month through. Electric power is now largely used, the cost being £2 6s. 6d. per horsepower-year as against nearly £70 for steam. This high cost of steam power has forced the management to look for further water power, and a scheme is proposed for obtaining 1,400 e.h.p. from the Rio do Peixe. As the ore contains a large proportion of sulphides, ranging from 36 to 40 per cent., the consumption of cyanide is very heavy, amounting to at least eight times more than on the Rand. Owing to the high cost of steam power the heavy freight rates for transport from the coast and to the inefficient labor, there there is great difficulty in keeping costs low; but it is evident that close attention is being paid to economy and that the management is in capable hands.

An All Slime Cyanide Plant at Guanajuato, Mexico

By Edwin Shapley*

The first all-slime plant in the Guanajuato district has been built and placed in operation by the Santa Natalia Mining and Milling Company. In this plant there are but two pumps used, one for lifting the water from the river and the other, a small centrifugal used for pumping precipitates from sump to filter press. All return solutions, sands, etc., are elevated by air lifts, which require no attention nor repairs, and the air consumption is exceedingly low.

The ore is brought down to the mill by a gravity tramway, the cars running over the bin and discharging onto a grizzly, the oversize going to a Blake crusher and then to the bins. From the bins it is fed to ten 1050-lb. stamps which crush through a 10-mesh screen in a 0.02 per cent. cyanide solution. The stamps drop 7½ in. 106 times per min., and crush five tons per stamp per 24 hours. Forty-five per cent. of the battery-screen sample will pass a 200-mesh screen. From the batteries the pulp is run to a cone classifier; the overflow, all of which passes 200 mesh, is run directly to treatment tanks; the underflow from this cone is fed directly to a tube mill. The discharge of the tube mill shows that 55 per cent. passes 200 mesh. This product from the tube mill is fed by gravity to another cone classifier, the overflow of which passes 200 mesh and is fed direct to treatment tanks; the underflow is returned to tube mill for regrinding by means of an air lift, notwithstanding the fact that this pulp is quite thick, about two of water to one of sand, and that it has to be lifted 13 ft. vertically. This air lift has not required one minute's attention since the plant started three months ago.

Operation of Treatment Tanks

Pulp is thickened in the treatment tanks, the solution being constantly decanted to the sump tank while the charging is going on, and being lifted to the mill tank, by air lift, to be used in the batteries again. When this solution is found to contain much gold or silver on account of the extraction that takes place in the mortars, it is run through the zinc boxes. The tanks are charged for 24 hours with a charge of 50 tons.

The treatment tanks are 20 ft. in diameter and 10 ft. high, and are cone bottomed, the cone part having an angle of 50 deg. A flange is placed at the bottom of the cone to which is fitted a 10-in. cross; to this cross is connected a 10-in. pipe extending far enough horizontally to clear the vertical sides of the tank, another pipe of equal diameter being connected to this horizontal pipe by means of a T. This pipe extends vertically so as to come about one foot above the top of the sides of the tank. A 4 ft. length of pipe is then connected horizontally so as to throw the pulp into the tank. This is also connected by a T, as when the tanks are charged, the pulp is run directly into the vertical pipe and passes down and through the horizontal pipe at the bottom into the tank. In this way the tanks are charged from the bottom and there is always clear solution on top of the pulp to decant while the tank is charging. A ¼-in. hole is tapped at the bottom of the vertical pipe for the introduction of the air. When the air is turned on it causes the pulp to be forced up through the 10-in. pipe and discharged into the top of the tank, coming out with enough force to discharge half way across the top of the tank, with the full capacity of the pipe. As the pulp is constantly being drawn from the bottom of the cone and discharged into the top of the tank, it is thoroughly and constantly aërated.

The pulp is given 10 hours agitation on the first wash, and six hours on the second and third; the fourth and last wash is water. The solution is decanted from tanks to filters and then lifted by air lift to a storage tank and run by gravity to zinc boxes.

The tube mill used is 20x3½ ft. and is run by a 20-h.p. motor. A mill of this proportion was selected on account of the fact that it requires less power to run than one of greater diameter and less length. Judging from the work it is doing, its efficiency is as great as that of other-style mills.

The ore from the mine averages 15 grams gold and 300 grams silver per ton. The extraction, being figured on the actual recovery in bullion, is 87 per cent. of the silver and 98 per cent. of the gold contents of the ore.

*Mining engineer, Apartado No. 87, Guanajuato, Mex.

The production of petroleum in Mexico in 1908 was about 4,000,000 bbl., compared to 2,000,000 bbl. in 1907.

A bonus of 4d. per lb. will be paid on the first 100,000 lb. of marketable retorted quicksilver produced in New Zealand (*New Zealand Mines Record*, April 16, 1909). Certain conditions are specified.

The United States production of pyrite in 1908, according to reports collected for The Mineral Industry, decreased to 206,471 long tons ($744,463) from the 1907 figure of 261,871 long tons ($851,463). A number of the smaller companies failed to operate.

Problems of the Russian Oil Industry

By Frank Richards*

I have recently had some interesting correspondence with A. Mancho, managing director of the Bibi-Eybat Petroleum Company, Limited, Baku, Russia. I am not only at full liberty to use the information thus conveyed, but it is desired that the problems presented may be brought to the attention of engineers for discussion. The matter which I have collected is taken from the correspondence referred to and also from a report prepared by Mr. Mancho for the Technical Commission for the Preservation of the Baku Oilfield. Baku is in Transcaucasia, at the southeastern corner of European Russia. The town of this name is situated on the west shore of the Caspian Sea. The remarkable escape of natural gas in the neighborhood, which became ignited and blazed for centuries, made this section a great resort for fire worshippers.

Oil Raised by Buckets

The oil wells in the government of Baku are not flowing wells, nor are they pumped by any device customary in the American oilfields. The oil is raised by buckets, using steam for the hoisting, and burning a portion of the oil under the boilers for generating this steam. The problem now arises as to the employment of a more economical system. A falling off in the output of the oil wells, especially in the Bibi-Eybat section, has taken place lately, notwithstanding the repeated deepening of the wells and the increased expense thereby involved.

The cost of labor, machinery, materials, etc., having also increased, many producers have been compelled to discontinue work. There has also been additional discouragement in the low price of crude oil, and a belief that a substantial improvement in the near future is out of the question. During the last half of 1908 general reductions in operations have been taking place, with the conviction that worse conditions are in store.

In view of these circumstances the producers naturally have turned their attention to the oil they are using for fuel. This, according to official statistics, reaches the extraordinary amount of 15 or 16 per cent. of the total output. My correspondent says that the actual figures are higher, as some firms are keeping back the correct figures on account of the large quantity of oil so used. A boiler of the ordinary type, for instance, is usually said to require 100 to 150 poods—a pood is 36 lb.—of oil per day, whereas the average is probably 200 poods at the very best, and in cases of emergency the figures rise to 250 poods per day.

During the last year much has been done by some producers with a view of economizing steam power and reducing the consumption of fuel; but on account of the reduced output of the individual wells all that could be done in most cases was to keep the percentage at the former rates. In fact, there is a further increase in the fuel rate to be feared, and an entire cessation of work on some wells is not improbable.

Utilizing the Natural Gas

Many of the baling wells produce large quantities of combustible gases which at present simply go to waste. Up to 1907 attention was occasionally called to this fact in a casual way, but the opinion prevailed that the wells not being covered, it would be impossible to get the gas in sufficient quantities to make its use for fuel a commercial success. In the summer of 1907, however, the Bibi-Eybat Petroleum Company, Limited, connected several wells with a boiler by means of an exhauster.

The experiment showed that notwithstanding the light pressure of the mixture of gas and air—about 100 to 120 mm. of water—it was possible to generate steam in the boiler equal to about two-thirds of the horsepower produced with oil fuel. The possibility of the commercial utilization of the gases from the baling wells not being proved, the necessary pressure as well as the capacity of the gas exhauster were ascertained and eventually the Bibi-Eybat Petroleum Company proceeded to instal a complete plant for the purpose of burning these gases under the boilers.

In December, 1907, the members of the Technical Commission, who were in the neighborhood inspecting the route of a proposed fresh-water pipe line, were given an opportunity to see 10 boilers at work on a plat where 17 wells were in production. Five of these boilers were fired with oil and five with gas, which was drawn from seven of the wells. Thus in the quantity of oil used for fuel a considerable saving will be effected.

In this particular case the saving of oil to the company is 1000 to 1200 poods per day; but according to the forecast of the Association of Oil Producers (Ssoviet Ssyesda) for the year 1909, the total consumption of oil for fuel will amount to about 70,000,000 poods. Supposing the substitution of gas for fuel would reduce this figure by 20,000,000 poods, this quantity thus brought on the market would in some measure make up for the inevitable decline in production.

Unfavorable Leasehold Conditions

The conditions of leasehold of government lands are not such as offer much inducement to economical operations. According to the contracts, the oil used for fuel is free from any charge (royalty, etc.), and paying, as the operators do, 40 to 50 per cent. of their net output to the government, every pood saved would be subject to the same tax. The remaining 50 to 60 per cent. would be such a comparatively insignificant gain, that considering the high rate of money and the indisputable decline in the production of the Bibi-Eybat oilfield, the utilization of gas is not of much interest from a commercial point of view.

This is the view of the situation as it is generally accepted; at the same time, Mr. Mancho states in his report that the rapid decline of these oil-bearing properties and the falling off in the output point to the conclusion that, merely from the standpoint of the political economist, attention must be given to the fact that a large amount of combustible material is continually going to absolute waste, whereas if it were properly captured and utilized millions of poods of oil would become available for the market, and of consequent benefit to the country. It has been suggested, therefore, in his report that the government, for reasons of state, can and ought to waive its claim on any saving effected by the producers in using gas for fuel in place of oil.

The use of gas would not necessitate any important alterations to the boilers now adapted for the use of oil. To hang up the oil burners when the gas burners were in action, and *vice versa*, would be all that would be required, and not more than two or three minutes would be needed for either operation. Mr. Mancho with suitable apparatus conducted investigations, the result of which were not embodied in the above report. The mixture drawn from the wells contained from 30 to 70 per cent. of air, also a certain percentage of moisture.

The products of condensation of the oil gases, as ascertained by analyses of samples taken from the gas mains, showed the following characteristics: Specific gravity at 15 deg. C., 0.837 to 0.811; evaporation at 100 deg. C., practically nil; at 240 deg. C., about 92 per cent.; residue amounted to 7.9 per cent. in one case and 10.4 per cent. in another; in one sample sulphur was present.

Under conditions varying so greatly it was found extremely difficult to ascertain the precise power or fuel value of the gas as drawn from the well, and it was in the quest for additional apparatus that I was consulted. The obvious suggestion was volunteered that the gas should not be used as fuel for steam boilers, but rather to develop power directly in gas engines, with presumably a resultant saving of all the oil for commercial purposes. The answer which this suggestion elicited is interesting, and shows other difficulties of the case. It proceeds as follows:

Use of Gas Engines

"Regarding your remark as to substi-

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tuting gas engines for steam engines, I may say that the same idea has occurred to ourselves. The difficulty lies in the fact that we possess complete and extensive steam plants which would have to be disposed of for almost nothing, and that the installation of a gas plant would mean a large capital outlay. A gas engine would be required for every individual well, which would scarcely be compatible with our mining regulations which provide, with a view to minimizing the risk of fire, that such engines shall be situated at a distance of not less than 70 ft. from the center of any well, oil tank, etc. This would be too great an encroachment upon our available space.

"Neither do I suppose that such engines, generally speaking, could receive the same careful handling here as would no doubt be the case on your side of the water. It must further be considered that fierce winds prevail in our part of the country, which is almost devoid of vegetation and instead covered with loose sand. Every gust of wind raises a cloud of fine dust, which getting on the piston of the engine would soon destroy the air tightness which is so essential a condition for gas motors.

"Moreover, the cost of the gas engines which are mostly imported would be so greatly in excess of the cost of our locally built steam boilers and engines that the advantages resulting from the use of gas motors here would not leave so large a margin of profit as they probably do in America. Nevertheless, even under the conditions as mentioned, gas engines are gaining more and more ground in Baku.

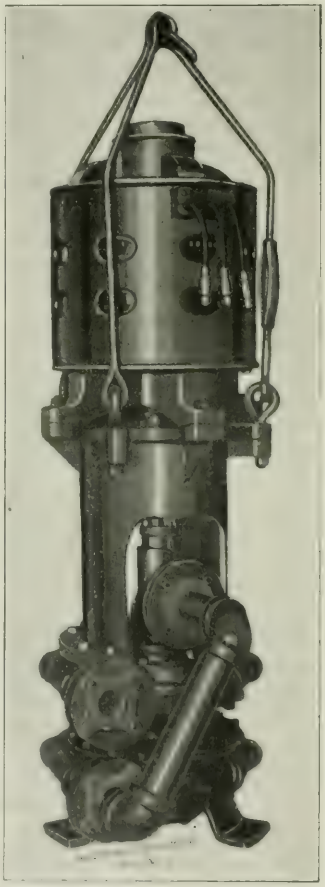
"Regarding the chief issue of the question dealt with in my report, it remains the same as far as the ownership of the oil-bearing lands is concerned, whether gas engines are used or not. The government leases the land on the condition that 40 per cent of the net output goes to the government, the assumption being that the necessary power will be supplied by steam, in view of which all oil used as fuel is exempt from any charge. It is in this respect that the situation remains unchanged, the 40 per cent clause applying as hitherto to the whole net output. In other words, in the saving effected by using gas engines instead of oil as at present we would benefit only to the extent of 60 per cent. To have this restriction removed is of paramount importance to our industry."

During the 14 years preceding the Courrieres mine disaster in 1906, (*Engineering News*, April 29, 1909) there was not a mine explosion in France in which there were more than nine men killed; in the Courrieres explosion nearly 1200 men were killed.

The exportation of bar copper from Argentina in 1908 was 224 long tons, of copper ore 2860 tons.

Unusual Centrifugal Pump

The accompanying cut shows a $2\frac{1}{2}$-in. compound-vertical shaft sinking pump, driven by a 20-h.p. motor, designed to handle from 120 to 185 gal. per min. against varying heads up to 225 ft. The pump is equipped with bronze runners, each made in two pieces, brass glands, forged steel shaft and cast-iron casings and side plates. The action of the thrust



ELECTRIC SINKING PUMP

is balanced, the pump suction inlet being at the bottom of the lower or first stage while the inlet for the second stage from the first is above at the top of the upper casing. The thrust bearing on the motor was built sufficiently heavy to bear the weight not only of the motor rotor but also of the moving parts of the pump, the shafts being connected only by flange coupling, each half being held securely to shaft by taper pin.

When in place in the mine shaft the motor is protected from stones dropping down by a circular conical baffle or deflector made of ¼-in. boiler plate and slung below the ring on the three rods supporting the pump from the tackle. A similar plate is attached to the bottom of the machine to guide it down the shaft to prevent catching on cross timbers. Water is taken through about 10 ft. of marlin-wound heavy rubber hose connecting with the suction inlet and protected at the lower end by an ample strainer.

The pump construction as shown in the cut weighs without motor 650 lb., with motor 1500 lb., and was recently shipped to a foreign customer by the Buffalo Steam Pump Company, of Buffalo, N. Y.

Dominion Iron and Steel Company

The annual meeting was held at Montreal June 17. The annual report showed a profit, after payment of all expenses except interest and after setting aside the necessary appropriation for sinking fund, exhaustion of minerals and depreciation of plant, of $2,225,834. Interest charges amounted to $654,422, including interest on floating indebtedness curtailed by litigation, leaving a net surplus of $1,571,412. The payment of $2,750,000 by the Dominion Coal Company in settlement of the damage suit leaves a balance of $1,201,092 still to be adjusted, but of this sum only $302,490 has been taken into account in making up the books to May 31. The directors have taken advantage of the readjustment to appropriate $1,800,000 in reduction of property and construction account, leaving a balance of $2,000,801 to be carried forward to the next year to profit and loss. The report is optimistic as to the business outlook. Frank Merrick, an expert, presents an estimate as to the extent of the company's iron ore areas at Wabana, Newfoundland. The land area is estimated to contain 17,750,000 tons, and the first submarine 90,650,000 tons a total of 108,400,000 tons. The cost of mining at present and within any reasonable time is likely to remain so low that the ore can be mined to yield a handsome profit, either by converting it into pig iron or selling it in the open market. The shareholders authorized a new issue of $20,000,000 consolidated mortgage bonds.

Production for the fiscal year ended May 31 was as follows, in long tons:

	1907-8.	1908-9	Changes.
Pig iron	282,357	282,051	D. 306
Steel ingots	290,932	284,495	D. 6,437
Blooms	250,377	270,881	I. 20,504
Rails	156,021	134,607	D. 21,414
Wire rods	45,667	50,554	I. 4,887

At the present time the steel works are running to their full capacity, in all departments.

Statistics of THE MINERAL INDUSTRY show that the output of gypsum for the United States decreased in 1908 as compared with 1907 1,721,829 short tons ($4,138,500) against 1,751,748 short tons.

Tailings Disposal Plant at the Wolverine Mill

After Being Unwatered in the Smith Separator, the Tailings Are Conveyed 1000 Feet on Robins Balata Belts with Small Power Expenditure

BY C. KEMBLE BALDWIN*

In choosing the location for a stamp mill, two of the determining features are the necessity for an abundance of water and a convenient space for the disposal of the tailings. Because of these considerations, the mills in the Lake Superior country are usually located on some body of water from which the supply may be pumped, the water and sand being discharged back to the lake or river through launders.

Steel launders carrying all of the water, sand and slime from a mill must have a drop of ⅜ in. per ft., therefore the mill must be built on elevated ground to provide for sufficient dumping space, particularly if the sand must be carried any great distance from the shore line. Heavy storms will frequently wash the sand banks down, increasing the available space, but this can hardly be depended upon. In many cases high ground for the mill is not available, and in other cases the dumping space is so filled in that it is necessary to raise the sand and water mechanically to admit of its disposal.

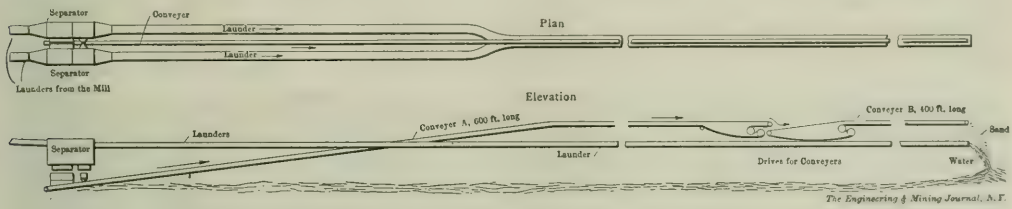
The stamp mills of the Mohawk Mining Company and the Wolverine Copper Mining Company are located at Gay, Michigan, on the shore of Lake Superior. The mills adjoin and are built on an elevation of approximately 37 ft. above the lake level. The ore for the Mohawk mill is hauled about 15 miles from the mines at Mohawk, and that for the Wolverine mill from the mines at Kearsarge, about 17 miles. The standard gage cars are hauled up the inclines at the mills and the ore is discharged into the bins from which the stamps are fed.

The Mohawk Tailings Plant

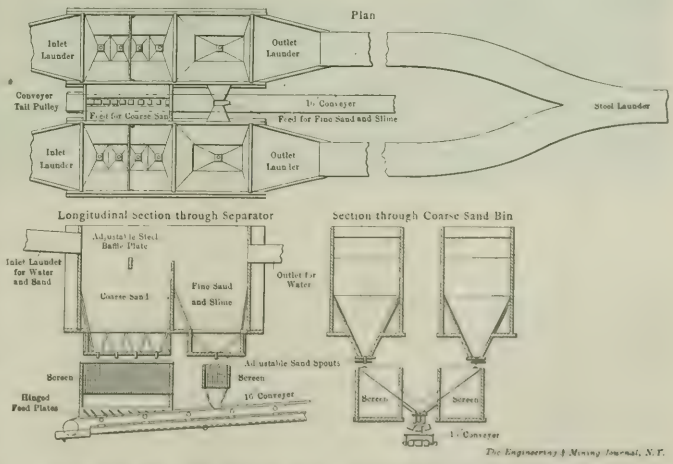
The Mohawk mill, started in 1902, has a capacity of 2800 tons of ore per 24 hours. The mixture of water and sand was originally discharged by launders back to the lake, but about three years ago the space had been so filled up that some method of lifting the material became necessary. After carefully considering the sand wheel, pumps and mechanical elevators, they adopted the suggestion of J. F. Jackson, an engineer, of Houghton, Mich. His scheme consisted of the separation of the sand and water close to the mill.

The material was discharged into a sump by the launders. Four chain and bucket elevators, 13 ft. long, with perforated buckets 25½x14x11½ in., lifted the sand from the sump, the surplus water draining off through the holes in the buckets. The water overflowed from the sump tank to a launder with a drop of 13/16 in. in 10 ft., which carried it 700 ft. toward the lake. The sand from the four elevators (two of them being reserve elevators) was discharged to a horizontal 20-in belt conveyer 700 ft. long, which I designed. This conveyer ran over the launder in a covered gallery at the end of which the sand and water joined and flowed into the lake.

A 700-ft. launder with a drop of ⅜ in. per ft., carrying all of the sand and water from the mill would have a total drop of 21 ft. 10½ in. When the sand was removed, however, the water would flow in the launders at a drop of 13/16 in. in 10 ft., so that the total drop of the 700-ft. launder was only 4 ft. 8⅞ in.; the discharge point 700 ft. from the mill was, therefore, raised about 17 feet.



TAILINGS DISPOSAL PLANT OF THE WOLVERINE COPPER MINING COMPANY, GAY, MICH.



SAND SEPARATOR AND CONVEYER FEED—WOLVERINE TAILINGS DISPOSAL PLANT

Maintenance Troubles

The installation developed several difficulties. The conveyer was equipped with a high-grade rubber belt, but the load being less than 116 tons per hour, it was more difficult to make the belt run straight than if it had been fully loaded. This, coupled with the fact that the belt was continually soaked in water, caused it soon to show signs of wear on the edges. Rubber belts are waterproof only when

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the cover is intact, as the rubber is applied to the duck in a plastic form, the consistency of putty, so that it coats the surface only and is not absorbed by the duck. When the edges became worn and the duck exposed, the water was absorbed by the duck, causing the rubber to lose its hold and thus the life of the belt was shortened. A more satisfactory belt for this service has been found and will be referred to later.

The chain elevators proved to be expensive to maintain, owing to the sand rapidly cutting out the links, pins, shafts, tumblers and buckets. In spite of these minor difficulties, however, the plant in principle was eminently successful, as it solved the problem of giving additional dumping space at a small operating expense and at a reasonable first cost. Each elevator required about 4½ h.p., the conveyer about 8¼ h.p., and two men looked after the operation on each shift. The launders were of steel, semi-circular, 48 in. in diameter. The gallery was built of timber covered with asbestos board.

proved the advisability of making the conveyer in two parts, the first section 600 ft. and the second 400 ft. long; the 400-ft. section being designed so it may be extended to 600 ft., making the total distance 1200 feet.

As the stress in the belt fixes the maximum length of the conveyer, it was possible to use narrower and lighter belts by building the conveyers in two sections, thus decreasing the first cost, power and maintenance. It also made it possible to discharge for a considerable period from the end of the first section, filling up the dumping ground at this point. In Fig. 1, the photograph was taken from the lakeside, with the Mohawk mill and its 700-ft. conveyer on the right, and the Wolverine, with its 1000-ft. gallery, on the left. The unwatering apparatus is located in the enlarged portions of the galleries outside the mills proper.

The Unwatering Apparatus

The Wolverine mill handles 960 tons of rock per 24 hours, requiring 8,500,000 gal. surplus water. From the screens the sand with about 15 per cent. of water is fed to the belt conveyer, a series of hinged wing plates directing the material forward. The conveyer runs between the boxes at an incline of 5 deg. until above the level of the launder and then horizontally to the discharge. The launders from the two boxes are merged into one beyond the inclined portion of the conveyer. Fig. 3 shows the arrangement of separators, launders and conveyer.

The discharge openings in the spouts are adjusted so that there is a steady flow of sand from the boxes to the screens. The sand moves slowly down the screens as the conveyer draws its load out of the feeding slot. The feeding is continuous, requiring neither power nor labor. Owing to the tendency of the fine sand and slime to adhere to the belt, the spout from this box is arranged to discharge the material on the stream of coarse sand so the slime does not come in contact with the belt at any time. An attendant is necessary at this point to regulate the

TAILINGS DISPOSAL PLANT OF THE WOLVERINE STAMP MILL, GAY, MICH.

Designing the Wolverine Plant

The operation of the Mohawk plant was carefully studied and the objectionable points noted with a view of building a similar plant for the Wolverine mill. At the direction of Fred Smith, agent of both the Mohawk and the Wolverine companies, a series of experiments was started to unwater the sand without the use of the elevators. These tests, in charge of W. J. Smith, assistant superintendent of the companies, resulted in the production by him of a gravity separator and conveyer feed, which is being made the subject of U. S. and foreign letters patent. This portion of the problem having been successfully solved, I was called in to study the conveyer installation. As the Wolverine mill adjoins the Mohawk, there is practically a common dumping ground. It seemed advisable, therefore, to provide a system which would carry the sands farther into the lake, 1000 to 1200 ft. being decided upon. Calculations

of water. The separation of the sand from the water is accomplished by the gravity separator shown in Fig. 2. Two separators, side by side, were installed, although one will handle the product of the mill, the other being held in reserve. The launder from the mill is split and provided with a switch so that the material may be diverted to either box at will.

The launder is 30 in. wide, but increases to 60 in. as it enters the separator. The first section of the box catches the coarse sand, there being an adjustable steel baffle plate about midway to assist in throwing down the sand. The second section of the box catches the fine sand and slime, the overflow water passing out through the launder which gradually narrows again to 30 inches.

The bottoms of the boxes are hoppered to a series of sand spouts, the openings of which are adjusted by means of sliding plates. These spouts discharge to inclined punched plate screens which remove the

feeding spouts, should there be a change in the amount of sand from the mill. Any such change is quickly shown by the quantity of water in the sand, but when the amount of sand is constant, no adjustment is required.

The Belt Problem

In the design of the Wolverine conveyers, the main problem was to provide a waterproof belt, and this had been found since the Mohawk plant was designed. The only waterproof belt that I know of is the balata belt. Balata is a vegetable gum found in Venezuela, in nature between gutta percha and india rubber. Balata is applied to the duck in a liquid form so that the gum penetrates and saturates every fiber of the fabric, thoroughly waterproofing it.

The U. S. Government dredge on the Fox river in Wisconsin is equipped with three 6-ply balata belts, 32 in. wide. A granite boulder fell from the belt and

became lodged against one of the idler pulleys. The edge of the belt rubbed against the boulder and pulley with the result that both were worn flat, and although the belt was worn down from 6 to 3 ply and was continually soaked in water, the plies exhibited no tendency to separate. A similar treatment of a rubber belt, allowing the water to reach the duck, would have brought about the rapid destruction of the belt by the opening up of the plies.

The lack of waterproof qualities in the rubber belts caused the main difficulties on the Mohawk installation, and in view of the satisfactory record of the balata belts on the Fox river dredge, balata belts were decided upon for the Wolverine conveyers. A special troughing idler was also used, giving a much wider pulley surface and a troughing angle suited to this type of belt. The belts used were 16 in. wide and 4 ply.

Driving the Conveyers

As has been already explained, the conveyer was built in two sections, the first, 600 ft. long, being driven by a multiple-pulley drive from the discharge end; the second section, 400 ft. long, with provision for extension to 600 ft., was driven from the loading end with a similar type of drive. This construction brought the two drives together so they could be driven from a single motor, which was belted to a countershaft, the conveyers being driven from this shaft by a special sprocket-chain drive. The countershaft was driven by a 15-h.p., direct-current, 220-volt motor, provided with a variable-speed rheostat.

A power test of the first section, 600 ft. long, lifting the material about 17 ft. and handling 40 tons per hour of sand, carrying 15 per cent. water, at a belt speed of 224 ft. per min., gave the following results: Empty belt, 5.8 h.p.; loaded belt, 7.7 h.p. The no-load reading, therefore, was about 75 per cent. of the full-load reading.

The launder from the separating box has a drop of 1/16 in. per ft., so that there is a total drop in the 1200 ft. of 6 ft. 3 in. Add to this a loss of 6 in. in the separator and there is a total loss of head room of 6 ft. 9 in. To discharge sand and water at a similar point, 1200 ft. from the mill, with either pump or sand wheel feeding a launder having a drop of ⅜ in. per ft., would require the lifting of the material at the mill 37½ ft. Allowing 2½ ft. for sump and discharge to launder, gives a total hight of 40 ft. to which the material must be lifted.

Power Required by Other Methods

The 8,500,000 gal. of water and 960 tons of sand have a total weight of about 36,400 tons, which, handled in 24 hours, gives a capacity of 1516 tons per hour. To dispose of this by the Wolverine method requires 15 h.p. Assuming a centrifugal pump with an efficiency of 60 per cent., lifting 1516 tons per hour to a hight of 40 ft., about 100 h.p. would be required.

There has been but little information published on the efficiency of the sand wheel, but 50 per cent. seems generous; assuming the same duty as for the pump 120 h.p. would be required. It is evident, therefore, that the Wolverine method effects a great saving of power and as the first cost is insignificant compared with either the pumps or sand wheels, the system should ultimately come into general use.

The perfection of this plant naturally required much experimenting and the design of the conveyers presented many difficult problems which were successfully solved by careful study. The long conveyers with light loads of water and sand require special designs throughout, and balata belts seemed to be necessary to a satisfactory plant, as rubber belts, "waterproof canvas belts" and imitation balata belts lacked the required waterproof qualities, when tried on the experimental work. The data used in this article were supplied by Willard J. Smith, assistant superintendent of the plant and the inventor of the separator and conveyer feed described.

TAILINGS DISPOSAL PLANT OF WOLVERINE STAMP MILL, GAY, MICH.—MOHAWK MILL ON THE RIGHT

In some metallurgical and chemical operations, steam is admitted to large vats or tanks for the purpose of agitating and, in some cases, heating their contents. In special cases, the consumption of steam for this purpose is enormous. It is often possible to obtain better results by mixing air with the steam. This may be accomplished by cutting in an ordinary Garfield injector. To insure the proper working of the device, the steam is first turned on, then the valve of the injector gradually opened until the desired amount of air is obtained. If it is desired to maintain the contents of the tank or vat at a certain temperature, the use of a thermometer will quickly indicate when too much air is being used. By the use of this device, better agitation is secured, the contents of the tank or vat suffer less dilution, and there is a large saving in the amount of steam used.

In mine reports, sketches, maps and photographs throw a great deal of light on the subject under discussion. In many cases such illustrations are absolutely essential. A sketch or a photograph will often tell more than a page or two of descriptive writing. With the aid of a tape, clinometer and hand level, or one of several instruments on the market that combines those mentioned (except the tape) in a compact form, it is possible to prepare fairly accurate maps of the surface and of underground workings. The data for such maps may be quickly collected, and the product will be sufficiently accurate for the purpose. Few engineers seem to be able to make an accurate and presentable sketch. The camera, however, is simple of operation and gives splendid results. Indeed, it may be said that a photograph is often more to be desired than even a well made sketch.

An Electrically Operated Hoisting Plant

A Novel Scheme Has Been Devised to Eliminate the Expensive Fly-Wheel Converter. Engine Is Stopped Automatically in Case of Mishap

BY A. GRADENWITZ*

The most serious drawback to the adoption of electrical operation in connection with main-pit hoisting engines, has so far been the expensive flywheel converter. This is eliminated by a novel scheme recently applied for the first time by Messrs. Brown, Boveri & Co., in connection with the Mauve pit winding plant of the Consolidated Heinitz mines at Beuthen, Upper Silesia.

This scheme utilizes the excellent maneuvering capacities of the Brown, Boveri, Parsons steam turbine, for transmitting any load fluctuations of the winding plant, without the intermediary of converters, directly to the boiler plant which constitutes an ideal accumulator. To a steam turbine of the above system, provided with a self-acting overload valve, are coupled a rotary current generator (intended for the general operation of the mines) and a continuous current generator which drives the winding motor arranged in Leonard connection. The rotary current generator forms the fundamental load to the turbine, thus [illegible] its steam consumption while absorbing at the same time any breaking shocks of the winding plant which it reconverts into useful electrical energy.

The mechanical part of the winding engine constructed by the German-Luxemburgian Mining and Metallurgical Company, is designed on the following data:

Depth	700 m.
Useful load	7200 kg.
Rope speed	10 m. per sec.
Winding output	230 tons per hour
Diameter of winding pulley	8 m.

The present electrical equipment designed for one-half of the useful load with the same rope speed, is to be doubled for the full useful load.

The winding turbine represented in Fig. 1 is a Brown, Boveri, Parsons turbine designed for steam at 9.5 atmospheres surplus pressure, and 275 deg. C. superheat at the admission valve, and connected to a central condenser of 90 per cent. vacuum. The automatical overload valve of patented design is of special interest, being actuated, not by a centrifugal regulator, the operation of which would pre-suppose an alteration in the number of turns of the turbine, but by the steam pressure behind the ordinary regulating valve of the turbine. This steam pressure, producing a throttling action, is smaller in the case of normal loads than the pressure in front of the valve. As soon, however, as this valve, owing to a full load on the turbine, is opened entirely, any throttling action is bound to cease and the pressure behind the valve equals that in front of it. The automatical overload valve then leads some steam into an intermediary stage, thus increasing considerably the output of the turbine, which consequently can be designed in accordance with its average load. A further advantage of the overload-valve is its being worked earlier in the case of a lower pressure in the boiler plant, so as always to adjust for the proper output of the turbine, even in the case of fluctuating boiler pressures.

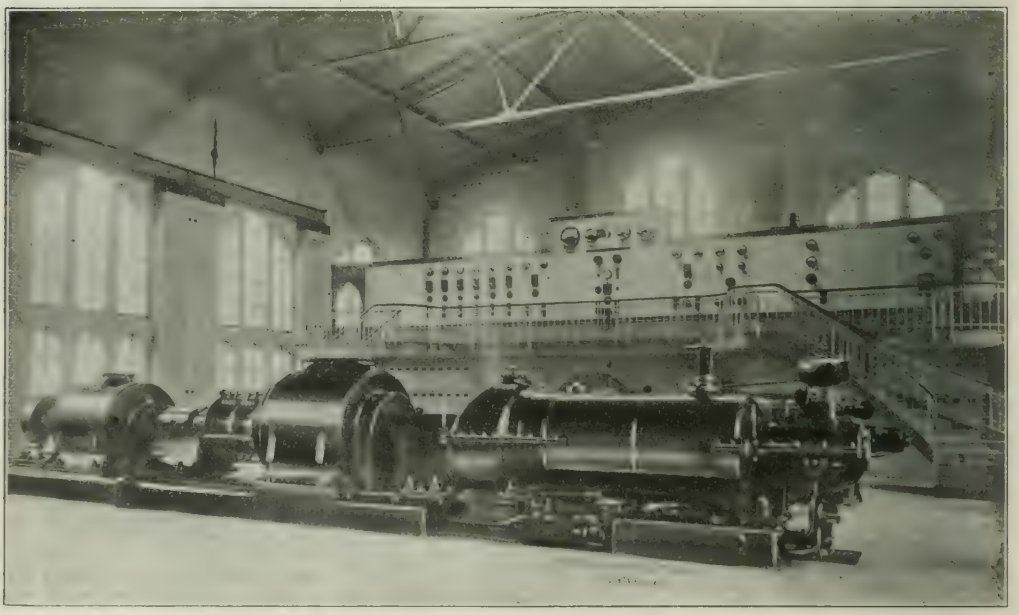

FIG. 1. GENERAL VIEW OF HOISTING TURBINE, CONNECTED TO A CENTRAL CONDENSER OF 90 PER CENT. VACUUM

Regulation of the Turbine

The regulation of the turbine is so satisfactory, that a fluctuation of less than 2 per cent. in the number of turns, attends a sudden transition from the maximum positive load to the maximum nega

*Berlin W. 50, Regensburgerstrasse 2.

tive load of the winding dynamo. No alteration in the load of the winding engine has been able to disturb the working of the rotary-current dynamo connected in parallel.

quirements for excitation. The field regulator having to absorb quite an immaterial current, can accordingly be given very small dimensions.

The rotary-current generator is de-

SHOWING HOW THE ENGINE IS STOPPED AUTOMATICALLY

Fig. 2 is a general view of the winding engine. To the right of the steering jack is located a support with hand-wheel for

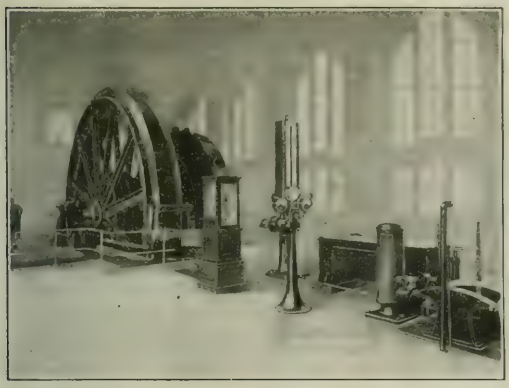

FIG. 2. GENERAL VIEW OF WINDING ENGINE AND STEERING JACK

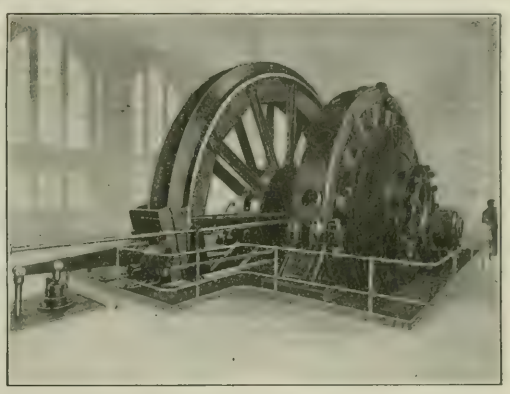

FIG. 3. SHOWING WINDING MOTOR, ONE OF THE LARGEST EVER CONSTRUCTED

FIG. 4. SHOWING THE POLE HOUSING

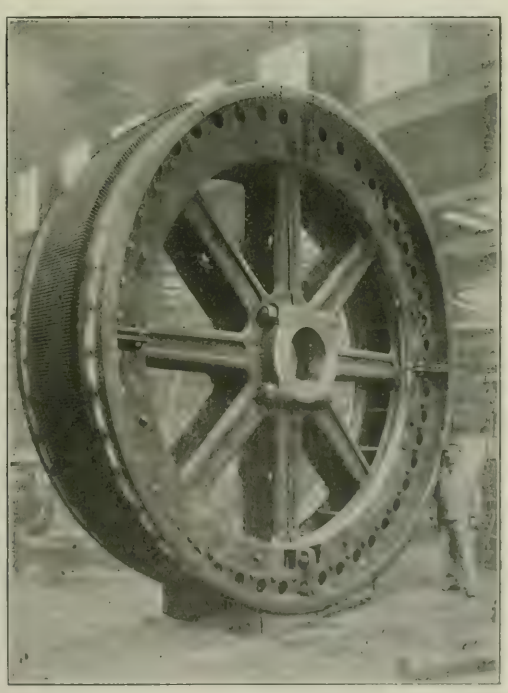

FIG. 5. VIEW OF ARMATURE

The continuous-current turbo-dynamo is provided with the well known Deri type of winding, which combines the advantage of a sparkless commutation at any load, with that of extremely low energy re-

signed for an effective permanent output of 1000 kw., corresponding to 1250 kilovolt-amperes with $\cos \phi = 0.8$ and generates rotary current of 3150 volt with 50 periods per second.

actuating the emergency switch. In front of this is arranged the regulator, the contact slide of which is displaced by a chain-transmission. The depth gage, provided with a slackening gutta, in the case of in-

advertency on the part of the machinist reduces the steering lever to zero, and whenever the cage gets beyond the pit-mouth, actuates the emergency switch and at the same time the safety brake, stopping in a minimum of time the previously slackened engine. Furthermore, the safety brake is actuated by the emergency switch; first, when the exciter tension fails; secondly, when the exciter tension exceeds by 15 per cent. its normal figure (that is, in the case of any undue increase in the number of turns of the turbo-generator), and thirdly, in the case of any inadmissible increase in the armature current of the winding motor, due to excessive loads or to the cage being jammed in the pit.

A switch column comprising all necessary electrical instruments and a compressed-air manometer as well as a Karlik speedmeter completes the equipment of the mechanic's stand.

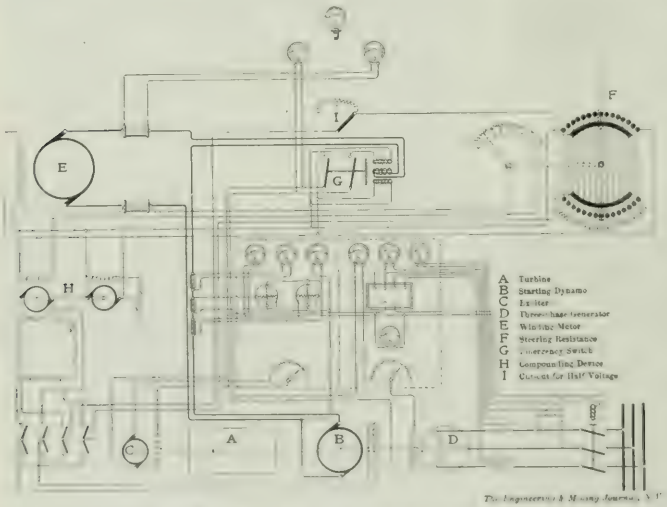

FIG. 6. GENERAL ARRANGEMENT OF CONNECTIONS

The Motor Armature

Fig. 3 represents the winding motor, which, on account of its low number of turns (24 r.p.m.), is one of the largest so far constructed. Its dimensions are illustrated by Figs. 4 and 5, representing the pole-housing and armature of the motor. A special winch has been provided in order to allow the motor armature to be rotated for the sake of repairs without getting hold of the rope. This winch comprises two rollers susceptible of being lifted independently by a lever system, on which rollers the coupling flange of the motor is supported while the clutch is disengaged. This arrangement affords the additional advantage of allowing the winding plant when definitely extended, to be driven independently by one of the motors, the other being uncoupled. The winch also allows of reducing the dimensions of the traveling chain, which need not suffice for the weight of the motor armature.

Arrangement of Connections

This arrangement of connections, represented in Fig. 6, does not present any novel features apart from the special compounding system of the steering dynamos according to which the speed is controlled entirely by the position of the steering lever. A special small exciter machine with two separate field coils—the excitation of one of which is controlled by the winding current—has been provided for exciting the steering dynamo; the other field coil of this exciter receives a variable excitation from a rheostat. Leaving the first-named exciter coil out of account, it is seen that the exciter dynamo would absorb a tension depending on the resistance of its second field coil. The excitation of the starting dynamo and accordingly its tension are thus controlled, not by a resistance in its exciter field, but by altering the excitation of its own exciter dynamo; this exciter tension is acted upon by the first-main exciter coil in accordance with the main current of the winding motor in such a manner that a surplus or minus tension—according to the direction of this current—is generated.

The number of turns of the winding motor can thus be made to depend exclusively on the position of the steering lever, independently of whether the motor is absorbing or yielding current for the propulsion of loads, and independently of the magnitude of the latter. An additional advantage of this arrangement is that the controller has to deal, not with the exciter energy of the starting dynamo, but with the very small exciter energy of its exciter, so that its dimensions could even be reduced considerably below the dimensions so far in use.

As it is, the existing controller was retained in the present case, after having been provided with a switch, responding to the excitation of the starting dynamo so that the compounding can be switched out whenever required. This is found especially advantageous in connection with the adjustment of the machines, without interfering with the winding operation.

Advantages of Scheme

The advantages of this scheme as compared with the familiar Ilgner system can be summed up as follows:

Reduction in the number of engines and apparatus; absence of expensive flywheel converters, using up energy, and accordingly, reduction in the first cost and operating expenses, and improvement of the total efficiency; permanent readiness for operation, the turbine being started in a few minutes; reduced space requirements and possibility of using cheaper foundations.

New South Wales Coal Trade

F. Danvers Power, in an address before the Engineering Society of Sydney University says: "Since coal mining commenced in New South Wales, the price has fluctuated between 16s. 1.51d. per ton in 1853 and 5s. 4.86d. in 1898. The output of coal has more than doubled during the past 10 years. The following table shows the output and value during this period:

	Tonnage.	Value
1899	4,597,028	£1,325,799
1900	5,507,497	1,668,911
1901	5,968,426	2,178,929
1902	5,942,011	2,206,598
1903	6,354,846	2,319,660
1904	6,019,809	1,994,952
1905	6,632,138	2,003,461
1906	7,626,362	2,337,227
1907	8,657,924	2,922,419
1908	9,147,025	3,353,093

"It will be seen that the output and value do not vary in the same ratio, for the value per ton was not constant. In 1908, the total number of persons employed above and below ground in connection with the various collieries was 17,734. The value of coal raised for each person employed in and about the mines was £147 11s. 7d., or for each person employed underground £173 13s. 9d.; but from this sum not only wages but depreciation of plant, management, amortization and other expenses have to be deducted before the net profit is found."

According to statistics of the U. S. Geological Survey, the 1908 production of bauxite in the United States amounted to only 52,[illegible] long tons valued at $263,968, while the 1907 production was 97,776 long tons valued at $480,330. Arkansas and Georgia were large contributors to the total output.

The Coal Mining Industry in Illinois During 1908

The report of David Ross, Secretary of the Commissioners of Labor of the State of Illinois, has been submitted to Governor Deneen. Considerable space in the report is given to a consideration of the prices charged for coal, the waste of powder, accidents, their causes in certain cases and suggestions touching the conservation of life and property in the coal mines of the State. Among other things, Mr. Ross says, "With a mining equipment easily equal to twice the demands of the market, the natural ambition to get business has resulted in the almost complete demoralization of prices on contract coal. Never before has coal sold to the big consumers at a price so near, if not in some instances, below the cost of production. In addition to general wasteful methods, we are robbing a valuable future inheritance and yielding up without adequate return, an essential element of present and future power.

"What a ridiculous commentary it is upon modern business sense when we are compelled to admit that the larger the concern, the less it has to pay for what it needs—that values are not based on worth or the labor required in their production, but on the side of the concerns with which we do business and the extent of the orders they may grant. A great railroad or other corporation lets a contract for 100,000 tons of coal and it is filled at $1 per ton or less; the private household consumer requiring 20, 30 or 50 tons per annum is charged $2.50 or $3 per ton delivered. The local trade is taxed for the benefit of the big consumers. If the larger buyers continue to dodge their share of the costs, the little ones must make good the difference.

"A business that taxes most those who can least afford it, is not conducted on the principle of the Golden Rule and its failure is but a question of time. If the transportation interests have not secured too strong a grip on the coal-mining industry of the country, it is possible to reorganize the business on a basis that will insure justice to all; a reasonable and uniform charge for an indispensible commodity; a fair return on the capital invested, and liberal wages for all classes of men engaged in the occupation. Instead of wasting brain tissue in the foolish attempt to get business at no-profit prices, better devise a plan that would distribute charges by withdrawing favors to great consumers, put all in respect to prices, on an equality, and the cost to the average consumer would be less, profit and wages could be increased while the necessities created by the present unbusinesslike system, which puts everybody at the mercy of someone else, would immediately cease to exist. It is a consideration devoutly to be wished, and its promise will not be realized until some of the power now wasted in mere quibbling over details is applied in a practical manner that will put the industry on a safe paying basis without oppressing or treating unfairly, any legitimate interest.

"It is impossible to make the small class of consumers believe, many of whom live in the coal regions, that the average reported value of coal at the mines is but a fraction in excess of $1 per ton, neither can they understand why they should be selected for discrimination in the matter of prices compared with favored rates granted the great consumers.

There is Ground for Complaint

"Under the prevailing system, if it is permissible to speak of it as such, there is valid ground for the double complaint, first, on the part of the smaller consumers that they are compelled to pay excessive prices for fuel, and second, on the part of the mine owners that, figuring on the prices at which the entire output is sold, there is but little, if anything, in the business for them. So dangerously close has the margin become, that any change in the way of legislation or otherwise designed to further protect employees, if it adds to the cost of production in a degree, however insignificant, is followed by a threat to close the mines. When an industry reaches a point where the men who have their money invested feel more secure with their property idle than in operation, the time has certainly arrived to test the sanity of present business methods.

"The total product for the year was 49,272,452 tons, of which amount the 407 commercial mines furnished 47,809,730 tons, and the 515 local mines, 1,462,722 tons, representing about the usual ratio between the shipping and local mines. There was employed in every capacity in and about the mines 70,841 men, of which number 46,194 were miners employed in the shipping mines, an average of 191 days during the year and producing 1033 tons per miner.

"More than one-third of the entire tonnage was cut by machines. Notwithstanding an unfavorable machine mining rate, the quantity of coal secured through the use of machines continues to steadily increase. Naturally with an increased machine tonnage the quantity of powder used in blasting would decrease proportionately. The figures show the reverse to be true and that while the machine tonnage for this year compared with last, increased 719,969 tons, there was an increase of 66,544 kegs in the quantity of powder consumed or an average of 34 tons of coal to each keg of powder.

An Increase in the Amount of Powder used Per Ton of Coal Produced

"The coal miners attribute the increase to the fact that powder is cheaper than formerly and therefore inferior in strength. The powder companies insist that there has been no change either in the composition of the product or in the process of its manufacture. It would seem unnecessary to seriously consider either of these claims, but where the facts show that it requires the consumption in solid-shooting mines of nearly one pound of powder for every ton of coal produced, the results cannot be considered in any other way than as a condemnation of existing methods.

"In the thick coal seams of the State, furnishing 73.3 per cent. of the total product used, powder or some other explosive equally powerful, will be necessary in the process of extracting coal, whether it is undercut before shooting or not. The question therefore resolves itself to the simple proposition, whether having in view the conservation of life and property, we shall continue to commit to incompetent and careless hands, the use of dangerous explosives, or provide, either by statute or mutual agreement, that only men specially educated and trained for such work shall be employed, whose exclusive duty it shall be to drill holes, charge and fire same. In commenting on this question in the 1906 coal report, in which such a plan was recommended, reference was made to the great and unnecessary expense entailed in the present promiscuous use of powder. On the assumption that fully one-half of the powder consumed was practically wasted, a loss that could be avoided under the proposed plan, in addition to the saving of lives and the production of a better quality of coal, it was estimated that nearly one million dollars could be saved annually to the miners.

"So terrific have been some of the explosions in our coal mines, that, had they occurred while the usual complement of men were at work, not a single life would have been spared. It was the consideration of such a possibility that induced the legislature to enact the shot-firers law, effective July 1, 1905. The law was, and is, subject to the fair criticism that it transferred the responsibility from the man who prepared the improper shot to the man whose duty it now is to fire the shot. The friends of that law could not do otherwise than admit the truth and force of such an objection; but in answer thereto, they set up the justifiable plea that if the lives of men had to be sacrificed in such work, it was the part of wisdom to expose the least number possible to the deadly fury of the blast.

"Taking the years from 1903 to 1908 inclusive, three years preceding and three years succeeding the enactment of the shot-firers law, it is found that the loss of life directly due to the use of powder is nearly 40 per cent. less during the three-year period that the law has been in operation, during which time there has been a material increase both in the tonnage and in the number of men employed. It was

the intention of the law to protect the shot-firer in his refusal to fire shots which in his judgment, were dangerous.

"The causes from which many shot-firers have lost their lives, indicate either that many of them were selected without considering their qualifications for such employment, or that their judgment was defective. No matter what the cause, whether bad judgment on the part of the shot-firers or undue haste in the discharge of their duties; or a desire not to offend miners whose shots were not properly located or prepared, the law has not been given a fair trial. The deaths in most instances resulted from the firing of dead holes, which is strictly forbidden by the law.

"If the enforcement of the law had been intrusted only to men particularly equipped for that kind of work, the percentage of loss would have been considerably less.

"Of the 29 fatalities reported this year as a result of using powder, 14 were shot-firers, and 15 miners; seven of the miners lost their lives in an ignorant and unlawful effort to prepare shots, which is an additional reason why some plan should be adopted that would entirely divorce the present class of miners from all connection with deadly explosives.

"In the general classification of fatal accidents, it is noted that of the 183 fatal accidents this year, one-half, or 49.7 per cent. resulted from falling roof and coal at the working faces of rooms and entries. Mine cars account for 35, or 6 more than are due to the use of powder. No amount of legislation can make absolutely safe the business of coal mining. The occupation, by its very nature, is hazardous, and accidents from one cause or another will continue to occur. In respect to the accidents resulting from falling slate and coal, many of them are due to carelessness and therefore, are preventable.

"The statement that 'familiarity breeds contempt' is as true of danger as of other things. Men whose occupations expose them to a certain class of known risks, become indifferent and are willing at all times to take chances. It is this association with dangers and the natural disposition of men that swell the totals of our [illegible] lists. As a means of protecting our miners from themselves, it has become the custom recently in certain coal mining districts for companies to employ what is known as [illegible], whose duty it is to visit men while at work, and when they [illegible] places, to insist upon the [illegible] dropping them without delay. A [illegible] reduction in the [illegible] of accidents from such causes in those districts has resulted, and the general adoption of such a practice in the State would doubtless have a most salutary effect. Men who have followed the business of coal mining, know how natural it is for those, who while [illegible] of a bad roof in their eagerness to complete some other work, will defer propping it only to be caught in its fall later on. If it only cripples him, he becomes a charge upon his family and friends during recovery; if it proves fatal, a widow and perhaps a number of orphan children suffer and pay the penalty of parental carelessness.

Summer Meeting of the Coal Mining Institute of America

EDITORIAL CORRESPONDENCE

The Coal Mining Institute of America, held its regular midsummer session at Punxsutawney, Penn., June 29-30, July 1. More than 100 members were present from Pennsylvania and adjacent States. The afternoon and evening of the first day of the session were devoted to the reading and discussion of the various papers.

The most animated discussion followed the reading of Mr. Campbell's paper on "The Pyrometry of the Beehive Coke Oven." There was also considerable comment following Mr. King's paper entitled, "The Sociological Side of Coal Mining." This latter discussion centered principally on the question as to the best plan of regulating the liquor problem in coal mining camps. Mr. King presented figures to support his argument that by placing a limitation on the amount of liquor supplied to each family, and by offering inducements in the way of better houses to those miners whose alcohol record is cleanest, the consumption of alcohol in a mining town can be materially reduced. Some of the members present contended that there could be no such thing as a well regulated saloon, and that the manager of such an establishment is sure eventually to consider only the money that can be made, and neglect to act in a restraining manner when such a course would be advisable. It was further argued that when miners meet in a saloon, the intermingling of so many nationalities is not beneficial, and often leads to greater disorderliness than is the case when liquor is furnished separately to each family.

It seldom occurs that those who arrange for the entertainment of a convention such as this, succeed in preparing such an enjoyable program. The second day of the meeting was devoted to a visit by special train on the Buffalo, Rochester & Pittsburg Railroad and the Buffalo & Susquehanna Railroad to mining plants in Indiana and Armstrong counties. The train on which the trip was made, had a café car attached, and from the moment the whistle blew at the beginning of the journey, there was no occasion for any member of the party to go hungry. Stops were made at the Iselin, Ernest, Juneau, Sagamore and other important mines, so that the institute members could carefully inspect the elaborate installations that are now located in this field.

On the third day of the session the party made visits by automobiles to mining plants in the vicinity of Punxsutawney and Du Bois, Penn. These mines are older and less modern operations than the plants visited the day before. The number of applications for membership was unusually large, and the meeting as a whole was one of the most instructive and pleasant yet held.

To fill the vacancy created by the death of President B. F. Jones, the Institute elected H. H. Stoek of Scranton, Penn., as president; Mr. A. W. Calloway of Punxsutawney, was elected first vice president to succeed Mr. Stoek.

This brief summary of the meeting would be incomplete if we failed to recognize the excellent work of the reception committee of which Mr. Calloway was chairman. The arrangements for the entertainment of the guests could hardly have been improved upon, and it is certain that the program was so varied that none of the members present can complain of a dull three days.

The Efficiency of Sprinkling

On Nov. 15 of last year, a disastrous mine explosion occurred at the Radbod mine in Germany. At the time of the explosion many authorities claimed that dust was the destructive factor, and that since this mine was watered at regular intervals, the accident went to prove the inefficiency of such a system of sprinkling. It now appears from a more careful examination, that the explosion was due to gas rather than to coal dust. One engineer, who is an advocate of the sprinkling system in mines, defends the watering system used at the Radbod property by stating a number of facts that seem to prove the gas theory. This authority says that fires occurred in different parts of the mine, indicating that the heat developed by the explosion was greater than is usually the case with coal-dust explosions. Also that during the flooding of the mine 10 days later, there occurred a second powerful explosion which could only have been a firedamp explosion. He says that these circumstances force the conclusion that the initial explosion was caused by a sudden great outbreak of gas. In contradicting the argument that such sudden appearances of great quantities of gas have never taken place in Prussia, the same authority mentions that since the accident in Radbod, a sudden outburst of gas has occurred in another mine in the same district. An explosion in this latter case was only prevented because the sudden pressure of air extinguished all the lamps which were in the district affected.

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Selling a Mine

At the recent meeting in London of the Oroya Brownhill Company, Ltd., to which we referred recently, Herbert C. Hoover, the managing director and well known engineer, made some illuminating remarks respecting the purchase and sale of mines. His company for a long time has been searching for a new mining property. It was early decided not to undertake ventures of a highly speculative order, but rather to secure a property possessing some commensurate value in actually exposed profits. "There is no scarcity of mines in London for sale," said Mr. Hoover. "There are always two difficulties that confront one in dealing with these; the first difficulty is the price, and the second difficulty is to find out the truth about the property." Mr. Hoover then gave some figures from his recent experience which we reported fully a fortnight ago. In brief, out of 680 properties looked over, 550 were quickly rejected, 20 were exhaustively examined, three were taken under working options and one was purchased. These figures are admirably illustrative of the half-baked condition in which the majority of mining projects are presented, and of the exaggerated terms that are generally asked.

The ordinary vendor fixes his price upon his idea, generally fanciful, of what he would like to get; not upon any well defined idea of what his property is actually worth. In one way and another this results in a frightful waste of money. The misguided vendor fritters away time and traveling expenses; the mining houses are put at great expense in winnowing out the chaff from the wheat; worst of all, some of the projects rejected by qualified promoters fall into the hands of the ignorant and unscrupulous who take them up as means for parting the unwary part of the public from its money.

Fortunately conditions in this respect are not now so bad as they used to be. The spectacular misadventures and swindles, like the sale of the Emma mine back in the '70s, have steadily been becoming fewer. This is, of course, as it should be, marking a progress in knowledge and experience. Nevertheless, we are still very far from reducing mining to a strictly business basis. Ninety per cent of the consulting mining engineers still deplore that the chief demand for their services is from clients who need them to act as a doctor for a moribund mining venture.

The direction for improvement in this phase of the industry lies in closer coöperation between the owners of mining property and the mining engineers. Under present conditions, it is seldom satisfactory for an engineer to undertake an examination and report in behalf of a vendor. Some engineers announce that they decline that kind of work. This is often taken to imply that they consider the undertaking of such work to be discreditable. As a matter of fact, there is nothing discreditable about it; and an honest engineer may make a report for an honest vendor without any loss of prestige, and generally to the advantage of both concerned; the declination of some engineers to enter upon such commissions is based, we believe, rather upon the desire to avoid unpleasant features that too often arise.

John Hays Hammond has been criticized for some of the advice that he has lately been giving to mining students in commencement addresses. He may have unduly emphasized some of the commercial features of the mining industry, but nevertheless we are disposed to think that on the whole he has been giving good advice. In a recent address at the Colorado School of Mines, he made the following remarks "For many years I have strongly advocated the evolution of the engineer and expert into that of the 'mining man.' There is now interposed between the mining engineer and the investors a class of men known as promoters. To what I regard as the butting in of these mine promoters I ascribe the failure of many mining enterprises. These promoters are, as a rule, men who have but a superficial knowledge of mining. Indeed, many of them have been failures in other walks of life, and have gone into this vocation because of the fact that it presents unusual opportunities of getting rich quickly. Not only are the majority of men in this class incompetent and ignorant about mining matters, but they are very often unscrupulous as well. But here let me say that I recognize the fact that there are among these mine promoters many men who have a fairly good knowledge of practical mining, and who possess undoubted integrity. I should like to see the mining engineer acquire such a knowledge of business methods as to enable him to take the place of the mine promoter. This would prevent overproduction, so to speak, on the

part of the mining schools of the country, which are annually turning out hundreds of mining engineers. It would also insure that mining investments would be placed upon a more conservative basis, thereby greatly minimizing the risks of such investments. To the engineer who in that way becomes the mining man to whom I have referred, an interesting and remunerative field for his professional activities would be opened." We may add that there would be also a better protection of the investor and an increase in the prestige of the mining industry.

The Lackawanna Plan

The Delaware, Lackawanna & Western, one of the larger anthracite-carrying companies, meets the Supreme Court establishment—and limitation—of the commodities clause of the Interstate commerce law by a device which has some elements of novelty. The law, as interpreted by the court, prohibits railroads from carrying coal which they own; but it cannot prevent them from mining coal or selling it, as long as they do not own it at the time it is carried over their lines. Most of the anthracite railroad companies mine their coal through the medium of a subsidiary company and do not, therefore, come under the law. The Lackawanna has always owned and mined its coal without the intervention of another organization. It was, in fact, a coal company in the first place, its original railroad having been built solely for the purpose of carrying its coal to a market.

The company does not transfer its mines, doubtless seeing some advantage in continuing to work them and to hold its original Pennsylvania charter. It has organized a coal-selling company, which will buy all the coal as mined, and will have charge of its sale. It will pay transportation charges to the railroad, and will, therefore, be the owner of the coal while in transit, thus complying with the strictly legal requirements. It is worth noting that the contract provides that the purchasing price shall be 15 per cent. of the tidewater selling price of coal, which is the rate at which the anthracite companies have been paying the coal mined by the individual operators. The selling company will start with a large working capital, having $6,800,000 stock, paid for in cash. This stock will not be held by the railroad company, but will be sold to the stockholders; provision against a possible—but quite improbable—future change of ownership being made by a clause in the contract which allows the railroad company to terminate it on brief notice.

It may be added that the Lackawanna company thoughtfully provided its stockholders with means to buy the coal stock by declaring a cash dividend of 50 per cent. The announcement sent its stock on the Exchange to the record price of $680 per share, though very little of it is for sale. Few companies have the ability or the disposition to treat their shareholders so liberally.

The Steel Corporation and the Amalgamated Association

The strike which began on July 1 in the union plants of the American Sheet and Tin Plate Company—a subsidiary of the United States Steel Corporation—is notable as being the first serious difference between the Corporation and organized labor. The strike on the Mesabi iron range two years ago may perhaps be considered an exception; but that was on a wholly different basis and was not directed especially against the Steel Corporation mines, nor was it really a rational, well organized movement.

The Amalgamated Association of Iron, Steel and Tin Workers, which is concerned in the present strike, is one of the oldest labor organizations in the trade, and has generally been managed on rather conservative lines. It has lost something of its importance through the substitution of steel for wrought iron, as it was originally an organization of puddlers; but it still controls a great majority of the skilled workmen in a large and important branch of trade. The American Sheet and Tin Plate Company makes between 60 and 70 per cent. of the products which its name implies in the United States. The greater part of its works were union plants, in which wages were controlled by the yearly agreements made with the Amalgamated Association, but it has had also non-union plants in which the men were not members of the association, though they usually worked under the same wage scale. The union scales have run for the year ending June 30, and were settled each year in conferences between the employing companies and representatives of the union.

Late last the American Sheet and Tin Plate Company announced in advance that it would hold no conference, but that after July 1 all of its plants would be run on the nonunion or open-shop plan. No reduction in wages was announced, so that the question presented turned entirely on the recognition of the union. The other parties dealing with the union are the Western Bar Iron Association, an organization of a number of independent bar-iron makers; the Republic Iron and Steel Company, which has extensive plants in the East and South, and some independent tinplate plants in Pennsylvania and Indiana. With the Western Bar Iron Association and the independent tinplate makers the Amalgamated Association has already made a settlement for the coming year; while its officers are in conference with the Republic company, the prospect being that an agreement will be concluded without any serious difficulty. The strike now begun is, therefore, only against the American company—that is, the Steel Corporation. As previously said, it does not turn on the question of wages, but entirely on the recognition of the union.

The important point is whether this presages—as many observers think it does—an intention on the part of the Steel Corporation to bar all organized labor. The management of the Amalgamated Association has been for the most part conservative and reasonable and it has not made for exorbitant wages and for constant trouble, like some of the miners' unions. A fight between the Steel Corporation and organized labor would be of national importance.

THE NOTES ON the German Potash Syndicate given on another page are to be taken with a certain amount of caution as they are possibly rather more sensational than the situation warrants. Nevertheless they are believed to be substantially correct in outlining the conditions. It is not quite clear what American interest is at present concerned in the proposed purchase of one of the large potash-salt mines. It is known, however, that one fertilizer interest in this country holds an advantage of value under its existing contracts, and it is not at all extraordinary that others should try to secure a similar one. The potash industry, with its practical monopoly of production, is a very valuable one to Germany, and it is readily understood that the Germans will try to hold it; but the suggestion of a high export duty is hardly credible.

German Potash Syndicate

According to recent press despatches Germany's most powerful industrial combination, the potash syndicate, which controls the world's supply, is on the brink of disintegration as the result of American enterprise. The members of the syndicate were in conference in Berlin for the last two weeks in June, debating terms for a renewal of their pooling arrangement, which expired June 30. The syndicate's rules provided that if a renewal had not taken place by July 1 the individual members should have the right to make sales regardless of the combination's schedule.

At 2 o'clock the morning of July 1 a bombshell was dropped into the meeting, which was still in session at the Hotel Adlon, by the owner of the Sollstedt mine, one of the largest in the combination, who announced that since midnight his property had passed into the possession of the American Agricultural Chemical Company. This transfer meant that Americans, who are by far the largest foreign consumers of German potash, would no longer submit to the extortion the syndicate had hitherto been able to practice by reason of its absolute monopoly.

This announcement spread the utmost consternation. The Prussian government, which was a leading member of the combination, led a movement to resort to prompt and radical extremes to block the Americans' game. Its first proposal is to nullify the American coup by inducing the Imperial government to impose an export tax of 100 per cent. on potash. This obviously is more or less of a bluff, as such a tax would automatically deal a heavy blow to the Germans themselves.

Efforts are now afoot to renew the combination for another term of years, but the change in the ownership of the Sollstedt mine has thrown all negotiations into chaos. The syndicate adjourned its meeting for a week in the hope of inventing ways and means for circumventing the "American peril."

Later despatches state that the German potash syndicate has agreed to continue the existing mutual protective arrangement provisionally for one week in order to permit of further discussion with American interests. Beyond this nothing definite in the matter of selling potash property to Americans has been decided.

The latest despatch, bringing the news up to July 7, says: With the exception of one man all the members of the former potash syndicate and some new ones have signed a new mutually protective agreement. The exception is Waldemar Schmidtmann, proprietor of the Sollstedt and Ascherleben mines, who in 1907 made contracts to supply various American fertilizer concerns with potash for a term of 10 years. Herr Schmidtmann is considering whether he will derive greater advantage from joining the syndicate or remaining independent. The American agents here have been offered various potash mines, but as the prices are unsatisfactory, none of the negotiations has been brought to a conclusion.

Iron and Manganese Ore in Brazil

United States Consul-General George E. Anderson, of Rio de Janeiro, reports as follows concerning the iron- and manganese-ore deposits of Brazil:

Iron-ore Deposits

The Brazilian government has just transmitted a report, for the use of the authorities having in charge the preliminary preparations for the International Geological Congress, which meets next year in Stockholm, covering certain iron-ore deposits in the Republic, the result of a survey sent out for the purpose, with a special expert at its head; and although the text of this report is withheld, pending the use to be made thereof by the authorities for whom it was prepared, an outline of it has been secured by this office.

The examination of the deposits in Minas Geraes located 52 outcroppings of ore which was from 60 to 75 per cent. pure iron, free from all impurities which might interfere with its proper smelting. Of these outcroppings the expert selected nine of average size and quality, which he carefully surveyed and measured, calculating their contents at a little less than 1,000,000,000 tons of high-grade ore, on or near the surface and in situations permitting easy working and economical handling. On the basis of the surveys made the 52 deposits contain a little less than 6,000,000,000 tons of the highest-grade ore. In addition, loose high-grade ore was located to an amount as large as that found in the outcrops, the total high-grade ore located thus amounting to 12,000,000,000 tons.

As Brazil, for various reasons, will be unable to work these vast deposits, they have recently been visited by representatives of American and British syndicates with a view to making contracts for ore shipments, in the immediate future, from Rio de Janeiro or from Victoria, about 300 miles north of Rio de Janeiro. The only result of these visits, as far as known, is the completion of a contract between a part of one of the British syndicates and the Victoria & Diamantina Railway Company for ore shipments via Victoria.

Manganese Mining Industry Depressed

The exports of manganese ore from Brazil in 1908 were valued at $1,200,868 against $2,442,984 in 1907. The exports of the ore to the United States in 1908 amounted to only $140,648, as compared with $521,581 in 1907.

According to Brazilian newspaper reports, the high freight rates on ore shipped by rail to the seaboard are the cause of the depression, but as a matter of fact the high cost of production shares equally with the freight in causing it. When the exchange value of the milreis is low, manganese ore can be profitably mined, but when the exchange value rises to 30c., as at present, mining becomes unprofitable. Manganese ore is sold abroad at gold prices, while it is produced on a paper-currency basis. When an American dollar received for the ore was worth 4 milreis the gold cost of the ore was about 25 per cent. less than when the dollar was worth only 3 milreis, the paper cost remaining the same.

Waihi Gold Mine

Special Correspondence.

During the year 1908, this New Zealand mine produced bullion to the value of £930,511 from 393,214 tons, or an average return of 47.3s. per ton. The expenditure in New Zealand and London, including development work at the mine amounted to £381,392. Including the sum of £9023 for interest, there was a gross profit for the year of £558,141, being an increase of £27,230 over the profit made in 1907. The dividends paid during the year 1908 amounted to £371,930, or 15s. per share, besides which there was a bonus of 2s. per share recommended for payment at the close of the year, making a total distribution of 17s. per share. The present price of the shares is about £9 2s. 6d., at which price the return equals 9.3 per cent. The ore reserves on Dec. 31, 1908, were estimated at 1,329,872 tons, being somewhat larger than at the corresponding date of the previous year. In order to have reserve pumping capacity a new installation is being made, consisting of two 750-h.p. Crossley gas producers, two 368-h.p. gas engines and two electrically driven three-throw plunger pumps with a capacity of 1500 gal. per min. The power plant will be erected at No. 5 shaft, and the power transmitted electrically to the pumps at No. 4 shaft when needed. When not required for pumping the power will be used for driving air compressors and other machinery at No. 5 shaft. The revenue account has been charged with the whole of the capital expenditure on new plant during the year, amounting to £41,511, as well as with the sum of £30,374 for depreciation of plant and machinery. No sinking has been done in any of the shafts during the year. The mine has six shafts, the deepest of which is No. 5, 1020 ft. The assay value of the ore treated averaged 54s. 10d. The average yield was 47s. 3d., making an average recovery of 86 per cent. The development of the mine continues to be of a satisfactory character.

Geology of the Manhattan District, Nevada

Prevailing Rocks are Metamorphic Shales, Quartzites and Limestone of Pre-Cambrian Age; Little Faulting after Deposition of Ore

BY WALTER P. JENNEY*

The geological structure of Manhattan district is comparatively simple; especially is this true when it is contrasted with the highly complex ore-bearing formation of other mining camps in Nevada. The prevailing rocks are metamorphic shales, quartzites and limestone of pre-Cambrian age. Along the northern side of the district there is a broad belt of volcanic rocks that were mainly erupted during the Tertiary. Notwithstanding that the Toquima range is largely made up of volcanic formations, it is seldom that igneous rocks are found within the sedimentary area described. It will be shown, however, that an intimate relation exists between these late Tertiary volcanic disturbances and the formation of the ore. The sedimentary strata are strongly folded and upturned, and in places are heavily faulted. Most of this faulting occurred prior to the formation of the deposits. It is rare in the mines of Manhattan that faults are encountered cutting off the ore, or disturbing the continuity of the veins.

The Toquima range has been repeatedly subjected in its past history to erosion, so that in places only a remnant of the sedimental strata remains. These successive erosions afford evidence that gold-bearing quartz veins have been formed at distinct and widely separated periods in the geologic history of the district. The coarse gold, in rounded grains or water worn nuggets in the deep placers of lower Manhattan gulch, is different in the appearance and character, in the relative proportion of gold to silver, and in the associated quartz, from the crystalline gold, derived from the wearing away of the later formed veins.

Examined more particularly, it is seen that metamorphic shales occur in great variety in the district; that the broad belts of silicious shales are commonly barren, or only carry small or low-grade deposits of ore; while the calcareous, or lime-shales, associated with belts of crystalline limestone, are more favorable to the occurrence of ore-bearing quartz veins. In a different way, the thick strata of quartzite which occur interbedded with the limestones and shales, are frequently altered to massive quartz; but from some cause do not carry gold in quantity sufficient to admit of economic extraction. In places, however, the quartzite carries workable ore at the contact with strata containing lime. The highly favorable nature of limestone, as a wall-rock of the veins, is strongly marked throughout the district, the deposits of ore being more regular and continuous, as well as more uniform in their content of gold, wherever the veins occur in limestone. Often a vein will be found to pay where it traverses rocks containing an excess of lime; but on entering silicious shales or quartzite, becomes barren, or only carries occasional small deposits of ore. It is this ore-bearing character of these lime-belts, which has caused them to be regarded as mineral zones or lodes, similar in their nature and structural features to the lead-silver lodes of limestone at Eureka, Nevada, and certain silver mining camps in Utah and Idaho. The most favorable limestones for ore are coarsely crystalline pure carbonates, which are readily soluble in surface waters and have, in the deposition of the ore, been readily replaced by silica and converted into quartz. Such a lode or belt of mineralized limestone and lime shales follows in its outcrop the crest of Litigation hill and extends through the Manhattan Consolidated property.

A small mud-dike, of volcanic origin, has been developed in the mine-workings on the Katie and Silver Pick locations; it courses northeast-southwest, dipping steeply to the southeast, and cuts at an acute angle through the Consolidated vein, near the main shaft. It is known as the "mud vein" and appears to be a local occurrence.

In the age of the ore-bearing formations, and in some of the peculiar features of the occurrence of ore, there is a resemblance of Manhattan to the mining district of Marysville, Montana, where are situated the Drum Lummon, Penobscot and other noted gold and silver mines.

The Lodes and Veins

The ore-bearing fissures are naturally separated into two systems; (1), the east and west fissures, which are the result of a strong fault movement imparting to them certain of the characteristics of fissure veins; and (2), the north and south cross fissures, or verticals, of more recent formation than the veins of the first system. Further, the cross fissures are far more numerous than the veins, and are commonly of less breadth; they occur in belts, irregularly distributed over the district, are parallel in course, and nearly vertical in attitude. The intimate association of these fissure systems, crossing and intersecting one another, with the belt of limestone and calcareous shale described causes the ore formation, viewed as a whole, to resemble in some of its features, a mineral-zone or lode. The manner in which the deposits of ore have been confined in their formation to this zone of lime-bearing rocks, further supports this view, that from the standpoint of the miner, the limestone is the lode.

The ore formation is more readily understood if we consider the systems of fissures separately and then discuss their relation in connection with the lime-zone, and its influence upon the deposition of the ore. A prominent lode of this first system traverses the Manhattan Consolidated ground and extends westerly into the Earl and Dexter-Union properties, on Litigation hill. In places it cuts the sedimentary strata on both strike and dip, although the fissure more often displays a tendency to follow the bedding of the limestone, and especially the contacts of the limestone with the shale; only locally is the vein found to leave the limestone and extend into the shale. Its general course is near true east and west, swinging more northwesterly as it enters Litigation hill. The dip is south, at an angle of 40 to 45 deg., comformable to the beds of the enclosing strata. The breadth of the fissure, and the ore as well, varies with the nature of the inclosing strata; where shale forms the walls, the fissure is contracted, opening out as the vein traverses the limestone, or follows the plane of contact of the limestone and shale. As far as explored, the fissure is 4 or 5 ft. wide, expanding in the orebodies and in favorable ground, to a breadth of 25 to 30 ft. It is seen that whatever may have been the width of the fissure when originally formed, the expansions of the vein have been caused by the water, which deposited the quartz and associated minerals, eating out the walls and converting the rock adjacent to the fissure into ore. The size of the vein is thus dependent upon the composition and nature of the special stratum of rock traversed, being largest in soft crystalline limestones, rapidly dissolved by the mineral-depositing waters, while in hard dense rocks, high in silica and containing little lime, the vein is narrow, no wider than the fracture, for in such places the waters circulating through the fissure had but slight effect upon the walls. Commonly in depth, the gangue or vein rock is dark, bluish gray quartz; near the surface it oxidizes to a rusty-brown quartz, colored by the

NOTE—Taken from report of April 5, 1909, on the property of the Manhattan Consolidated Gold Mines Company of Nevada.

*Mining engineer, Salt Lake City, Utah.

large proportion of iron in the ore. It is largely the result of the replacement of the lime-shale and limestone, by the up-flowing heated waters depositing silica; the rock being converted particle by particle into hard, crystalline quartz; as a particle of lime was dissolved, a particle of silica took its place, a process somewhat like the silicification of wood, buried in volcanic-ash or gravel beds, in its gradual alteration to agate. The intense dynamic movement creating the fissure, crushed and ground the rocks between the walls to a fine, angular breccia; subsequently, in the deposition of the ore, this brecciated material was completely silicified, the rock fragments being altered to dark quartz, cemented by a matrix of lighter colored crystalline quartz. Thus in some parts of the vein, the material filling the fissure was in great measure produced by the grinding of one wall upon the other during the fault-movement, and subsequently silicified. In other places the limestone included in the lode still preserves its bedded structure, notwithstanding that the rock has been changed to quartz; especially is this true where the silicification has extended beyond the walls of the original fissure. At the Earl incline on Litigation hill, and in the surface workings on an extension of the vein into the Silver Pick ground; the fissure is regular in width, with smooth or polished walls. The vein rock is also different, being white crystalline quartz, often cellular and crumbling from the oxidation and removal of the pyrite; a mineral structure frequently seen in fissure veins.

Deposition of the Ore

In the deposition of the minerals, at first quartz alone was formed; but as the mineralization proceeded, gold and the associated sulphides, pyrite, arsenopyrite, etc., were deposited together with quartz. Two distinct periods of ore deposition may be distinguished: the early silicification, with the precipitation of the included suphide, and a late mineralization forming high-grade gold quartz in the cross-fissures and enriching the orebodies in the east and west lode at the crossings, or places of intersection. The early deposition took place through the east and west fissure, the up-flow of a large volume of heated waters forming the great masses of quartz in the lode; the more recent enrichment occurred through the cross-verticals, the minerals being brought up from below by the intensely heated vapors and emanations, that deposited quartz and fluorite, with free gold. Owing to the nature of this later ore formation, the quartz deposited at that time is relatively small in quantity compared with the earlier formed bodies of quartz; but is remarkably rich in native gold. Beautiful specimens of crystallized gold, fluorite and quartz are found in these north and south fissures at Litigation hill. Some of the larger verticals carry gold, sufficient to pay for extraction across the breadth of the zone of limestone and shale. The larger deposits of gold quartz, however, occur in the east and west vein where it is crossed by these verticals. Not only is the orebody enlarged at such spaces of intersection, but the content of gold is notably increased. Further the pitch of the ore, or the inclination of the shoot, in its descent in the lode, is seen to conform to the inclination of the common line of intersection of the two systems of fissures.

The breadth of the mineralized zone of interbedded limestone and calcareous shale has not been determined by exploration; a single stratum of limestone is crosscut in the Consolidated mine workings for 100 ft.; along the crest of Litigation hill, the outcrop measures more than 250 ft. in width.

Most interesting is the part played by the limestone in the deposition of the ore; great masses of limestone have been dissolved by the heated waters and vapors, and the substance of the rock carried away in the run-off, where the lode broke to the surface. The chemical activities set free in the creation of the orebodies have removed the soluble lime and formed quartz in its place. In truth it may be said that the lime of the country rock has precipitated both the metals and the gangue. For this reason ore deposits are largely confined to the zone or belt of rocks containing an excess of lime. Further, the principal fissures course easterly and westerly and conform more or less perfectly to the bedding of the limestone and shale. Another reason is that the fissures are tight and pinched to a thin seam, in traversing the quartzites and silicious shale; but open out in the limestone. Within the lime zone the fissures are enlarged by the circulating waters attacking and eating away the walls; even the narrow verticals are enlarged in this way, and in favorable places carry workable ore deposits.

The union of these systems of fissures, the east and west master-fissure with the cross-verticals, together with their intimate association with the belt of limestone and shale, has made the great mineral zone or lode, traversing the Manhattan Consolidated ground. How the large bodies of gold-bearing quartz in this lode were deposited at an early period, and at a later date reinforced and enriched by a second mineralization, has been described. The lode or mineral zone extends through the full length of the Silver Pick claim a distance of 925 ft.; in its descent into the ground, the dip of the lode, which is to the south, is largely covered by the Keystone and Red Boy claims

The Ore Deposits

Wonderfully varied are the forms in which ore deposits are found in limestone. The controlling conditions are observed to be the permeability of the rocks, dependent upon the degree of disturbance and fracturing that they have undergone, and their relative solubility in the solutions and gases that brought in the minerals. In hard, difficultly soluble rocks, the ore is confined to the fissures and does not extend into the walls; under such conditions the deposits occur in shoots, like those of fissure veins. In soft, easily soluble limestone, crushed by even small crystal-movements, the fissures are more or less enlarged by the solvent action described, and the ore makes into the walls; local expansions are often produced by the intersection of the master fissure by cross fissures, which shatter and break up the beds, admitting the free and wide spread circulation of the depositing waters; which, introduced through an open crevice, escape and penetrate the adjacent strata. In some instances, great blocks of limestone are crushed and brecciated by some dynamic movement of the earth's crust, and such breccia masses, penetrated by the fissures and cross fissures, were converted into bodies of ore by the slow and long continued circulation through the interstices in the crushed rock, of a vast volume of mineral-bearing waters that dissolved and carried off the lime in solution and deposited the ore in its place. The size of the orebody produced was limited only by the extent of the brecciation within the zone, the volume of the mineral-forming solution and duration of its flow. Ore formations of this kind merge into chamber deposits; the ore filling cavernous spaces eroded in the limestone.

Owing to concentrative deposition in the lode, around centers of upflow of the mineral-forming waters, and to the nature of the chemical processes involved in their generation, deposits in limestone, though so varied in form, are characterized by clean and often large bodies of ore of uniform grade. When the deposits are of large size, the work of extraction may be planned in advance, with substantial reduction in cost; even where the ore is confined to the fissures, it is cheaply mined.

By the decree of April 30, published in the *Diario Oficial* of May 12, 1909, the importation of machinery, implements and materials for the prospecting and exploitation of mines and the installation of metallurgical works in Uruguay is made free of duty for a period of 10 years. Persons desirous of taking advantage of the above concession must apply to the executive, indicating the character and quantity of the materials to be imported. The cost of verifying the above information is to be charged to the importers.

In 1908 the North American Lead Company, of Missouri, began producing cobalt oxide and turned out, according to THE MINERAL INDUSTRY, [illegible] pounds

The Position of the Electric Furnace

By P. McN. Bennie*

This paper reviews in general the progress and present position of the electric furnace in the manufacture of iron and steel. The conclusions arrived at are of interest.

Uses of the Electric Furnace

First, as to high grade steel, the electric furnace is rapidly becoming a serious competitor of the crucible method, for the simple reason that it is less expensive. Against a high cost of labor, crucible renewals and the fact that steel must be melted in small units, we have a lower labor cost, small cost for refractories, and the possibility of handling several tons of metal of uniform composition.

Second, as to steel for structural and rail purposes, the electric furnace is so far only asking recognition as a useful adjunct to existing apparatus, for doing additional refining or treatment in an economical and expeditious manner. Not a rival, but an ally, in the general siderurgical scheme.

Third, for steel castings the electric furnace cannot compete with open-hearth castings, but for a grade somewhat better, where additional refining would be required, the electric furnace has decided advantages. For castings of crucible quality the electric-furnace methods will give satisfactory results at less cost than crucibles. In addition, for heavy castings the larger quantity of metal which can be treated as a unit is of much importance.

Temperatures and Quality

It is undoubtedly a fact, to which all who have seen an electric-steel furnace in operation will bear witness, that higher temperatures are at the command of the metallurgist than heretofore. Generally speaking, refining operations can be carried on more rapidly and thoroughly with higher temperatures. Whether any substantial good is accomplished by additional refining, must be left to the steel makers, when they shall have come to agreement among themselves as to that point. I heard it said recently by a metallurgical engineer that product with just as good analysis could be made in any ordinary furnace as in the electric furnace. The truth of this contention is granted, but not the implied conclusion that analysis is the whole story. Given a choice between two steels of identical price and analysis, one of which is known to be the product of the crucible process and the other of the open-hearth process, would any engineer hesitate?

As to the electric furnace, it can produce an improvement in quality, worth more than the increased cost, its future is assured. All electric steel furnaces work under basic conditions, even those used for tool steels. It has been found in Germany, for example, that steel is improved by simply putting it into an induction furnace, leaving it there for an hour or two, without attempting any refining by slags, meanwhile supplying only sufficient energy to maintain the temperature. It is believed that this gives dissolved gases an easy opportunity to escape.

Probable Improvements

To sum up, the following improvements in electric furnaces may be looked for:

1. Electrodes of larger size and quality that will reduce the present consumption per ton.

2. Refractory materials superior to those now in use, and probably themselves the product of electric furnaces, such as fused alumina and other refractory oxides. In electric furnaces where an arc is present there is considerable vapor formed by volatilization of silicon, calcium, calcium oxide and even iron itself, which vapors are very active chemically, attacking the walls and roofs of the furnace. The destruction of the roof in electric furnaces is probably due as much to these vapors as to the high temperatures.

3. Increase in size and capacity of furnaces. Keller can now build furnaces for treating molten steel with a capacity of 10 to 12 tons. Robert Turnbull, Dr. Heroult's engineer, is confident that 15-ton furnaces present no difficulties whatever.

Production

For the first time electric-furnace steel was reported in the German returns of production for 1908. The amount was 20,000 tons. When it is considered that electric furnaces charged with molten metal are good for 10 heats daily it will be seen that with a total daily capacity of from 100 to 150 tons of steel the electric furnace may fairly be said to have emerged from the metallurgical nursery.

Note. Abstract of paper read before the Engineers' Society of Pennsylvania, published in the Iron Age, New York.

*Metallurgical engineer, Niagara Falls, N. Y.

Rhodesia and the Chartered Company

Special Correspondence

The report of the British South Africa Company for the financial year ended March 31, 1908, records an improvement in the condition of Rhodesia, and is the most favorable report that the company has yet issued. In southern Rhodesia for the first time the administrative expenditure has been met by the revenue, a small surplus being shown in the accounts. The provinces of Northeastern Rhodesia and Northwestern Rhodesia are administered at a loss. The Chartered Company had to provide £280,000 for interest on the debentures of railway companies, but it is anticipated that for the year ended March, 1909, the net shortage owing to increased traffic will not exceed £180,000.

Arrangements have been made for the main line from the south to be extended to the Congo frontier and for an extension to the Star of the Congo mine. The second mortgage debenture stock offered to the shareholders in March, 1908, was subscribed for to the extent of £981,069. An application made to the Imperial Government for relief in connection with the financing of new railways was refused. In the memorandum submitted to the Imperial Government by the British South Africa Company, attention is called to the large sums that have been spent by the Chartered Company and its allied railway companies in opening to civilization a large area of Africa which, 20 years ago, was in a state of barbarism. The British South Africa Company has spent £11,000,000 of capital, and the railway companies about the same amount, so that altogether the cost of conquering and civilizing Rhodesia has been about £22,000,000.

A favorable report in the report is the statement that there has been a net increase of 1100 in the European population since the census of September, 1907, when the number of Europeans was 14,018. The company sent representatives to the South African National convention to discuss unification with the four self-governing colonies: Cape Colony, the Orange River Colony, Natal and the Transvaal. Provision was made in the draft of the bill to be submitted to the Imperial Parliament for the inclusion of Rhodesia in the union at some later period.

Protective Screen for Zinc Furnaces

Emile Dor-Dellattre proposes in U. S. Pat. 921,375, May 11, 1909, an arrangement for protecting operatives of zinc and analogous furnaces from heat, fumes and dust, without impeding the progress or rapidity of the operations. A movable screen is used with several panels, each being formed of three thicknesses of sheet iron; between the first and second plates is a layer of hard asbestos, and between the second and third is an air space. The screen is raised by a hydraulic ram, and by inserting steel pins in the furnace frame through the holes in the panels, any row of retorts can be uncovered while all the others remain covered. Above the movable screen is a fixed screen, behind which the former can be raised. When the movable screen is lowered, the space at the back of the fixed screen is connected with an exhaust system for the withdrawal of fumes, dust, heat, etc.

New York produced 70,730 short tons ($607,900) of chrome talc in 1908.

New Publications

PROCEEDINGS OF THE AMERICAN MINING CONGRESS, ELEVENTH ANNUAL SESSION, 1908. Pp. 268. 6x9 in.; paper. Denver, 1909: American Mining Congress.

SECOND ANNUAL REPORT OF THE RAILROAD COMMISSION OF WISCONSIN, FROM JUNE 30, 1907, TO JUNE 30, 1908. Pp. 1229. 6x9 in.; cloth. Madison, Wis., 1908: Railroad Commission of Wisconsin.

BIBLIOGRAPHY OF THE GEOLOGY, MINERALOGY AND PALEONTOLOGY OF BRAZIL. By John C. Branner. Bull. of the Geological Society of America, Vol. 20. Pp. 132. 7x10½ in. New York, 1909: Published by the Society.

SUMMARY REPORT OF THE GEOLOGICAL SURVEY BRANCH OF THE DEPARTMENT OF MINES FOR THE CALENDAR YEAR 1908: Sessional Paper No. 26. Pp. 220. 6½x10 in.; paper, 15c. Ottawa, 1909: Printed by C. H. Parmelee.

MINERAL RESOURCES OF THE KOTSINA-CHITINA REGION, ALASKA. By Fred H. Moffit and A. G. Maddern. U. S. Geological Survey, Bull. No. 374. Pp. 103, illustrated. 6x9 in.; paper. Washington, 1909: Government Printing Office.

RESULTS OF PURCHASING COAL UNDER GOVERNMENT SPECIFICATIONS. By John Shober Burrows; with a Paper on Burning the Small Sizes of Anthracite for Heat and Power Purposes. By Dwight T. Randall. U. S. Geological Survey, Bull. No. 378. Pp. 44. 6x9 in.; paper. Washington, 1909: Government Printing Office.

SOME CENTRAL IDAHO GOLD DISTRICTS. By S. P. Jellum. Pp. 84, illustrated. 7x9½ in.; paper, 50c. Spokane, Wash., 1909: The Northwest Mining News.

Contents: Early discoveries. Geography, Topography and Geology. Lolo Mining District. Pierce City District. Newsome District. Elk City District. Oro Grande-Fourmile District. Buffalo Hump District. Dixie Mining District.

INVESTIGATION RELATING TO IRON AND MANGANESE BY THE UNITED STATES GEOLOGICAL SURVEY IN 1908. By E. F. Burchard, E. C. Harder and Sidney Paige. U. S. Geological Survey, Bull. No. 380-E. Pp. 115, illustrated. 6x9 in.; paper. Washington, 1909: Government Printing Office.

Contents: Estimates of Clinton Iron Ore in the Chattanooga Region. Taylor Peak and White Pine deposits, Colorado. Hanover deposits, New Mexico. Iron Ores of the Appalachian Region in Virginia. Manganese deposits of the United States. List of Survey publications.

PAPERS AND REPORTS RELATING TO MINERALS AND MINING. Pp. 164, illustrated. 8¼x13 in.; cloth. Wellington, 1908: John Mackey, Government Printer.

Contents: Statement by the Minister of Mines. Report on the goldfields. Report on coal mines. State coal mines. Features of special interest and electrical installations at mines in New South Wales and Victoria.

THE AMERICAN FERTILIZER HAND BOOK, 1909. Pp. 247; illustrated. 8x11 in.; cloth, $3. Philadelphia, Penn., 1909: Ware Brothers Company.

Contents: A classified list of Fertilizer Manufacturers, Phosphate Miners, Sulphuric Acid Plants, Brokers, Chemists, Lead Burners, etc., and Cotton-seed Mills. State Fertilizer Laws Governing the Manufacture and Sale of Commercial Fertilizers. Sulphuric Acid Tables, conveniently arranged. Patents issued during 1908 Pertaining to the Fertilizer Industry. The Nitrate of Soda Industry, (illustrated). Conclusions Reached with Raw-rock Phosphate Experiments. Potash Salts Statistics. Manurial Effect of Calcium Cyanamide under Different Conditions. The Fertilizer Materials Market, and other Practical Information.

THE MINE INVESTORS' GUIDE. By Floyd Davis. Pp. 168, illustrated. 5½x7½ in.; cloth, $1.50. Des Moines, Iowa, 1909: The Western Correspondence School of Mining Engineering.

Contents: The frenzied days of placer mining. Gold and silver mining in the United States. Influence of mining in developing the country. Fortunes and failures in mining. The sedimentary rocks and their ores. Igneous rocks. Origin and occurrence of valuable metals in fractured rocks. Composition, distribution and production of principal ores. Structure of ore deposits. Economic mining of coal. Examination of mining properties. Valuation of mines. Mining investments.

OFFICIAL YEAR BOOK OF THE COMMONWEALTH OF AUSTRALIA. Statistics for Period 1901-1908. By G. H. Knibbs. Pp. 1159, illustrated. 6x10 in.; board covers. Melbourne, 1909: Commonwealth Bureau of Census and Statistics.

This bulky publication—unlike some other statistical annuals—covers very fully the ground suggested by its title. It gives full statistics with regard to population, vital statistics, lands and land tenure, agricultural and pastoral production, forests, fisheries, mines and mining, manufacture, commerce and means of intercommunication. To these are added important sections on the government, both Commonwealth and local and all the governmental activities, including finance. Almost any statistics which are desired can be found in this volume by those interested. Necessarily the chapter on mining is limited on account of the space taken up by the other statistics, but it covers 40 pages and gives a good condensed summary. To the general reader, who is not perhaps so much interested in statistics, the greatest interest will be found in the opening sections which give a condensed history of the discovery and colonization of the Island Continent and an account of the more recent federation of the different Colonies—or States as they are now called—into a single commonwealth. The second section of the introduction gives an account of the physiography of Australia, its geography, geology, climate and the fauna and flora. This is quite as interesting as the historical section.

SUMMARY REPORT OF THE GEOLOGICAL SURVEY BRANCH OF THE CANADIAN DEPARTMENT OF MINES FOR 1908. Pp. 220; 9½x6½ in. Paper. Ottawa, 1909; (?) King's Printer.

This volume, comprising the results of the operations of the Survey during the season of 1908 in nearly every province and territory of Canada, contains much information of practical importance and interest to mineralogists and all concerned in mining, in addition to its scientific value. Director R. W. Brock calls attention to the need of coöperation between the Survey and the provincial governments in topographical work and other branches, and points out that in view of the demand for men of trained technical ability by private corporations and colleges the salaries of the staff must be largely increased, if its efficiency is to be maintained. Among the more important of the reports of explorations, from an economic point of view, are those of D. D. Cairnes on the district in the Yukon between Whitehorse and Tantalus; W. W. Leach on the coal deposits of the Bulkley Valley, B. C.; R. G. McConnell on the northwestern part of Texada island, B. C., where valuable iron deposits occur; O. E. Le Roy on Phœnix camp, B. C.; D. B. Dowling on the coalfields of Alberta and Saskatchewan; G. S. Malloch on the Big Horn coal basin, Brazean river, Alberta; R. W. Ells on the oil shales of New Brunswick and Nova Scotia. A branch of the Survey to take up the subject of underground water and deep borings for natural gas, oil, etc., has been formed in charge of E. D. Ingall, who reports the steps which are being taken to keep in touch with those engaged in drilling and to secure their coöperation in the collection of records. Robert A. A. Johnston notes the increasing demand from colleges and other educational institutions for the collections of mineral and rock specimens supplied by the Survey.

Personal

Mining and metallurgical engineers are invited to keep THE ENGINEERING AND MINING JOURNAL informed of their movements and appointments.

Arthur S. Dwight has returned to New York.

Franklin W. Smith, of Bisbee, Ariz., is visiting New York

W. H. Shockley has sailed for London, where he intends to make his future headquarters.

J. V. N. Dorr has returned to Denver after spending four weeks in New York and vicinity.

Horace V. Winchell returned to Minneapolis, Minn., on June 26 from a three months' trip to Europe.

Wm. A. Paine, president of the Copper Range Consolidated Company, is a visitor at the properties in the Lake Superior region.

Samuel Franklin Emmons received the honorary degree of doctor of science at the commencement of Harvard University last week.

James J. Mahon, consulting engineer of the Crucible Steel Company, of America, Pittsburg, sailed for Europe June 30, on a business trip.

F. B. F. Rhodes, assistant manager of the United States Zinc Company, Pueblo, Colo., has severed his connection with that company and is open for an engagement

William C. Baar, secretary of the Ideal Mining Company, left Indianapolis July 6, in company with several directors on a visit to the mine at Custer, South Dakota

E. E. Henner, of the Oliver Iron Mining Company has been made chief engineer at Duluth. He is succeeded as engineer of the Hibbing district by Wm. M. Tilden.

Jules Schirmann and L. Coin, of Schneider & Co's. steel works, Creusot, France, who have been visiting manufacturers in this country the past four weeks, sailed for Europe June 24

H. R. Robbins, of New York and Seattle, has been appointed managing engineer for the Colonial Gold Mining Company, and has taken charge of its mining operations at Kerameos, British Columbia

Professor John J. Porter, of the University of Cincinnati, recently returned from a three weeks' stay in the Birmingham district, where he has been conducting a furnace test at the Heacock mountain gray ore of the Alabama Ore and Iron Company

W. W. Graff, who has been superintendent of the Cleveland Cliffs Iron company's Cliffs shaft and Moro mines for the past five years, is to be promoted to the company's new Negaunee Lake mine. He will be succeeded at Ishpeming by Lucien Hanson, who has had supervision of the company's Iron Belt mine on the Gogebic range.

S. T. Lockwood, of Buffalo, N. Y., an expert in rare minerals, recently visited Gilpin county, Colo., in order to obtain pitchblende or uranium ore for the purpose of experimenting on the extraction of radium, the experiments to be conducted at the Colorado School of Mines at Golden, through the Vinson Walsh research fund, the gift of Thomas F. Walsh, of Denver

Obituary

Robert Dun Rhodes, a graduate of the School of Mines, Columbia College, and for years superintendent of large works at Bingham, Utah, died June 26 instantly of Bright's disease. He will be mourned by a host of his mining friends.

James H. Blackburn, for many years a leading business man in Blair county, died at Williamsburg, Penn., last week, aged 81 years. He was long engaged in mining and shipping coal, ore and limestone, and for more than 25 years conducted large operations in various parts of Blair county. He was the father of W. W. Blackburn, secretary of the Carnegie Steel Company.

As a result of being thrown from his horse while riding along the Beverly shore road, Robert D. Evans, owner of the Stetson house at Beverly, occupied by President Taft and family, died at the Massachusetts Homeopathic hospital in Boston, July 6. Mr. Evans was 67 years of age, and was one of New England's wealthiest men. It was only in the last 10 years that Mr. Evans has been identified with mining interests, in which he had amassed the greater portion of his wealth, which is estimated at $12,000,000. Previous to that time he was chiefly identified with the rubber industry, having organized the American Rubber Company of Cambridge, which went into the United States Rubber Company. He was the first president of the rubber trust. After his retirement from that company he became interested in the United States Mining Company. When the company was passing through financial difficulties in 1899 he purchased large blocks of the stock under $10 per share and assumed the presidency, and at the time of his retirement from the successor company, the United States Smelting, Refining and Mining Company, a few months ago because of ill health, he had accumulated 150,000 shares of common and preferred. His other large mining enterprise was the Yuba Consolidated Gold Mines Company, a gold-dredging proposition in California, capitalized at $12,000,000. He organized the company, built 12 large dredges, at a cost of about $1,500,000 and has been receiving for two years $650,000 a year in dividends from a 65 per cent stock ownership. He has been receiving an annual income of about $1,000,000 from the these two properties. He has other large investments in mines, rubber plantations and manufacturing companies. His collection of paintings, including many of the old masters and said to be one of the finest in the country, is valued at over $1,000,000.

Samuel Francis Luty, for many years the esteemed and trusted Pittsburg correspondent of the JOURNAL, died in Pittsburg, July 5, after a long illness. Mr. Luty was born in 1860 in Allegheny, and was educated at the Fifth Ward school and the Western University of Pennsylvania, now the University of Pittsburg. About 30 years ago he entered the newspaper business as a reporter on the *Allegheny Mail*, and soon gained a reputation as a news gatherer. After leaving the *Mail* he became a reporter on the old *Chronicle*, and there first took up the branch of work of which he later made a specialty, that of labor reporter and editor. He had few equals in this department of news, and was especially noted for his understanding of the intricacies of wage scales. His services along this line brought him into contact with manufacturers, mine operators and other business men in all parts of the country, and he was equally well known among the labor leaders and general workers in city, State and National organizations. His first work as labor reporter was during the big puddlers' strike in 1882. In 1884, Mr. Luty went to the *Dispatch*, remaining with that paper until 1889, when he was appointed assistant secretary of the American Tin Plate Association. The association, its object attained, was dissolved in January, 1891. Mr. Luty then went to the *Chronicle Telegraph*. Early in 1906 Mr. Luty resigned to take the position of associate editor of the *Industrial World*, which position he was occupying at the time of his death. He also acted as Pittsburg correspondent of several trade publications in other parts of the country. He was noted for his literary tastes and took great pride in his library. He leaves his widow, who was Miss Annie Jackson before her marriage; one daughter, Mrs. Frank Moore, of the North Side, and two sons, William Porter, with the H. C. Frick Coke Company, and Harry, with the Carnegie Steel Company.

Societies and Technical Schools

Lake Superior Mining Institute—The 14th annual meeting will be held on the Marquette range, beginning Wednesday, Aug. 25, and continuing until Saturday, Aug. 28. Headquarters will be in Ishpeming. Excursions will be arranged for the entertainment of members and guests, and local committees are preparing a program and itinerary. A number of papers have been promised. The officers of the institute are M. M. Duncan, president; A. J. Yungbluth, secretary, Ishpeming; E. W. Hoskins, Commonwealth, Wis., treasurer

Special Correspondence from Mining Centers

News of the Industry Reported by Special Representatives at San Francisco, Butte, Denver, Salt Lake City, Goldfield, Colbalt, London

REVIEWS OF IMPORTANT EVENTS

San Francisco

July 1—The dredge operators in Yuba county have been given a setback by the court deciding that the law is valid which prohibits hauling over 3500 lb. over the county roads in one vehicle during the winter and spring months when the roads are wet. Nine teamsters employed by the dredge and manufacturing companies were arrested for hauling loads exceeding the limit and fined $50 each. One case was appealed to the Supreme Court and decided adversely to the teamsters. In the manufacture of heavy dredging machines at Hammerton, large pieces of machinery have to be handled. The law was formed long before there was any idea of such a class of work being done in the county. The manufacturers claim that they cannot run the factory unless they are permitted to haul heavy pieces over the roads. They may, therefore, have to remove their factory for dredge machinery to some other place.

To guarantee a bond issue of $25,000,000 a deed of trust has been placed on record by which the Netomas Consolidated Company of California hypothecates all its holdings in Butte, Sacramento, and Eldorado counties to the Mercantile Trust Company of San Francisco. This is the result of the merger of a number of dredging companies, made last winter. This money will provide new dredges, develop power, and purchase dredging land. The company already owns numerous dredges at Folsom and Oroville, and is building others. Among the purchases made by the company is the property of the Feather River Exploration Company. The shops of the latter company are to be moved from Dredgeville to Corona Terrace, below Oroville.

Since the compromise was effected between the city of Oroville and the Indiana Dredging Company, by which the dredge people agreed to level off the tailing piles, to repay costs of suit, and do other things the city trustees advised, other communities along the Feather river are seeking similar advantages. The State engineer does not consider the Oroville settlement as satisfactory.

The California State Mining Bureau is issuing a series of maps of the mining counties of the State, showing the boundaries of the national forests.

Butte

July 1—In the case of F. A. Hall against the Yellowstone Park Railroad *et al.* Judge Hunt has appointed H. L. French and H. Maguire receivers for the defendant road. The suit was brought to recover $30,000 alleged to be due Hall for services rendered and money advanced to the company. In his complaint Mr. Hall alleges that there is a conspiracy to defraud him of his interest in the company. The appointment of two receivers was in the nature of a compromise, one being given to each faction interested. The road operates between Bridger and Bear Creek in Carbon county.

The Raven Mining Company, through its president, E. C. Frisbie, has issued another circular letter to its stockholders reminding them of the necessity of taking active steps to protect their interests. The letter states that a new company, known as the Raven Copper Company and capitalized at $1,000,000 with shares of the par value of $1 each, has been incorporated under the laws of Maine. The new company proposes to acquire the property of the old, assume expenses of the maintenance of the property from June 1, 1909, and place $50,000 in the treasury. Stockholders in the old company are to be given the opportunity to purchase shares in the new on the basis of surrendering one old certificate and paying 25c. for each new one issued. The payment is limited in time to July 19, 1909.

Bruce Blake, receiver of the bankrupt Idaho Smelting and Refining Company, has filed a report with the referee in bankruptcy showing the company's liabilities to be $501,559 and its resources $222,244. The liability on open accounts alone amounts to $219,398, the largest individual account being in favor of the Fidelity National Bank of Spokane and the First National Bank of Ponderay, Idaho, and amounting to $71,280. The first meeting of creditors will be held on Aug. 2, instead of earlier as previously arranged.

Denver

July 2—That portion of the Ouray mining district which lies below the town, at elevations of from 7000 to 9000 ft., and which is free from the snow, is extremely active. The silver-bearing veins, such as the Wedge, Neodesha, Bachelor and Calliope, which are fissures in the sedimentaries, are all doing diligent exploration for new orebodies, as are also the Black Girl and Pony Express, in the limestone, these two, however, being in ore. The American Nettie, in the quartzite at the top of this geological section, is ready to ship and the Savage Bear Company up Bear creek, east of the town, has been cleaning out the old tunnel workings, and reports the discovery of high-grade ore in the breast 300 ft. into the mountain, and 100 ft. below the outcrop. The fact that so many of the early day bonanza mines are being reopened augurs well for Ouray in particular, and the San Juan in general.

In the Red Mountain district, outside of the Carbon Lake mine, owned by the San Antonio company, and described in the JOURNAL of May 1, 1909, the district from Ironton to Red Mountain town has for years been largely dependent upon the movements of Mr. Crawford, who originally brought the district into notice about 1883, when he negotiated the purchase of the Yankee Girl and Robinson by Eastern capital, and has now projected a long tunnel (which is partially constructed) to cut this group and the Gennessee-Vanderbilt at greater depth. It is reported that he is on his way here now with a party of Eastern capitalists, and that all outstanding indebtedness will be paid and work recommenced. That there are still big mines in this area, miners and engineers knew, but it is hard to interest capital in a mining camp which shows moss-grown dumps, tumble-down buildings and deserted shacks. The Koehler tunnel, to cut the Carbon Lake vein at depth, is expected to reach the oreshoot about the middle of this month. It is now in 2150 feet.

It is reported in the local press under big headlines that the competition for Cripple Creek ores may end in a merger, i.e., that the American Smelting and Refining Company has absorbed the Golden Cycle plant at Colorado City. There is absolutely no truth whatever in it, and in certain circles it is regarded simply as a very ingenious method of letting the public know that this valuable property is for sale. The Golden Cycle mine is probably today the biggest and best mine in the Cripple Creek district, for the production for the last month is given at 6500 tons of good grade gold ore, and 1000 tons from the Christmas mine on the same vein were hoisted through the Golden Cycle shaft.

The Blue Bird mine on Bull hill, is under lease and is shipping high-grade ore, as is also the Ruby, adjoining. The production of the district for the first six months of 1909 is given at 357,703 tons of gold ore, of a bullion value of nearly $8,000,000. The dividends paid in June by four companies alone amounted to $92,200. The Gold Dollar Consolidated

will pay $12,500 on July 10. The Mary McKinney Company, which paid $26,000 in dividends last month, sends a statement to shareholders which shows shipments for the past year of a total gold bullion value of $86,000, net income $55,626, with cash in hand of $90,840. These are wholesome statements that go far to encourage and increase the mining industry of the State.

Goldfield, Nevada

July 1—Friday, June 26, every mine in Goldfield depending on the Nevada-California Power Company for electric power, was shut down. A freshet destroyed the diverting dam at plant No. 2 at Bishop, Cal., and the ditches at plants No. 4 and 5 were choked with débris. Saturday afternoon service was resumed.

A compromise was effected by which the Florence Goldfield Mining Company paid $10,018 in settlement of bullion taxes and penalties claimed by the State, and indictments against the company were quashed.

The rate war between the Santa Fe and Southern Pacific and Tonopah & Goldfield railroads has been terminated in such a way as to benefit both Goldfield and Tonopah. By the new arrangement the Tonopah & Goldfield with service over the Southern Pacific and Pennsylvania systems will be able to deliver supplies to Goldfield in about half the time formerly required.

The official report of the Goldfield Consolidated Company for the month of May shows that 21,630 tons of ore valued at $762,748 were produced. The average cost per ton for mining, milling, transportation, etc., was $6.117.

Shipments, to the mills, from Tonopah for the week ending June 26 were: Tonopah Mining, 3300 tons; Belmont, 750; Montana-Tonopah, 953; Midway, 100; MacNamara, 300 and West End, 85; making a total of 5488 tons, $137,200 being the estimated value.

Salt Lake City

July 2—Emma Copper is getting to be a live issue. While comment has been rather harsh and bankruptcy proceedings have been threatened, action is expected by the shareholders in the near future that will bring this property into prominence again. At one time the Emma Copper was counted one of the big things in the Alta district and report was made that big improvements and development work would be done and money secured from the sale of stock to Samuel Newhouse, D. C. Jackling and other big operators but what was done with the money has not been disclosed. Mr. Jackling and Mr. Newhouse deny the report that they had sold their stock in the advance and claim to still have their allotment of stock in their possession.

In connection with the plan of reorganization of the Newhouse Mines and Smelters Corporation, it is stated that about 90 per cent. of the bondholders and about three-quarters of the shareholders had signified their intention of coöperating with the reorganization committee. As a large number of shares of this stock are held in Europe, the committee will allow a reasonable time for these shareholders to be heard from. It is understood that the Macquisten tube concentrators, operating on the principle of surface tension, are to be installed for treating the tailings. In a report made by E. P. Jennings, of Salt Lake, for the reorganization committee, he estimates the following assets in ore: Ore in sight, 1,127,083 tons averaging 1.8 per cent. copper; partly developed and probable ore, 1,000,000 tons of 2 per cent. tenor, partly exposed by surface outcrops and developments on the 400- and 500-ft. levels; partly developed ore west of ore shoot, 1,000,000 tons containing from 1 to 1¼ per cent. copper; possible ore, 500 ft. in length of undeveloped territory on the west end of the Cactus ground. Mr. Jennings estimates a cost of 11.39c. per lb. of copper based on an output of 25,000 tons of 1.8 per cent. ore per month, with present cost of mining and milling and a production of 12.9 per cent. concentrate, with 80 per cent. recovery in the mill.

With the further development of the modified caving system of mining, and an output of 30,000 tons per month, with 80 per cent. recovery in the mill, he estimates that copper can be laid down in New York for 9.46c. per lb., exclusive of the cost of selling and New York office expenses, which would add about 0.2c. per lb. of copper. In this latter estimate, mining is figured at $1 per ton, milling at 45c., and miscellaneous expenses at 10c. per ton. By the use of the modified caving system of mining, the cost of mining has already been reduced from $2.40 to $1.25 per ton; milling costs have been 55c. per ton. The mine at present has two vertical shafts to the 600-ft. level, and an incline from the 600- to the 900-ft. level. Mr. Jennings recommends the sinking of the shaft from the 600- to the 800-ft. level and believes that the company should derive a profit of 3c. per lb. at the present market price of copper, if operations are conducted with ordinary business and technical ability.

Cobalt

July 2—A new vein has been cut at the Big Pete mine of the Cobalt Central. It was found on the 300-ft. level in the crosscut about 300 ft. north of the shaft. The vein matter consists of calcite, smaltite and native silver. The crosscut is being driven to tap a vein formerly located by the diamond drill. The find was made in the Huronian slates, which underlie the diabase. The Foster has been diamond drilling to locate the same formation. They succeeded in getting it, but the drill passed through the Huronian into underlying Keewatin.

The first year of La Rose Consolidated has ended and for that period the company produced a total of $1,575,493. The total expenses for the year were $481,921. This leaves a net profit of $1,093,572. The production was 3,010,531 oz., as against a total previous production of 2,675,161 ounces.

The preliminary surveys for the extension of the Temiskaming & Northern Ontario Railway from Charlton to Gowganda have been completed to a point within five miles of the latter place. The government engineers are making exhaustive inquiries into the possibilities of the country, in order to ascertain the amount of traffic there is liable to be. So far no reports have been issued and it is not likely that any decision will be arrived at before the end of August. The road would be about 48 miles long and the cost is estimated at $2,000,000. The location surveys have been completed as far as Elk lake.

At the Nova Scotia mine, development is being carried on in a vigorous manner, with the object of increasing the ore reserves sufficiently to warrant the erection of a concentrator. Plans and specifications for the mill have been completed and the estimated cost is $100,000. At the present time the No. 3 shaft is being changed to a double compartment. This shaft will be used for hoisting only. A new hoist with a capacity of 1000 ft. is being installed. The lowest level is 240 ft. from the surface and at this depth on No. 2 vein a winze is being sunk. The veins of this mine are wide, but low-grade and suitable only for concentrating.

The Cobalt Silver Prince mine, which is near Cross lake is to open up again. This property, which adjoins the King Edward has not been worked for some time. There are two shafts on this property and strong calcite leads occur in the workings. No extensive operations will be undertaken until the hydraulic air is in the camp.

The Beaver mine is in good ore again. A winze was sunk on the vein. The plant, which was destroyed by fire some time ago is being rebuilt and when the mine is able to supply its own power, operations will be resumed on a larger scale. At present air is being purchased from the Temiskaming.

Toronto

July 2—The Canadian Department of Mines is devoting a good deal of attention to the subject of electric smelting, owing to the satisfactory accounts received from Sweden and Norway, as to the commercial success of the process on the lines laid down by Dr. Eugene Haanel, director of mines. The department has

received a letter from the British Ambassador to Sweden, stating that another commercial plant is being erected at Trollhatten Falls to consist of three furnaces, each of a capacity of 7500 tons of pig iron per year. The conditions of the iron and steel industry in Norway and Sweden being similar to those obtaining in Canada, especially in Quebec and Ontario, Doctor Haanel is encouraged to believe that electric smelting offers great possibilities for dealing with ores which cannot profitably be treated in the ordinary way. Ores are successfully smelted in Sweden by electricity containing from 0.4 to 1.9 per cent. phosphorus. To show the extensive field thus opened for development and stimulate inquiry by capitalists and manufacturers, the department has in preparation exhaustive reports on the iron ore deposits of the Gatineau and Ottawa valleys, and Thunder bay in Quebec and Ontario, and of New Brunswick and Nova Scotia. Many of these, while too high in phosphorus or too far distant from the coalfields to be available by the ordinary process are adjacent to extensive water powers which would furnish electric energy.

Some excitement has been caused by the reported discovery of extensive gold fields at Lac la Ronge, Saskatchewan, some 200 miles north of Prince Albert. The gold-bearing district is said to cover an area of 40 miles, and rich samples are reported to have been brought to Prince Albert by prospectors. The first discoveries in that district were made about a year ago, but on being assayed by the Geological Survey branch showed but little gold, so that the officials are disposed to be doubtful as to the value of recent finds. William McInnes of the Geological Survey staff, who reported on the previous discovery, has left for Lac la Ronge to make an investigation.

Mexico

June 30—The incorporation of a new company, with a capitalization of $75,000,000, to consolidate the Southern Pacific company's lines on the west coast of Mexico and for acquiring the property of the Cananea, Yaqui River & Pacific railroad, which company is to be known as the Southern Pacific Railroad of Mexico, directs fresh attention to affairs governing that portion of the company's already extensive system.

When completed the Southern Pacific company's Mexican line will extend from Nogales, Ariz., southwestward to Guymas, Mex., and thence southward to Mazatlan and Guadalajara, from which point the company will have trackage rights over the lines of the Mexican Central to the City of Mexico. Altogether, the company's lines will embrace between 1200 and 1300 miles of road. Of that portion of the line that is already completed 600 miles are now in operation.

It is understood that the cost of building the new Mexican line, when completed, will be in the neighborhood of $52,000,000 or $53,000,000, to which sum there should be added an additional $6,000,000 or $8,000,000 for a complement of equipment to take care of the large tonnage that is expected to develop. It may be stated that the country through which the company's line runs is rich in mineral products and, it is expected, within a short time will become an extremely productive agricultural center.

London

June 26—The directors of the Camp Bird mine in Colorado are considering the purchase of an important operating mine in Mexico which has been recommended to them by their consulting engineer John Hays Hammond. Some of the officials of the Camp Bird have gone to Mexico to make further examination and R. T. Frecheville, one of the directors of the company is also to pay a visit to the property. The directors have issued a circular to their shareholders saying that in order to be in a position to carry out the purchase, if the reports are favorable, some of the directors and their friends have entered into a conditional agreement to underwrite an issue of 280,000 reserve shares of Camp Bird, Ltd., arranging that an offer of them shall in due course be made to the shareholders.

The report of the directors of the Great Boulder Gold Mining Company, Ltd., for the year ending Dec. 31, 1908, has been issued. During the year 204,406 tons of ore were treated, realizing bullion to the value of £304,078. The profit, after deduction of administration charges in Australia and London, Western Australian government tax, depreciation on capital accounts, and expenditure on development work, amounted to £46,725. Adding to this the balance at profit and loss account at Dec. 31, 1907, there was a disposable sum of £91,253 out of which two dividends of 6d. each have been paid, absorbing £69,972. During the year the working costs have amounted to 19s. 4.654d. per ton, as compared with 18s. 2.059d. in 1907. The increase in working costs for 1908 has been mainly due to the fact that the method of stoping adopted has proved increasingly disadvantageous, but the difficulties experienced in roasting have also partly accounted for the higher costs, in addition to the increased cost of power and labor. The ore reserves are valued at 391,947 tons of ore, averaging 6.58 dwts. per ton, valued at £547,093 and 218,440 tons of probable payable ore.

The London firm of Hooper, Speak & Williams was appointed as general managers from March 1, 1908, and Ernst Williams, the resident partner in Australia will carry on the superintendence. The general managers report that the feature of the year was the proving of the Lake View lode at the 1750- and 1900-ft. levels. It is apparent, they say, that more settled country prevails below the 1600-ft. level, and that the unfavorable zone between the 1100-ft. level and 1600-ft. level is giving way to better ore-forming conditions, where chances of richer ore may be expected to exist.

Johannesburg

The reef cut at 3754 ft. in the Turf Mines shaft has turned out to be some nondescript body overlying the south reef, while the true representative of this orebody lies 61 ft. lower at 3815 ft. At this depth three or four bands of banket have been cut, assaying 4.1 dwt. over a width of 69 in., including the quartzite partings. This value is rather low, but good results in the south reef were not to be expected in view of the poor disclosures in the Village Deep above. In this part of the Rand, at great depth, the lower reef—the Main Reef Leader—is the basis of all prosperity. As the south reef has been cut at 3815 ft., it may be safely estimated that the Main Reef Leader will be found about 100 ft. lower.

It is some weeks since the committee in charge of the stope-drill competition issued a report on the results of the underground trials. As the drills are being tried in four different mines, injustice might easily be done by attempting to anticipate the verdict of the judges. The elimination trials underground were conducted principally by men better acquainted with the mechanism of the drills than with the placing of holes on other aspects of mining work. Now that the machines are in the hands of capable miners, more promising results are being obtained. Trouble still appears to be experienced with the hollow steel used in conjunction with some of the drills and one of the machines, the Siskol (a reciprocating drill) has been obliged to use solid steel. The four drills now mentioned as doing especially good work are the Chersen, Holman 2⅛- and 2¾-in., and the Siskol. The Chersen and Holman drills have been used upon the Rand in ordinary practice for many months, but the Siskol, which led at the surface trials with the remarkable speed of 434 in. per min. was first introduced upon the Rand as a competitor in the trials.

As reported in previous communications, the Premier Diamond Mining Company has fearlessly increased its scale of operations in spite of the market's continued lack of activity. During the six months ended April 30, 1909, the company washed 3,612,254 loads of mine ground and 20,911 loads of cylinder lumps for a yield of 938,388 carats of diamonds. These figures show an increase of 271,700 loads of mine ground, of 77,000 loads of lumps and of 55,663 carats in output.

Mining News from All Parts of the World

New Enterprises, Installations of New Machinery, Development of Mines and Transfers of Property Reported by Special Correspondents

THE CURRENT HISTORY OF MINING

Alaska

KATALLA

Copper River Railway—It is stated that this company will work 2500 rockmen next winter to hasten the construction of the line to the Bonanza mines. There are 3000 men at work at present. A branch line will be built to the Behring lake coal-fields as soon as it is known that the Government will give title to applicants for coal lands.

TANANA

The winter work as well as that under way at the present time will yield, it is estimated, considerably in excess of last season's production.

VALDEZ

The Government road between Valdez and Fairbanks will be completed by Sept. 1, according to Maj. W. P. Richardson, U. S. A. On the Yukon a winter road will be made from Eagle to Forty-Mile, and a wagon road from Circle City to the Birch Creek mines.

Arizona

COCHISE COUNTY

Denn Arizona—A body of rich copper ore has been encountered on the 1200 level.

Gleason—The Southern Pacific branch line from Pearce to the old camp of Gleason was completed June 26. S. H. Bryant, a pioneer, drove a copper spike as being emblematic of the rich copper-turquois district opened by this road.

Copper Queen—Attorneys Neal and Sutter have filed suit in the district court against the Copper Queen Consolidated Mining Company for $1,250,000 in behalf of [illegible] Winders, who acts as administrator of the estate of R. J. Winders, deceased, and various other heirs. The bill of particulars alleges that R. F. Winders was one-fourth owner of the Black Jack mining claim in the Warren district, and that the Copper Queen Company has received a net profit from the ores taken out of said claim to the value of $5,000,000 and the plaintiff asks damages in the sum of one-fourth that amount. During early years the property was transferred to various owners, finally again acquired by the Winders family, when a deed for same was issued to Mrs. Winders in 1892. Subsequently the property was deeded to the Copper Queen and, as now claimed, the deed was not signed by the husband.

GILA COUNTY

Superior & Boston—The last payment has been made on the Collins-Doyle property, although it was not due for nearly a year. This gives the company title to about 1000 acres of land. W. G. Rice, Globe, Ariz., is president.

Cactus—Three miles of wagon road are to be built from this to the Live Oak property. It is reported that a concentrator is to be built. The mine is 5 miles from Miami. C. W. Pritchett, of Denver, is general manager and consulting engineer. Mine office, Globe, Arizona.

Warrior—Daily ore shipments to Globe amount to 65 tons. The larger part of the ore is from development work.

PINAL COUNTY

Ray Consolidated—It is reported that a contract has been let by the company for about 4000 tons of structural steel to be delivered next autumn for the construction of reduction works.

YAVAPAI COUNTY

Consolidated Arizona—A number of men are now engaged in unwatering the Blue Bell mine preliminary to active development. It is reported that the smelter will resume custom business.

California

BUTTE COUNTY

Boston & Oroville—The old Continental dredge at Oroville is being dismantled after 10 years' work. The tract of land on which the dredging has been done is worked out.

Big Blue Lead—Superintendent N. Lambert, of Bangor, expects to resume operations on this gravel mine by the middle of July. The new ditch is almost completed.

Butte Creek Consolidated—Manager H. C. Chesboro reports that gold enough is being obtained to shortly pay off the indebtedness on the dredge on Butte Creek. This is a Los Angeles company.

CALAVERAS COUNTY

Plymouth Rock—San Francisco men have obtained a bond on the mine at Jenny Lind and are running five of the stamps on satisfactory ore.

Washington—Eastern men have purchased the Letora ranch near San Andreas for the purpose of developing this and other mines.

Fox—The new dredge at this property near San Andreas has started operations.

MARIPOSA COUNTY

South Fork Power and Mining Company—This Boston company locally represented by Smith and Arnold has acquired the Great Tree group of mines on the South Fork, five miles from Hites Cove.

MODOC COUNTY

Bidwell Consolidated—In the Mountain View mine, near Fort Bidwell, ore of high grade has been discovered on the 150-ft level.

MONO COUNTY

Casa Diablo—Fourteen men are now taking out 30 tons of ore daily and another crew is doing development work. The mill is running steadily.

NEVADA COUNTY

Fairview—From this property, at Relief Hill, C. M. Wilson, manager, much specimen ore is being taken out. In addition to the rich seam close to the hanging-wall, the vein carries high average values.

Lecompton—This mine, at Nevada City, has been finally unwatered and the mill has been started up on ore.

Prescott Hill—The shaft of this mine, at Grass Valley, now 1300 ft. deep, is to be continued 500 ft. deeper.

Champion—In the Providence mine of this company, at Nevada City, leasers have discovered on the footwall on the 600 level, a 2½-ft. vein. The Providence is one of the oldest mines in the State.

PLUMAS COUNTY

Newton—This company, of which S. J. Norris is a large owner, is operating a steam scraper on one of its claims on Coquette creek. The gravel deposit is on a bar or flat, where there is little grade and the scraper hauls the gravel up the side of the hill to a point where it may be washed.

Pilot—Operations will shortly be resumed on the quartz mine in Onion valley.

SAN LUIS OBISPO COUNTY

Klan—The quicksilver mine has been started up again and the furnaces have been put in order. H. D. Richards, of Paso Robles, is manager.

SHASTA COUNTY

Mountain Copper—The Iron Mountain depot, the bunkers and the company's saw mill and timber shed at Iron mountain have been destroyed by fire. No ore can be shipped until the bunkers are rebuilt.

TUOLUMNE COUNTY

United Mines Corporation—The company is retimbering the old Dead Horse shaft. Drifting is being done from the raises and the mills are crushing 300 tons of ore per day.

Confidence—The bond having been forfeited, the owners, Baker and Hamilton, of San Francisco, will soon resume work on the mine.

Colorado

BOULDER COUNTY

Cashier—The mill at Camp Albion is being remodeled and extended to handle the lead ores of this property.

Yellow Pine—This old silver mine has been acquired by a new company and is to be extensively developed.

GILPIN COUNTY

Moon Gulch—The Siren property, recently acquired, will be developed by this company under the direction of L. C. Todd, Rollinsville, Colo.

Russell—Smelting ore has been encountered by leasers on the 300-ft. level. M. A. Harris, Russell Gulch, Colo., is superintendent.

Aztec—An electric pump is to be installed to unwater the lower levels for further development. J. E. Hastings, Central City, Colo., is manager.

Hearne—The main shaft will be sunk deeper as soon as the lower levels can be unwatered by the electric pump. W. H. Hearne, Central City, Colo., is in charge.

CLEAR CREEK COUNTY

Whiting—The development of the Terrible and Dunderberg mines near Silver Plume will be undertaken, following the visit of Eastern stockholders.

Nashotah—After an idleness of two years the property on Sherman mountain, near Georgetown, is to be reopened. Some equipment renewals will be required.

Horstman & Snowy Range—Operations have been resumed under the direction of W. H. Robinson, of Georgetown. A milling plant is contemplated.

SAN JUAN COUNTY

Ophir Consolidated—Upon foreclosure by the bondholders the property at Ophir was sold on June 21, 1909, to the Milwaukee Trust Company for $335,988.

LAKE COUNTY—LEADVILLE

Tribune—Through the Yak tunnel this Breece Hill property is being worked at a depth of 1340 ft. from the surface and the breast of the drift is now about 600 ft. from the tunnel. The drift has passed through 150 ft. of mineralized ground, the last 50 ft. being pay. Several carloads have been shipped.

Penn—The various lessees on this property are shipping steadily from both the lower and the upper levels, the daily output being in the neighborhood of 250 tons.

Sunday Tunnel—Development work is being carried on from the tunnel level south on the vein. Work is also being done at the 550-ft. level from a drift in the old shaft on the copper vein, which at this point is about 5 ft. wide.

Lilian—Lessees have resumed washing the dump and from 150 to 200 tons are being handled daily; the returns in gold are better than day's pay, and considerable lead is also saved. The lessees in the mine are shipping regularly gold ore of good grade.

Helena—It is reported that the stockholders in Pittsburg have subscribed the money to pay off all indebtedness and to continue the development of the favorable showing at the 780-ft. level.

Dinero Tunnel—Work has been temporarily suspended on this Sugar Loaf enterprise, but is to be resumed again in a week or two if the company succeeds in raising the necessary funds to carry out the more active campaign that has been planned.

Garbutt—As development is pushed on this claim the orebody increases and 50 tons daily are being sent to the local smelter. When the ground is thoroughly opened it is probable that the output will be doubled.

Cleveland—Driving for the footwall is still in progress; the vein is now over 20 ft. wide, with 5 ft. of smelting ore and the balance low grade.

TELLER COUNTY

Coriolanus—Leasers operating on the north block have encountered a new ore shoot, from which a trial shipment has been made.

Portland Gold Mining—Work was commenced on June 28 on grading the roadbed to the site selected for the new 300-ton mill near Victor, Colo., to treat the extensive dump of this company. Excavation for the mill buildings is also in progress. The site selected is on the northeastern slope of Battle mountain between No. 2 and No. 3 shaft.

Gold Dollar Consolidated—Cleaver & Sharp, sub-lessees at the Husted shaft dump, have installed a washing equipment which is to have a daily capacity of 125 tons.

Illinois

The following apportionment of mine inspection districts in Illinois has been made, effective July 1. They show the counties, number of mines, men and tons produced.

First District—Inspector, Hector McAllister, Streator. Counties—Grundy, Kankakee, La Salle, Putnam and Will; 95 mines; 7524 men employed; 3,983,304 tons of output.

Second—Inspector, Thomas Hudson, Galva. Counties—Bureau, Fulton, Henry, Knox, Mercer, Rock Island, Warren; 216 mines; 9168 men employed; 4,515,424 tons of output.

Third—Inspector, John Dunlop, Peoria. Counties—Hancock, Livingston, Logan, McDonough, McLean, Marshall, Peoria, Schuyler, Stark, Tazewell, Woodford; mines, 179; men employed, 5151; 2,792,586 tons of output.

Fourth—Inspector, Thomas Weeks, Bloomington. Counties—Brown, Cass, Menard, Morgan, Sangamon, Scott; 68 mines; 7336 men employed; 5,502,104 tons of output.

Fifth—Inspector, Thomas Moses, Westville. Counties—Christian, Edgar, Macon, Moultrie, Shelby, Vermilion; 65 mines; 6556 men employed; 4,493,781 tons of output.

Sixth—Inspector, James Taylor, Peoria. Counties—Calhoun, Green, Jersey, Macoupin, Montgomery; 43 mines; 6753 men employed; 5,625,204 tons of output.

Seventh—Inspector, W. W. Williams, Litchfield. Counties—Bond, Clinton, Madison, Washington, Marion; 49 mines; 7077 men employed; 5,870,767 tons of output.

Eighth—Inspector, Walton Rutledge, Alton. Counties—Randolph, St. Clair; 92 mines; 6027 men employed; 5,190,966 tons of output.

Ninth—Inspector, W. S. Burris, DuQuoin. Counties—Franklin, Gallatin, Jefferson, Perry, Saline, Wabash, White; 73 mines; 7747 men employed; 5,891,130 tons of output.

Tenth—Inspector, Thomas Little, Murphysboro. Counties—Jackson, Johnson, Williamson; 72 mines; 7502 men employed; 6,007,126 tons of output.

Michigan

COPPER

Ahmeek—Work on the stamp mill that this company is erecting is going forward satisfactorily; the steel frame work is in position and the work of inclosing the building is nearing completion, and barring some unforseen delays this mill will be ready for service about Dec. 1. The mine is shipping about 1700 tons of rock daily, about equal amounts going to the Tamarack and Franklin mills.

Atlantic—Section 16 shaft is down about 2100 ft. and is bottomed in the same shattered formation that has characterized this opening from the start. The lateral openings are being extended in hopes of passing through this broken zone and a more substantial formation revealed. The company has a large tract of unopened ground and it may yet encounter paying rock. This shaft is at present the deepest opening on the Baltic lode.

Allouez—Excavating on the site of the stamp mill that is to be erected jointly by this and the King Philip company has

been completed and work on the foundations is going forward rapidly. A dam of about 100,000,000 gal. capacity is to be built at the Sleeping river for its water supply. It is planned to re-use the water after it has passed through the mill. This is to be accomplished by a system of settling and clarifying and the water then pumped back to the heads. In this manner it is thought that it will only be necessary to draw on the fresh water supply for about one-third the amount.

LaSalle—The company has cleared the site for the proposed new shaft, the overburden at this point being only a few feet thick. This shaft is going down on the Kearsarge lode at a point between the No. 1 shaft of the Tecumseh tract and No. 1 of the Caldwell tract. No. 1 shaft of the Tecumseh is down to the 17th level, and from the 10th level a good grade of rock has been in evidence. Developments at the Caldwell tract has not yet revealed anything of a substantial nature. The equipment of No. 2 shaft of this tract will be moved to the new shaft and operation will start in the near future at this point.

Seneca—The shaft that is going down on this property has reached a depth of 440 ft. and a station is being cut preparatory to driving a crosscut to open the formation. This shaft is in the foot wall, about 60 ft. behind the lode. At a depth of 200 ft. the first level was established and the lode cut by means of a crosscut; it was found badly shattered and carried practically no copper.

Franklin—The No. 1 shaft is below the 26th level. At this level a crosscut is being driven to the Pewabic lode. As depth is obtained there seems to be a gradual increase in the mineral contents of the rock. The north drifts from the 21st, 23d and 24th levels are within the Rhode Island tract. All work on the conglomerate lode will be discontinued as soon as the ground that has been broken down is hoisted. Work will be transferred to the Amygdaloid lode.

Oakland County

Detroit Salt Company—Rock salt, said to be a good quality, was struck on June 26 at a depth of 900 ft. at the property in Oakwood, about 40 miles from Detroit. Prospecting was begun about a decade since, but was discontinued several times on account of shaft sinking difficulties, the flow of salt and water being finally overcome by cementing the walls of the shaft under the direction of Engineer Bradt. It is proposed to mine the deposit and a surface plant is to be installed at once.

Missouri

Zinc-lead District

Webb City—Floods have occurred on Center creek and the Richvale, American Boy, Vantage, Mercedes, and McConey mines are under water. It will take several weeks pumping to unwater these properties.

Peacock—The Moler-Smith mine has been flooded by Center creek and the steam shovel and all the large pumps are under water. The large gas engine which operated the pumps was removed before the flood came.

Hartford—The mine at Galena has entered the producing list again with an output of 125,000 lb. of zinc.

New Century—This company is overhauling its 300-ton mill, the largest in Galena, with a view to resuming operations at once.

Little Jen—This mine west of Joplin has encountered ore at 150 ft. that bids fair to keep the 150-ton mill running full time.

Little Persimmon—This company has been incorporated at Carthage with a capital stock of $50,000. H. T. During and others, of Carthage, are the incorporaters.

Sarcoxie—A deal has been consumated by which the Optimo, Lone Pilgrim and O. K. properties have been brought under one management. These mines are large producers of high-grade ore. F. A. McClelland, of Sarcoxie, is manager.

Red Dog—Electrical equipment to the amount of 200 h.p. has been installed.

Lehigh Circle—The John Nilson farm at Carl junction was purchased by this company for $26,000. An orebody has been encountered at a depth of 156 ft. Development work will continue. F. A. Brown, of Joplin, is president.

Granby—Prospecting is in progress on 1400 acres of land two miles west of Spring City.

Carnation—The 300-ton plant at Prosperity was started last week.

Montana

Butte District

Butte & Highlands Gold Mining Company—The company has recently been incorporated by C. V. Franzman, T. R. Cook, Isador Klein, Charles Barnaman and W. N. Waugh. The capital stock is $1,000,000 with shares of the par value of $1 each. The company owns six claims located about 10 miles from Feeley, on one of which a 75 ft. shaft has been sunk.

Coalition—Sinking has been started at the Rarus. The shaft is now down 2250 ft. and will be sunk another 100 ft. before a station is cut. About 850 tons of ore are being hoisted daily. At the Tramway mine sinking will be begun this month for the purpose of making room for the lowering of the big cages to the lowest level. It is probable that the sump will be increased 30 ft. On the 1700 ft. level a crosscut is being run to the Minnie Healey ground. The crosscut is in at present about 70 ft., and it is thought that the lead will not be reached in less than 250 ft. The Tramway is hoisting about 650 tons of ore daily, most of which comes from the Minnie Healey.

Beaverhead County

Silver Fissure—General Manager Harry Armstead, Jr., arrived from New York the first of the week to inspect the property at Polaris. He states that the company will build a spur from Polaris to connect with the new Gilmore & Pittsburg railroad.

Broadwater County

Ohio-Keating—The south shaft, now down 125 ft., is being cleaned out and retimbered preparatory to sinking another 100 ft. A No. 5 Knowles pump is being operated on the 120-ft. level.

Nevada

Elko County—Midas

Old Judge—This property adjoining the Elko Prince mine has been leased and bonded to B. P. Howell and associates. A tunnel 125 ft. long has already been driven.

Gold Crown—Two shifts are being worked in the lower tunnel which is drifting on the ore.

Esmeralda County—Luning

Lodi Mines Company—The company will soon blow in its new lead smelter. The furnace is to use a vaporizing system, by which the shortage of water is expected to be overcome.

Lincoln County—Pioche

Nevada-Utah—Since June 1 the Day mine has been running two trains daily on the narrow-gage road to Pioche, and handling from 150 to 230 tons of ore. The output of the mine is increasing.

Pioche Metals—The first carload of ore produced under the new management was shipped last week. Regular shipments will be made as soon as a new gasolene hoist is installed. The mine is four miles west of Pioche and owned by John A. Kirby and associates.

San Pedro, Los Angeles and Salt Lake Railroad—A preliminary survey has been completed from the Prince Consolidated mine to Pioche, via Pioche Metals mine, a distance of eight miles. Another route is being surveyed from the Prince direct to Panaca, making a shorter haul to Salt Lake, but not going near any of the other mines as does the first survey. Three to five cars of ore are being shipped daily from Pioche to Salt Lake smelters.

Nye County—Bullfrog

Denver, Clothier, Jingles—Returns from the last shipment of 21 tons, sent out from this lease, show a value slightly under $95 per ton.

Bullfrog Pioneer—Thirteen cars of ore

were sent out during the week ending June 19, averaging from $40 to $50 per ton.

NYE COUNTY—GRANTSVILLE

Alexander—This group of gold and silver claims has been transferred by the Horn Silver Mining Company, which has held them as collateral security for about 20 years, to the Cupric Mines Company, the latter company paying $400,000 of its stock and agreeing to provide the capital necessary to promptly develop the property. A report on the property is being prepared by Engineer J. B. Wilson. The Cupric Mines Company has offices in the Whitehall building, New York, and at 207 Templeton building, Salt Lake City. It also operates a group of 16 claims in the San Francisco district in Beaver county, Utah.

NYE COUNTY—MANHATTAN

Goldfield-Bald Mountain—The electrically operated machinery has been put into commission and the hoisting capacity is now 125 tons per day.

Edith—This claim, consisting of 1000 ft. in the main gulch has been purchased by G. W. Pierce and associates of Denver. A third shaft is being sunk to bed rock.

Big Five—Operating about a mile below Central, the company now has its machinery in place and has begun washing gravel.

San Francisco—This placer company is managed by Jeffrey Schweitzer. Electric hoist and pumps are to be installed.

NYE COUNTY—RHYOLITE

Keane Wonder—The new shaft has opened up a wide orebody which shows good milling ore throughout. The orebody is being explored by a crosscut.

NYE COUNTY—ROUND MOUNTAIN

Round Mountain—J. P. Loftus, president, has just completed an examination of the mine, and reports that it is in better condition than ever before. The clean-up for the first 15 days of June resulted in $22,000 bullion. In the 700-ft. level a remarkably fine ore shoot has been disclosed which shows a width of 7 ft. The mill at present is treating between 90 and 100 tons of ore per day.

NYE COUNTY—TONOPAH

MacNamara—The new 10-drill compressor, motor and transformers have been put into commission. Six carloads of ore averaging 50 tons each were shipped last week to the Balaklala smelter in Shasta county, Cal. Most of this ore came from the 200-ft. level.

Montana - Tonopah—Chas. E. Knox, president of the Montana-Tonopah Mining Company, inspected the property last week and as a result it is reported that work will be pushed in the north crosscut on the 765-ft. level. The semi-monthly clean up of cyanide precipitates resulted in the production of 25 bars of bullion of about 80 lb. each.

Tonopah Mining—The regular quarterly dividend of 25c. per share and an extra dividend of 10c. per share have been declared, payable in July. During the last week 144 ft. of new work was driven, the Mizpah shaft being sunk 14 feet.

West End Consolidated—Development amounting to 88 ft. was completed last week. Shipments to the smelter amounted to 85 tons.

Tonopah Extension—Underground development has been shut down and will probably not be resumed until the mill is completed, work on the foundation of which is now being rushed. Contracts were awarded last week for furnishing different portions of the machinery, and it is expected that the mill will be ready for operation by the end of the year.

Belmont—Development work is being actvely carried on on the 1100-ft. level and the ore reserves there are being constantly enlarged. The east drift from the bottom of the winze, sunk from the 1000-ft. levels shows four feet of high-grade milling ore in the face.

STOREY COUNTY—VIRGINIA CITY

Brunswick—A reorganization of the companies operating on the Brunswick lode has been effected. The officers of the new company are E. P. Barrett, president, A. K. Durbrow, secretary and James H. Kinkead, superintendent. It is proposed to confine exploratory work to the vicinity of shaft No. 1 which is 1200 ft. deep on the incline.

WHITE PINE COUNTY—ELY

Steptoe Valley Smelting and Mining—It is expected that the copper production for June will reach considerably over 5,000,000 lb. of copper, of which the Nevada Consolidated will contribute about three-fifths and the Cumberland-Ely the balance. Three units of the Steptoe concentrator have been in operation during June, each unit handling approximately 1500 tons per day. The fourth unit will be finished about July 20 and is expected to be in good running condition by the first of August. It is officially stated that ample water for any future extensions has been provided by the developments on Duck creek and at the hydroelectric plant on the McGill ranch. At the smelter three reverberatory furnaces and three converters have been operating during June, and the fourth reverberatory is to be completed about July 25. This furnace will probably be put in operation during the early part of August. The fifth reverberatory is now under way, construction work having been started on June 10. The concentrator at Steptoe is in charge of Superintendent Waddell, and S. S. Sorensen, formerly of the Utah Consolidated, is superintendent of the smelter. The entire operations of the three companies, the Nevada Consolidated, the Cumberland-Ely, and the Steptoe reduction works, are under the general direction of C. B. Lakenan.

Oklahoma

MURRAY COUNTY

Indian Mining and Development Company—A valuable zinc field is being opened up at Davis. This company has been hauling ore from the mine for a three-carload shipment. Messrs. McGuire and Robnett, who are operating leases adjoining those of the development company, are preparing to work their mines. Ore from the latter has been tested that runs from $10 to $20 per ton.

Pennsylvania

ANTHRACITE COAL

Delaware, Lackawanna & Western Coal Company—This company is organized to buy and sell the coal mined by the Delaware, Lackawanna & Western Railroad Company. The contract provides that the new company shall buy all the coal at the mines at a price to be 65 per cent. of the tidewater selling price. The coal company in addition to paying such price for the coal, assumes all transportation charges from the mines. It is capitalized at $6,800,000, and all of the stockholders of the railroad company will be invited to subscribe to the stock of the coal sales company on the basis of one share of stock of the coal sales company for each four shares of stock held by them, respectively, in the railroad company. It is expected that a large majority of the stockholders will so subscribe. The incorporators of the company elected as directors George F. Baker, Jr., Percy R. Pyne, 2d., James A. Stillman, Edward E. Loomis, William H. Truesdale, George E. Gardiner, and Henry R. Taylor. The board has elected as president of the Delaware, Lackawanna & Western Coal Company, Edward E. Loomis; vice-president, Daniel E. Russell; secretary and treasurer, J. J. A. Owens.

BITUMINOUS COAL

Maryland Coal Company—The first coal has been hoisted from the Coleman shaft at St. Michael, on which work has been in progress for about two years. The shaft is 670 ft. deep, tapping the B, or Miller vein. It is thoroughly equipped with pumping and hoisting machinery and tipple of the latest patterns.

Tennessee

POLK COUNTY

Tennessee Copper—Preparations are being made to enter the sulphuric acid field on a larger scale than originally planned and the directors have authorized

the construction of an additional unit that will more than double the present capacity.

Utah

Beaver County

King David—The big double compartment shaft at the King David is down 400 ft. and will be continued to the 500-ft. level, when drifting will be commenced and the work of opening up the mine will start in earnest. David Evans, manager, Salt Lake City.

North America—Although the shaft is going down at a distance of 100 ft. away from the contact, a fissure filled with lead carbonate ore carrying silver has been encountered at a depth of 165 ft. Charles Morrison, manager, Salt Lake City.

Leonora—At a distance of 318 ft. from the mouth of the tunnel a vein over 4 ft. wide has been cut, which contains good silver-lead ore, carrying some gold. John Matson, manager, Beaver, Utah.

Cupric Mines—At a depth of 296 ft., the workings have passed through 7 ft. of high-grade copper ore. Sinking is being continued to catch the Horn Silver ore channel.

Juab County

Tintic District—During the week the ore shipments totaled 203 car loads as follows: Yankee, 2; Centenniel Eureka, 48; Uncle Sam, 4; Bullion Beck, 3; Eagle & Blue Bell, 1; Chief Consolidated, 1; May Day (crude), 9; May Day (concentrates), 1; Victor Consolidated, 1; Victoria, 2; Grand Central, 5; Mammoth, 1; Sioux Consolidated, 13; Colorado, 36; Lacleve, 1; Swansea, 6; Iron Blossom, 30; Beck Tunnel, 3; Dragon Iron, 35; Carisa, 1; Ajax, 3.

Salt Lake County

Columbus Consolidated—The company is sending down 50 tons of crude ore per day over the aërial tramway from Alta to Tanner's Flat, whence it is hauled by team to Sandy.

Boston Consolidated—The twelfth unit of the concentrating mill at Garfield was put in commission on June 20. The thirteenth unit has also been completed. The net copper production for May was 1,515,186 lb., of which 1,273,028 lb. were obtained from porphyry ore, and 241,552 lb. from sulphide ore. This production was obtained from 67,956 dry tons of porphyry ore and 5224 tons of ore from the sulphide mine.

South Columbus—The body of shipping ore recently found about 60 ft. from the Quincy drift is holding up well. It is some 100 ft. below the Quincy drift, the vein has apparently been cut off. The company is drifting on the body of high-grade ore recently found in the Wedge claim.

Bingham Metal—The Bingham Central Mining Company, of which Samuel Newhouse is president, and the Bingham Standard Copper Company, both having mines in Bingham cañon, have filed amendments to their articles of incorporation, this action being taken to enable a merger of the two companies into the Bingham Metal Mining Company. The details of the consolidation are to be announced in July.

Tooele County

Susanna—A mill is being erected to treat the gold ores developed in this property in the Park Valley district.

Canada

Alberta

West Canadian Collieries—A new tipple is to be constructed at this company's Bellevue mine, the engineer being on the ground laying out the work. Chas L. Rameau, of Blairmore, Alta., is general manager.

British Columbia—Atlin

North Columbia Gold Mining Company—The season has opened disastrously for this company, of Cincinnati, Ohio, operating the Pine Creek Power Company's hydraulic gold mining property on Pine creek under the management of J. M. Ruffner. The Pine Creek Power Company owns 4½ miles of placer leases on Pine creek, 575 acres of bench lands, and extensive water rights. The mine equipment included 12 monitors, 10 miles of ditch and flume carrying prior to enlargement 4500 miners' inches of water, three miles of pipe reducing from 30 to 13 in., and a dredge of the dipper type. During 1907 and 1908 the ditch was enlarged by the dredge for five miles to 26 ft. wide by a minimum depth of 6 ft., calculated to carry 15,000 miner's inches of water on a grade of 8 ft. to the mile. At Surprise lake a dam was constructed which raised the level of the lake 6 ft., thus providing a reservoir with an area of about 16 miles by 4500 ft. Floods resulting from heavy rains recently broke away this dam, and an immense volume of water carried everything before it as it swept down the creek. The damage is stated to be about $75,000, but it may be much larger. The loss of the water will involve a practical suspension of mining operations until fresh provision shall be made for a supply for gravel washing.

Nova Scotia—Sidney

Dominion Coal—As a culmination of the controversy between the United Mine Workers of America and the Provincial Workingman's Association the former organization has declared a strike. Higher wage are demanded. Collieries Nos. 2, 6 and 9 are crippled by the walkout of about 1000 men and the strikers are making an effort to close colliery No. 2 which is the largest operated by the company.

Ontario—Cobalt

Cobalt—The town of Cobalt was swept by fire on July 2. A considerable portion of the town was destroyed, and serious damage was done to the surface plants of a number of mines.

Ore Shipments—Shipments of ore from Cobalt for the week ended June 26 were: Buffalo, 46,153 lb.; Crown Reserve, 124,725; Drummond, 240,000; Kerr Lake, 61,600; La Rose, 139,367; McKinley-Darragh, 51,364; Nipissing, 453,135; O'Brien, 188,981; Right-of-Way, 61,363; Temiskaming & Hudson Bay, 63,000; total, 1,429,688 pounds.

Davis Silver Company—This company, owning 170 acres in southeastern Coleman, has adopted the leasing policy and has let three properties on five-year leases on a basis of 25 per cent. royalty on the output. Shafts are down on these leaseholds to 95, 85 and 65 ft., respectively, on calcite veins having low silver contents.

Nancy Helen—The directors have given a lease of a portion of the northern 40-acre lot to S. D. Madden. Diamond drilling on the main lot will be carried on in the hope of discovering rich ore.

Ontario—Elk Lake

Cleaves Claim—This location, one of the earliest discoveries in the district, upon which a large number of calcite veins, six of them carrying silver, has been sold to the Beacon Consolidated Mines Company, of Boston.

Mexico

Chihuahua

Batopilas—The company owns 1087 acres of mineral land which is to be thoroughly developed. In addition to this the directors have decided to do a large amount of prospecting on a concession which covers 62 square miles.

Hinds Consolidated—Deister sand tables have recently been installed in the concentrating mill.

Africa

Rhodesia

The gold production for May was 53,467 oz. fine; for the five months ended May 31 it was 248,768 oz. By values the total for the five months was $5,000,169 in 1908, and $5,095,053 in 1909; an increase of $95,484, or 1.9 per cent.

Other production reported in April includes 22,116 oz. silver, 11 tons copper, 81 tons lead, 33 tons asbestos and 623 tons chrome ore. The coal output was 14,420 tons.

Australia

Queensland

Gold output in April is reported at 34,682 oz. fine, a decrease of 3576 oz. from April of last year.

Metal, Mineral, Coal and Stock Markets

Current Prices, Market Conditions and Commercial Statistics of the Metals, Minerals and Mining Stocks

QUOTATIONS FROM IMPORTANT CENTERS

Coal Trade Review

New York, July 7—The coal trade in the West continues to show a fair degree of improvement so far as steam coal is concerned. Manufacturers are taking larger quantities and the mines are doing more work in consequence. Prices have been held down at most of the large centers by the tendency of operators to ship too largely. This is the case on every apparent revival of demand, and it is very hard to keep down this tendency to over-production.

In the East the bituminous trade is also gaining ground, though not as fast as mine operators would like to see. However, there is a real improvement, with signs that it will continue, and many sellers of coal are preparing for active fall work.

The anthracite trade continues steady and rather quiet. Most of the collieries are running full time which, of course, only meant four days during the past week. The current week will not be much better, owing to the large number of men who are accustomed to take three or four days' holiday, at least, around the Fourth.

Announcement has been made of the plan finally adopted by the Delaware, Lackawanna & Western Company for meeting the requirements of the Hepburn law. In brief, it may be said that a new company is organized, the stock of which will be sold to stockholders of the railroad company. A long contract has been made under which this new company will buy all the coal mined by the railroad company and will take charge of its sale and its transportation to tidewater and to Western selling points. The company, therefore, will cease to carry any coal nominally belonging to itself. This is very much the same plan as that adopted by the Delaware & Hudson, in a general way, but differs somewhat in details.

Coal Traffic Notes

Tonnage originating on Pennsylvania railroad lines east of Pittsburg and Erie, year to June 26, short tons:

	1908.	1909.	Changes.
Anthracite	2,689,901	2,495,403	D. 194,498
Bituminous	15,690,393	17,040,186	I. 2,349,793
Coke	3,298,115	4,847,837	I. 1,549,722
Total	21,678,409	24,383,426	I. 2,705,017

Total increase this year to date 12.5 per cent. Increase for the week, 96,968 tons, or 11.3 per cent.

New York

Anthracite

July 7—The anthracite market is dull and monotonous. About the usual trade is being done and work at the collieries is generally good, although a majority of them announced a three days' holiday this week. Prices are unchanged, the regular schedule for the month on prepared sizes being $4.55 for lump, and $4.80 for egg, stove and chestnut, f.o.b. New York harbor. For steam sizes prices are also unchanged at $3.10@3.25 for pea; $2.35@2.50 for buckwheat; $1.70@2 for rice or No. 2 buckwheat; $1.25@1.50 for barley, all f.o.b. New York harbor. Some washery pea is still offered at 10 or 15c. below the list price.

Bituminous

Trade is improving a little, though there is no great boom nor any talk of one. The far East is buying some coal for immediate use and is talking about putting in stocks for winter, but has not quite come to the point so far. Long Island Sound is doing a little better in the buying way and there seems to be more activity among the New England mills. Now York harbor remains the weak point. All-rail trade is the strongest.

Prices in New York harbor remain unchanged at $2.40@2.50 f.o.b. for grades of steam coal, and $2.60 up for better grades. Gas coal is in fair demand with slack a little scarce.

In the Coastwise trade vessels are still in good supply, but there is a tendency to ask more money. Very few are getting it, however, and rates are practically unchanged from last week.

Birmingham

July 5—The coal market in Southern territory continues to improve and the output at the mines is growing better. Four or five new mines are being opened in Alabama, railroad extensions to be put in as the mines are opened. Old mines are beginning to resume operations. The statement is made on good authority that several large contract have recently been received by Alabama coal producers.

The coke demand is good. The work of rebuilding a battery or two of coke ovens in the Blue Creek region, in the southern part of Jefferson county, is being rushed to completion. The iron companies are having all demands for coke met right along. Coke quotations are healthy.

Chicago

July 6—The coal market is firm and quiet, with buying of harvesting coal increasing at a rate gratifying to dealers, and the steam trade somewhat better. With lump in better demand because of the harvesting requirements, fine coals continue the strongest in the market. Low prices due to forced sales to escape demurrage charges exist on some Illinois lump and indicate the general weakness of large-sized coal. The range of prices is low, because of the large amount of coal being supplied on contracts at minimum figures and the large shipments, relative to demand, that have been pouring in for many weeks. Speaking generally, however, there is an improvement in the market conditions, due to better arjustment between supply and demand and to slowly but constantly increasing consumption.

Illinois and Indiana coal brings $1.75@2.15 for lump, $1.60@1.75 for run-of-mine and $1.50@1.70 for screenings. Eastern coals, headed by smokeless, are in good demand, with prices held fairly firm by the lessened receipts on the best grades, but second-rate coal selling low. Pocahontas and New River smokeless sell for $3.05@3.30 for lump and egg, and $2.90@3.05 for run-of-mine. Hocking coal is still overabundant at $2.90@3.15, but improving. The anthracite market, like the bituminous domestic market, can hardly be said to exist in any satisfactory condition, but promises improvement with the general bettering of business conditions and the realization by retailers that early laying in of stocks is profitable.

Cleveland

July 6—The market has been dull, but perhaps not unusually so for a holiday week in midsummer. Lake shipments are slow, though there is plenty of coal on hand at all the Lake Erie ports. Local prices for steam coal are about the same: No. 8 district coal brings $1.90@$2.05, Cleveland, for lump; $1.70@$1.80 for run of mine, $1.40 for slack. Middle district coal is $1.85@$2 for lump, $1.65@$1.75 for run of mine and $1.25@$1.35 for slack. Pittsburg coal brings $[illegible]@$2.05, Cleveland, for run of mine.

Indianapolis

July 6—The midyear finds the coal mining industry in an improved and favorable position. The mills, factories and railroad have entered upon the task of accumulat-

ing fuel supplies, and there are evidences of strength in other ways.

The domestic trade which usually brightens up in July is already manifesting interest in Indiana. Operators are giving attention to municipal contracts for the coming winter. Local dealers are also beginning to stock up under the belief that prices will soon advance. Manufacturers are likewise making inquiry about the lower grades, or steam coal, stating that it is their purpose to store their supplies for the next eight months.

Pittsburg

July 6—The regular movement of coal up the Lakes was scheduled to start today. The strike on the Lakes has not been definitely declared off, but there is enough labor available to man all the boats needed. Railroad shipments are not being greatly increased, as there was a large accumulation of coal at the docks. The market continues quiet and not particularly strong. Nominal prices continue at $1.10 to manufacturers and $1.20 to retail dealers for mine-run, these prices being shaded 5 to 10c. as formerly. Slack remains at 60@65c. per ton.

Connellsville Coke—The coke market continues dull. Nothing new has developed regarding the coke merger. The field work of the appraisements has been concluded and the office work is now in progress. A formal statement as to the nature and scope of the merger has been promised by the promoters the middle of this month.

Prices on furnace coke remain at $1.55 @1.60 for prompt and $1.65@1.75 on contract, depending on grade; standard foundry coke being $1.80@2 for prompt and $1.90@2.25 for contract.

The *Courier* reports the production in the Connellsville and lower Connellsville regions in the week ending June 26 at 320,634 tons, a gain of nearly 14,000 tons over the previous week. Shipments are reported at 4153 cars to Pittsburg, 6315 cars to points west of Pittsburg and 858 cars to points east of Connellsville, a total of 11,326 cars.

Foreign Coal Trade

German Coal Production—Coal production in Germany, four months ended April 30, metric tons:

	1908.	1909.	Changes.
Coal	49,396,530	48,184,594	D. 1,111,936
Brown coal	21,661,840	21,842,382	I. 180,542
Total mined	70,955,470	70,023,976	D. 931,394
Coke made	7,178,806	6,946,642	D. 232,164
Briquets made	6,854,721	6,929,165	I. 74,444

Of the briquets reported this year 4,698,707 tons were made from brown coal or lignite.

Spanish Fuel Imports—Imports of coal into Spain, three months ended March 31, were 544,561 tons, an increase of 78,615 tons over last year. Imports of coke, 63,713 tons, a decrease of 26,581 tons.

Welsh Coal Prices—Messrs. Hull, Blyth & Co., London and Cardiff, report current prices of coal as follows, on June 19: Best Welsh steam, $4.32; seconds, $4.08; thirds, $3.96; dry coals, $4.14; best Monmouthshire, $3.60; seconds, $3.48; best small steam, $2.70; second, $2.58. All per long ton, f.o.b. shipping port.

Iron Trade Review

New York, July 7—Although July is now well upon us, when dull business is usually expected, the iron and steel markets continue active, and business is still expanding. There is not, perhaps, quite as much new buying as there was a month or so ago, but inquiries are numerous and consumers show a disposition to fill their requirements for longer periods, indicating that they have confidence in the future.

In pig iron there have been good sales of foundry and basic iron in the East. The New England machinery makers seem to be waking up and are taking fair quantities of foundry. There has been a renewed demand among the pipe makers, principally for the lower grades of foundry pig. In the Central West there has been some buying of bessemer iron from the merchant furnaces, which has not been seen until very recently for over two years.

In finished material small structural contracts have made up a good aggregate of business. Such contracts continue to come in and some larger ones are under negotiation. There is also a good tonnage of plates and shapes for ship-building and car-building to be placed. Bars are in good demand and a general—but probably slight—advance in prices is expected.

The strike of the Amalgamated Association seems to be general so far as the American Sheet and Tin Plate Company is concerned. As announced last week the Association made terms with a number of independent companies and it is now negotiating with the Republic Iron and Steel Company with a strong probability that an agreement will be reached. This strike is referred to at length elsewhere.

Exports of Pipe—The sale is reported by the United States Steel Products Export Company of 9000 tons of pipe to the Anglo Persian Oil Company for the development of the oilfields of Persia. The Mexican Petroleum Company is in the market for 6000 to 7000 tons of pipe, which will probably come to this country.

Baltimore

July 7—Exports for the week included 1,169,426 lb. tin scrap to Rotterdam and 2,404,000 lb. steel billets to Liverpool. Imports included 5003 tons cupreous pyrites from Spain and 5100 tons iron ore from Cuba.

Birmingham

July 5—The Southern pig-iron market is in a strong condition and gives signs of improvement. Quotations have advanced to $12.50 per ton, No. 2 foundry, with $13 asked for special brands and special analysis iron. A 50c. advance is again looked for in a few days, the demand being good. Four companies are remaining out of the market so far as immediate iron goes. Much of the iron that has been on furnace yards in this section of the country for several months now will begin to move out, the expectations being that 100,000 tons of the product will be carried off within 60 days if not quicker. The make in the Southern territory has not been increased, though four furnaces are on the calendar for operation soon. Inquiries are coming in from all parts of the country. One of the largest Southern consumers of pig iron was in the market inquiring for something like 25,000 tons recently. Several bids were made for the business but the prices were considerably over that which the buyer was willing to pay and there has been some delay in the trade. The manufacturers assert that there are no reasons why any concessions should be made.

Operations at the steel plant at Ensley continue briskly with additional labor being put on. The rolling mills of the Tennessee company at Bessemer, Ala., are working steel.

The cast-iron pipe plants in Southern territory have much business in hand or in sight. J. W. Worthington, of the Sheffield cast-iron pipe works, is quoted as saying that that plant would resume operations shortly.

Chicago

July 6—A better tone seems to exist in the iron trade generally, and pig iron is undoubtedly firmer, with Southern especially strong relatively to its position a week or two ago. Quotations hold firmly to $12 Birmingham ($16.35 Chicago) for No. 2 iron, with 25 or 50c. more asked for last quarter deliveries by some interests. Northern sales and demands are more steady, with $16.50 the ruling price and a slight premium on fourth-quarter business obtained in some sales. The average demand is yet small, but the volume of sales is large, and some melters have bought good-sized lots. Melters continue to make heavy inquiries that indicate a disposition to buy freely in the event of a decisive turn in the range of prices, but such a turn is not expected soon. All branches of the iron and steel trade are watching developments closely.

The general conditions of iron and steel products continue encouraging; there is heavy buying, widely distributed, and increasing activity of users of such products. Coke remains at $4.70, with a good demand and supplies well regulated.

Cleveland

July 7—Ore is moving freely, and it is safe to say that no more trouble will be experienced from the lake vesselmen's strike. Sales of iron ore continue at a fair rate, prices being $4.50 f.o.b. docks for Old Range bessemer and $4.25 for Mesabi; $3.70 for Old Range non-bessemer and $3.50 for Mesabi.

Pig Iron—The market has been quiet, but prices are firm. For Cleveland delivery quotations are $16@16.15 for bessemer; $15.50@15.75 for No. 2 foundry; $14.85@15 for gray forge.

Finished Material—Some heavy orders for structural steel are pending; also for plates and other shipbuilding material. Specifications on contracts continue to come in well.

Philadelphia

July 7—The past week has not been productive of large orders. There has been steady buying of small lots among small consumers. The most interesting feature of the week is the receipt of inquiries from a few large foundry concerns which ordinarily do not buy until the latter part of August. Their early interest is caused by the fact that one element of vexing competition seems to have been withdrawn for the present—that of cutting Southern furnaces. Southern quotations have advanced. Quite a number of northern furnaces will blow in this month—six or seven. Their product is already practically sold. With Southern iron from 50 to 75c. higher it is possible for northern makers to do some business at better prices. The pipe founders continue to pick up orders. No. 2 X foundry is $16.50; Gray forge, $15.50; Basic, nominally the same.

Steel Billets—Notwithstanding the fact that two non-business days have intervened there has been a large amount of business done in billets. Prices have been marked up 50 cents.

Bars—The mills start out this week with order books well filled for several weeks. Prices are firmer than they have been. Orders from country iron stores are numerous.

Sheets—Corrugated sheet continues to sell freely and heavy plain sheet is under better sale. Users of sheet-mill products are now contracting with some liberality for future needs.

Pipes and Tubes—This branch of the industry is improving steadily.

Plates—All Pennsylvania plate mills are booking orders for all classes of plate users. Car building is making a heavy draw on the plate mills.

Structural Material—The rush of orders have only temporarily subsided. Western railway systems have about completed estimates which will be submitted within two weeks. Bridge builders are figuring on large orders. Municipal and county demands are coming along. Their orders are individually small, but there is a big bunch of them.

Scrap—The scrap demand is practically dead this week and scarcely any sales are reported.

Pittsburg

July 6—July and August are almost invariably quiet months in the iron and steel trade, and this year promises to furnish no exception as regards the placing of new business. There is, however, a large volume of specifications for finished steel products on the books, due in part to the fact that much of the low-priced material was sold with the definite proviso that a large tonnage should be specified by July 1. This will give the mills ample opportunity to run, and there will be no decrease in production except as mills here and there close for needed repairs, while a few mills are closed on account of failure to sign the Amalgamated Association scale.

The independent sheet and tinplate manufacturers which had formerly operated as union signed the Amalgamated Association scale at noon June 30. The American Sheet and Tin Plate Company stood on its declaration of a month earlier that it would operate on the open shop basis after the expiration of the scale June 30, and at the close of the night turn June 30 the men walked out of all the company's sheet and tinplate mills which had formerly been union, with the exception that the men at the Guernsey plant, Cambridge, O., continued at work. This closed 131 of the 202 tin-mills the company had been operating, leaving 71 non-union tin-mills running, which number is being increased to 90 by the starting of the United States and Monongahela works, which had been idle for a long time, but which had formerly been non-union. It is possible that no active efforts will be made by the company to break the tie-up. The sheet industry presents no problem, as only a portion of the company's sheet mills had been union.

The independent iron mills had also signed the Amalgamated Association scale, while the Republic Iron and Steel Company had failed to sign, the difficulty appearing to be only as to whether or not the continuous steel mills at the Brown-Bonnell and Sylvan works should be included in the agreement. On June 30 the men walked out of the company's iron mills, but it is understood the continuous steel mills at the Brown-Bonhell plant remained in operation, so that the question may solve itself in the near future, the company signing the scale for the iron mills and the Amalgamated Association relinquishing its claim to the continuous steel mills.

Pig Iron—Owing to the season of the year and the interruption of the holiday the pig-iron market has been quiet, but no strength has been lost and former prices are rigidly adhered to, at $15.50, Valley, for standard bessemer, $15@$15.25 for basic, $15@$15.50 for No. 2 foundry, $15.25@$15.50 for malleable and $14@$14.25 for forge, all f.o.b. Valley furnace, the freight to Pittsburg being 90 cents.

Steel—Prices in the open market remain firm, bessemer billets being $23 and bessemer sheet-bars $25, while open-hearth material generally is quoted at 50c. or $1 advance. The Carnegie Steel Company has advanced its price on forging billets to $27, Pittsburg. These usually command an extra of $2 over rolling billets. Deliveries of billets and sheet-bars on regular contracts will be smaller in July than in June, owing to a number of finishing mills closing for repairs, and, in the case of certain Steel Corporation sheet and tin mills, on account of the labor difficulty. Plates are stronger, concessions of $1 a ton from the 1.30c. price having entirely disappeared, leaving the market quotable at a minimum of 1.30@1.35 cents.

Sheets—The strike closes only a small proportion of the mills previously operated and as the independents are running fairly well the supply of sheets is ample. The market is fairly firm at 2.20c. for black and 3.20c. to 3.25c. for galvanized.

Ferromanganese—A sale of a round lot for delivery into next year and several sales of small lots are reported. The market is firmer, being quotable at $41, Baltimore, for delivery in the next 60 days; at $42 for delivery over second half, and at slightly higher prices for delivery into next year, freight to Pittsburg being $1.95 per ton.

Foreign Iron

German Pig Iron Production—The German Iron and Steel Union reports the production of pig iron in Germany in May at 1,090,467 metric tons, an increase of 43,270 tons over April. For the five months ended May 31 the make was, in metric tons:

	1908.	1909.	Changes.	
Foundry iron	955,328	944,200	D.	11,128
Forge iron	292,706	290,382	D.	2,324
Steel pig	426,239	447,585	I.	21,256
Bessemer pig	181,746	172,425	D.	9,321
Thomas(basic)pig	3,237,187	3,327,476	I.	90,289
Total	5,093,206	5,182,068	I.	88,772

The total increase was 1.7 per cent. Steel pig includes spiegeleisen, ferromanganese and all similar alloys.

Russian Exports—Exports of iron and steel from Russia for the full year were, in metric tons:

	1907.	1908.	Decrease.	
Pig iron	72,484	9,344	D	63,040
Scrap iron and steel	30,944	2,992	D	27,952
Rails	88,960	87,776	D	1,184
Other iron and steel	27,048	8,169	D	18,879

This shows a material decrease in all items except steel rails.

Metal Markets

New York, July 7—The markets have been rather quiet, on account of the holiday break. The tendency seems to be towards unchanged or lower prices.

Gold, Silver and Platinum

UNITED STATES GOLD AND SILVER MOVEMENT

Metal.	Exports.	Imports.	Excess.
Gold:			
May 1909..	$11,171,265	$ 2,263,721	Exp. $ 8,907,544
" 1908..	26,555,913	3,101,002	Exp. 23,464,911
Year 1909..	55,487,891	17,767,857	Exp. 37,720,034
" 1908..	44,891,257	22,958,223	Exp. 21,933,034
Silver:			
May 1909..	4,428,448	3,857,388	Exp. 571,060
" 1908..	4,028,334	3,389,568	" 638,766
Year 1909..	23,854,629	18,532,453	" 5,322,176
" 1908..	21,077,185	17,688,150	" 3,389,035

Exports from the port of New York, week ended July 3: Gold, $2,992,000, chiefly to Holland and France; silver, $854,370, to London and Paris. Imports: Gold, $118,723, chiefly from Haiti and South America; silver, $79,957, from Mexico and Central America.

Treasury Department's estimate of amount and kinds of money in the United States on July 1:

	In Treasury.	In Circul'n.
Gold coin (inc. bullion in Treasury)	$ 188,411,745	$ 601,433,854
Gold certificates	34,772,660	817,829,209
Silver dollars	7,640,133	71,990,679
Silver certificates	6,096,484	478,317,516
Subsidiary silver	27,210,207	132,135,741
Treasury notes of 1890	10,013	4,294,987
U. S. notes	6,039,413	340,641,603
Nat. bank notes	23,415,062	666,565,012
Total	$293,595,717	$3,113,058,601

Amount of money in Treasury does not include government deposits in National banks, amounting to $63,230,880. Population of the United States July 1, 1909, estimated at 88,926,000; circulation per capita, $35.01. Total circulation shows an increase of $67,601,312 over July 1 last year.

Gold—No special demand developed for gold this week and the price in the open market in London continued at the minimum, 77s. 9d. per oz. for bars. Most of the gold arriving was taken by the Bank of England. In New York $2,500,000 was taken early in the week for shipment to Argentina on London account. There were arrangements made for further shipment of bars to Paris later, probably about $2,000,000, perhaps more.

Platinum—Business this week has been very dull owing to the broken week. Quoted prices are unchanged at $22 50 for platinum, $25 for hard metal containing iridium and $18@20 for good scrap.

SILVER AND STERLING EXCHANGE

July	1	2	3	5	6	7
New York	51½	51½	51½	[illegible]	[illegible]	51½
London	23¾	23	23¼	23¼	23⅛	23⅛
Sterling Ex.	4.88[illegible]	4.88[illegible]	4.88[illegible]	[illegible]	4.88[illegible]	4.87[illegible]

New York quotations are cents per ounce troy fine silver. London prices are pence per ounce sterling silver, 0.925 fine.

Silver—The silver market has declined this week on speculative selling in India and also on sales by Chinese banks, and closes steady in London at 23½d., with the tendency uncertain.

Exports of silver from London to the East, Jan. 1 to June 17, as reported by Messrs. Pixley & Abell:

	1908.	1909.	Changes.
India	£ 3,929,168	£2,870,900	D. £1,058,268
China	516,400	1,155,100	I. 638,700
Straits	90,510	82,800	D. 7,710
Total	£ 4,536,068	£4,108,800	D. £ 427,268

Imports for the week were £3000 from Mexico, £12,000 from New Zealand and £260,000 from New York; total, £275,000. Exports, £3500 to Port Said, £80,000 to China and £271,500 to India; £355,000 in all.

Copper, Tin, Lead and Zinc

July.	Copper. Lake, Cts. per lb.	Copper. Electrolytic, Cts. per lb.	Copper. London, £ per ton.	Tin. Cts. per lb.	Lead. New York, Cts. per lb.	Lead. St. Louis, Cts. per lb.	Zinc. St. Louis, Cts. per lb.
1	13⅜ @13⅝	12⅞ @13⅛	58¾	29¾	4.35	4.25 @4.30	5.25 @5.30
2	13⅜ @13⅝	12⅞ @13⅛	58⅞	28⅞	4.35	4.25 @4.30	5.25 @5.30
3	13⅜ @13⅝	12⅞ @13⅛	....	28⅞	4.35	4.25 @4.30	5.25 @5.30
5	.....	.....	...	....	....	....	....
6	13⅜ @13⅝	12⅞ @13⅛	58¾	29	4.35	4.25 @4.27½	5.22½ @5.27½
7	13½ @13	12⅞ @13	58	29	4.35	4.25 @4.27½	5.22½ @5.27½

London quotations are per long ton (2240 lb.) standard copper. The New York quotations for electrolytic copper are for cakes, ingots and wirebars, and represent the bulk of the transactions made with consumers, basis, New York, cash. The price of cathodes is usually 0.125c. below that of electrolytic. The quotations for lead represent wholesale transactions in the open market. The quotations on spelter are for ordinary Western brands; special brands command a premium.

Copper—A midsummer dullness pervades the market and business during the week has been practically at a standstill. Ample quantities of copper are for sale at current prices, and in the absence of any demand the tone of the market is easy, the close being lower at 13¼@13½ for Lake; 12⅞@13c for electrolytic in cakes, wirebars or ingots and 12¾@13c for casting copper.

Copper sheets are 17@18c base for large lots. Full extras are charged, and higher prices for small quantities. Copper wire is 15c base, carload lots at mill. Business is rather dull.

Disappointed speculators have been steady sellers in the London market, and prices have crumbled away from day to day, the close being cabled at £58 for spot and £59 5s. 6d. for three months.

Refined and manufactured copper are quoted English tough for ingots, best selected, £60 to £61 for ingots, strong sheets, £72 10s.@£73; tos.

Statistics for the second half of June are cabled us as showing an increase of 5125 tons.

Exports of copper from New York and Philadelphia for the week were 6823 long tons. Our special correspondent gives the exports from Baltimore at 931 tons copper.

Tin—There has been a fair influx of orders in the London market from American sources, which helped to sustain prices early in the week. Toward the close there are rumors to the effect that the chief consumer in this country is trying to find a market for his surplus. These reports, however, are not taken seriously and prices have given way only slightly.

Spot business in New York is done around 29c., while the close is cabled from London as £135 15s. for spot and £132 12s. 6d. for three months.

Lead—Inquiries from consumers have been very light, and consequently the premium which has ruled for certain Missouri brands is gradually disappearing. The close is easy at 4.25@4.27½c., St. Louis, and 4.35c., New York.

The London market has again recorded a decline, the close being cabled at £12 15s. for Spanish lead and £12 17s. 6d. for English.

Spelter—In sympathy with other metals, the market for spelter has also given way somewhat, consumers having supplied their requirements for the time being. The close is barely steady at 5.37½@5.42½c., New York, and 5.22½@5.27½c., St. Louis.

The quotation for spelter in New York July 1-3, inclusive, was 5.40@5.45c.; July 6 and 7 it was 5.37½@5.42½ cents.

Base price of sheet zinc is 7c. per lb., f.o.b. La Salle-Peru, less 8 per cent. discount.

The London market closes steady at £21 17s. 6d. for good ordinaries and £22 2s. 6d. for special brands.

Silesian Spelter Market—Paul Speier writes from Breslau, Germany, under date of June 25, that prices have remained firm. Spelter is quoted at 45 marks per 100 kg.—equal to 4.85c. per lb.—f.o.b. works in Silesia. Zinc sheets are in fair demand at 52@56 marks per 100 kg., average 5.83c. per lb.—base price. The tons of the market is strong. The production of spelter in upper Silesia for the first quarter of 1909 was 35,047 metric tons, an increase of 1337 tons over the first quarter of 1908. The output of zinc sheets for the quarter was 11,023 tons, a decrease of 2613 tons from last year.

Other Metals

Antimony—Current quotations are quite nominal at 8¾c. per lb. for Cookson's.

7⅝c. for Hallett's; 7⅞c. for U. S., and 7⅝c. for outside brands. Business has been dull, owing to the tariff uncertainty.

Aluminum—Prices are unchanged at 22@24c. base for No. 1 ingots; 31@32c. base for wire, and 33@34c. base for sheets.

Quicksilver—The New York price is a little lower, dealers quoting $43.50@44 per flask of 75 lb. Business is fair. San Francisco quotations are $43.50 for domestic and $41.50 for export orders. The London quotation is still nominally £8 7s. 6d. per flask, but jobbers sell at £8 1s. 3d., an unusual difference.

Nickel—Large lots, contract business, 40@45c. per lb. Retail, spot, from 50c. for 2000-lb. lots, up to 55c. for 500-lb. lots. The price for electrolytic is 5c. higher.

Cadmium—Current quotations 75c. per lb., in 100-lb. lots, at Cleveland, Ohio. In Germany, 450@475 marks per 100 kg. at factory.

Magnesium—Quotations for this metal are $1.25 per lb., New York, in 100-lb. lots; for 5-lb. lots, $1.40 per pound.

Spanish Metal Exports

Exports of metals and minerals from Spain, three months ended March 31, reported by *Revista Minera*, in metric tons:

Metals.	1908.	1909.	Changes.	
Pig and manuf. iron	5,470	5,568	I.	98
Copper	2,416	3,763	I.	1,347
Copper precipitate	5,388	3,923	D.	1,465
Lead	42,383	34,847	D.	7,536
Zinc	402	778	I.	376
Quicksilver	635	422	D.	213
Minerals.				
Iron ore	2,137,663	1,740,868	D.	396,795
Manganese ore	8,574	1,650	D.	6,924
Copper ore	316,420	273,041	D.	43,379
Lead ore	919	805	D.	114
Zinc ore	22,415	30,348	I.	7,933
Pyrites	365,081	275,058	D.	90,023
Salt	147,612	123,458	D.	24,154

Imports of phosphate rock, 25,395 tons in 1908, and 25,128 in 1909; decrease, 267 tons.

Zinc and Lead Ore Markets

Platteville, Wis., July 3—The base price of 60-per cent. zinc ore was $44@44.50; no premium price is reported. For 80 per cent. lead ore $57@58 per ton was paid.

SHIPMENTS, WEEK ENDED JULY 3.

Camps.	Zinc ore, lb.	Lead ore, lb.	Sulphur ore, lb.
Platteville	679,620	.....	.....
Benton	441,180	.....	.....
Hazel Green	237,300	45,700	.....
Strawbridge	198,000	.....	.....
Harker	185,960	.....	.....
Days Siding	176,000	.....	.....
Galena	154,000	.....	.....
Livingston	140,000	.....	.....
Highland	74,000	.....	.....
Cuba City	60,000	246,355	83,515
Linden	63,000	.....	.....
Total	2,418,060	292,055	83,515
Year to July 3	60,191,985	2,787,145	4,936,815

In addition to the above there was shipped to the American Zinc Ore Separating Company 291,600 lb., and to the Joplin Separator Works, 374,500 lb. zinc concentrates.

Joplin, Mo., July 3—The highest price paid for sulphide zinc ore was $47.50 per ton. The assay base price was $44@45 per ton of 60 per cent. zinc, but very little ore sold under the $45 base. Silicate zinc ore sold on a base of $17@19 per ton of 40 per cent. zinc. The average price, all grades, was $41.78 per ton. The highest price paid for lead ore was $57, offerings at the week-end declining to $55. The average, all grades, was $56 per ton.

Heavy buying was continued this week, and the purchasable stock is practically all sold. Purchases for the coming week must be curtailed to the output, which was greatly reduced by a water spout. The mines between Webb City and Oronogo and at Carl Junction were inundated. The inflow of Center creek and a small tributary between Webb City and Carterville created a heavy water problem for some of the sheet-ground mines. Though the market was strong until the purchasable ore was sold, it weakened materially at the week-end, indicating very light buying ahead.

SHIPMENTS, WEEK ENDED JULY 3.

	Zinc, lb.	Lead, lb.	Value.
Webb City-Carterville	4,098,210	595,420	$104,782
Joplin	2,221,390	325,740	57,961
Duenweg	811,950	127,130	21,015
Oronogo	661,160	.....	14,986
Alba-Neck	620,650	.....	13,964
Galena	546,390	53,390	13,241
Prosperity	477,920	54,380	11,797
Miami	532,350	48,030	10,660
Granby	713,220	23,350	10,356
Carthage	388,810	.....	8,753
Badger-Peacock	347,000	.....	7,634
Spurgeon	202,630	102,860	7,234
Aurora	370,410	.....	5,288
Quapaw	203,400	.....	4,175
Sarcoxie	88,700	.....	1,951
Carl Junction	50,630	.....	1,164
Zincite	52,730	.....	1,160
Totals	12,387,550	1,330,240	$296,121
27 weeks	306,018,970	48,039,880	$6,964,747

Zinc value, the week, $258,867; 27 weeks, $5,672,510
Lead value, the week, 37,254; 27 weeks, 1,292,237

MONTHLY AVERAGE PRICES

Month.	Zinc Ore. Base Price. 1908.	Zinc Ore. Base Price. 1909.	Zinc Ore. All Ores. 1908.	Zinc Ore. All Ores. 1909.	Lead Ore. All Ores. 1908.	Lead Ore. All Ores. 1909.
January	$37.60	$41.25	$35.56	$38.46	$46.88	$52.17
February	36.43	36.94	34.92	34.37	49.72	50.50
March	36.19	37.40	34.19	34.71	49.90	50.82
April	35.40	38.63	34.08	37.01	52.47	55.63
May	34.19	40.06	33.39	37.42	56.05	56.59
June	33.06	44.15	32.07	40.35	60.48	57.52
July	34.56	.....	31.67	.....	59.90	.....
August	36.52	.....	33.42	.....	60.34	.....
September	37.63	.....	34.44	.....	54.59	.....
October	35.95	.....	33.28	.....	52.63	.....
November	39.13	.....	35.02	.....	54.53	.....
December	42.75	.....	39.63	.....	49.68	.....
Year	$36.63	.....	$34.31	.....	$53.93	.....

NOTE—Under zinc ore the first two columns give base prices for 60 per cent. zinc ore; the second two the average for all ores sold. Lead ore prices are the average for all ores sold.

Chemicals

New York, July 7—Business for the week has been dull, as was to be expected from the combined effects of the holiday and the hot weather.

Copper Sulphate—The market remains stationary with prices unchanged at $4.22½ per 100 lb. for carload lots; $4.32½@4.40 per 100 lb. for smaller parcels.

Arsenic—The market is weak and quotations have fallen off slightly, 2¾@3c. per lb. being named for white arsenic. Two causes are named for the depression, the appearance of a new producer in the field, and the general belief that white arsenic will be admitted free of duty under the new tariff.

Nitrate of Soda—There is no change, but the demand is good and the article is firmly held. Quotations continue 2.15c. per lb. for spot, and 2.12½c. for futures.

Messrs. Mortimer & Wisner, New York, report the position of nitrate in the United States on July 1 as follows, in long tons:

	1908.	1909.	Changes.	
Stocks, Jan. 1	5,900	9,140	I.	3,240
Imports 6 months	124,950	150,350	I.	25,400
Total Supplies	130,850	159,490	I.	28,640
Deliveries 6 months	120,170	158,590	I.	38,420
Stocks, July 1	10,680	900	D.	9,780
Afloat for U. S.	60,000	71,000	I.	11,000

Quantities afloat include all cargoes due to arrive at United States ports before Oct. 15 next.

Mining Stocks

New York, July 7—The holiday this week added to the irregularity in the general stock market, already rather confused in its tendencies, as has been the case for the past week or two. Price movements were variable, some stocks advancing and others declining. While the market is still chiefly a professional one, there seems to be no directing power just at present, and profits are taken on very small fluctuations.

On the announcement of a plan for disposing of its coal, together with a dividend of 50 per cent. in cash, and 15 per cent. in stock, Delaware, Lackawanna & Western reached a record point, selling at $680 per share or $50 par value.

On the Curb the same conditions prevailed as on the Exchange. Price movements were irregular and some shares were notably heavy. This was the case with nearly all the copper stocks, which were depressed to a considerable degree. On the opening, after the holiday, trading was very dull and limited to small sales, but prices were rather firmly held. Cobalt shares were the active end of the market, and the industry that has been applied to bringing those issues into notice is evidently beginning to bear fruit. The Nevada gold stocks were rather neglected.

Boston, July 6—The triple holiday period tended to restrict market operations and the result has been a resting spell in the mining share list. Prices have main

tained a fair amount of strength and very few stocks are offering. Any attempt to buy them would easily put prices up.

American Zinc, which had a sharp upward movement last week, has been quick and the price ran off $1.50 to $29.25, with some recovery today. Superior & Pittsburg has had a good upward movement, extending $4 within the week to $18.50. This company is paying off its floating debt, incurred almost two years ago, at the rate, it is said, of $50,000 per month. The company is largely owned by Pittsburg interests.

Upon the announcement of the unexpected and sudden serious sickness of R. D. Evans, U. S. Smelting securities softened in today's operations. The common lost to $48.75 and the preferred went to the same figure. Mr. Evans sold his large interests in this company to other inside interests last spring because of internal dissensions, so that in the event of his death there will be no material effect on the company's future.

North Butte has been quiet and steady until today when it broke to $54.75, which is almost a $3 decline from a week ago. Although sentiment is not optimistic on this stock it is not particularly pessimistic.

Curb business has been on the wane, also. Prices, as a rule, have held well; while in the case of Ohio Copper the stock has risen over $1.25 to $5.50. Nevada-Utah has steadied on official reports that the company had no intention of calling an assessment and had a plentiful supply of ready cash with no debts.

STOCK QUOTATIONS

NEW YORK July 7 Name of Comp.	Clg.
Alaska Mine	.12
Amalgamated	82 3/4
Anaconda	48 1/2
Balaklala	‡2 1/16
British Col. Cop	7 3/8
Buffalo Mines	3 1/2
Butte Coalition	25 1/8
Colonial Silver	.30
Cum. Ely Mining	8
Davis-Daly	5 1/2
Dominion Cop.	7
Douglas Copper	2 1/4
El Rayo	2
Florence	3
Foster Cobalt	.32
Furnace Creek	06
Giroux	7 7/8
Gold Hill	1/4
Goldfield Con	6 7/8
Granby	101
Greene Gold	1/4
Greene G. & S.	9
Guanajuato	1
Guggen. Exp	196
Hanapah	‡15
Kerr Lake	7 3/4
McKinley Dar	85
Miami Copper	17 3/4
Micmac	1/4
Mines Co. of Am	5/8
Montezum of C. R.	.35
Mont. Sho. C.	1 1/2
Nev. Utah M. & S.	2
Newhouse M. & S.	.14
Nipissing Mines	10
Old Hundred	1/2
Silver Queen	.35
Stewart	[illegible]
Tennessee Cop'r	‡38 1/4
Tri Bullion	1/4
United Copper	10 3/4
Utah Apex	6 1/2
Utah Copper	49 1/4
Yukon Gold	4 1/16

†Ex Rights

BOSTON July 7 Name of Comp.	Clg.
Adventure	6 3/4
Allouez	‡42
Am. Zinc	29 1/2
Arcadian	‡4
Arizona Com	‡39 1/2
Atlantic	9
Boston Con.	14 7/8
Calumet & Ariz	105
Calumet & Hecla	640
Centennial	‡32
Copper Range	81
Daly-West	‡7 1/4
East Butte	12 1/4
Franklin	17 1/2
Greene-Can	10
Hancock	10 1/4
Isle Royal	25 1/2
Keweenaw	3 1/2
La Salle	12 1/2
Mass	8 1/2
Michigan	‡10
Mohawk	66
Nevada	23 1/8
North Butte	55 1/2
Ojibway	11
Old Colony	‡60
Old Dominion	54
Osceola	‡132 1/2
Parrot	31
Quincy	90
Rhode Island	14 3/4
Shannon	15 1/4
Superior	41 3/4
Superior & Bost	15 1/8
Superior & Pitts	17 1/2
Tamarack	‡70
Trinity	12
U. S. Sm. & Ref	49 1/4
U. S. Sm. & Re. pd	49 1/2
Utah Con.	42 1/2
Victoria	‡4 1/2
Winona	5
Wolverine	‡140
Wyandotte	‡2 3/4

‡Last quotation

N. Y. INDUSTRIAL	
Am. Agri. Chem.	46 1/2
Am. Smelt. & Ref.	94 1/8
Am.Sm. & Ref., pf.	112 1/4
Colo. Fuel & Iron.	44
Federal M. & S., pf.	‡88 3/4
National Lead	86 3/8
National Lead, pf.	‡107
Pittsburg Coal	11 1/4
Republic I. & S.	31
Republic I. & S., pf.	104 3/4
Sloss-Sheffield	‡82 1/2
Standard Oil	‡685
U. S. Steel	68 3/4
U. S. Steel, pf.	125 1/2
Va. Car. Chem.	54 1/2

BOSTON CURB	Low.
Ahmeek	175
Chemung	14
Chino	8
Corbin	7
Globe Con	4 1/4
Helvetia	5 1/4
Ray Central	2 1/16
Ray Con	16 7/8
San Antonio	10

Furnished by Hornblower & Weeks, N. Y.

ST. LOUIS July 3 N. of Com.	High.	Low.
Adams	.40	.30
Am. Nettie.	.08	.06
Center Cr'k	1.80	1.50
Cent.C. & C.	82.00	81.00
C.C. & C. pf.	81.00	80 00
Cent. Oil	110.00	100.00
Columbia	8.00	7 00
Com. Coal	19 00	18.00
Doe Run	110.00	100 00
Gra. Bimet.	.20	25
St. Joe	13.00	12.00

LONDON July 7 Name of Com.	Clg.
Dolores	£1 58 0d
Stratton's Ind.	0 3 1½
Camp Bird	1 7 6
Esperanza	2 16 3
Tomboy	1 2 6
El Oro	1 7 0
Oroville	0 13 6

Cabled through Wm. P. Bonbright & Co., N. Y.

Furnished by Weir Bros. & Co., New York.

NEVADA STOCKS. June 30.

Name of Comp.	Clg.
Comstock Stocks	
Belcher	48
Best & Belcher	40
Caledonia	22
Chollar	.18
Comstock	30
Con. Cal. & Va.	88
Crown Point	.47
Exchequer	27
Gould & Curry	.20
Hale & Norcross	.26
Mexican	1 02
Ophir	1.47
Overman	.32
Potosi	27
Savage	24
Sierra Nevada	30
Union	.48
Utah	05
Yellow Jacket	51
Tonopah Stocks	
Belmont	.85
Extension	48
Golden Anchor	‡ 51
Jim Butler	09
MacNamara	.24
Midway	.20
Montana	.60
North Star	.02
Tono'h Mine of N.	6.62½
West End Con	.20
Goldfi'd Stocks	
Adams	.01
Atlanta	.10
Blue Bell	.02
Booth	.11
C.O.D. Con	.11
Columbia Mt.	.10
Comb. Frac	.60
Con. Red Top	‡ 57
Cracker Jack	02
Dia'dfield B. B. C.	03
Goldfield Belmont	.04
Goldfield Daisy	26
Great Bend	05
Jumbo Extension	.10
Kendall	02
Lone Star	.03
May Queen	.03
Oro	06
Red Hill	.05
Sandstorm	08

Name of Comp.	Clg.
Silver Pick	.10
St. Ives	.10
Triangle	.01
Bullfrog Stocks	
Gibraltar	.02
Homestake King.	.01
Mont. Shoshone C.	1.50
Tramp Cons	.05
Miscellaneous	
Cumberland Ely	7.87
Giroux	7.62½
Greenwa'r Copper	05
Nevada Con	23.12½
Nevada Hills	.87½
Nevada Smelting.	1 00
Nevada Wonder	.40
Nevada-Utah	1 87½
Penn-Wyoming	...
Pittsburgh S. Pk.	47
Ray Central	2 43¾
Ray Con	16.75
Round Mt. Sphinx	10

COLO. SPRINGS July 2 Name of Comp.	Clg.
Acacia	.07
C. C. Con	‡ 03 1/8
Dante	‡.05 1/2
Doctor	.09 1/4
Elkton	.65
El Paso	.53
Findlay	.14
Gold Dollar	11 1/2
Gold Sovereign	.03 1/4
Isabella	22 7/8
Jack Pot	.07 1/4
Jennie Sample	.07 1/2
Jerry Johnson	.06 1/4
Lexington	‡.02
Mary McKinney	.39
Pharmacist	.03 1/8
Portland	80
U. G. M.	05
Vindicator	55
Work	06 1/4

Assessments

Company.	Delinq.	Sale	Amt.
Alpha, Nev	July 15	Aug 6	$0 05
Best & Belcher, Nev	July 20	Aug 10	0.10
Black Jack, Utah	June 15	July 8	0.01
Brunswick Chol., Nev	July 10	Aug 2	0 01
Brunswick Potosi, Nev	July 10	Aug 2	0 01
Bullion, Nev	June 14	July 13	0 05
Caledonia, Nev	July 23	Aug 13	0 05
Challenge Con., Nev	June 22	July 13	0 05
Mexican, Nev	June 28	July 14	0 10
Mountain Dell, Utah	July 19	Aug 5	0 01
N. Y. Bonanza, Utah	July 10	July 31	0 03
Potosi, Nev	July 9	Aug 2	0 10
Progressive, Utah	June 23	July 14	0.01
Scottish Chief, Utah	July 7	Aug 4	0 01
Seg. Belcher, Nev	July 7	July 29	0 03
Seven Troughs Mon., Nev	June 23	July 10	0 00
Sierra Nevada, Nev	July 15	Aug 10	0.10
Silver King Con., Utah.	July 6	July 17	0.10
Union Con., Nev	June 28	July 19	0 10
W. Con. Va., Nev	July 16	Aug 10	0.10
Yellow Jacket, Nev	July 13	Aug 5	0.25

Monthly Average Prices of Metals

SILVER

Month.	New York. 1908.	New York. 1909.	London. 1908.	London. 1909.
January	55.678	51.750	25.738	23.834
February	56.000	51.472	25.855	23.706
March	55.365	50.468	25.570	23.227
April	55.505	51.428	25.133	23.708
May	52.795	52.905	24.377	24.343
June	53.663	52 538	24.760	24.166
July	53.115	......	24.514	......
August	51.683	......	23.858	......
September	51.720	......	23 877	......
October	51.431	......	23.725	......
November	49.647	......	22.933	......
December	48.766	......	22.493	......
Year	52.864	......	24.402	......

New York, cents per fine ounce; London, pence per standard ounce.

COPPER

	New York. Electrolytic 1908.	Electrolytic 1909.	Lake. 1908.	Lake. 1909.	London. 1908.	London. 1909.
January	13.726	13.893	13.901	14.280	[illegible]	57.688
February	12.905	12 949	13.098	13.295	58.786	61.198
March	12.704	12.387	12.875	12 826	58.761	56.231
April	12.743	12.56¼	12.928	12.93¾	58.331	57.363
May	12.598	12.893	12.788	13.238	57.387	[illegible]
June	12.675	13.214	12.877	13.548	57.842	59.627
July	12.702	......	12.933	......	57.989	......
August	13.462	......	13.639	......	60.500	......
September	13.388	......	13.600	......	60.338	......
October	13.354	......	13.646	......	60.139	......
November	14.130	......	14.386	......	63.417	......
December	14.111	......	14.411	......	62.943	......
Year	13.208	......	13.424	......	59.902	......

New York, cents per pound. Electrolytic is for cakes, ingots or wirebars. London, pounds sterling, per long ton, standard copper.

TIN AT NEW YORK

Month.	1908.	1909.	Month.	1908.	1909.
January	27.380	28 060	July	29.207	.....
February	28.978	28.290	August	29.942	......
March	30.577	28.727	September	28.815	......
April	31.702	29.445	October	29.444	......
May	30.015	29.225	November	30 348	......
June	28.024	29 322	December	29.154	......
			Av. Year	29.465	......

Prices are in cents per pound.

LEAD

Month.	New York. 1908.	New York. 1909.	St. Louis 1909.	London. 1908.	London. 1909.
January	3.691	4.175	4 025	14.469	13.113
February	3.725	4 018	3 868	14.250	13.313
March	3.838	3.986	3 835	13 975	[illegible]
April	3.993	4 168	4 051	13 469	13.297
May	4.253	4.287	4.214	12.938	13.225
June	4.466	4.350	4 291	12 600	13.031
July	4.744	......	......	13.000	......
August	4.580	......	......	13.375	......
September	4.515	......	......	13.125	......
October	4.351	......	......	13 375	......
November	4.330	......	......	13 538	......
December	4 213	......	......	13.156	......
Year	4.200	......	......	13.439	......

New York and St. Louis, cents per pound. London, pounds sterling per long ton.

SPELTER

Month.	New York 1908.	New York 1909.	St. Louis. 1908.	St. Louis. 1909.	London. 1908.	London. 1909.
January	4 513	5.141	4 363	4 991	20 563	21.425
February	4 788	4 889	4 638	4 739	20 875	[illegible]
March	4 665	4 757	4.527	4.607	21.075	[illegible]
April	4 645	4.965	4 495	4 815	21 .344	21.531
May	4 608	5 124	4.458	4.974	19 906	21 975
June	4 543	5.402	4 393	5.252	19 000	[illegible]
July	4.485	.....	4.338	.....	19 031	......
August	4 702	.....	4.556	.....	19 350	......
September	4 769	.....	4.619	.....	19 563	......
October	4 801	.....	4.651	.....	19 750	......
November	5 059	.....	4.909	.....	20 875	......
December	5 137	.....	4.987	.....	20 625	......
Year	4.726	.....	4.578	.....	20.163	......

New York and St. Louis, cents per pound. London, pounds sterling per long ton.

Mining and Metallurgical Companies—U. S.

Name of Company	and Location.	Shares. Issued.	Par Val.	Dividends. Total to Date.	Latest. Date.		Amt.
Alaska, Mexican, g.	Alas.	180,000	$ 5	$ 2,184,381	April	'09	$0.40
Alaska Treadwell, g	Alas.	200,000	25	10,485,000	April	'09	0.50
Alaka United, g	Alas	180,200	5	513,520	April	'09	0.25
Amalgamated, c.	Mont	1,538,879	100	70,018,993	May	'09	0.50
Am. Sm.&Ref.,com	U. S	500,000	100	16,500,000	July	'09	1.00
Am. Sm. & Ref., pf.	U. S.	500,000	100	31,500,000	July	'09	1.75
Am. Smelters, pf. A	U. S	170,000	100	3,965,000	June	'09	1.50
Am. Smelters, pf B	U. S	300,000	100	6,000,000	June	'09	1.25
Am. Zinc, Lead&Sm.	Kan	80,000	25	280,000	Nov.	'07	0.50
Anaconda, c	Mont.	1,200,000	25	44,850,000	June	'09	0.50
Arizona, c	Ariz	3,682,520	....	6,182,520	April	'06	0.50
Atlantic, c.	Mich.	100,000	25	990,000	Feb.	'05	0.02
Bald Butte, g. s.	Mont	250,000	1	1,354,648	Oct.	'07	0.04
Beck Tunnel, g. s. l.	Utah	1,000,000	0.10	675,000	Oct.	'07	0.02
Bent'a M.&D.,pf.,l.z.	Wis.	196,607	1	10,949	Nov.	'08	0.01½
Boston & Montana	Mont	150,000	25	53,400,000	April	'09	3.00
Bull.Beck.&Cham.,g.	Utah	100,000	10	2,728,400	July	'08	0.10
Bunker Hill & Sull.	Ida	300,000	10	11,016,000	June	'09	0.15
Butte Coalition, c. s	Mont	1,000,000	15	2,450,000	Dec.	'07	0.15
Calumet & Arizona, c.	Ariz	200,000	10	10,500,000	May	'09	1.00
Calumet & Hecla, c.	Mich.	100,000	25	108,950,000	June	'09	6.00
Camp Bird, g., s.	Colo	820,000	5	5,707,200	April	'09	0.24
Carisa, c. g	Utah	500,000	1	55,000	Nov.	'06	0.01
Colorado, l. g. s.	Utah	1,000,000	0.20	1,470,000	June	'09	0.08
Columbus Con., c.	Utah	285,540	5	226,832	Oct.	'07	0.20
Con. Mercur, g	Utah	1,000,000	1	3,385,313	Dec.	'06	0.02½
Continental, z. l.	Mo	22,000	25	231,000	Oct.	'08	0.25
Copper Range Con	Mich.	384,185	100	8,452,070	July	'09	1.00
Creede United, g	Colo	1,625,000	1	214,053	July	'06	0.00½
Daly Judge, g. s. l.	Utah	300,000	1	225,000	April	'07	0.37½
Daly West, g. s. l.	Utah	180,000	20	5,785,000	July	'09	0.30
De Lamar, g. s.	Ida	80,000	5	835,200	Sept.	'06	0.24
Doe Run, l	Mo	63,508	100	1,955,156	June	'09	1.50
Elkton Con., g	Colo	2,500,000	1	2,354,460	June	'09	0.01½
El Paso, g	Colo	2,450,000	1	1,315,545	Sept.	'08	0.01
Fed. Sm., com	Idaho	60,000	100	2,708,750	Jan.	'09	1.50
Federal Sm., pf	Idaho	120,000	100	4,751,250	June	'09	1.75
Findley, g	Colo	250,000	1	337,500	Sept.	'06	0.01
Florence, g	Nev	1,050,000	1	525,000	June	'09	0.10
Frances-Mohawk, g	Nev	912,000	1	546,000	Jan.	'08	0.05
Gemini-Keystone	Utah	5,000	100	2,000,000	Aug.	'07	10.00
Gold King Con.	Colo	3,750,370	1	1,407,504	May	'05	0.01
Goldfield Con., g	Nev	3,546,013	10	2,834,232	July	'09	0.30
Grand Central, g	Utah	250,000	1	1,321,250	Dec.	'07	0.04
Granite, g	Colo	1,650,000	1	230,500	June	'09	0.01
Hecla, s. l	Idaho	1,000,000	0.25	1,690,000	Dec.	'08	0.01½
Homestake, g	S. D	218,400	100	24,481,640	June	'09	0.50
Horn Silver, g.s.c.z.l.	Utah	400,000	25	5,642,000	Sept.	'07	0.05
Imperial, c	Ariz	500,000	10	300,000	June	'07	0.20
Inter'l Nickel, pf	N. Y	89,126	100	2,005,335	Aug.	'09	1.50
Iron Blossom, s. l	Utah	1,000,000	0.10	160,000	June	'09	0.08
Iron Silver	Colo	500,000	20	4,100,000	Oct.	'07	0.10
Jamison, g	Cal	390,000	10	347,100	April	'09	0.02
Jerry Johnson	Cal	1,500,000	1	86,700	Jan.	'08	0.01
Kendall, g	Mont	500,000	5	1,275,000	Oct.	'08	0.02
Liberty Bell, g. s.	Colo	130,551	5	130,440	Jan.	'07	0.15
Lightner, g	Cal	102,255	1	253,081	Oct.	'06	0.05
Lower Mammoth, g	Utah	190,000	1	57,000	Sept.	'07	0.07½
MacNamara, s. g.	Nev	728,341	1	21,850	May,	'09	0.01
Mammoth, g. s. l	Utah	400,000	2.50	2,220,000	Mar.	'08	0.05
Mary McKinney, g	Colo	1,309,252	1	867,278	June	'09	0.02
May Day, g. s. l.	Utah	800,000	1	108,000	Sept.	'08	0.01½
Mohawk, W	Mich	100,000	25	1,850,000	Feb.	'09	2.00
Mont. Ore Purch.	Mont	80,833	25	9,437,274	Jan.	'07	15.00
Nevada Hills, s.g	Nev	746,000	5	373,000	Dec.	'07	0.10
New Century, z. l	Mo	300,000	1	213,000	Dec.	'06	1.01
Newhouse M. & S. c.	Utah	600,000	10	300,000	Sept.	'07	0.50
New Idria, q.	Cal	100,000	5	1,404,000	July	'09	0.30
New Jersey Zinc	U. S	100,000	100	12,000,000	May	'08	4.00
North Butte	Mont	400,000	15	7,200,000	June	'09	1.00
North Star, g	Cal	250,000	10	2,086,989	June	'09	0.40
Old Dominion, s.	Ariz	293,245	25	849,332	Mar.	'09	0.50
Old Dominion, M&Sc	Ariz	162,000	25	526,500	Mar.	'09	1.00
Ophir, g. sz.	Nev	201,600	3	1,816,360	May	'08	0.10
Osceola, c	Mich	96,150	25	7,804,850	June	'09	4.00
Parrot, c. s	Mont	229,850	10	6,807,649	Sept.	'07	0.25
Phelps, Dodge & Co	U. S	44,934,600	1	2,246,730	June	'09	0.02½
Portland, g	Colo	3,000,000	1	8,227,080	Jan.	'09	0.40
Quartette, g. s	Nev	100,000	10	375,000	July	'07	0.20
Quincy, c	Mich	110,000	25	18,560,000	Mar.	'09	1.00
Round Mountain, g	Nev	800,000	1	160,027	June	'09	0.04
Sacramento, g. q	Utah	1,000,000	1	225,000	Nov.	'06	0.00½
St. Joseph, l	Mo	1,000,000	10	6,458,357	June	'09	0.15
Shannon, s	Ariz	300,000	10	450,000	July	'07	0.50
Silver Hill, g. s.	Nev	108,000	1	81,000	June	'07	0.05
Silver King, g. s. l.†	Utah	150,000	20	11,187,500	July	'07	0.33½
Silver King Co't'n.†	Utah	1,250,000	5	1,303,350	July	'09	0.15
Sioux Con	Utah	746,389	1	440,089	June	'09	0.07
Snow Storm, s. l.	Ida	1,500,000	1	780,000	June	'09	0.03
Standard Con., g. s.	Cal	178,394	10	5,194,130	Dec	'08	0.10
Stratton's Independ.	Colo	1,000,000	5	4,895,865	April	'06	0.12½
Swansea, g. s. l.	Utah	100,000	5	329,500	Mar.	'07	0.05
Tamarack, c	Mich	60,000	25	9,420,000	July	'07	4.00
Tennessee, c	Tenn	200,000	25	2,056,250	Sept.	'08	1.25
Tomboy, g. s.	Colo	300,000	5	2,016,000	Dec.	'08	0.48
Tonopah of Nev.	Nev	1,000,000	1	4,950,000	July	'09	0.35
Tonopah Belmont	Nev	1,500,000	1	600,000	April	'07	0.10
Tonopah Ext'nsion.	Nev	928,433	1	283,030	April	'06	0.15
Tonopah Midway	Nev	1,000,000	1	250,000	Jan	'07	0.05
Uncle Sam, g. s. l	Utah	500,000	1	295,000	Dec.	'08	0.02
United States, com	Utah	351,010	50	2,323,565	July	'09	0.50
United States, pf.*	Utah	486,042	50	5,731,609	July	'09	0.87½
United Cop. com	Mont	450,000	100	5,962,500	Aug.	'07	1.75
United, c. pf.	Mont	50,000	100	1,500,000	May	'07	3.00
United, z. l., pf.	Mo.-Kan.	19,556	25	312,782	Jan.	'08	0.50
United Verde, c.	Ariz	300,000	10	1,385,322	Mar	'09	0.75
U. S. Red & Ref. Pf.	Colo	39,458	100	1,005,504	Oct.	'07	1.50
Utah, g. (Fish Sp'gs)	Utah	100,000	10	323,000	Feb.	'09	0.02
Utah Con., c.	Utah	300,000	5	7,650,000	July	'09	0.50
Utah Copper	Utah	727,100	10	1,423,487	July	'09	0.50
Victoria, Utah	Utah	250,000	1	177,000	Mar.	'07	0.04
Vindicator Con., g.	Colo	1,500,000	1	1,980,000	Jan.	'09	0.03
Wolverine, c.	Mich	60,000	25	5,400,000	April	'09	5.00
Work, g	Colo	1,50 ,000	1	172,500	July	'08	0.01
Yankee Con	Utah	1,000,000	1	182,500	Jan.	'07	0.03
Yellow Aster, g.	Cal	100,000	10	958,789	Aug.	'07	0.20

*Previous to consolidation $1,436,250 were divided. †Amalgamated.

Coal, Iron and Other Industrials—United States

Name of Company	and Location.	Shares. Issued.	Par Val.	Dividends. Total to Date.	Latest. Date.		Amt.
Allis-Chalmers, pf.	U. S.	161,500	100	$3,108,875	Feb.	'04	$1.75
Amer. Ag.Chem., pf.	U. S	181,530	100	1,747,620	April	'09	3.00
American Cement	Penn	200,000	10	1,348,000	July	'09	0.30
American Coal	Md	50,000	25	2,572,187	June	'09	0.375
Bethlehem Steel, pf.	Penn.	150,000	100	900,000	Nov.	'06	0.75
Cambria Steel	Penn.	900,000	50	9,450,000	Feb.	'09	0.75
Central C. & C., com.	Mo	51,250	100	2,613,750	April	'09	1.51
Central C. & C., pf.	Mo	18,750	100	1,476,562	April	'09	1.25
Col.& Hock.C.&I.,pf.	Ohio	69,244	100	487,684	July	'09	1.50
Consolidated Coal	Ill	50,000	100	350,000	July	'04	1.00
Consolidation Coal	Md	102,500	100	x10,431,650	Jan.	'09	3.50
Crucible Steel, pf.	Penn.	244,365	100	8,736,049	June	'09	1.25
Empire S. & I., pf.	N. J	25,000	100	933,033	Jan.	'09	1.50
Fairmont Coal	W. Va	120,000	100	1,980,000	Jan.	'09	2.00
Gen. Chem., com.	U. S.	74,103	100	2,297,193	June	'09	1.00
General Chem., pf.	U. S.	100,000	100	6,405,000	July	'09	1.50
International Salt	Penn.	182,280	100	911,400	Dec.	'06	1.00
Jeff.&Cl'f C.&I., cm.	Penn.	15,000	100	330,000	Aug.	'05	5.00
Jeff. & Cl'f C. & I., pf.	Penn.	15,000	100	900,000	Feb.	'09	2.50
Kern River Oil	Cal.	20,000	100	84,000	July	'08	0.10
Lehigh Coal & Nav.	Penn.	382,260	50	15,779,410	May	'09	2.00
Maryland Coal, pf.	Md	18,850	100	2,061,122	June	'09	2.50
Monon. R. Coal, pf.	Penn.	100,000	100	2,324,000	July	'08	3.50
Nat. Carbon, com	U. S.	55,000	100	715,000	April	'08	1.00
Nat. Carbon, pf.	U. S.	45,000	100	3,071,259	Nov.	'08	1.75
National Lead, com.	N. Y.	149,034	100	3,456,497	July	'09	1.25
National Lead, pf.	N. Y.	149,040	100	18,155,068	Mar.	'09	1.75
Nat'l Steel&Wire,pf.	N. Y.	25,778	100	631,561	May	'06	1.75
New Central Coal	Md	50,000	20	390,000	Nov.	'08	0.40
New River Coal, pf.	W. Va	37,617	100	451,405	Nov.	'08	1.50
Pacific Coast Borax.	Cal	19,000	100	2,086,500	Aug.	'05	1.00
Peerless Oil	Cal	92,000	10	711,000	June	'08	0.06
Penna. Salt	Penn.	60,000	50	15,098,000	Oct.	'08	3.00
Penna. Steel, pf.	Penn.	165,000	100	8,662,500	Nov.	'08	3.50
Phila. Gas, com	Penn.	664,800	50	*24,264,600	Feb.	'09	0.75
Phila. Gas, pf.	Penn.	120,000	50	2,850,000	Sept.	'08	1.25
Pittsburg Coal, pf.	Penn.	297,010	100	11,434,962	April	'09	1.75
PocahontasC.C., pf.†	W. Va	28,000	100	252,000	Jan.	'09	3.00
Pocah'tasC.C., cm.†.	W. Va	45,000	100	†406,800	Oct.	'08	3.00
Republic I.&S., pfd.	Ill.	204,169	100	6,453,676	July	'09	2.00
Sloss-Sheffield, com.	Ala	100,000	100	2,133,000	June	'09	1.25
Sloss-Sheffield, pf.	Ala	67,000	100	4,338,000	July	'09	1.75
Standard Oil	U. S.	970,000	100	652,802,000	June	'09	9.00
Tenn. C. & I., com.	Tenn.	225,536	100	3,583,060	Nov.	'07	1.00
Tenn. C. & I., pf.	Tenn.	2,840	100	390,040	Nov.	'07	2.00
Texas & PacificCoal.	Texas	23,940	100	1,747,620	April	'09	1.50
Uni. Metals Selling.	U. S.	50,000	100	5,875,000	Jan.	'09	5.00
U.S. Steel Corp., cm.	U. S.	5,083,025	100	85,889,569	June	'09	0.50
U. S. Steel Corp., pf.	U. S.	3,602,811	100	237,890,029	June	'09	1.75
Va. Carolina Ch., pf.	U. S.	180,000	100	15,060,869	July	'09	2.00
Warwick I. & S.	U. S.	148,671	10	517,739	Nov.	'08	0.30
Westmoreland Coal.	Penn.	60,000	50	8,880,000	Oct.	'08	2.50

*Since 1894. †Since 1907. ‡Since 1890. xStock div. $6,130,000 Mar.'09

Canada, Mexico, Central and South America

Name of Company	and Location.	Shares. Issued.	Par Val.	Dividends. Total to Date.	Latest. Date		Amt.
Amistad y Conc'rdia	Mex	9,600	50	$417,070	April	'08	$1.36
Batopilas	Mex	446,486	20	†55,784	Dec.	'07	0.12½
British Columbia, c.	B. C	503,000	5	201,200	Sept.	'07	0.40
Buffalo, s.	Ont	900,000	1	444,000	July	'09	0.05
Butters' Salvador, g.	Salv	150,000	5	600,000	April	'05	0.25
Cobalt Central, s.	Ont	4,761,500	1	187,460	Aug.	'09	0.01
Comagas	Ont	800,000	5	720,000	July	'08	0.15
Consolidated M. & S.	B. C	53,552	100	781,885	Nov.	'07	1.25
Crow's Nest Pass	B. C	160,000	25	2,018,648	July	'07	0.62½
Crown Reserve, s.	Ont	1,750,000	1	898,700	July	'09	0.15
Dolores, g. s.	Mex	400,000	5	600,000	Aug.	'09	0.15
Dominion Coal, com.	N. S	150,000	100	3,300,000	July	'09	1.00
Dominion Coal, pf.	N. S	30,000	100	‡630,000	Feb.	'08	3.51
Dos Estrellas, g.s.	Mex	300,000	0.50	3,780,000	Jan.	'09	1.00
El Oro, g.s	Mex	1,080,000	5	4,989,600	July	'09	0.36
Esperanza, s.g	Mex	455,000	5	9,558,750	July	'09	0.37
Foster Cobalt, s.	Ont	1,000,000	1	50,000	Jan.	'07	0.05
Granby Con	B. C	135,000	100	3,518,620	Dec.	'08	2.00
Greene Con. Copper.	Mex	864,000	10	6,137,800	Mar.	'07	0.40
Guanajuato	Mex	540,000	5	74,250	Oct.	'06	0.07
Guanajuato D., pf.s.	Mex	10,000	100	30,000	July	'08	3.00
Guggenheim Expl	Mex	105,000	100	5,535,000	July	'09	2.50
Hinds Con., g. s. c. l.	Mex	5,000,000	1	100,000	Feb.	'08	0.02
Kerr Lake, s.	Ont	600,000	5	1,108,000	June	'09	0.30
La Rose Con., s.	Ont	1,143,368	5	876,925	July	'09	0.20
Le Roi, Ltd., g	B. C	200,000	25	425,000	Dec.	'06	0.48
Le Roi No 2, g.	B. C	120,000	25	889,200	Mar	'09	0.48
Lucky Tiger-Com.,g	Mex	65,000	10	71,500	Dec.	'08	0.30
McKinley-Darragh,s	Ont.	2,247,692	1	780,000	June	'09	0.05
Mex. Con. M &S Co	Mex	240,000	10	660,000	Mar.	'08	0.25
Mex. Mill.&Trans.pf.	Mex	12,000	100	35,450	Jan.	'08	3.00
Mines Co of Am.	Mex	2,000,000	1	3,605,000	Aug	'09	0.03
N Y & Hond. Ros.	C. A	150,000	10	2,512,000	June	'09	0.10
Nipissing, s	Ont	1,200,000	5	2,940,000	July	'09	0.25
N. S. St. & Coal, com	N. S	9,876	100	1,087,876	April	'08	1.56
N. S. St. & Coal, pf	N. S	10,300	100	479,150	April	'09	2.00
Penoles*	Mex	2,500	100	8,620,000	Dec.	'07	20.00
Peregrina, pf s	Mex	10,000	100	538,650	Mar	'09	3.50
Pinguico, pf. s.	Mex	20,000	100	240,000	Oct	'08	3.00
Reco, g s l	B. C	985,000	1	527,082	April	'06	0.02
Right of Way	Ont	499,518	1.00	219,768	July	'09	0.06
Securities Corp., pf.	Mex	2,000	100	42,000	July	'08	3.50
Silver Queen, s	Ont	1,500,000	1	345,000	Nov	'08	0.05
Temiskaming, s	Ont	2,500,000	1	525,000	April	'09	0.06
Tezutlan Copper.	Mex	10,000	100	......	Dec.	'08	1.20
Tilt Cove, c.	N. F.	89,000	2	495,630	May	'08	0.55
Tretheway, s.	Ont	945,450	1	311,998	May	'09	0.01
Tyee, c.	B. C	180,000	5	201,600	Aug	'07	0.68

*Mexican Currency. †Since reorganization. ‡Since August, 1905.

Industrials

The Baldwin Locomotive Works, Philadelphia, Penn., has purchased the entire property, business and good will of the firm of Burnham, Williams & Co., and assumed all its assets and liabilities.

F. E. Brandis & Sons, Brooklyn, N. Y., have recently supplied a transit to a large Japanese mine. The transit was made of a new composition known as Ajaxa, and is very much lighter than the composition now being used by the majority of transit manufacturers.

The city of Nappanee, Indiana, has doubled the capacity of its water supply plant by the installation of a second double-stroke geared pump, manufactured and installed by the Keystone Driller Company, of Beaver Falls, Penn., who also had contract for boring the well in which the pump was hung.

The Cutler-Hammer Manufacturing Company, of Milwaukee, Wis., announces that it has purchased the plant, business and patents of the J. L. Schureman Company, of Chicago, Ill. The manufacture of the well-known types of Schureman controlling apparatus will be continued, and all agreements and contracts made by the J. L. Schureman Company will be faithfully carried out by its successor.

Keuffel & Esser Company, Hoboken, N. J., has introduced to the field a new linen-measuring tape, called the Samson, of great durability and made especially to withstand the severest conditions of mining, etc. This tape will prove highly efficient where steel tapes and ordinary linen lines do not give satisfaction. The line is made of very heavy pure linen, is closely woven and has a coating which protects it from atmospheric influences.

One large double-stroke geared pump and two single-stroke geared pumps are being installed by the Keystone Driller Company, Beaver Falls, Penn., at the plant of the United Ice and Coal Company, Harrisburg, Penn. The water obtained is to be used in the manufacture of ice. It has been found that artesian water is more pure than the city supply. But the greatest saving is effected in the cooling of the water. The artesian supply can be frozen at a cost of about 30 per cent. less than the city water.

Detroit Lubricator Company, Detroit, Mich., has issued a forty-page booklet on the New Detroit bullseye locomotive lubricator, which is of special value to the practical man in view of its comprehensive arrangement, the illustrations and general descriptive matter relative to the theory, construction and operation of the locomotive lubricator. All material used in the "Detroit" bullseye locomotive lubricator is of the best quality, put together in a thoroughly workmanlike manner, and with ample strength and material at all points to insure durability. Before leaving the factory every lubricator is subjected to various tests at pressures far in excess of any reasonable factor of safety to insure their withstanding every possible requirement of service.

The Hendrie & Bolthoff Manufacturing & Supply Company has issued a new publication entitled "Power Irrigation," which calls attention to the wonderful work that is being accomplished in pumping water for irrigation purposes. The book contains more information of value to irrigation men than any work heretofore published. The company has had years of experience in power equipment of all kinds and feels that this has been of value not only to it in securing so many contracts for the installation of pumping plants, but also to its customers in enabling it to install plants that have proven to be eminently satisfactory. The illustrations of some plants and drawings of others give a good idea of what the company is doing in these lines. It has in its engineering department men skilled in electricity, steam, gasolene and hydraulics, and is in an excellent position to supply any information desired.

Among some recent notable installations of electrical machinery by the Westinghouse Electric and Manufacturing Company, in the mining territory of several western States, may be noted the following: The new blower house of the Washoe smelter of the Anaconda Copper Mining Company, at Anaconda, Mont., contains four 600-hp. motors driving Root blowers, and two additional 600-hp. slow-speed motors driving high-pressure air compressors for pneumatic-locomotive service. The turbine plant of the Helena Power Transmission Company, Butte, Mont., is a Westinghouse installation. This supplies the local Butte mines in parallel with a 70,000-volt, 85 mile transmission line, and has performed some remarkable overload and emergency service. The pumping station at the Leonard mine of the Boston & Montana C. C. & S. M. Company, 1200 ft. underground, contains two 300-h.p. couples of two 150-h.p. motors, each direct-connected to Nordberg pumps and supplemented by a similar 150-hp. motor driving an Aldrich pump. The station, 1200 feet under ground, is about 20 feet high, is lighted by arc lamps, and has a complete switchboard installation. The semi-automatic relay-controlled hoist of the Modoc mine of the Anaconda Copper Mining Company, Butte, Mont., is also an interesting recent installation of the Westinghouse Company.

A recent illustration of the productive rapidity possible in some of the great machine shops of the country was the record-time execution of a rush order for the headgate equipment required for a water power arrangement by the Anaconda Copper Mining Company, Rainbow Falls, Mont., in the plant of the Dodge Manufacturing Company, Mishawaka, Ind. The work involved the construction of 13 units of head gates, with frames and geared operating mechanism. The headgates and frames, 40 ft. long, were of structural steel and weighed a total of 75 tons. The operating mechanism was built of cast iron framing, with cast gears, etc., making an aggregate of 150 tons. The contract was taken by the Dodge people April 3, 1909, guaranteeing shipment in four weeks from date of order. Drawings and specifications were furnished by the Anaconda engineers, so actual construction could begin at once. All the patterns had to be made for the castings, which were of special nature throughout. This work was done, the castings were made and the assembling well under way on April 14, just eleven days later. The entire job was sent to Montana April 23, thus making the delivery in twenty days, or eight days less than the contract called for. It is one thing to make quick delivery of a large order for regular product that is simply a matter of warehouses and stocks. It is another thing to produce quickly, from pattern to paint, a big job of new and special stuff that is a matter of factory facilities and management.

Some time ago we referred in our columns to the fact that the Lunkenheimer Company, Cincinnati, Ohio, had received from the Panama Canal Commission a very large order for their "Renewo" globe, angle and cross valves. The order at time covered upward of seven thousand valves. Within the past two weeks this company received an additional order for "Renewo" valves, amounting in all to upwards of $50,000. This repeat order for this improved valve, from a discriminating purchaser such as the Canal Commission, tends to show that the merit of the device has been recognized, and the initial order must have opened up so satisfactorily that they thought it necessary, in spite of the severe competition and lower prices, to favor the Lunkenheimer Company with their specification. The "Renewo" valve has a renewable self-cleansing seat, and the disc can also be replaced when worn. Owing to the ingenious construction of the seating faces, the seat will outwear many discs. It is not necessary in every case to replace these parts, as the regrinding feature (which the Lunkenheimer Company originated, and which has been featured by them for many years in another valve construction, is also embodied in the "Renewo" valve, so that if desired the seating faces can be reground and made tight without removing the valve from connecting pipes. This device is worthy of the investigation of engineers generally, and the Lunkenheimer Company at Cincinnati, Ohio, or their branches in New York, Chicago or Boston, will be glad to supply full particulars.

Trade Catalogs

Dearborn Drug and Chemical Works, Chicago, Ill. Pamphlet. "Lubrication versus Friction." Illustrated, 44 pages, 4x8½ inches.

Detroit Lubricator Company, Detroit, Mich. Booklet. Detroit Bullseye locomotive lubricator. Illustrated, 40 pages, 5½x8 inches, paper.

Dodge Manufacturing Company, Mishawaka, Ind. Book. "Twenty-five Years of Rope Driving." Illustrated, 104 pages, 9x12 inches.

The Pressed Radiator Company of America, Pittsburg, Penn. Catalog. Kinnear pressed radiators. Illustrated, 24 pages, 6x9 inches, paper.

New York Engineering Company, 2 Rector street, New York. Catalog. Empire hand prospecting drill. Illustrated, 22 pages, 6x9 inches, paper.

Williams Patent Crusher and Pulverizer Company, St. Louis, Mo. Introductory catalog showing some of the materials, countries and states where machines are in operation. 20 pages, 6½x6½ inches, paper.

Production Notes

According to statistics of THE MINERAL INDUSTRY the production of barytes fell off badly in the United States in 1908, amounting to only 38,546 short tons ($130,109), as compared with 65,579 short tons ($251,308) for 1907.

Figures collected for THE MINERAL INDUSTRY show the 1908 production of zinc oxide, including zinc-lead pigments, in the United States, to have been only 65,100 short tons, worth $5,816,040, against 85,390 short tons, worth $7,731,100, in 1907.

Statistics collected for THE MINERAL INDUSTRY show that the production of bismuth in 1908 was not as great as that in the initial year in this industry in the United States; 5200 lb. only, valued at $6600, were produced, against 10,000 lb., valued at $12,500, in 1907.

The production of scrap and sheet mica in the United States in 1908 was as follows: Scrap, 2417 short tons, value $33,904; sheet, 972,964 lb., value $234,021. The 1907 production was larger, amounting to 3025 short tons ($42,800) of scrap and 1,060,182 lb. ($349,311) of sheet mica.

The United States produced only 700 short tons of emery valued at $10,360 in 1908 as shown by statistics of THE MINERAL INDUSTRY. This was a decrease from the 1907 output of 1069 short tons valued at $12,294. New York continued to contribute the greater part of the production.

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Notes on Manhattan Placers, Nye County, Nev.

The Pay Gravel, 2 to 4 Ft. Thick, Lies beneath an Overburden of 35 to 90 Ft. and Is Mined through Shafts. Said to Average $10 per Yard

BY CHARLES COLCOCK JONES *

The following observations were made during a recent examination of the Manhattan, Nev., placers generally and certain properties in particular. Regarding the formation, W. H. Emmons and G. H. Garrey in "Notes on the Manhattan District," have so well expressed general conditions that I quote from their paper.

MANHATTAN, NEV.—LOOKING DOWN THE GULCH TOWARD SMOKY VALLEY

"The rocks around Manhattan include slates, limestones, quartzite, diorite, porphyry and rhyolite; the orebodies so far discovered are in the sedimentary rocks.

Sedimentary Rocks

"The slates, limestones, and quartzites which make up the sedimentary series at Manhattan are exposed for two or three miles along the Tonopah road, and about as far on the road to Belmont. S. F. Emmons describes a series of slates, limestones and quartzites at Belmont closely resembling these and G. A. Gilbert further notes that the slates at Belmont contain Silurian fossils, and estimates their thickness at from 4500 to 5000 feet. The slates at Manhattan are probably of the same age.

"Near Manhattan, as at Belmont, the sedimentary rocks are extensively metamorphosed and consist for the most part of dark, fine-grained mica schists or phyllites. The limestone layers are in most cases less than 30 ft. thick and probably will be found not to persist for very great distances. Usually they have been entirely re-crystallized and in some places changed to an impure, gray marble. Quartzite layers also occur interbedded with the belts of schist. A quartzitic breccia or conglomerate layer less than 20 ft. thick, made up chiefly of large subangular quartz fragments occurs near the Reilly fraction, dipping with the schists.

"At Manhattan, the glossy or satin-like phyllites or fine mica schists predominate over other members of the series. These are present in considerable variety but the most common facies is one which in hand specimens appears to be composed almost entirely of biotite. Microscopic study shows that this schist consists chiefly of biotite, muscovite and quartz. The mica forms interlocking folia in perfect alinement with the schistosity, inclosing small grains of quartz having also a pronounced, though less perfect, lineal arrangement. In certain facies crystals of chlorite and magnetite cut across the laminæ of the mica in a manner which shows that they were formed after the schistosity was produced. The schistosity, as a rule, is approximately parallel to the bedding, as determined by contacts of limestone and slate.

Ore Deposits

"So far as developments have shown the ore deposits of the Manhattan district are confined entirely to the area of metamorphosed sedimentary rocks, which is surrounded by rhyolite, granite and alluvium. The orebodies are (1) Nar-

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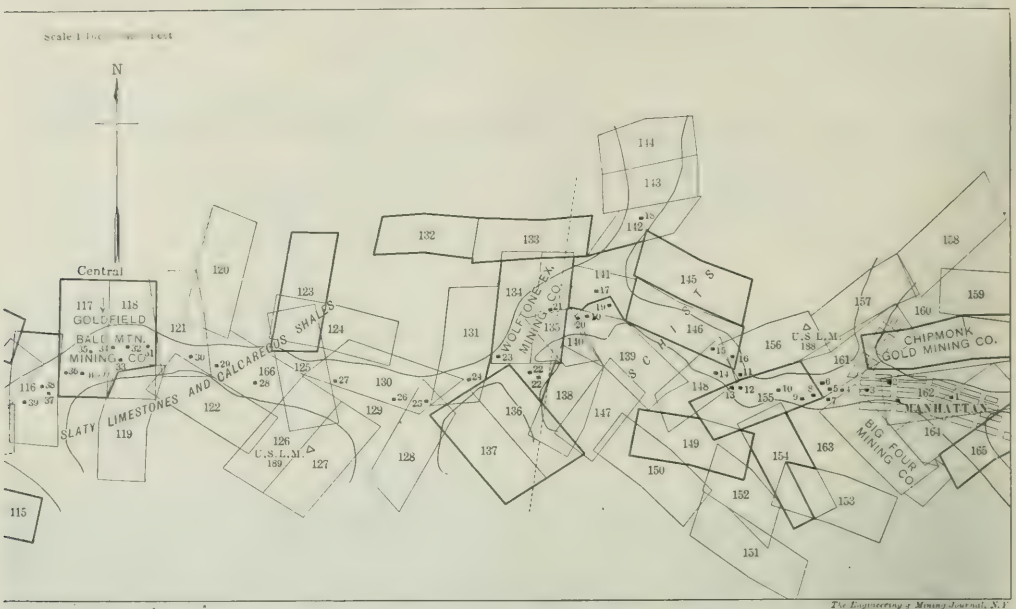
[1]Bull. No. 303, U. S. Geol. Surv., 1907.



MANHATTAN GULCH PLACERS, NYE COUNTY, NEVADA—UPPER END. MAP BY LIDDELL & LIDDELL

MANHATTAN GULCH PLACERS, NYE COUNTY, NEVADA—WEST END

row, tabular lode deposits occurring in rather continuous veins crosscutting the bedding and schistosity of the metamorphosed sediments; (2) deposits interlaminated with the schistosity, (3) deposits parallel to bedding planes of the quartzites, shales and limestones and replacing part or all of the limestone or calcareous layers.

"Most of the principal ore-bearing fissures of the district, so far as could be learned from a considerable number of compass readings, strike north or a few degrees west of north. * * * The dips of the principal veins range from 45 to 90

deg.; but a majority of them are inclined to the southwest at angles ranging from 60 to 70 deg. That there has been extensive faulting in the ore-bearing rocks is shown by brecciated zones and polished striated walls, exposed by mining explorations. Fractures traverse the slate, limestone and quarzite layers in all directions and along some of them the beds have been displaced."

Manhattan experienced a boom in 1905 and 1906, and very large sums of money were spent in building mills and trying to open paying mines in the schist and the slate and calcareous belts with rather disastrous results. There is a wide distribution of gold in the schist and other formations as interlaminated leaf gold, disseminated grains, crystallized gold in vugs, and as masses of considerable size, but from their character the deposits have been of a nature more profitable thus far to the leaser, or pocket-miner, than to an organized company. The formation as a whole was favorable to erosion and a concentration of its disseminated gold values in the gulches, following the lines of least resistance.

Topography

The rounded summits, soft outlines and easy grades of the Manhattan gulches are in strong contrast to the rugged outcrops of other Nevada camps in the volcanic rocks. The topography of the region indicates a widespread and deep erosion the greater part of which was tributary to the main Manhattan gulch. This gulch begins in a divide of the range about 1½ miles east of the town of Manhattan at an elevation of about 740 ft. A bench mark near the middle of the town reads 7021 ft., A. T.; at central the elevation is 6682 and at shaft No. 36 on the Happy Day claim it is 6350 ft., making an average grade of about 3½ per cent.

Beginning at the summit, the formation from there to the point of Wolftone hill opposite shaft No. 21, a distance of 2½ miles, is schist with intercalated lime beds, having a general north and south strike and a dip of 20 to 45 deg. to the west. From Wolftone hill to about shaft No. 45 on the Fairview claim the formation is a series of beds of slate, limestone and calcareous shale, lying flat or dipping slightly to the west.

Another belt of schistose rocks with dip to the west continues westward until covered on the lower slopes by alluvium merging into the Smoky Valley. As will be noted from the map, the gulch runs nearly east and west for a distance of four miles when it takes an abrupt turn to the north and two miles below ends in Smoky Valley.

Discoveries of Placer Gold

The early history of the discovery of placer gold is a trifle vague, but the facts are about as follows: The Dexter company in the fall of 1905 found colors in sinking a well for water in the gulch in the lower part of the town, but paid no attention to it. In the summer of 1906 nuggets were discovered at the surface on a bench above the gulch, on the Little Grey claim opposite shaft No. 12 by a miner named Burns. Throughout that summer and to the present time this bench channel has been worked in a southeasterly direction. The dirt is wheeled in barrows to sluice boxes and washed with water pumped from a well in the gulch.

In April, 1908, when mining in this camp was practically at a standstill, William McDonald, a placer miner from California, believing the gulch would pay, secured a lease on the Nellie Grey and sank shaft No. 13. He reached bedrock in 23 ft., finding pay gravel 5 to 7 ft. thick, which averaged $10 per yard and cleared several thousand dollars before his lease expired.

In 1905 a well had been sunk 45 feet to bedrock at Central, and gold had been found in the gravel, but the circumstance was overlooked in the rush for lode claims. However, the owners at Central, Auxier, Hayward & Crews, on the strength of McDonald's find, put down shaft No. 35 to bedrock, finding 3 feet of rich gravel. The sinking of this shaft and proving the gravel at Central was the real inception of gulch mining in Manhattan.

Thomas Wilson, familiarly known as "Dry Wash" Wilson from his successful placer work at Round Mountain, immediately acquired and completed shaft No. 24, dropping into a wet channel that

GOLDFIELD & BALD MOUNTAIN SHAFT—HEADFRAME WILL BE ON SUPERSTRUCTURE TO MAKE DUMP ROOM

MIDDLE PORTION OF MANHATTAN GULCH, NEV.—LOOKING WEST FROM WOLFTONE HILL

THOMAS (DRY WASH) WILSON'S WORKINGS—SHAFT NO. 25

SHAFT 30—LIMESTONE AND CALCAREOUS SHALES ON THE RIGHT

produced ample water and the largest nuggets found to date, ranging from 5 to 30 oz. From this time to March until the present date, May 24, there have been over 60 shafts sunk to bedrock varying from 35 to 90 ft., the latter being at shaft No. 63, the farthest west. Nearly all of these shafts have shown pay gravel from 2 to 4 ft. thick running from $5 to $30 per yard.

The Pay Gravel

About 25 per cent of the pay gravel consists of subangular boulders of limestone, quartz and quartzite, rarely exceeding 1½ cu.ft. in size, and generally of a convenient size to handle by one man; the other 75 per cent. is made up of sand, gravel and flat pieces of shale and limestone. Above the pay gravel is usually a foot or two of fine micaceous silt-like mud from the erosion of the schists; the balance to surface is made up of flat pieces of shale, limestone and limedust. The gravel stands so well that in sinking the prospect shafts the only timber used is a crib of two or three hewed poles as a collar to support the windlass. Two men, one on the windlass, can sink a 4x6-ft. shaft, on an average 8 ft. per day, down to 40 feet.

The gold is coarse, very few particles weighing less than half a grain, and from that up to several pennyweights with occasional large nuggets; it is generally flat in shape and only partially rounded. In fineness it approximates 770, the balance being silver, and averages $15 per oz. From washings and pannings made by myself of measured amounts I consider it is safe to say that $10 per cu.yd. is a fair estimate, judging from the work done to this date in the gulch. This is confirmed from other reliable sources, and by careful inquiry among the banks, handling the bulk of the gold, I find that at this date, with the crude apparatus being used, in excess of $1000 per day were being produced during May.

Electric Power Now Available

The Nevada-California Power Company has recently completed connection with the line at Millers, and by June 1 power will be available at Manhattan. This company has designed and proposes to supply the different operators with a complete plant consisting of headframe, 20 hp. hoist, pumps and dynamos, and to furnish power at a reasonable cost.

The first plant to go up under this arrangement is for the Goldfield & Bald Mountain Mining Company at Central, on shaft No. 36 which has been sunk 45 ft. to the bedrock, finding ample water. To secure dump room the headframe will be elevated 20 ft. above surface. A sump of sufficient capacity will be made in the mine and tank capacity will be provided on the surface for 100,000 gal. It is proposed to drive a central gangway to the extreme east limit of the block of ground, with laterals north and south to the "rim rock" and to adopt a modified longwall system using a minimum of timber.

The lines on the map indicate where the flat ground of the gulch is limited by the steep sides of the hills. These sides, or "rim rock" dip at an angle of 30 to 45 deg. so that the actual channel is less in width by about 100 ft., and so far as can be seen from the many prospect shafts the actual channel is comparatively flat and not V-shaped. A fair average width of the pay channel throughout the gulch would probably be 350 ft. and allowing for all contingencies, if the results from the haphazard shafts sunk throughout a length of 6 miles can be used as criteria. I estimate that the main gulch alone should produce gold in excess of $20,000,000 and capable of being extracted in a reasonable time.

I am indebted to Percy M. Train, who has been a resident at Manhattan for some years, for much interesting and valuable information. Mr. Train is the discoverer of trainite in this district, a phospho-silicate of lime and alumina, a mineral having possibilities as a semi-precious stone. In his collection from the district Mr. Train has some of the most remarkable specimens of crystallized gold, leaf gold and masses that I have ever seen.

Except for the lack of water the main Manhattan gulch reminds one strongly of Alder gulch, Montana. In a few instances I am informed gold has been found in the general gravel above the "pay gravel" running as high as 50c. per yd. Under present conditions of small ownership the value of the upper gravel is not a commercial one, but may become so after the exhaustion of the rich gravel and the bringing of water under sufficient head to sluice out the gulch as a whole. The value of these upper gravels will be determined during the course of the present operations. The accompanying photographs will give an idea of the various rigs in use at the present time; with the advent of cheap electric power more systematic work and more substantial equipment will become the rule.

Le Roi Mining Company Limited

Special Correspondence

The report of the directors of this British Columbia company for the 15 months ended Sept. 30, 1908, states that the operations of the company for that period have resulted in a loss of £24,895. During the 15 months 100,444 tons of ore, averaging in gold 0.303 oz., silver 0.55 oz. and copper 1.22 per cent., equal to a value of $11.11 per ton, were mined and shipped to the smelters at Northport. The results for the period were seriously affected by the heavy fall in the price of metals and also by a great falling off in the gold contents of the ore shipped in the earlier months of the fiscal year. The tonnage treated has been considerably less than in the two previous years causing an increase in the mining costs per ton. The operating expenses at mine and smeltery for the last three years are given in the accompanying table.

COSTS AT LE ROI.

	1906.	1907.	1908. (15 months)
Tons shipped.	110,042	131,696	100,444
	Cost per Ton.	Cost per Ton.	Cost per Ton.
Mining, including depreciation and amount written off exploration and development	$4.46	$4.04	$5.73
Smelting and realization (direct and indirect), including freight, interest, depreciation, etc.	6.04	5.98	5.98
	$10.50	$10.02	$11.71

During the year the company acquired the remaining interests in the Pack Train mineral claim which adjoins the Le Roi to the south, a share in which was purchased some years ago. The mineral property now owned by the company forms a block of about 142 acres in the center of the Rossland mining belt and a large part of which is virgin ground. The director's report is accompanied by reports from the consulting engineer, W. A. Carlyle, late general manager of the Rio Tinto mine, from the managing director and from the mine superintendent. Mr. Carlyle's report refers to an important discovery, on the 1650-ft. or lowest level, of an ore shoot now 200 ft. long and 4 to 12 ft. wide and of excellent grade; another shoot of good ore on the same level has been opened up for a length of 100 ft. and may be a continuation of the first ore discovered, in which case the ore shoot will have a length of at least 330 ft.

Of the ore extracted from these new openings during the six months ended Oct. 31 there were 4000 tons having, according to this report, an average value of $20 per ton. These shoots are in the South vein and are the downward continuation of the ore found some years ago on the 1350- and 1450-ft. levels. The discovery of such good ore in the deepest part of the mine is encouraging and warrants extensive development. The reduction works at Northport smelted during the fifteen months 124,263 dry tons of ore. The matte shipped was 2780 tons, yielding returns of $1,164,012 equal to $418.97 per ton. Owing to shortage of coal and coke the smelting plant was closed down for about three weeks in August, 1907.

The accounts of the company show that liberal amounts have been written off on account of mine exploration, development and depreciation. The issued capital is £1,000,000 divided into 200,000 shares of £5

Clay Mining and Its Relation to Coal Mining

A General Lack of Organization and Excessive Freight Rates Have Tended to Make This Little Known Industry Generally Unprofitable

BY RICHARD R. HICE*

Old as the clay industry is, and much as has been written regarding it, the ceramist of today freely admits he knows but little about it.

Where other industries have advanced, the clay worker has made but little progress, due largely to the want of organization among the manufacturers, coupled with the jealousies always present when working by the "rule of thumb," and not controlled by the knowledge obtained through technical investigations.

Ries, in his monograph on the "Clays of the United States East of the Mississippi River" has given us a practical definition of clay, and one broad enough to include all materials that can be used by the ceramist, which are not, in all cases, technically clays. He says, "The term clay is applied to a natural substance or rock, which, when finely ground and mixed with water forms a pasty, moldable mass that preserves its shape when air dried, and when burned changes to a hard, rock-like substance by the coallescence of its particles. through softening under the action of heat." There is nothing technical in this statement, but it is thoroughly a practical definition.

For many years the only knowledge we professed to have of clays was chemical, and we have been flooded with the results of ultimate analyses—confronted all the while with the fact that clays with the same ingredients, in essentially the same quantities, did not act alike when used in practical work. The geological reports of the past have been filled with analytical tables, the value of which is practically nothing, as we cannot tell from them how any one of the clays will behave, either in molding, in drying, or in burning.

Characteristics of Clay

Clay is never a simple chemical unity, but is always a mechanical mixture of a number of distinct chemical compounds. The recognition of this fact explains why a chemical analysis fails to give us any real knowledge of clay. The present study of clays gives but little attention, therefore, to the chemistry of raw materials, but most of the present work is in the line of practical applications only. What is needed in the way of real technical work on clays, lies in devising methods by which we can distinguish the various minerals present in the clay, and then learning the character and behavior of each, so that we can tell regarding any new combination presented to us. As an example of the want of value of a chemical analysis as generally made, let me simply mention that marcasite and pyrite, minerals of identical chemical composition, do not act the same when compounded in a clay body.

When I began to look up what has been written regarding the clays of this region I turned at first to the reports of the Second Geological Survey, and then to the scattered references in the publications of the United States Geological Survey, and I was disappointed in both. The references to clays in these reports are few, and of little value. This is due in part, at least, to the fact that the clays had been but little worked at the time of the Second Geological Survey, and the references there made are mainly in the way of chemical analyses; there have been but few geologists who have realized the great value of clays and the clay industry. Without going into figures, let me recall the fact that Pennsylvania ranks second as a clay-producing State, and if we eliminate pottery, it ranks first, and more especially does it stand forth as a producer of refractories, of which it is also the largest consumer.

There are at least five easily distinguished kinds of clays in this region. On the surface we have some clays due to the direct decay of the underlying rocks, and along the streams there are some deposits of sedimentary clays, generally in small quantities. These two classes of clays do not interest us at this time. Then there are the large deposits of shales found throughout the coal measures, clays of varying composition, and generally little value. These, also, hardly come within the bounds of the present subject. There remain the "flint" clays and the plastic "underclays" of the coal measures, which I take it are the only ones of direct interest to the coal miner.

The flint clays are largely found in the "Mercer" group and in the "Mahoning" sandstone. These horizons are without the limits of the workable coals, unless locally, and are not therefore of direct interest to the coal miner, except as the clays can be mined and used with other materials in the production of high grades of refractories.

The clays from these horizons differ somewhat in their character, and it has been thought this difference is such, and so general, that the proportions of silica and alumina present will indicate from which horizon a clay is derived. This, however, cannot as yet be stated as an established fact, although a study of the differences in the conditions of the deposition may show such a general difference in composition not impossible.

No Value in an Ultimate Analysis

While all the flint clays do not make equally good refractories, yet there seems no such difference in practice as is indicated by their chemical analyses. Among the published analyses of clays from this general region I note that the percentage of silica ranges from 40.820 up to 64.830, or higher, and the alumina runs from 38.010 down to 23.950.

It is, of course, no wonder that when we find a range of over one-half in the proportions of these two basic ingredients of clays, used for the same purposes, that we conclude there is no value in an ultimate chemical analysis.

While the Mercer group and the Mahoning are the main horizons for the flint clays, yet we have other valuable deposits of these minerals constituting at times portions of the underclays of the Allegheny river series. The deposits at these horizons are for the most part, however, irregular, and of relatively little value. An exception to this general statement is to be made, however, in reference to the Bolivar clay. There has been some confusion regarding this clay. Frequently it has been confounded with the Upper Freeport clay, and so called in geological reports. It belongs properly below the horizon of the Upper Freeport clay, at, or near, the horizon of the Upper Freeport limestone, and has been often spoken of as replacing the limestone, and occupying its place in the column. Whether, or not, this is correct I do not think has been definitely settled. The limestone seems to be absent without the clay being present, and is so irregular at all times that such a statement can only be based on an extended series of observations over the whole of the region covered by the Freeport series.

While the flint clays are so valuable in the productions of refractories, yet to the coal miner they are not of such direct value as the plastic clays underlying the various workable coal beds, and in this section these are mainly confined to the Allegheny river series. There is no coal horizon between the top of the Homewood sandstone, and the base of the Ma-

NOTE: Paper read at the summer meeting of the Coal Mining Institute of America, Punxsutawney, Penn.

*Beaver, Penn.

honing that does not have underlying it a clay bed.

Often these are not of workable dimensions; often they are so impure as to be of no value. Their character is in no way related to that of the overlying coal, nor does the character change in any way with a change in the character of the coal, or *vice versa*. The coal may be utterly worthless, yet the clay may be among the best of the plastic clays of the series, and on the other hand we often find a good coal, of a good thickness, and the underclay without value, or practically wanting. A clay will often change in a short distance, not only in thickness, but in quality and characteristics as well, so the fact a clay is of good value at any point does not mean it will be of equal value even one-fourth of a mile distant. While this is undoubtedly the rule, yet in the case of some of the clays they seem of a uniformly valuable character over quite large areas; the best known of these valuable districts in Pennsylvania probably being the Beaver river section, where the Lower Kittanning clay is uniformly developed over a large area, and while not uniform in character, yet possesses good workable qualities wherever it has been opened. Throughout that district the overlying coal is of little value, as is generally the case with all other clay horizons.

Question of the Underclays

The question of the underclays presents itself to the coal miner in a number of different ways. There is necessarily, in many cases, a portion of the underclay removed to facilitate mining. Generally this is mixed with the other refuse from the mine so that it is of no practical value. To use this portion of clay it is necessary that it be kept by itself, and not contaminated with the other waste materials, or by the waters from the mine. The amount of clay thus necessarily taken from the mine is generally small, and is not of sufficient amount to supply a modern clay-working establishment of itself. There are cases where the clay thus mined, being of a high fire-resisting quality, and plastic as well, can be used as a binder in working some of the clays derived from the flint horizons, or it might be mixed with shales and thus used in making some of the lower grades of brick. To do this, however, there must be a proper relation of market to the location of the plant, for these lower grades of brick will not permit of shipment to any great distance, especially under the present freight classification of brick, by which they take a higher freight rate than grain or grain products, or other articles of many times the value of clay goods, ton for ton. Of course it may be feasible in some cases to mine other clay from the mine after the coal has been removed, but this means the rooms must be kept free of all slate and other waste materials, and the water not allowed to accumulate until after the clay has been removed, and it may be questionable whether it will not be cheaper in all cases to mine the clay for itself from an independent opening, especially when by so doing a better clay can be had from a different horizon.

This brings up what seems to me is the real question for a coal miner to consider in reference to clay working, and that is whether or not he can mine a clay for itself, at or near the place where he mines his coal, and produce therefrom a product that will be profitable in itself, and not a mere hanger-on to his coal business.

Points to be Considered

This, of course, is a complicated question. The grade or quality of clay is the first question that presents itself. As there are a number of clay horizons, and the character of each clay is constantly changing as above mentioned, this question in the present state of our technical knowledge, or rather want of knowledge, resolves itself into one of a practical nature, under everyday conditions of manufacture.

A test of this character is not always easy to accomplish; however, it is the only real method of trying a clay, and no small laboratory, or semi-laboratory test will prove satisfactory. There must always be sufficient clay tested to give real practical factory conditions; and sufficient material to make up a small kiln of ware is desirable. At times a series of preliminary trials will be necessary, to obtain indications of the methods of manufacture to be followed in the real testing. We recently had such a case in our own experience: We had received a car of clay from Montana for trial; in this case, however, there were four different clays in the car, and we knew nothing of the conditions under which they were found, or how the samples were procured, and we had no experience with clays from that region. There was not sufficient of any one kind to permit any waste of material, so we made up a lot of small trial pieces by hand, carefully noting the behavior of the clay in molding and in drying, and then by placing these samples in different parts of the kiln, we obtained some knowledge of the behavior in burning, comparing the trials at all stages with materials of our own which we were using every day; and having run through a lot of these trials we were then in position to begin the real testing of the clays. It is generally believed that considerable knowledge can be had of a clay by mere inspection. Such is not the case. Where a person is familiar with a clay closely associated with one under investigation and knows regarding the surroundings from which it has come, experience will suggest the line of trials to be pursued, but the first actual trials may show deductions entirely wrong. A light colored clay may in use burn a very light color, or it may burn dark, while on the other hand a dark colored clay may burn white, the coloring matter being entirely organic and driven off by the heat of burning.

Securing a Proper Sample

In procuring a trial sample of clay, great care should be taken to secure a true average sample. A sample from the crop is worthless. It is weathered to such an extent that nothing can be told of the deeper-lying portions of the bed. Many of the impurities have been dissolved and washed away. The effect of the weathering has been to make the clay more plastic, and render it more difficult to dry. The particles have been broken up so that a smoother, denser article is produced. Excessive weathering in one way is an approximation to washing and hence the crop may indicate a use that will be found impossible when once under good cover, and away from the surface. For example, the crop often indicates a clay can be used for pottery of some sort, the excessive weathering, together with the accompanying washing away of impurities, permitting of its being readily molded; however, when followed into the bank, it is found there is but a relatively small portion of the clay that is washable, and the impurities are such that ware of an entirely different character is produced, with a great loss in breakage, and, often, such a high fire is required that pottery cannot be made at a profit—the vitrifying point being the point of destruction, or nearly so. At least one clay in this Pennsylvania district that has been used for pottery purposes has this character, resulting in such loss in burning as to really destroy its usefulness for the purpose used.

It is probable that most of the uses for the underclays of central Pennsylvania will be for sewer pipe, for street-paving brick, for building brick of various colors, or articles of such nature. For these purposes clays need not be of very great fire resisting quality, for these goods are generally burned at a relatively low heat, most of them being burned at or below cone No. 8. This is the heat generally used in pottery work in this country, and where a lower heat can be used, and good, dense ware produced, it is better, and the fuel cost is just that much less. Clays for the purposes indicated can have a large percentage of impurities present, for the matter of color, except in the case of face brick, is not important, indeed there seems to be a general preference in the markets for the darker shades of these goods, which are generally supposed to indicate a high degree of vitrification, not, however, necessarily so. In the matter of face brick, undoubtedly, the ideal clay is one that will burn a white color, or at most a very light buff, in which case the color desired can be readily produced by the introduction of the necessary metallic

oxides. Where these are in the clay in its natural state, they always vary in amount, and the coloring value being high, there is a corresponding variation in the color of the finished goods. Most of the classes of goods mentioned also require a clay that will flash, that is, under the action of the kiln gases, as these necessarily vary from time to time during the burning, there is produced on the surface of the ware a species of glaze, which we know as flashing the ware.

This is of all kinds of colors and shades from an imperceptible gloss, through a long line of yellows and browns, to a shade that is almost black. For the manufacture of sewer pipe, or salt-glazed brick, such a clay is almost a necessity, to produce that good, solid glaze, of the dark color so much desired, and which is such an essential in good sewer pipe. That most of the underclays of central Pennsylvania are of the grade or quality, and possessed of the requirements to produce the goods of the classes indicated, is undoubtedly the case, and this being so, the question is whether they can be profitably worked under all the existing conditions. This is a question that can only be determined for each particular case itself. The character of the clay will determine the possible uses, and then the question of cost of production, of cost of marketing, and prices in the available markets, will determine whether the business can be carried on at a profit.

Permanent Plants Should be Built

Clay-machinery men are constantly hunting up new possibilities in the matter of locations, and it is not an uncommon thing to hear that a brick plant can be erected at the cost of a dollar per brick of daily capacity. Such a factory will not prove profitable. The day of temporary structures is past. Heavy permanent buildings, permanent kilns, thoroughly drained and paved yards are a necessity today, and there is no doubt it will be but a short time until any uptodate brick plant will be operated entirely by electricity. There are too many advantages in this kind of power not to use it. The tendency is constantly toward larger plants, and plants that will in all cases be operated throughout the entire year.

As yet there has been but little organization among any of the brick people, aside from some of the firebrick makers, but it will be only a short time before the makers of other classes of brick must get together. As it is today, it is a time of ruinous competition, without any necessity of such being the case, and many plants have gone out of business, with a great loss of money. Many plants are today merely existing, being carried on in the hope of something turning up that will allow them to make a profit, while there are some, that owing to location, to the character of the goods they make, to the fact they make some kind of special line, have been and are making fair profits. In the absence of organization, the matter of freight rates is much against the clay manufacturer.

There are gross inequalities here that only can be remedied by organization, and no logical reason can be assigned for the present rates, they are either entirely too high, or there are other classes of goods that are being carried at a loss to the railroads of the country. These are some of the factors that must be considered. Like any other business, the clay industries have many sides, all of which need to be studied, and it is not only the possibilities from a mere manufacturing point of view that need consideration, but as in all other ventures it is the view from the business side that must in all cases determine the real possibilities of any clay working.

The Lemoine Diamond Case

Special Correspondence

The Lemoine case, which came to a termination last February owing to the absconding of Lemoine, has been reopened. Lemoine was accused of defrauding Sir Julius Wernher, the well known South African financier, of large sums of money by professing to have discovered a process for making artificial diamonds. Lemoine was tried in Paris and sentenced to 10 years imprisonment. He has now reappeared and seeks to have the judgment set aside, still maintaining that his process is a success, and that he is going to sound the death knell of the diamond. The evidence brought before the court all went to show that Sir Julius Wernher was the victim of a trick, it being stated that several of the stones which Lemoine claimed to have produced were marked stones which had been slipped into the crucible by Sir Julius' agents. The case was adjourned until June 14, to allow time for a further examination of the process by experts, but there is no reason to doubt that the verdict will be that a hoax, unparalleled for impudence, has been practised on one, who from his position as head of the De Beers company, having at his command the ablest expert advice, was of all men least likely to be imposed on by a trick of this sort. Later Lemoine was sentenced to a term in jail.

The United States produced no nickel from domestic sources in 1907 but in 1908, according to statistics of The Mineral Industry, the output amounted to 14,000 lb., worth $7000. The North American Lead Company, of Missouri, was the only producer.

The new Sultan of Turkey has given to the nation the Thassos mines and the rich oil seams of Mesopotamia. An Anglo-Australian syndicate has been constituted with the Deutsche Bank to work them

High Silica Slags at the Magistral Smelter—I

By C. A. Heberlein*

On March 31, 1909, the Magistral smelter at Zacatecas, Mex., was blown in to treat the ores of the Magistral mine. The smelter was designed by me, and especially constructed to treat silicious ores. The furnace is water-jacketed for 7 ft. above and 2 ft. below the tuyeres, and was built by the El Paso Foundry and Machine Company, of El Paso, Texas. Air is furnished by a Connellsville blower of 67 cu.ft. displacement. The forehearth is 9 ft. long, 3 ft. deep, and 2 ft. wide; it is placed on rails, and easily removable. The tuyere area of the furnace is 46x150 in., with 16 tuyeres of 5 in. diameter, 8 on each side. The feed floor is 12 ft. above the tuyeres. On account of the intention of running a highly silicious slag, an ordinary cast-iron tap jacket was placed in front for intermittent tapping. The top of the furnace is constructed of red brick. The gases are conducted by a steel uptake to a brick stack 103 ft. high. The total elevation of the top of the stack above the charge is 127 feet.

Operation of the Furnace

The furnace was blown in on an easy charge which gave a slag carrying 46 per cent. SiO_2, and ran very nicely. The coke in the charge was 12 per cent. Through lack of space at the mine a very silicious low-grade ore was first sent to the smelter. As all work was suspended at the mine on account of Holy Week, there was nothing else to do but smelt this material. The slag soon ran from 46 to 52 per cent. SiO_2, when unfortunately a check valve at the boiler gave way, necessitating the banking of the furnace with this highly silicious charge for 36 hours. The furnace started without trouble, except that the six back tuyeres remained dead. The furnace was banked April 2, and started on the evening of the 4th. It ran rather smoothly on the 5th, with the same silicious charge, but began to pick up on the 6th, when the total tonnage went up to 141 tons, and two more tuyeres were gained. On April 5 the coke in the charge was reduced from 12 per cent. to 10½ per cent.; again, on April 13, to 9 per cent. With this reduced coke the tonnage increased gradually up to 190 tons, when on April 26 the coke was reduced to 8.1 per cent., or 6.06 per cent. fixed carbon. On account of the low ash Pocahontas coal is used. Analyses of the slag from day to day is shown in an accompanying table.

From April 5 to 26, no extra coke charge was added, and the return slag and spillings amounted to about 2 per cent in the charge. The charge consists of ore,

*Mining engineer, Zacatecas, Mexico.

iron and lime. The iron ore comes from Durango and the lime from our own quarry about 1000 m. from the furnace. The air consumption now averages between 49,000 and 50,000 cu.ft. of free air per ton of charge; the altitude is 7800 ft. and the average barometric pressure about 23.5 in. of mercury. The hight of charge carried is 9 ft. above tuyeres; the speed of the furnace depends greatly on regularity in the hight of charge.

ANALYSES OF SLAGS AT MAGISTRAL SMELTER.

	SiO₂	FeO	CaO
April 5	16.4	32.1	18.7
April 6	18.0	29.1	18.8
April 7	33.0	26.1	21.5
April 8	49.0	22.6	20.4
April 9	49.6	21.7	22.0
April 10	51.0	22.7	20.8
April 11	50.0	22.8	20.5
April 12	49.8	22.2	22.7
April 13	51.0	22.5	19.7
April 14	50.2	22.1	22.4
April 15	49.8	22.9	20.7
April 16	51.2	20.3	23.2
April 17	49.6	22.5	21.1
April 18	48.0	23.6	22.1
April 22	50.0	19.7	22.6
April 23	50.0	20.4	22.0
April 25	50.8	18.8	22.5

Average copper 0.22 per cent

On April 26 I attached a revolution counter to the engine, in order to determine the exact air consumption, and found that the air used per ton of charge, exclusive of coke and slag, was 49,800 cu.ft. On this same day I reduced the coke to 8.1 per cent. per ton of charge, and the slag on the following morning seemed to run just as hot and the furnace made the same charges as on the day before. This reduces the fixed carbon to 6.96 per cent., with an average of 7.5 per cent. sulphur in the charge. The matte fall averages from 5.5 to 5.8 per cent., and the blast pressure between 32 and 34 oz. Having an uptake flue from the furnace to the chimney, the draft is so strong that we are able to leave the doors wide open. The top of the furnace is hardly warm and the feed floor, usually an unhealthy place on account of heat and smoke, is very agreeable. The charge is handled entirely by shovel. As mentioned above, the charge carried is always 9 ft. above the tuyeres. The tuyeres are all dark and no fire can be seen, indicating that the smelting focus has sunk. The tuyeres are cleaned twice every shift; this seems to be absolutely necessary.

Water Cooling

Judging from the jacket water, the inside of the jacket against the tuyeres is pretty well eroded. I found that 800 gal. of water per min. were used. The temperature of the intake was 90 deg. F., and the outlet 103 deg. F., or a rise of 13 deg. At the Aguas calientes furnace of the same size the consumption is 150 gal. per min., the rise in temperature between intake and outlet being 32 deg. F. Without doubt the consumption of water used at the smelter, on the Magistral furnace, has a 4 ft. bosh and the Aguas calientes practically none. As to the respective merits of the two furnaces, there are none, excepting that the furnace with a bosh is apt to run cooler on top with a strong blast than the straight furnace; I am convinced that an overfire means waste of blast and coke.

I am now making a 30 per cent. matte, chiefly for the purpose of making as much matte as possible in order to be able to run a high silicious slag with the smallest amount of coke. The economical point depends on local conditions. By simply intensifying the blast, I find it possible to raise the grade of the matte as high as desired.

Comparison of Slags

The accompanying table shows an interesting comparison of the polybasic slag produced at Mansfeld, Germany, with the practically bibasic slag of the Magistral smelter. Through the courtesy of Anton Eilers, I have been able to secure the complete analysis of the slag from the Mansfeld plant.

COMPARISON OF MANSFELD AND MAGISTRAL SLAGS.

	Kirchhütte, Mansfeld		Magistral, Mexico	
	Per Cent.	Per Cent. Oxygen	Per Cent.	Per Cent. Oxygen.
SiO_2	19.09	26.16	30.0	26.67
Al_2O_3	16.02	7.46	4.5	2.09
CaO	15.23	4.36	22.0	6.28
MgO	6.61	2.64	0.5	0.20
FeO	5.58	1.24	20.4	4.52
MnO	0.37	0.08	0.5	0.11
ZnO	1.76	0.35	1.0	0.20
K_2O	4.42	1.25		
Na_2O	0.44	0.18		

$$\frac{\text{Oxygen of Acids}}{\text{Oxygen of Bases}} = \frac{26.16}{17.56} = \frac{1.5}{1} \text{ Mansfeld.}$$

$$\frac{\text{Oxygen of Acids}}{\text{Oxygen of Bases}} = \frac{26.67}{13.40} = \frac{2}{1} \text{ Magistral.}$$

The Mansfeld slag corresponds to the formula, $3RO.2SiO_2$; the Magistral bisilicate slag corresponds to $RO.SiO_2$. I understand that the coke used at Mansfeld is in excess of 10 per cent. of the charge; at the Magistral smelter it is only 8.1 per cent. It goes without saying that the Magistral slag chills faster than an ordinary slag; this is plainly visible from the long hairs of slag, often 30 ft. in length, dragging behind the pots. The shells, however, are curiously often as thin as paper and never thicker than ¼ inch.

Alumina in the Slag

The alumina present is most likely a combination of alumina, $Al_2Si_2O_8$; the bases used were limestone, $CaSiO_3$ and Fe_2SiO_4 respectively. I do not entertain the statement made by Mr. Shelby in the Journal of Aug. 8, 1908, that alumina is similar to lime, as a foreign substance covered up the slag constituents, but is always present as an active acid;" on the contrary, I believe that alumina always behaves as a strong base and becomes more active through addition of silica and at times through lime and silica combined, most likely forming a double silicate of lime and alumina. A slag too high in lime can always be helped by the addition of an extra charge of silicious ore; I have found the same to be true with alumina.

In 1901 large quantities of gibbsite, aluminum oxyhydrate almost in the pure state containing copper sulphide, were treated at the Copper Queen, and I made many analyses and carefully studied slags as high as 32 per cent. in Al_2O_3. The ferric iron never exceeded 3 per cent. when the slag dropped below the monosilicate type; above this type no ferric iron appeared.

It seems that in all furnace work in the zone of slag formation, a bisilicate of iron and lime is formed, and the same enriched with FeO and CaO in descending the shaft of the furnace. If the furnace is run with an overfire, the smelting focus may be moved too high into the shaft and the slag may get chilled and cool down too much. But with a concentrated and well controlled smelting focus the bisilicate slag leaves the furnace very hot and is deceiving as to its silica content until a bar is put into the pot; this, on removal, shows long hairs of slag that may be drawn out 20 ft. in length. On cooling the slag shows no crystalline structure, excepting a fibrous form like asbestos. My anticipation that a highly silicious slag would prove hard on the settler has not been fulfilled; on the contrary, the settler after more than three weeks' run is as good as when put in.

Coming back to the draft, I believe that in modern smelting practice goosenecks and downtakes are unnecessarily employed to the great detriment of the furnace. If the gases become crowded above the furnace the fire will come up immediately, which means an unnecessary loss of coke and air. Air entering under high pressure into the furnace will cause strong and rapid drawing, but will not necessarily produce flue dust (an idea entertained by some), while overfire, on account of the extended smelting focus, will reduce the pressure of the blast and naturally cause great loss of the same; also more coke will be required.

Consul-General John E. Jones reports that the work of constructing a model glass works at Winnipeg has begun. The organizers have been inspecting the plants in the United States to secure the best ideas. A tract of 380 acres of sand has been purchased, and glassware of all kinds will be made, with plate glass and table ware a specialty. These two classes of goods have been imported into Canada from Germany.

The Rakowsky Automatic Unloading Ore Car

By L. S. Austin*

The cost of unloading an ordinary railroad gondola or flat car by shoveling out the load may be given at 6 to 7c. per ton, and hence the employment of bottom-dumping cars has been a great step in advance, decreasing the unloading cost to 1 to 2c. per ton for the labor. These cars work well where the ore is loose, lumpy, or capable of running freely from the car. When it is wet and sticky it is another matter, and in freezing weather it has been found necessary to set the car in a steam-heated shed or building where the ore, at least that adherent to the sides of the car, could be thawed out, though even then the ore may leave the car reluctantly. In summer the usual method with sticky ore, after dropping the bottom doors and loosening up the compact mass just above them, has been to poke down the contents with ¾-in. rods. Four men can poke down the contents of a 50-ton car in 15 minutes. The remainder is then scraped and swept out, and the doors are closed.

It has been sought to lessen the time of unloading by the use of an improved form of car which gives a larger bottom opening and a steeper slope so that it will more freely drop its load. Thus a certain car has a drop-bottom parting longitudinally, while another car has a bottom that slides on rollers. Either of these are opened or closed by hand, winding or unwinding a chain which in two to three minutes will complete the operation. The poking down must, however, be done as in the standard car, with the attendant danger that a man may lose his balance and be precipitated into the storage bin or pocket beneath.

The difficulties above enumerated are overcome in the Rakowsky car, which was invented and designed to handle Mesabi iron ore from the mines to the ore docks at Duluth and at Two Harbors, Minn. The car is well suited to any ores, but especially to those that are wet and sticky, and to wet concentrates.

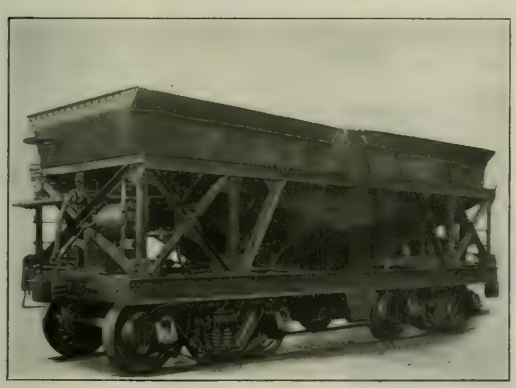
Fig. 1 is a view of the car closed and locked ready for loading; Fig. 2 represents the car with the two halves of the body, called buckets, wide open, the position assumed when the car is discharging its load. Each bucket is mounted on trunnions, supported by the top member of the main frame, and when closed the weight of each bucket is sustained at three points, the trunnions, the locked lip and at the rear.

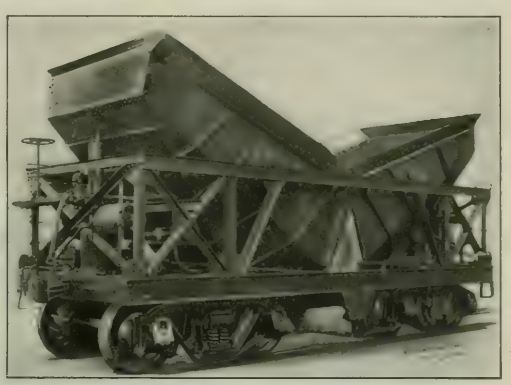
To open the car there is a vertical air cylinder (shown in the illustration) at each end. At one movement of the piston the central lock is opened and the rear of the bucket quickly raised until it assumes a slope of 52½ deg., the halves at the same time gaping open 5 ft. to discharge the load freely. All trunnions are so set that the weight of the load assists in dumping and, when empty, the halves tend to close by their own weight. The buckets, bringing up with a jar against the axles of the trucks, dislodge the ore still adhering. If all is not removed the jar can be quickly repeated until the car is quite clean.

The compressed air needed for discharging is obtained from the engine, or it may be supplied from a pipe line at the pockets. In case compressed air is not available a hand dumping attachment serves both to unlock and to dump the buckets, and this is the easier because the load assists in the movement. In case of an accident or for repairs the buckets may be taken off or replaced, and the main frame can then be easily got at for repairs.

I witnessed the unloading of this car at the Duluth ore docks of the Duluth, Missabe & Northern Railroad Company. The car worked smoothly; the time to unlock and open the car was 10 seconds, the load discharging in 25 seconds. The car was discharged and the ore was completely removed and the car locked ready for removing in 105 seconds. All the work of discharging can thus be done by a single operator, so that in case of a strike work will not be interrupted. The Rakowsky car has a capacity of 600 cu.ft., or about 100,000 lb. It is 22 ft. long and weighs 33,900 lb. The slope of dumping surfaces is 52½ deg.; center of gravity from rail, 6 ft.; pay load to total weight, 80 per cent. The rights to the use of the car are held by the Automatic Unloading Car Company, Duluth, Minn.

*Professor of metallurgy, Michigan College of Mines, Houghton, Mich.





THE RAKOWSKY AUTOMATIC DUMP CARS

Blau Gas

In the Journal of Feb. 27, 1909, under the title of "Blue Gas," by Robert Grimshaw, we published an article that has attracted a good deal of attention. It appears that Mr. Grimshaw made a mistake in the title of his article and the name of the gas that he described. The gas "Blau Gas" is named after its inventor, Hermann Blau (see U. S. Pat. 862,383). Mr. Grimshaw made the mistake of translating a proper name.

According to the U. S. Geological Survey, coal consumption in Alaska decreased in 1908, as compared with 1907, owing largely to the decreased industrial activities brought about by the financial depression, but in part to the increasing use of petroleum as fuel. At the Treadwell group of mines petroleum was substituted for coal, and there was also an increase of petroleum-burning engines on Yukon River boats. The shipments of petroleum to Alaska in the year ending June 30, 1907, amounted to 117,096 bbl.; they were 288,042 bbl. in the succeeding year.

Electric Hoisting Equipment at Winona, Mich.

Fly-wheel Motor Generator Set of Ilgner Type with Ward-Leonard Control; Maintenance and Repair Costs Reduced; Operation Successful

BY R. R. SEEBER*

The following description of the electric-hoist equipment installed at the Winona Copper Company's No. 4 shaft shows certain conditions under which electric hoisting was adopted to considerable advantage. The Winona Copper Company and the King Philip Copper Company are both working the Winona lode. The properties adjoin each other and are situated in the south end of Houghton county, Michigan. They are both under one management. Winona No. 4 shaft is 400 ft. north of the north boundary of King Philip property, and the King Philip No. 1 shaft is 1000 ft. south of that boundary. Each of these shafts is new and, at present, used for development work only. Each was equipped with geared hoist drums driven by duplex steam engines, the drum on the Winona hoist holding 1500 ft. of rope, and that at the King Philip 1200 feet.

The No. 4 Winona hoist is about 500 ft back of the railroad spur to the rock-house and about 25 ft. above it. Wood was burned under the boiler that supplied the hoist with steam, when the hoist was first started. No. 1 King Philip hoisting plant is within 100 ft. of the track and at about the track level. Coal was supplied to the boiler here by wheelbarrows from a pile alongside of the track. If the use of steam were to be continued for these plants after their production began, it would be necessary to provide facilities for coal storage and railroad trestles in each case. At the general power house, near No. 3 shaft, 1600 ft. north of No. 4, there was already installed a 250-kw., 60-cycle, 3-phase, 2300-volt alternator of Bullock make, driven by an Allis-Chalmers cross-compound condensing Corliss engine. This machine furnished light and power for both mines.

The Motor Generator Sets

For the operation of the above two hoists by electricity a flywheel-motor-generator set of the Ilgner type with Ward-Leonard control, built by the General Electric Company, of Schenectady, New York, was installed at the Winona No. 4 hoist house. The motor-generator set consists of the following equipment on a single shaft: In the middle of the set is a type "I," form "M," 12-pole, 450-h.p., 600 r.p.m., 2080-volt, 3-phase, 60-cycle, variable-speed induction motor, connected on either side by flexible couplings to a 20-ton flywheel 10 ft. in diameter, and a M.P.C.-6, 170-kw., 575-volt, interpole direct-current generator.

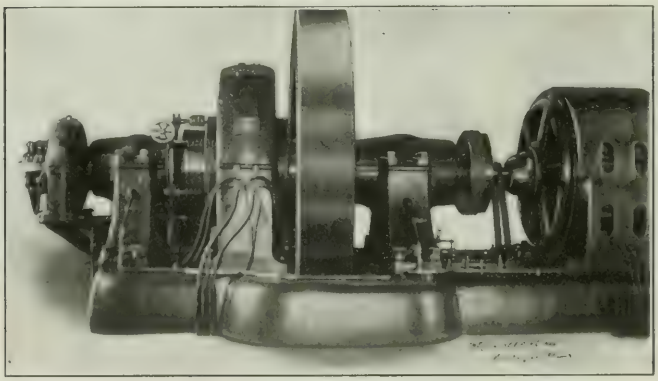


FIG. 1 HALF OF DOUBLE FLYWHEEL MOTOR GENERATOR SET

A separate exciter for each generator, delivering current at 125 volts, is placed on each end of the shaft. Fig. 1 shows half of the motor-generator set. The four main bearings supporting the flywheels and the direct-current generators are supplied with oil by two sets of pumps, belt driven from the shaft. These pumps are placed under the shaft on the main casting at either side of the induction motor. The oil used is Axle engine oil, which is stored in a tank in the main casting, from which the pumps take it and force it to the bearings. The oil enters the side of the bearings a little below the center line, so the revolving shaft carries the oil underneath. The oil returns to the tank by gravity. A water coil for cooling the oil is placed in the tank, but its use has not been found necessary. About three hours are required for the set to come to rest after the power is shut off. One generator furnishes current to operate the hoist in the same building at No. 4 Winona, while the other furnishes current for a motor at King Philip No. 1, a distance of 1400 feet.

The Hoist Motors

These hoist motors are type C.L.C., form "B," 6-pole, 200 h.p., 430 r.p.m., 550 volts, and are shunt wound. They are connected by double-reduction gearing to the hoist drum. Their fields are kept continually excited by current from the exciter on the motor-generator set. This current is kept at a pressure of 125 volts by Tirrell regulators. The current in the hoist motors is varied and reversed through controllers of the usual street-car type. The controllers are placed in the field circuit of the generators. The first point on the controller operates a contactor closing the main circuit from the generator to the motor.

Automatic-regulating Water Rheostat

The alternating current for operating the motor generator passes through a regulator, which automatically varies the resistance in the rotor of the motor, in proportion to the demand of the motor for current. Fig. 2 shows sectional views of the automatic-regulating water rheostat, the operation of which is as follows: The leads *A* are connected to the slip rings of the induction motor of the motor-generator set, the variable resistance in the armature circuit of the induction motor is that due to the column of salt water in the pipe below the plate *C*; the plates *C* of the various phases are short-circuited at the top by the bar *D*. The induction motor (regulating motor) operating the rheostat is connected in series with the primary of the main induction motor. The weight of the moving parts in the rheostat is balanced by the torque due to the regulating motor which acts in the direction shown by the arrow, and the counterbalancing weight *B* so adjusted that it together with the torque of the motor just balance the weights of the moving parts in the rheostat, when the line current is at its normal value. Increasing the counterbalancing weight

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tends to lower the current required to operate the rheostat; that is, to further limit the current taken by the main induction motor and *vice versa*.

Now assume the counterweight adjusted for 50 amp. As the load comes on the direct-current generator, the current taken by the main induction motor increases. When this current exceeds 50 amp., the torque of the regulating motor plus that of the counterweight raises the plate *C*, introducing resistance in the main induction-motor armature causing it to slip and allowing the flywheel to take the peak. The introduction of the resistance in the main induction-motor armature reduces the current to 50 amp., making a new balance. As the load continues to increase on the generator, the regulating motor continues to increase the armature resistance. As the load drops off, the reverse action takes place.

The handwheel at the left is for use in starting up the motor-generator set. The plates are raised by this handwheel a considerable distance. After the motor has started, the handwheel may be turned down rapidly, the regulating motor preventing the dropping of the plates faster than that corresponding to full-load current on the motor. The input of alternating current to the induction motor is thus automatically regulated and limited as determined by the setting of the regulator.

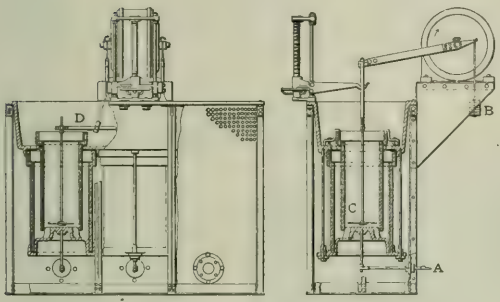

FIG. 2. SECTIONS OF WATER RHEOSTAT

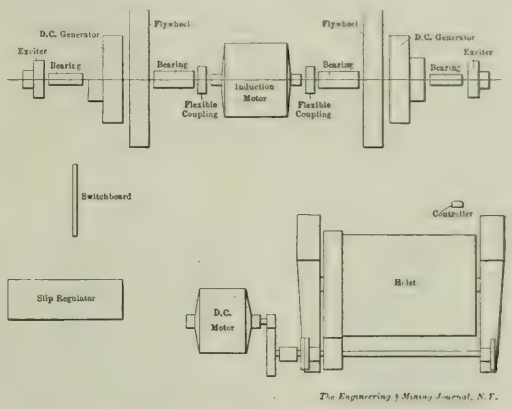

FIG. 3. PLANS OF GENERATOR SET AND HOIST

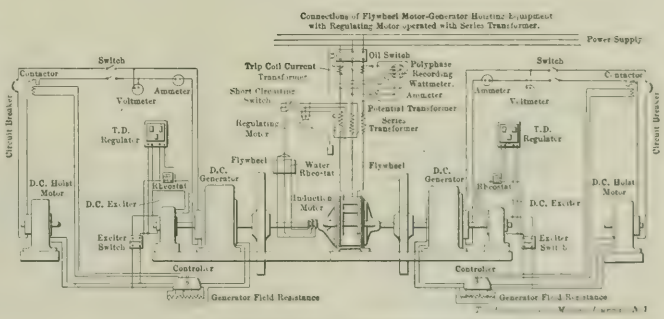

FIG. 4. CONNECTIONS OF HOISTING EQUIPMENT

Economics of the New Equipment

Each of the hoists described serves a shaft inclined 70 deg. from the horizontal. The skip weighs 1¼ tons empty and holds 2½ tons of rock. The hoist rope is 1⅛ in. in diameter. At Winona No. 4 shaft there are two skips working in balance; at King Philip No. 1, the skip is unbalanced. To start the skip, especially the unbalanced one, a large amount of power, sometimes 300 h.p., is necessary. This is supplied by the slowing down of the motor-generator set, the flywheels giving up their stored energy.

The rate of alternating-current input to this set, as shown by the ammeter on the switchboard, remains fairly constant, except when both hoists come in at once. When an unbalanced skip is descending the hoist motor is used as a brake, generating current and helping build up the speed of the set when it is below normal. Aside from the improvement in the handling of the skips in the shaft, this method of hoisting makes it possible to use a smaller and more efficient engine operated continuously under fairly uniform load.

The saving obtained by generating all the power in one plant is the principal saving in this case. With each of the plants using steam, four additional firemen would be necessary. In their place two boys, to attend to the motor-generator set, have been added.

Each plant, if using steam, would burn about 70 tons coal per month under present conditions, or together 140 tons. The additional coal burned by the No. 3 plant on account of the electric hoist is only 50 tons, showing a fuel saving of 90 tons per month. The maintenance and repair of two boilers are also saved. Having removed the reciprocating parts that operated the winding drums, the maintenance on the hoist becomes almost nothing.

At the main power plant there was already in existence a coal station and the necessary rail connections. If steam were continued as a motive power for these two hoists, it would be necessary to construct two new coal trestles, which construction expense would largely offset the construction expense on account of the electric hoist. The electric hoist has been in operation since Sept. 15, 1908, and has given entire satisfaction.

Statistics of The Mineral Industry show that less flint was quarried in the United States in 1908 than in 1907 by 11,341 short tons ($99,699). The 1908 production was 64,220 short tons, worth $318,000.

The Pennsylvania railroad specifications on galvanized iron for car roofing call for 4 oz. of zinc per square foot of material, this amount of coating being required on both sides of the sheets.

Shortening the Roasting Period for Mercury Ores

Roasting Period at Blackbutte, Oregon, Reduced from 24 to 4 Hours. Flat Temperature Slope Overcome in the Dennis Roasting Furnace

BY WILLIAM B. DENNIS*

The primary operation in every fire treatment of ore is the transfer of heat from the gas body to the ore body. The laws of heat translation are known to every academy student of physics but the phenomenon itself belongs to that class of "matter-of-course" experiences too familiar to be likely to suggest or awaken any interest in rudimental study. It is even so with the metallurgical profession and practice, notwithstanding the daily dealing with thermo-dynamics as the chief elementary basis of its work.

The effort to evolve from a pound of coal the highest thermal duty cannot be criticised. If our present effective value of fuel were to be utilized at higher efficiency in the final duty of heating, possibly equal or greater economy may be secured than the perfection of fuel combustion can afford.

In what follows I have called attention to the primary laws underlying the translation of heat and have endeavored to show their simple and practical application to furnace practice as developed by our work and experiments at Blackbutte, Ore. This work included the problem of treating a large mass of low-grade mercury sulphide ore. The treatment cost by the old method was reasonably low, but, besides other difficulties, the outlay of capital for furnaces of sufficient capacity to treat the necessarily large tonnage was almost prohibitive.

The usual roasting period for this class of ore is 24 to 36 hours. The theoretical temperature is 680 deg. F., but in practice it is actually from 1000 to 1200 deg. As the length of time required for the operation is the measure of capacity of a furnace of given dimensions, the reduction of the 24- to 36-hour period was the first step sought. This naturally led to the study of first principles as regards the primary laws of heat flow and absorption.

Heat Transference

In the science of heat, the phenomenon of transference naturally divides under two headings, the laws of flow from the heat source and the laws of absorption by the heat-receiving body. It is with the latter division that we are concerned here, and chiefly with the rate of absorption. At normal atmospheric pressure, the flow at given temperatures is constant and practically instantaneous in operation, but the rate of absorption is governed by the nature of the receiving body and its continuously changing conditions and state during the operation. Allowing for the latent period at maximum temperature required to complete the "cooking," the rate of absorption determines the capacity of the furnace, or the number of tons that can be put through in a given time.

Two general laws govern the rate of the absorption of heat. These may be stated

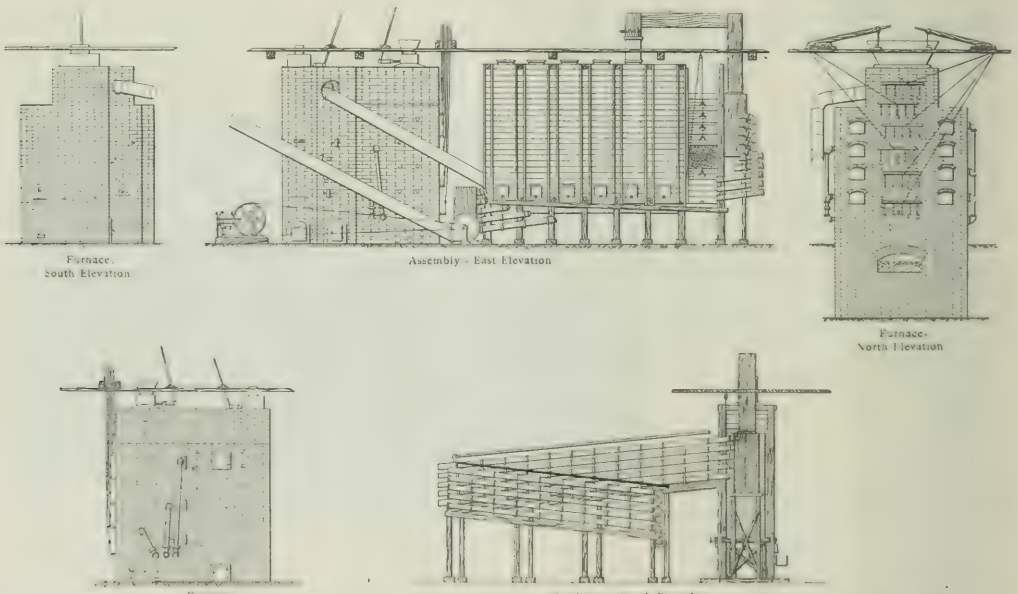

FIG. 1. ASSEMBLY OF TESTING PLANT FOR ROASTING MERCURY ORE AT BLACKBUTTE, OREGON

To suggest the value of a review of our early studies of the primary laws of heat flow and absorption, in connection with our thermo-metallurgical furnaces, is apt to smack of the academic and especially to over that such study must lead to conclusions justifying radical changes in standard designs of furnace construction. Confronted with increasing cost and decreasing supply of fuel every promise or proposal of an eight to ten per cent fuel saving is seized with avidity by the man or the company that pays the bills.

*General manager, Black Butte Quicksilver Company, Black Butte, Ore.

as follows: (1) The law based on the angle of temperature slope between the heat source and the receiving body, namely, the more acute the vertical angle, or in other words the steeper the slope, the more rapid will be the absorption. (2) The law based on the variations in the specific heat of substances due to temperature, namely, that the capacity for heat rises and falls in proportion to the rise and fall of temperature. It will be observed that with both laws the temperature of the receiving body (ore) is the controlling factor in the rate of absorption. And yet in our metallurgical furnaces the temperature of the ore and its relation to the temperature of the hot fuel gases have seldom if ever been taken into account.

The first law above referred to, which for convenience we will call the law of temperature slope, needs no demonstration to the readers of the JOURNAL. But for the purpose of fixing our minds upon its adaptation to the metallurgical furnace, a simple experiment may be appropriately referred to. Insert a mercury thermometer at ordinary temperature into a vessel containing hot water. It will be observed that the mercury column rises quite rapidly at first, but gradually slackens speed as the mercury and water approach equilibrium, and that the last few degrees of rise will be attained very slowly. This is illustrated by Fig. 2. In this diagram the water is assumed at a constant temperature of 210 deg. F. It will be observed how the lines representing the temperature slope grow gradually flatter as equilibrium is approached, and since the speed of absorption is in exact ratio to the angle of temperature slope, the same lines may be taken to represent the rate of heat transmission, as indicated on the shorter scale of the diagram.

Law of Temperature Slope

The so-called law of temperature slope may, therefore, be stated thus. In an atmosphere of constant temperature and pressure, the rate of speed at which heat will be absorbed by a substance at lower temperature, moves in inverse ratio to the quantity of heat absorbed when measured on a temperature scale.

In the light of this law, let us examine our metallurgical furnaces. In spite of the great variety of types in use, the primary operation of ore heating is substantially the same in all. The fuel gas at maximum temperature is introduced at one end of the ore receptacle and comes in contact with the ore zone of maximum temperature, or at that point where the temperature slope line between fuel gas and ore is the flattest obtainable within the limits of the operation. As the hot gas and ore move in opposite directions their respective temperatures move in inverse ratio to each other. The ore becomes hotter and the gas proportionately cooler, so that at each and every unit of contact from beginning to end of the operation a relatively flat temperature slope is maintained, and, therefore, the process of heating is permanently established at the slowest

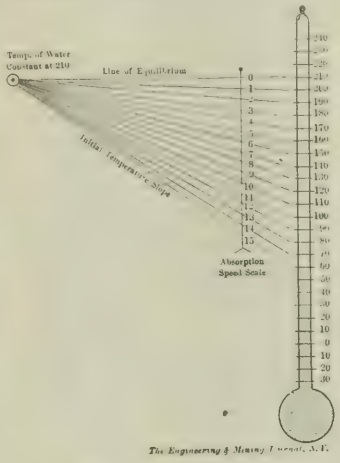

FIG. 2. HEAT ABSORPTION

Diagram illustrating the absorption of heat in a continuous operation of heating where the heat supply remains at constant pressure and temperature, showing the gradually reducing angles of temperature slopes moving from the initial slope to equilibrium; and demonstrating the law that with constant pressure and temperature the speed of heat absorption moves in inverse ratio to the quantity of heat absorbed. See absorption speed scale on diagram.

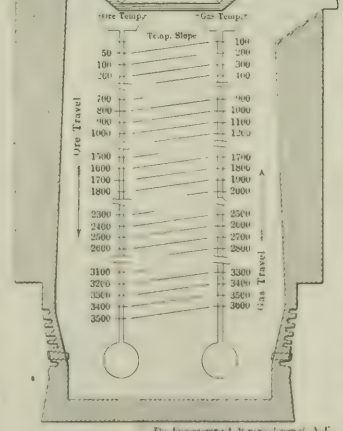

FIG. 3. FLAT TEMPERATURE SLOPE

Diagram illustrating the flat temperature slopes between heat current and ore in the common type of shaft furnace, where the ascending gradually cooling gas comes into contact with the descending gradually heating ore.

possible rate of speed. In fact if slowness of heating were desired it could not be better designed.

The diagram, Fig. 3, illustrates the principle in the operation of a shaft furnace. The temperature figures used are assumed for convenience. The same conditions prevail in the horizontal furnace of the rotary type, and in all furnaces where the ore and heat currents move in opposite directions without gas recuperation. In furnaces of the reverberatory type, and in intermittent furnaces, where the ore is subjected from the beginning to the fuel gases at maximum temperature, we have the exact conditions of the thermometer illustrated in Fig. 2. At the beginning of the operation, the temperature slope between heat current and ore is at maximum steepness, but gradually slackens as the temperature of the ore rises and equilibrium is approached.

The reverberatory roasting furnace has greater per diem capacity than the shaft furnace of equal area because of the steep temperature slope in the early part of the operation, but in the latter part it is seriously retarded by the reduced incline. From the foregoing it would seem clear that in the science of heat translation as applied to metallurgy, an important relation exists between the temperature of the ore and the temperature of the supplied heat current at each corresponding unit of the ore-heating operation.

Change in Specific Heat

We come now to consider the relation of temperature to specific heat in connection with the operation of ore heating. According to the second law above referred to, the capacity of a substance to absorb heat varies in ratio to the temperature of determination. Not until recently has laboratory experimentation furnished us any definite data concerning the variations in the specific heat of the unit, water, at different temperatures, but it has long been recognized by students of physics that measurable variations occur with many known minerals and metals.

Changes in the specific heat of the same substance arise from two causes, change of temperature and change of state or condition. And since in every ore-heating operation both temperature and condition are in continuous change, it remains only to be determined whether, in actual practice, the range of change is sufficient to appreciably effect furnace operation on a commercial scale. The experiments of Griffiths, Naccari, Tilden and others, show that for most solids the specific heat decreases or rises as the temperature of determination decreases or rises; and within given ranges of temperature the rise and fall in each substance is uniform as to itself. Or in other words, as the temperature of the substance under treatment rises and falls, its capacity for heat rises and falls ratably.

It follows, therefore, that as the ore gets hotter, proportional increased volume of initial heat should be supplied, and failure to do this in furnace practice will result in retarding the progress of the ore-heating operation, or in other words, in-

crease the time required to complete the roasting; and *vice versa*, that if the volume of heat supplied is in excess of the capacity of the ore at given temperatures to absorb, corresponding waste of heat will follow.

Relation of Ore Temperature to Heat Volume

That an important relation exists between ore temperature and volume of supplied heat, as well as between ore temperature and fuel gas temperature, appears certain. Just how important this relationship may be in practical furnace work may be anticipated to some degree by the study of H. F. Weber's determinations of the changes in the specific heat of crystallized silicon. Weber's experiments covered a temperature range of —50 deg. to 200 deg. C., and results are given as follows: Specific heat 0.13 at —50 deg.; 0.16 at zero; 0.18 at 50 deg.; 0.195 at 100 deg.; 0.202 at 200 degrees.

Since silicon dioxide is the chief element with which the metallurgical furnace usually has to deal, it is unfortunate that Weber's experiments were not continued to higher ranges of temperature. Failure to do so was due, no doubt, to the great difficulties of accurate calorimetry at high temperatures. Indeed it is doubtful, for the same reason, whether the result given for even 200 C. can be relied upon. Nevertheless the results furnished are sufficient to show the remarkable degree of change. And while the rate of change is shown to be greater at the lower temperatures, and while there may be even a limiting point at some higher temperature, it is more likely that the apparent greatly reduced rate of increase on the ascending temperature scale is partly, if not largely, due to the difficulties of determination mentioned.

Unfortunately no definite data are available upon which may be based mathematical calculations of practical value concerning the amount of increase in heat volume required to meet the conditions of change in specific heats of various substances corresponding to temperature rise. In practice it can be determined only by experimentation in each individual case, which is possible only when proper means have been provided for control of the heat supply. Hoadley[1] gives the specific heat of wrought iron over the range of 32 deg. to 200 deg. F. at 0.1129, and 32 deg. to 2000 deg. at 0.2619, showing the wide range of change. Another authority states that the specific heat of platinum from 32 deg. to 446 deg. F. increases 0.000305 for each 100 deg. temperature rise. Other individual examples are given, but the problem has not been reduced to a definite equation.

Effect of Change of State

Changes in specific heat of the same substance due to change of state or condition, are even more marked in some substances than those due to temperature. Examples of these changes in specific heat are: Ice, 0.5; water, 1; steam, 0.34 (constant pressure); solid lead, 0.0314; molten lead, 0.0402; cast iron, 0.1298; wrought iron, 0.1138. According to Kopp's law the molecular heat of a solid compound is the sum of the atomic heats of the constituents. A body of ore in process of heating is undergoing continuous structural and constituent change, due to evolution, absorption, expansion, and finally fusion. The change begins at comparatively low temperatures according to the nature of the ore, and by the time the crucible is reached, radical chemical and mechanical metamorphoses have taken place, the degree depending upon the nature of the ore and of the process. The changes of state and condition effected in the metallurgical furnace are, for the most part, in the same direction as the changes due to temperature, namely, toward increase in specific heat, demanding further increase of thermal supply as the heating process progresses.

A full discussion of our subject should include also the relation of temperature to kinetic energy as affecting the velocity of heat translation, but the two relations of ore temperature already discussed are sufficient to draw attention to the value of the ore-temperature factor in the heating operation. It has been shown that the temperature of the ore in relation to the temperature and volume of the supplied heat current determines the velocity of the absorption of heat by the ore according to the laws of temperature slope and change of specific heat. It would, therefore, follow that to secure high efficiency of the furnace would require proportional regulation of ore temperature to heat temperature and volume, at each unit, or step, in the ore-heating operation. A brief description of what has been done in this direction by the writer, experimentally and in actual practice, follows.

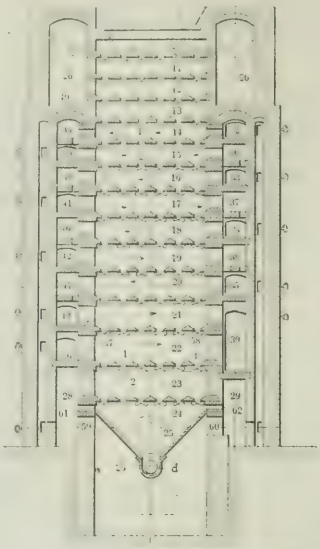

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FIG. 4. DENNIS ROASTING FURNACE

Vertical section through ore tower of experimental furnace erected at Blackbutte mine, Lane county, Ore., for testing the Dennis roasting process, showing the division of the ore tower into zones and the arrangement of primary and secondary combustion chambers whereby the temperature slope between heat current and ore in each zone was regulated, resulting in the reduction of the roasting period of mercury sulphide ore from 24 to 4 hours. At each primary combustion chamber (32, 40, 33, 41, 34, 42, 35, 43) a fresh supply of fuel gas was admitted. Arrows show gas travel.

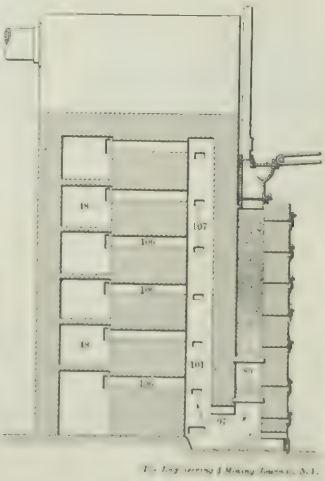

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FIG. 5. WOOD-GAS PRODUCER

Showing the wood-gas producer connected with the furnace as an integral part of the structure. Zone No. 80 is the reducing zone.

The Problem at Blackbutte

The ore under treatment was mercury sulphide with a gangue of dolomite, silicified andesite and volcanic ash rock, carrying 53 to 58 per cent. silica, and some free sulphur, pyrite, marcasite and quartz limonite. Its total content of sulphur, combined and free, was from 8 to 12 per cent. The only available fuel was wood—Oregon fir and hemlock. A Scott-Hutner furnace of the usual California type erected on the property at a cost approximately of $40,000, treated at best 36 tons per 24 hour day. The ore was 36 hours passing from the feed hopper to the discharge ports. It was estimated that the ore reserves of the mine could furnish from 350 to 400 tons per day. This output would require about 10 Scott-Hutner

[1] Trans. A. I. M. E. Vol. VI. p. 713.

furnaces costing in the neighborhood of, say $300,000 to $400,000.

This was at least frightening if not prohibitive, and a remedy was sought. The reduction of the 36-hour roasting period would result in a corresponding reduction in the number of furnaces required, as well as operating expenses. With this aim, among other considerations, experiments were undertaken.

It early became evident that to secure the regulation of temperature slopes and heat volumes above described, some form of gas firing, as distinguished from direct firing, would be required. The extreme resinous character and other peculiarities of our Oregon fir wood prevented the use of any of the gas producers now on the market, even those claiming to have solved the problem of wood gasification. Therefore, a simple form of gas producer, Fig. 5, was designed, constructed of ordinary brick and made an integral part of the furnace. Intervening the producer and the furnace was a brick chamber which operated as a gas holder, and from which the hot gas was drawn off and conducted under control to various parts of the furnace as wanted. There were no scrubbers, the sensible heat of the gas being conserved. Artificial-suction, down draft was employed, the fan being located at nearly the extreme end of a series of mercury condensers following the furnace.

Passing over other special features of the producer, it may be well here to mention only the reducing zone formed by the space allowed between two sets of grate bars, as shown in the diagram. This zone, in operation, becomes automatically filled with live coals that drop through the first set of bars. The fuel gases are drawn through the bed of live coals, thus formed in this zone, resulting in the well known chemical reaction $CO_2 + C = 2CO$. In this constituency the gas is maintained during its further passages, until it reaches the particular ore zone of the furnace where it is to be utilized. Just before entering the zone it passes through an antecedent combustion chamber, where it is mixed with the requisite supply of heated air and burned again to carbon dioxide. A separate antecedent combustion chamber is provided for each zone of the furnace. By this means the temperature and heat volume of each zone of the furnace is at all times under control, therefore admitting of that regulation of temperature slope, etc., previously described.

Attaining a Steep Temperature Slope

It has been shown that the steeper the temperature slope between ore and heat current the more rapid will be the absorption of heat by the ore. The maximum slope would be represented by a line drawn between the initial or minimum ore temperature and the maximum fuel-gas temperature. But, since the maximum gas temperature is a fixed quantity, and the ore temperature is continuously rising during the heating operation, it is evident that the maximum cannot be maintained. Having first determined the duration of the latent period of the "cooking" process for the particular ore under treatment, as hereafter explained, it next becomes necessary to ascertain the mean temperature slope and the number of units of the ore body to which the mean slope must be applied in order to heat the ore to the maximum temperature within the same time, as nearly as may be, as that of the latest period. Division of the ore-body into corresponding units is necessary.

In roasting processes it is practicable to make this division actual, while in smelting the ore column may be maintained in its integrity and the segmentation into zones defined by the arrangement of the gas inlets. Thus the heating operation, though still remaining continuous and gradual, proceeds in well defined steps, the mean temperature slope being maintained uniformly for all the steps. Fig. 4

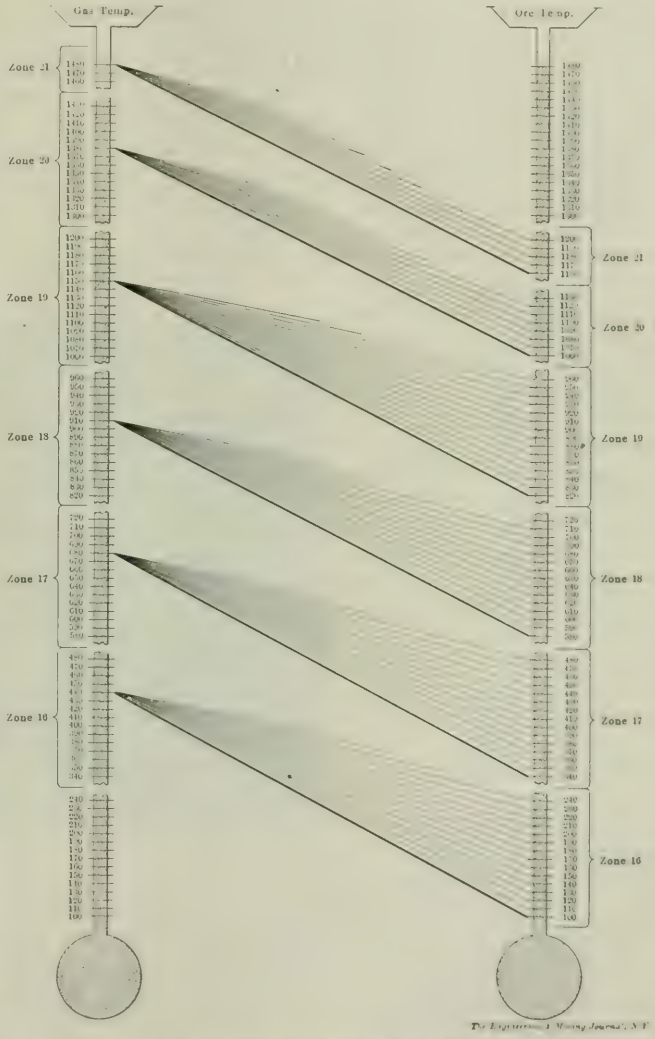

FIG. 6. TEMPERATURE SLOPES WITH DENNIS ROASTING PROCESS

Diagram of the approximate temperature slopes maintained in actual practice between ore and heat current in an ore column divided into six zones. See Fig. 4. Heavy lines indicate the primary slopes; light lines, intermediate slopes. Note uniformity in all zones.

is a vertical section through the ore tower of the furnace that was constructed and operated for these tests.

Fig. 1 shows the complete assembly of the plant. As will be seen the ore tower is divided by means of a combination of V-tiles and dumping gratebars into a series of superimposed zones. The gratebars are operated from the charging floor of the furnace by means of levers. In Fig. 4 is shown the arrangement of the primary and secondary combustion chambers, the primary chambers being numbered, respectively, 32, 40, 33, 41, 34, 42, 35, 43, 36, and the secondary, 44, 36, 45, 37, 46, 38, 47, 39. At each primary chamber a fresh supply of fuel gas and heated air is admitted under control. Hot air only is admitted to the secondary chambers. The zigzag travel of the fuel gases in a general downward course, is shown by arrows.

It was found that after the furnace had attained its full heat and the dampers had been once adjusted to fit the desired temperature slopes, thereafter very slight changes in their position were required to maintain continuous uniform action. The number of zones into which the ore tower may be advantageously divided depends upon the nature of the ore, the maximum temperature required for the process, and the period of latency in completing the "cooking" operation. With Blackbutte mercury ore six zones were found to be sufficient. The upper and lower zones were used respectively for drying and "cooking." The depth of ore on the hearth is a matter to be determined by individual conditions.

To ascertain the economic mean-temperature slope, accurate determinations of the temperature of the ore and the heat current in each zone were necessary. This was done with a Heraeus Le Chatelier pyrometer using a platinum-rhodium thermocouple connected by flexible copper wires to a galvanometer. Frequent determinations are necessary until the dampers have been adjusted to satisfactory working conditions. After that only occasional readings are required, or might be omitted altogether and reliance placed on the educated eye of the foreman.

Results

In the six zones it was found practicable to maintain approximately the relative temperatures given in the accompanying table.

ZONE TEMPERATURES.

Zone No.	Constant Gas Temp. Deg. F.	Primary Ore Temp. Deg. F.
16	440	100
17	680	340
18	910	580
19	1150	820
20	1380	1060
21	1480	1160

The "primary ore temperatures" are the temperatures of the ore when dropped into the zone represented, this temperature having been induced in the previous zone. The zone numbers have reference to Fig. 4. Referring to same diagram, zones 10, 11, 12, 13, 14, 15, are drying zones, and 22, 23, cooling zones.

The temperature slopes of the above are shown in Fig. 6. It will be observed that the step from zone 20 to 21 is not so great as the preceding steps, although the slope is the same. Zone 21 was used substantially to take care of the period of latency required to complete the cooking process, as 1060 deg. in zone 20, is ample for volatilization.

The maximum temperature slope in the above work would be represented by the figures 1480 − 100 = 1380, and the slopes for the individual zones are shown in the accompanying table.

SLOPE OF INDIVIDUAL ZONES.

Zone No.	Gas Temp. Deg. F.	Ore Temp. Deg. F.	Temp. Slope Deg. F.
16	440	100	340
17	680	340	340
18	910	580	330
19	1150	820	330
20	1380	1060	320
21	1480	1160	320

It will be observed that the slopes range from 340 to 320, reducing in the direction of the hotter zones, and that the depth of the zones, Fig. 4, gradually increases in the same direction. This is due, as already explained, to increased speed of absorption and larger heat volume required at higher temperatures.

During the writer's experiments, which included the operation of the plant for nearly a year, many combinations of classified ores were tried, ranging from all fines to 6-in. diameter. The best results were obtained from the ore just as it came from a Gates gyratory crusher, breaking to egg size and carrying about 33 per cent. fines passing a four-mesh screen, of which 15 to 18 per cent. would pass 20 mesh.

Practical Benefits

In the usual method of heating ore, with the ore and heat current moving in opposite directions through the ore receptacle, the amount of time required to finish the roast is virtually governed by the amount of time it takes for the first unit of the ore; that is, the ore nearest the feeding hopper, to absorb under existing conditions the first unit of heat. The existing conditions are minimum cooled gases and minimum cold ore, flat temperature slope and low capacity of absorption. In a continuous process the attempt to move the ore any faster, that is, before the first ore unit has absorbed its due proportional first heat unit, would result in soon cooling down the furnace. Any process of heating based upon such an arrangement is manifestly unscientific and not economic. It is the wrong end of the furnace to exercise the control. The time required at the finishing end, where the "cooking" is finally completed, should set the time pace for the whole process.

In every thermo-metallurgical process there is a period of latency during which the maximum temperature remains constant. The duration of this period is the true scientific measure of the time necessary for the whole operation. The preceding steps of the heating—from normal temperature to maximum—should be conducted approximately in the same period of time, unless special reasons exist for slow heating. If this is practicable any other course is manifestly a flagrant waste of time in our metallurgical practice.

Let us suppose the latent period for an ore at, say 1200 deg. F., to be one hour. To require 24 hours for the preliminary operation of inducting into the ore the 1200 deg. of heat appears ridiculous. Fuel economy ceases to be a factor in face of such a condition. Time is the paramount factor in economy. The operating payroll figured against fuel coal leaves a wide margin in favor of time. But it must not be assumed from this remark that the consumption of fuel is increased by the process described. On the contrary, the per ton consumption is greatly reduced.

The practicability of the divided-zone method of heating by the regulation of temperature slopes between heat current and ore, as far as developed by the writer's experiments to date, has been shown by the reduction of the roasting period of mercury sulphide ore from 24 and 36 hours to four hours, with a cleaner and in every way more satisfactory roast. It would seem that the results of these experiments were sufficiently definite and encouraging to suggest other and greater possibilities along the same lines, which it is hoped others may realize and assist in developing.

Thyssen & Co., of Muelheim-Ruhr, who have acquired the patent rights of the Gayley dry-air blast for Germany and some other European countries, are building a plant for the Deutscher Kaiser Company, at Bruckhausen, for one furnace of 500 tons daily capacity. An extension for three additional furnaces is provided for.

The production of calcium in the United States in 1908, as shown by statistics collected for The Mineral Industry, was 350 lb., valued at $525. The first metallic calcium was produced in this country in 1907 when 350 lb., valued at $613, were marketed.

Deposits of iron ore in Lower California are said to be extensive and of high grade, assaying up to 64 per cent. iron. One of these, near San Quentin, is within a short distance of deep water.

The first shipment of refined copper from Australia was made in May last by the Electrolytic Refining Company, of Australia from Port Kembla, New South Wales.

Texas Celestite Deposits*

By Frank L. Hess†

Celestite, strontium sulphate, is one of the rarer minerals which, although not of great economic value, is of considerable general interest because of its rarity. In the United States there are but few deposits of celestite which are capable of commercial exploitation. A deposit, which could possibly be worked should the demand for the mineral warrant, is situated about five miles north and a little west of Austin, Tex., in two hills on the east side of the Colorado river. These hills, known as Mount Bonnel and Mount Barker, have an elevation of about 800 ft. above sea level, and rise 400 ft. above the river.

A narrow saddle separates the two hills, and through this a wagon road has been cut to a depth of from 16 to 20 ft., affording good exposures of the country rock, which is a flat-lying, somewhat sandy and clayey, Cretaceous limestone belonging to the Glen Rose formation. The celestite seems to be limited to a zone about 9 ft. thick in this limestone, the lower edge of the zone coinciding with the bottom of the road cut. The strontium-bearing beds are also exposed on the river face of Mount Bonnel. What digging has been done is just north of the cut on the west side of Mount Barker. Celestite is also found in the Glen Rose formation in the vicinity of Lampasas, Texas.

CAVATIES FILLED WITH CELESTITE IN GLEN ROSE LIMESTONE NEAR AUSTIN, TEXAS

Occurrence

Near Austin the celestite occurs in rounded cavities which are partially, or wholly, filled by the mineral. These pockets are somewhat irregularly distributed through the limestone. In places there are but few, and those small, while at other places the cavities are large, from 6 to 18 in. in diameter, and sometimes almost touch one another. Usually the cavities are nearly filled with celestite, but in all that were seen, a part of the mineral has been dissolved by percolating waters. A portion of that taken into solution has been redeposited as strontium carbonate upon the etched crystals of celestite, in beautiful acicular crystals which form masses having an appearance almost velvety from the thickly spread and delicate points. The celestite rarely shows definite crystal faces, owing to the etching and to the fact that the cavities have been so filled that the crystals have coalesced and lost their individuality. In color it ranges from white to dark blue. Much of it is a delicate light blue comparable to that of the sky, whence the name celestite. Dark blue crystals are comparatively rare.

The specific gravity of celestite is about 3.9, as compared with 2.7 of limestone. It is probable that an approximation of the amount contained in the limestone may be fairly obtained by estimating the comparative areas of the cavities and the face of the limestone, although as remarked, a portion of the celestite has been dissolved and carried away. Based on measurements made upon photographs, it is estimated that the limestone contains not over 5 per cent. of celestite in the richest part seen.

Commercial Aspects and Uses

The deposits can be easily worked, as the limestone is comparatively soft and is well exposed on the side of a hill where excavation and dumping would be easy. At one time 14 tons of celestite was dug and shipped to Germany, but upon the arrival of the consignment in Germany it was found that the price which the shipper had been advised could be obtained for the celestite was several times the market value, and money was lost on the shipment.

Celestite, as such, is sparingly used in pyrotechnics for making red fire. For this purpose, however, the nitrate, carbonate and chlorate of strontium and the strontium-potassium chlorate are much more used. The carbonate is also used in making irridescent glass. The hydrate is largely used in the preparation of beet sugar, and in the separation of crystallizable sugar from molasses. The use of this compound depends upon the property of the oxide and hydrate of strontium to form saccharates, which are readily decomposed by carbon dioxide. Strontium hydrate is said to be preferable to lime for use in sugar manufacture as the saccharate of strontium is more granular than that of lime. The acetate, arsenite, bromide, iodide, phosphate, lactate and strontium caffeine sulphonate are used in medicine. The chloride is sometimes used in alcoholic solution to produce red flames; the monosulphide in luminous paints, because of phosphorescent properties, and the hydrated dioxide for bleaching. The peroxide, one of the later productions of the electric furnace, is used as an oxidizing agent for organic compounds.

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†Of the U. S. Geological Survey, Washington, D. C.

Iron Ore Reserves

A statement prepared by John Birkinbine, of Philadelphia, who has for many years made a study of the iron-ore question, for the use of the Finance Committe of the United States Senate, gives the following brief concluding summary of the probable iron-ore reserves of the United States:

"The reserves of iron ore in the Lake Superior region, of material such as is now shipped, exceed 1,600,000,000 tons, and that this amount may be greatly augmented by the utilization of some ore not now classed as desirable.

"That in the Adirondack district of New York the ore reserves amount to 125,000,000 tons, which may be supplemented by 25,000,000 tons of other New York ores and the possibility of large future additions from the deposits of Clinton ores in the center of the State.

"That New Jersey has over 35,000,000 tons of available ore, and in addition 100,000,000 tons of concentrating ore can be obtained.

"That Pennsylvania has reserves amounting to 45,000,000 tons, which may be in-

creased by liberal exploitation of Clinton and carbonate ores.

"That the Southern States may be counted on for a supply exceeding 1,200,000,000 tons, and possibly a much larger amount.

"The reserves in the Rocky Mountain region and west of this, tentatively estimated as 100,000,000 tons, cover but a small part of the producing territory.

"That the New England and other Atlantic States and the Central States, including Indiana, Illinois, Iowa, Mississippi, Missouri, Arkansas and Texas will further add to the reserves."

It will be observed that Mr. Birkinbine, whose knowledge of the subject is generally admitted, is much more cautious in his estimates than some other writers, who have recently approached this question. His total amounts to 3,130,000,000 tons, without counting the additions which may be made by the use of concentrating processes and by possible improvements, which may permit the use of lower-grade ores than are now considered available for the blast furnace. These supplemental reserves are about entirely a matter of conjecture, so far as their quantity is concerned. The same may be said of possible new discoveries.

The following table gives a statement, also submitted to the Finance Committee, of the iron-ore reserves owned and controlled by the United States Steel Corporation. The first column includes ores of the standard now considered commercially available; the second, silicious and other low-grade ores, which may hereafter be brought into use by concentration or other treatment:

	Standard Ores.	Low-grade Ores.	Total.
Northern ores	1,258,289,000	365,845,000	1,624,134,000
Southern ores	459,300,000	239,000,000	698,300,000
Total	1,717,589,000	604,845,000	2,322,434,000

This would show that, according to the estimate of Mr. Birkinbine, the Steel Corporation controls about 55 per cent. of the reserves of ore of the standard now commercially available, without counting its low-grade ores.

The Pilbarra Asbestos Company in 1908 took out 40 tons of high grade asbestos in development work on its mines at Tambourah, in the Pilbarra district of Western Australia.

According to statistics collected for THE MINERAL INDUSTRY the total lead production of the United States in 1908 was 314,097 short tons, worth $26,881,628. The 1907 production was [illegible] short tons, worth $37,288,8[illegible].

A financial group at Nancy (Meurthe et Moselle) has taken [illegible] concessions of potash salt in Alsace. The first drillings lead to a conclusion that the deposits in at least as rich as those of the best mines at Stassfurt.

Sulphide Corporation

SPECIAL CORRESPONDENCE

This company owns the Central mine at Broken Hill, New South Wales, and smelting works at Cockle creek. For the year ended June 30, 1908, only a small profit was earned mainly on account of the low price of the metals produced, namely, lead, silver and zinc. During this period the new mill was only for a portion of the time in complete working order. The results obtained by the new plant are now considered satisfactory and fully equal to expectation. The crude ore is treated by a continuous process, lead concentrates being produced in one section and zinc concentrates in another, by which means nearly the whole of the valuable metal content is recovered in the form of salable concentrates. The recovery in June amounted to 90.4 per cent. of the silver, 96.6 per cent. of the lead and 87.7 per cent. of the zinc.

During the year 191,594 tons were passed through the mill, producing 33,674 tons of lead concentrates and 54,842 tons of zinc concentrates. The costs for the half year ended June 30, 1908, on 100,943 tons of crude ore treated were £5 16s. 6d. per ton of lead concentrates and £1 3s. 2d. per ton of zinc concentrates. For the 20 weeks ended Nov. 14, 1908, the costs were £5 6s. 11d. and 19s. 2d. per ton, respectively.

In addition to the production from the new mill 80,900 tons of dump tailings were treated by the flotation process producing 29,042 tons of zinc concentrates, and 43,508 tons treated by the magnetic process produced 15,155 tons of concentrates. The magnetic plant has now been shut down as the flotation process gave better results.

In this connection it should be mentioned that two flotation plants were at work, and that the plant owned by the Minerals Separation Company has given the best results. This plant treated 34,506 tons of tailings assaying 7.4 oz. silver, 6.1 per cent. lead and 20.1 per cent. zinc from which 12,529 tons of concentrates were obtained assaying 15.4 oz. silver, 11.2 per cent. lead and 44.7 per cent. zinc, representing a recovery of 74.2 per cent. of the silver, 65.2 per cent. of the lead and 86.5 per cent. of the zinc.

A slimes plant has given excellent recoveries from a product which in the past had resisted satisfactory concentration. The recoveries have reached 78.0 per cent. of the silver, 78.0 per cent. of the lead, and 86.3 per cent. of the zinc. During the latter part of the period when it was adjusted into fair working condition 1030 tons of slime yielded 1030 tons of concentrates, containing 25.0 oz. silver, 25.0 per cent. lead, and 33.2 per cent. zinc. At the smelting works at Cockle creek the input of lead concentrates, purchased ores, etc., was 73,351 tons, which yielded 21,813 tons of bullion containing 92,195 oz. gold, 2,147,904 oz. silver. The zinc distilling plant treated 3462 tons of zinc concentrates, producing 967 tons of spelter.

According to the chairman of the company the production of zinc is in few hands and, therefore, the regulation of spelter output ought not to be a difficult matter. The maintenance of the price at a point remunerative both to works and mines is so much a matter of common interest that the establishment of a convention for the purpose in the near future is regarded as probable. Regarding lead and silver the position is more uncertain, but better prices than those obtained during the year under review are expected and are necessary for the success of the company.

Sulphuric Acid Making at Ducktown, Tenn.

According to data communicated at the recent annual meeting of the Ducktown Sulphur, Copper and Iron Company, the sulphuric-acid plant, in connection with the pyritic smelting furnaces, went into operation on June 11. This was several months in advance of the anticipation of the contracting chemical engineer, N. L. Heinz. The plant, which is designed with a view to future extension, consists of 16 chambers, aggregating 1,050,000 cu.ft. There are three towers, all contained in two buildings of structural steel. The capacity of the plant is rated at 160 tons per day of acid of 60 deg. B. The construction was done rapidly. Ground was broken in July 14, 1908, wherefore, the plant was completed and put in commission in about 11 months. In the construction of the plant 1350 tons of lead, over 1,000,000 ft. of timber and 6000 cu.yd. of concrete were used. The cost of the plant was $305,000, which comes to about $5.50 per ton of annual capacity.

The exploration of the coal seams in the east of France is continued with great activity, owing to the success met with in a drilling made at Gironcourt by the Buffet group. This same group is boring at Aulnois, close to the railroad from Mirecourt to Neufchateau. Other drillings are being made at Foulain, at Jévoncourt in the Madon valley, and at Brion sur Ource in the department of Aube, while some Paris people are said to be preparing to drill at Château Villain in the Haute Marne.

There were 32 dredges at work in New South Wales at the close of 1908, in the recovery of tin ore, or stream tin; three being bucket dredges and 29 pump dredges. The quantity of stream tin saved during the year was 1562 tons, of $632,400 estimated value.

Autogenous Welding for Mining Machinery

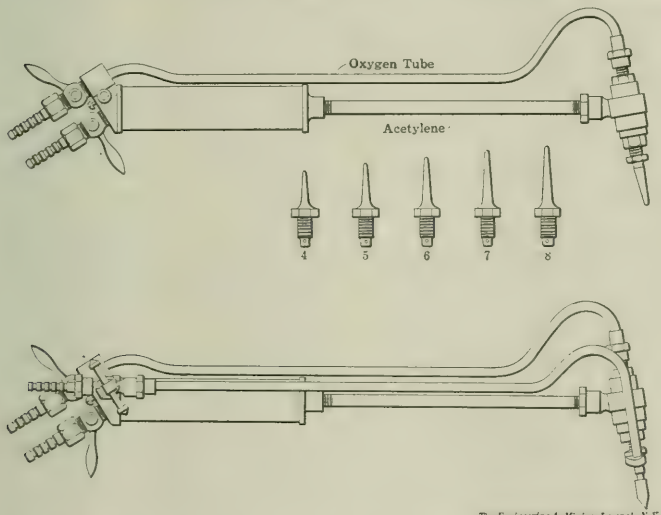
Autogenous welding is accomplished by means of an oxy-acetylene flame applied by a torch or blowpipe to the parts to be joined. The necessary apparatus consists of an acetylene generator, oxygen generator, containing tanks, a small compressor, together with torches of various sizes. The acetylene generators are made in various sizes, using 20, 50, 100, 200, or 300 lb. of carbide per charge. The acetylene gas is generated under a pressure of 5 to 15 lb. per sq.in. as required. The oxygen generator may be dispensed with when it is possible to buy oxygen and have it shipped in drums, yet for mining purposes it would hardly be advisable on account of the usually isolated location of mining camps. It is necessary to have a supply at hand, and one of the important essentials is that the oxygen be pure.

The torch is the chief and most important factor in the success of the operation. This torch is furnished in various sizes, 14 in. to 2 ft. long, and each one is provided with half a dozen tips. For light work the small tip is used, but for extra-heavy work it is necessary to use a large torch and a large tip. The accompanying illustration shows the torch used for welding, also the cutting attachment, which consists of a tube and tip for supplying an extra quantity of free oxygen.

The cutting of steel plates, bars, or castings, is effected by applying the blowpipe flame along the line to be cut. The heat is so intense that it melts the metal, and this coming in contact with the oxygen rapidly oxidizes, leaving a clean-cut channel. The makers, the Davis-Bournonville Company, claim that by this method steel up to ½ in. thick may be cut at the rate of 60 linear ft. per hour, and 1½-in. steel may be cut at the rate of 40 ft. per hour.

The rate of welding varies with the thickness of the metal, oxygen pressure and size of torch; the welding of 7/16- to ½-in. steel plate may be done at the rate of 5 ft. per hour. The parts to be welded are beveled to allow the flame to play well into the metal; the intense heat fuses the edges and they unite readily. It is usually necessary to add some extra metal of the same kind by melting the end of a rod and allowing it to drop on the joint, as is done when using solder.

An outfit of this character should find a large use in mining operations, since it is more or less portable; the gas cylinders may be taken from the generating plant to any part of the mine, mill or smelter. The cylinders contain enough gas for any ordinary piece of work. In the event that the gas does give out, all that it is necessary to do is to refill the tank. It often happens that a piece of machinery breaks and there is no duplicate to be had nearer than the factory. If the mine is an isolated one, the long delay entails a serious loss. With this appliance it is possible to repair broken flywheels, pumps, water mains, and even the heavy castings and framework of engines, hoisting plants and dredges. It is also useful in building up or repairing gear wheels, in which case the metal is added and then filed down to its proper size and shape. It is also a valuable aid in repairing boilers, as by this appliance it is an easy matter to cut out a defective part and weld in a new piece of like dimensions, doing away with the necessity of punching holes and riveting. With this process aluminum, copper, brass and alloys are welded. It is claimed that the temperature attained by the oxy-acetylene flame is 6300 degrees.



THE UPPER ILLUSTRATION SHOWS THE TORCH WITH VARIOUS SIZED TIPS. THE LOWER ONE SHOWS THE SAME TORCH WITH CUTTING ATTACHMENT

European Zinc Companies

SPECIAL CORRESPONDENCE

The Société des Mines de Malfidano, a large zinc producer, lost nearly $100,000 last year owing partly to the low price of metals, but mainly to the bad working of its Noyelles-Godault works. The company of Malfidano was given leave by the shareholders to exchange the mines of Faucon l'Argentière and La Môle for the concession of Poullaouen, near its concession of Huelgoat, where development work is now carried on. It is said that the Société de la Vieille-Montagne would give its technical and eventually financial help, while the Malfidano company would supply the Vieille-Montagne with crude zinc. The latter would thus develop its strong position in the zinc market to which it brings about one-fifth of European consumption. The Vieille-Montagne company works 40 mines in Belgium, France, Algeria, Tunis, Germany, Italy, England, Sweden, Spain and Sardinia, and its works are located in Belgium, France, Germany and Sweden and produce crude zinc and rolled zinc. It is also a large producer of sulphuric acid and superphosphates. The enormous development of this company was obtained by investing part of the yearly profits; the capital has not been increased since 1845, and loans issued in 1866 and 1871 have been completely paid off.

The largest nugget ever found in Australia was called the Welcome, and was mined at Ballarat by a party of miners, one of whom, Francis Webster, died recently. The Welcome, says the *Mining Standard*, was found June 19, 1858, at a depth of 180 ft., and weighed 2159 oz. The price paid for it to the lucky diggers was £10,500, but this was a fancy price, and was offered with the idea of recovering a large proportion of it by exhibiting the prize, and after making a good haul in this way, the enterprising showman sold the Welcome for $1325. In November, 1850, the nugget was melted in London, and was found to contain 99.2 per cent. of pure gold, so that it was about $44,200 actual value.

In 1908, according to statistics collected for THE MINERAL INDUSTRY, the United States produced 23,466,666 short tons of coke worth $55,595,792 ($2.30 per ton), while in 1907 the total output amounted to 40,505,238 short tons worth $107,445,050 ($2.65 per ton).

The Pyrometry of the Beehive Coke Oven

Devices Used and Methods Employed in Taking Temperatures. Results of Examination of Beehive Coke Oven Gases During Coking Process

BY J. R. CAMPBELL*

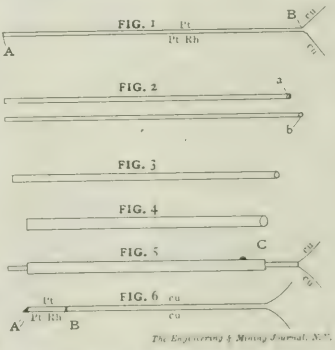
The pyrometer (pyro + meter), derived from the Greek words *pyre* and *metron*, meaning fire and measure, is, literally, an instrument used to measure fire, but we have come to understand this to mean high temperatures in general.

The data recorded in this article has been taken from the ordinary beehive coke oven in the Connellsville region, the oven either burning through the trunnel head or into a waste-heat flue. I do not claim that these temperatures will hold true on other coals, since the constituents of the coal gas will vary in different coals as will the volume of gas per ton of coal, nor do I claim that the temperatures recorded will hold true in a by-product coke oven.

The temperatures to be given have been taken with several devices which will be described somewhat in detail and their relative merits touched upon. For a standard I have taken a form of the Le Chatelier thermoelectric couple, which will be described by the following diagram. Without doubt this is the most accurate apparatus yet devised for measuring and recording high temperatures, but it has its limitations and is open to serious objections as a practical apparatus. The fire end shown in the cut is one made in the laboratory of the H. C. Frick Coke Company and has served its purpose admirably.

Fig. 1 shows the standard thermocouple, made of two wires of different metals or alloys. In this case one is a platinum wire and the other an alloy of platinum and rhodium, the latter being about 10 per cent. usually. *A* is the hot junction and *B* is the cold junction. The junction at *A* can be made by welding the two wires together in the flame of an oxyhydrogen lamp as is my practice, or they can simply be twisted together. At the cold junction *B* two copper wires are fastened as the formation of lead wires. The couple thus described is about 6 ft. long, a good length for use in a coke oven. This couple when exposed to heat sets up a current of electricity the strength of which can be accurately measured by a sensitive galvanometer or milli voltmeter, which is calibrated to read in degrees Fahrenheit to within about 25 deg., which is close enough for practical purposes.

Fig. 2 shows small bore porcelain tubes *a* and *b* for insulating the thermocouple. Fig. 3 shows a cast iron pipe of sufficient length and diameter to hold the insulated couple, while Fig. 4 is a still larger and shorter pipe for slipping over the whole for a greater protection. Fig. 5 shows the fire end of the pyrometer complete. It is strong and durable, thus overcoming in a measure the fragility of the older fire end which was a couple protected by a porcelain and clay covering. The form described was not designed for stationary use. It is a portable device and intended to make quick readings in high temperatures. The cast-iron pipes when burned up can be renewed. As the reducing gases of a coke oven have a deleterious effect on the couple, the end of the inner cast-iron pipe is filled with a good quality of fire clay.



SIMPLE DEVICES FOR MEASURING TEMPERATURES IN BEEHIVE COKE OVENS

By means of the set screw *C* in Fig. 5 the inner pipe can be moved back and forth for exposure or protection as the case may be. As the limit of such a couple is about 2000 deg. F., the melting point of cast iron along in that neighborhood, and the temperature of a coke oven rarely above that figure in the Connellsville region, such a fire end as the one described has quite a long life in the hands of a careful operator.

In Fig. 6 is shown what is known as the short thermoelectric couple, which is constructed exactly along the lines already described. This couple is only a few inches long as shown by the hot and cold junctions *A'* and *B'*. In the first arrangement the cold junction is always in the air, while in the latter it may be or may not be in the air. In taking oven temperatures per force of circumstances, the latter type would nearly always have both hot and cold junctions in the high temperatures, a bad feature.

Oven Readings Must Be Taken Quickly

It may be well to note here that the cold junction of a thermoelectric couple must be kept at the temperature at which it is standardized, which is usually from 15 to 20 deg. C., or ordinary atmospheric temperatures, to obtain accurate readings on the galvanometer, unless a special compensating apparatus is used, which is not usually the case. This short couple arrangement is very inexpensive and is ideal in theory but very difficult to work in practice. The readings, to be accurate, must be taken in a few seconds, or before the cold junction has its standard temperature destroyed, a thing very difficult to perform in a coke oven where the fire end has to be thrust in 5 or 6 ft. In the operation of this couple the indicator on the galvanometer moves to the maximum almost instantly and then reverses and drops back. If this recession starts before one has the fire end where he wants it, he simply cannot manipulate fast enough to get the temperature correctly.

Then after the reading has been taken, by reversing the current through the galvanometer, a positive reading of several hundred or even 1000 deg. will be obtained. Before another reading can be taken the fire end must be cooled down to the normal temperature of the cold junction.

This form of the thermoelectric couple as devised by Mr. Bristol might prove useful in some cases, but most unfortunately I have had to discard it in the coke-oven practice and revert to the longer and more expensive couple in which the cold junction is not affected materially and in which the indicator on the galvanometer moves more slowly to the maximum. Some form of the Le Chatelier thermoelectric couple properly constructed for the purpose for which it is intended and properly manipulated, no doubt, will remain a standard for accuracy, but there are many objections to it from a practical standpoint, such as the fragility of the fire end and galvanometer, and the difficulty of transportation and manipulation in all places where temperature is desired.

Among the many other devices on the market for the observation of high temperatures, Wanner's optical pyrometer will commend itself to every practical man for the simplicity of construction, ease and rapidity of manipulation and accur-

*Note: Paper read before the Coal Mining Institute of America, Punxsutawney, Penn., June 29, 1909.

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acy of results. This device will be detailed somewhat as it has especial merit. In fact, some of the temperatures to be given were made with this instrument and I consider them most reliable.

The Wanner Optical Pyrometer

The principle on which the use of this pyrometer depends is the same as in the various older forms, that is, the comparison of the quantity of light emanating from the heated mass to be measured, with a constant source of light. An osmium lamp of the necessary voltage is used as the standard light.

Looking through the pyrometer, a circle of light appears, divided into distinct halves of different intensities of light. By turning an adjustment on the pyrometer, these two halves can be made to appear alike or matched as it were. I have jocosely referred to this in reading coke-oven temperatures as the appearance of the full moon—only it is a blood-red one. Then the temperature is easily read from the scale on the adjustment with the aid of a table. This type of pyrometer must be standardized at least once a day against an amylacetate lamp flame after which the osmium lamp is regulated by a resistance, which is switched into the lamp circuit.

The personal equation, of course, is a factor in the operation of this pyrometer but I have no hesitancy in recommending it in commercial work. A careful observer with unimpaired vision will get excellent results. However, one cannot examine particular points in a coke oven as with a thermo-couple. The results obtained by these two types of pyrometers have always agreed in the oven work, and I have seen many observations by each.

Among the other means of taking the temperatures of coke ovens, the remaining most important one is by means of the Seger cone. This method is familiar to everyone, hence need not be detailed here, and for a long time performed the function of recording high temperatures. In this connection it need only be noted that the melting points of the silicate mixtures which compose the Seger cone, do not correspond with scientific exactitude to definite temperatures, because the fusion of any complex substance is not wholly a matter of temperature. It depends upon the rate at which the heat is applied, the fineness of the grain of the mixture, the chemical conditions of the heating process, etc. For the above reason the Seger cone is not reliable, but it is understood that it does serve a useful purpose in the ceramic industry when exactitude is not absolutely required.

I have discussed three modes of recording high temperatures in the order in which I consider they should stand as to accuracy: First, the Le Chatelier thermo-electric couple; second, the Wanner optical pyrometer; third, the Seger cone. For all practical purposes it would not be unfair to put the Wanner optical pyrometer in first place.

The Theory of High Temperatures in a Beehive Coke Oven

It has always been my practice to set before me a theory from which the practical problem is evolved. The theoretical problem may or may not be correct, but the training is invaluable. Accordingly the theory of the combustion of coal gases in a beehive oven will be set forth roughly, as it were, from which certain conclusions may be drawn, which otherwise would be lost sight of.

By reference to the tabulations it is to be expected that by complete combustion of the oven gases we should attain a temperature of about 3500 deg. F. in a beehive coke oven, but since this condition is rarely, if ever, obtained in the Connellsville practice, whether from the standpoint of good practice or not, I am not in a position to judge, certain corrections must be made. In the past I have made a somewhat extended examination of the beehive coke-oven gases during the coking process, and for the purpose of this article, without detailing a large number of individual analyses taken at various stages in the coking process, I will assume what I consider a fair average.

The assumption is made that the combustible gases found in the coke oven are simply distilled out and not burned, though such may not be the case. It is more than likely that the hydrogen found in the oven gas is formed by the decomposition of the H_2O formed in the combustion process, which process also furnishes oxygen for further combustion of the hydrocarbons. This seems reasonable since the ignition point of H is below C_2H_4, CH_4, or CO. It should be the first gas burned theoretically. In view of these theoretical considerations the maximum temperature of a coke oven is 3550 deg. F., and with a loss of 600 deg. F., due to incomplete combustion, this is reduced to 2950 deg. F. There is one other source of loss, also, the loss by radiation.

Without multiplying the data, I will proceed to give some actual pyrometric tests, made on beehive ovens of various types. One can readily follow the theoretical with the practical test.

COMPOSITION OF COAL GAS.

	By Volume.	By Weight.
Carbon dioxide (CO_2)	2 00	6 80
Ethylene (C_2H_4)	5 50	12 00
Oxygen (O_2)	0 50	1.20
Carbon monoxide (CO)	11 50	24 70
Hydrogen (H_2)	43 50	7 70
Methane (CH_4)	35.00	43 20
Nitrogen (N_2)	2.00	4.30

TEMPERATURES PRODUCED BY BURNING IN AIR.

Carbon monoxide (CO)	2828 deg. C.
Hydrogen (H_2)	2080 deg. C.
Methane (CH_4)	1935 deg. C.
Carbon (C_2)	2450 deg. C.

Therefore

0 deg. x 6.80 = ...
2450 deg. x 5.10 = 12,495.0 deg.
0 deg. x 1.20 = ...
2828 deg. x 24.70 = 69,851.6 deg.
2080 deg. x 7.70 = 16,016.0 deg.
1935 deg. x 50.10 = 96,493.5 deg.
0 deg. x 4.30 = ...

100)195,306.1

1953 deg. C. = 3,547 deg. F.

$C_2H_4 = CH_4 + C$
therefore
12.00 of C_2H_4 =
5.10 C. and 6.90 CH_4
and 43.20 CH_4 + 6.90 CH_4
= 50.10 CH_4

BEEHIVE COKE OVEN GAS.

	By Volume.	By Weight
CO_2	3.00	5.30
CO	9.00	9.95
H_2	12.00	1.10
C_2 or CH_4	1.00	0.65
N_2	75.00	82.95

0 deg. x 5.50 = ...
2828 deg. x 9.95 = 28,138.6
2080 deg. x 1.10 = 2,288.0
1935 deg. x 0.65 = 1,257.75
0 deg. x 82.95 = ...

100)31,684.35

317 deg. C. = 600 deg. F.

3550 — 600 = 2,950 deg. F.
maximum temperature

COMBUSTION OF COAL GAS.

(1) $C_2H_4 + 3\ O_2 = 2CO_2 + 2H_2O$
(2) $2CO + O_2 = 2CO_2$
(3) $2H_2 + O_2 = 2H_2O$
(4) $CH_4 + 2\ O_2 = CO_2 + 2H_2O$

(1) 1 vol. C_2H_4 + 15 vol. air = 2 vol. CO_2 + 2 vol. H_2O + 12 vol. N_2
(2) 2 vol. CO + 5 vol. air = 2 vol. CO_2 + 4 vol. N_2
(3) 2 vol. H_2 + 5 vol. air = + 2 vol. H_2O + 4 vol. N_2
(4) 1 vol. CH_4 + 10 vol. air = 1 vol. CO_2 + 2 vol. H_2O + 8 vol. N_2

(1) Multiplying by 5.50 = 11 vol. CO_2 + 11 vol. H_2O + 66 vol. N_2
(2) Multiplying by 5.75 = 11.5 vol. CO_2 + 23 vol. N_2
(3) Multiplying by 21.75 = + 43.5 vol. H_2O + 87 vol. N_2
(4) Multiplying by 35.00 = 35.0 vol. CO_2 + 70.0 vol. H_2O + 280 vol. N_2
(5) Already present = 2.0 vol. CO_2 + 2 vol. N_2

Total product of combustion =
59.5 vol. CO_2 + 124.5 vol. H_2O + 458 vol. N_2
or 100 vol. gas = 642 vol. of the products of combustion
Then 1 cu.ft. = 6.4 cu.ft.

TEMPERATURE OF BEEHIVE OVEN DURING COKING PROCESS.

2110 deg. F.	3 hr.
2285 deg. F.	6 hr.
2460 deg. F.	9 hr.
2490 deg. F.	12 hr.
2660 deg. F.	15 hr.
2765 deg. F.	18 hr.
2560 deg. F.	21 hr.
2660 deg. F.	24 hr.
2800 deg. F.	27 hr.
2725 deg. F.	30 hr.
2725 deg. F.	33 hr.
2660 deg. F.	36 hr.
2560 deg. F.	39 hr.
2490 deg. F.	42 hr.
2370 deg. F.	45 hr.
Average 2555 deg. F.	

This was a 48-hour charge burning normally in a 12 ft. 6-in. beehive coke oven. The test was taken on a plant which used the waste heat of the oven for operating the boiler plant by means of the familiar short flue connecting the oven to a main waste heat flue which led under the boilers. I consider the tabulation as a fair average. For the purpose of this article the readings are assumed to be taken every three hours. As a matter of fact, the first reading was taken after the charge was burning freely and the last just before the oven was watered. The main object is to show the variation of the temperature during the coking process.

The Variation in Temperature During Coking

One interesting thing to note in this connection is the fall in temperature along about the 21st hour of the coking process. This was caused by the "watering out" of the oven next to it. It will also be noted that the maximum temperature of 2800 deg. F. is attained when the coking process is about half completed and the minimum is at the incipient stage of the coking process; also, that the temperature at the close is slightly greater than at the beginning.

These conditions could almost be formulated into a universal law. It is understood that in particular instances higher temperatures than the 2800 deg. have been obtained.

Also it may be pointed out the beehive coke oven from which the waste heat is utilized may burn hotter than the same oven burning into the air. This is due to the increased draft on the flue oven which leads to completer oxidation of the coal gases. This brings us sharply back to the statement made previously as to whether this is consistent with the best practice of coke making from the standpoint of the yield of coke to coal and the physical quality of the coke itself. I am not prepared to enter into a discussion of these and kindred points but would point them out. The complete combustion of coal gases gives us:

CO_2	11.50 and 3550 deg. F
N_2	88.50

This means that we are approximating the greatest possible temperature to be obtained in a coke oven. This brings in a new factor, the question of the refractories used in oven building, and I desire to say that this is a pretty serious problem for the manufacturer of oven brick, and a still more serious one for the operator who is being handicapped at every stage of the game, on this score, in his efforts to make progress in modern equipments. He is "up against it good and proper." This has led him to devise all kinds of schemes to get away from the evil effects of this intense heat and falling flues and ovens. Some operators have adopted the air-cooled, overhead connecting flue instead of the regulation short flue, but this is at the sacrifice of heat, which means power to the boiler plant. This point is illustrated by the following pyrometric readings:

Regulation short flue	2650 deg. F.
Air-cooled over-head flue	2300 deg. F.

These tests were made on a 48-hour charge after the oven had been burning normally for about 18 hours. There is a dissipation of 350 deg. F., which means power to the boiler plant.

It has been noted that the waste-heat gases are conducted under the boilers, where the temperature is approximately 2000 deg. F. When we figure that the average temperature of the beehive flue oven is 2550 deg., here again comes a heavy loss of heat and power. This, no doubt, is caused by radiation and would be hard to overcome.

TEMPERATURE IN BEEHIVE COKE OVENS AT VARIOUS POINTS.

Kind of Oven.	Kind Charge.	Time Burnt.	Point Where Temperature Was Taken.	Deg. F.
Bank Beehive..	48 hrs.	24 hrs.	Front of oven directly inside of arch.	1600
Bank Beehive.	48 hrs.	24 hrs.	Top of charge 4 ft. 0 in. inside of arch.	1850
Bank Beehive.	48 hrs.	24 hrs.	Crown of oven 3 ft. below trunnel	2350
Bank Beehive.	48 hrs.	33 hrs.	Front of oven directly inside of arch.	1525
Bank Beehive	48 hrs.	33 hrs.	Top of charge 4 ft. inside of arch.	1950
Bank Beehive.	48 hrs.	33 hrs.	Crown of oven 3 ft. below trunnel.	2250
8 ft. Rect	48 hrs.	30 hrs.	Front of oven directly inside arch.	1925
8 ft. Rect	48 hrs.	30 hrs.	Crown of oven 3 ft. below trunnel.	2050
6 ft. Rect.....	48 hrs.	26 hrs.	Front of oven directly inside of arch.	1800
6 ft. Rect	48 hrs.	26 hrs.	Crown of oven 3 ft. below trunnel.	2150
Block Beehive.	48 hrs.	30 hrs.	Front of oven directly inside arch	1550
Block Beehive.	48 hrs.	30 hrs.	Top of charge 4 ft. inside of arch.	1925
Block Beehive.	48 hrs.	30 hrs.	Crown of oven 3 ft. below trunnel	2500
Block Beehive..	48 hrs.	30 hrs.	Intersection of outside arch with front wall	800 to 1000
Bank Beehive..	72 hrs.	0 hrs.	Bottom of oven under tile at center of oven.	500
Bank Beehive.	72 hrs.	72 hrs.	At point midway between trunnel and over arch.	1525
Bank Beehive.	72 hrs.	72 hrs.	Maximum temperature inside of trunnel.	2300
Bank Beehive.	72 hrs.	72 hrs.	Bottom of oven under tile at center of oven.	1100
Bank Beehive..	72 hrs.	72 hrs.	Bottom of oven, top of tile, after 16 min. watering.	150

The accompanying tabulation is interesting in that it shows the temperature of special points in a coke oven. The cold air entering the oven over the door naturally lowers the temperature at this point. Also it is a natural conclusion that the hottest part of a coke oven is not on top of the charge but higher up in the combustion chamber. This brings us to the point where the Seger cone may prove misleading. It is usually placed on top of the charge or at the best only a few inches above it.

The Larger Oven Produces a Higher Temperature

The figures in this tabulation were obtained on the straight beehive coke oven burning into the atmosphere. These ovens naturally do not burn as hot as the flue oven, as has been noted, due to the draft not being forced. Then again the smaller beehive oven in the old Connellsville region does not attain the high temperature of the larger oven in the newer fields. Or we may put it like this: In the same field and on the same coal, the larger oven produces a higher temperature generally. We may find the reason for this in the fact that in the larger oven, heavier charges are made and greater volumes of gas are being given off and burned in the prescribed time of coking; consequently there are a greater number of heat units developed, and less chance for radiation. Also, the quantity and quality of the volatile matter is an important factor in this problem. A coal yielding a volatile matter of 33 per cent. will develop more heat units than a coal of 30 per cent. volatile matter, if the size of the charge and the size of the oven remain constant for the reasons already cited; and provided, of course, the coking process is completed in the prescribed times of 48, 72, or 96 hours, respectively, for the various kinds of coke. In bringing this article to a close, I draw the following conclusions based upon experience in connection with the various types of ovens and localities in the Connellsville region:

Maximum temperature attained in:

1. Small type of beehive oven and low volatile matter (comparatively) 2200 to 2400 deg. F.

2. Large type of beehive oven and high volatile matter (comparatively) 2400 to 2600 deg. F.

3. Large type of beehive oven and high volatile matter (comparatively) with flue system for operating boiler plant 2700 to 2900 deg. F.

From which we deduce (a) that a low-grade refractory will serve its purpose in No. 1, hence the longevity of this type of oven; (b) that this same material used in No. 2 fails of its purpose, hence come the many and manifold troubles of the present coke oven builder and operator, caused by falling ovens; (c) that only the highest grade refractory will stand the heat of No. 3.

Now, the application. Mr. Operator,

thoroughly understand your problem of the beehive coke oven, know what you want done and then solve it along rational and technical lines; do not pursue a willy nilly, haphazard, hit-or-miss plan, but get down to the bottom of the thing and act upon the results of your investigations; there are always several courses open and you must choose the one you want to follow, but whatever course is taken, follow it understandingly.

An Example of Proper Ventilation

The coal industry in the Pittsburg region has recently come into the limelight because of the numerous mine explosions that have occurred in that field. The officials of the Pryor mine at Pryor station, on the Pittsburg Terminal railroad, believe that the safest remedy for the prevention of disastrous explosions is ample and efficient ventilation. The accompanying illustration goes farther to substantiate the assertions of the officials of the Pryor mine than would a lengthy theoretical discussion. The photograph here shown was taken during working hours at a time when 175 men were employed underground.

It is unnecessary to explain that in a bituminous mine, operating in the Pittsburg coal, considerable danger is attached to the act of taking a flashlight photograph at one of the faces of the underground workings, unless those in charge are absolutely sure of the safety of prevailing conditions. The face of the coal is clearly indicated in the photograph and the large lumps are also distinctly shown.

It would be interesting to know how many coal-mine managers, developing gaseous bituminous seams, would be willing to support their claims of ample ventilation at the working faces of their mines by permitting a flashlight photograph to be taken at the face of one of their own chambers.

VIEW AT FACE OF A CHAMBER IN THE PRYOR MINE OF THE MORELAND COKE COMPANY, PITTSBURG, PENN. THE PHOTOGRAPH SUBSTANTIATES THE COMPANY'S CLAIMS OF PROPER VENTILATION

Dangers Attending Use of Electricity in Coal Mines

By James Ashworth*

Several times during and after inquiries into the cause of explosions in collieries, it has been suggested that the use of electricity ought to be curtailed, but up to date, this suggestion has not received many adherents among those who are actively connected with the mining of coal.

It will be remembered that after the explosion at the Monongah mine in West Virginia, attention was pointedly directed to the "network" of electrical wires at the point on the main haulage road of No. 8 mine where the No. 1 north and south entries branched off. These wires were broken down by the force of the explosion, and to what extent the shorts and arcs, that were then produced, contributed to the disaster, has not been much theorized upon. The use of electricity underground necessitates the use of junction boxes, switches and fuses, and at all these points where the continuity of the cables carrying the live current are placed, they necessariy introduce a danger which in spite of all the best apparatus is not entirely removed.

The attention of electricians and all colliery operators and their staffs has been startlingly directed to this subject by the explosion which happened at the West Stanley colliery in England, on Feb. 16, when 178 people lost their lives. The coroner's jury after hearing evidence for 10 days brought in a verdict that the loss of life was caused by an explosion of coal dust, although they were unable to say how the coal dust was primarily ignited.

The West Stanley Explosion

This disaster, as the evidence indicated,

*Mining engineer, "The Cloud," Congleton, England.

was divided into two distinct explosions. The first arrived at the pit tops in the form of smoke and violence, opening the "horse hole" doors and splintering them, and also tearing off the wood work on three sides of the upcast shaft. This effect was soon over and in about a minute the smoke pillar was cut in two, and there was a reverse current in the shafts which sucked down the smoke still in the shafts. Almost immediately after this effect, another column of smoke was projected out of the shafts accompanied by flame, and again the smoke column divided and part returned down the shaft.

The various witnesses who testified at the inquest, stated that the accident occurred between 3:35 and 3:45 p.m. The chief mechanical engineer of the colliery was in the air-compressor house about 3:40 p.m. and suddenly heard a loud burring in the adjacent room where the electrical generating plant was placed. This burring noise after a few seconds, was replaced by a great bang and immediately afterward, the smoke of the first explosion reached the pit top. The engineer then ran to the pit top which was about 90 yd. away, and saw the second explosion. About 3:35, the surface electricians were in telephonic communication with the pump-house motorman, and he informed the generating station that he was about to start the big pump.

Explosion Started in Pump House

That he should give this notice before starting was a rule of the colliery, and therefore nothing unusual could be expected to result from it. However, a careful examination of all the electrical appliances and connections after the explosion brought to light the facts, that the cables (three-phase) were safe and sound, from the generating station to the pumping station. The fuse at the pit bottom was undamaged and although the cable was seriously damaged under a fall about 75 yd. from the pump, there was no external appearance of firing or burning. In the pump house, however, two fuses had their porcelain covers broken, and the switch box was blown to bits. The remains of the switch box were found in different directions and the elbow pipe of the pump was broken. The evidence of force showed that it was about the same at the southeast entry as at the west exit, and these facts point directly to the initiation of an explosion inside the pump house.

The chief engineer stated that the pump had started work, and from the times already stated, it is evident that the starting of the pump and the explosion initiation were practically within say a moment of time. The pumpman was killed, and therefore the evidence which would have cleared up this mystery cannot be available and is consequently entirely problematical.

None of the mining experts who examined the pit and gave valuable evidence, placed the initiatory explosion in the pump house, but they were practically in agreement that it was in the main haulage road, and somewhere between or at a fall of roof 75 yd. outbye of the pump house.

Now the conditions in the main haulage road were most favorable to a disaster if only it could be proved that an explosive had been used anywhere about this point, but as a matter of fact, it was most clearly shown that in none of the mines worked from these shafts had there been any shot fired about the time of the explosion. It would appear that when the set of full cars of coal were at the "curve" something went wrong and the engine was signaled to stop, it was then signaled to move on and this time the engine was stopped without signal, as the train was fast. At this moment the explosion occurred. It is clear, therefore, that the air in the haulage road would contain a considerable quantity of both old and new dust in the intake current as a natural result of the movement of the cars, and this dust would also enter the pump house with the air. The bursting of the switch box at this instant supplied the necessary flame, and initiated the explosion. The evidence of the onsetter who was recovered alive, and remained unconscious for three weeks, showed that the people working about the pit and on the haulage road had some intimation that an explosion had occurred, because they were all found some distance from their proper places, and the onsetter heard the noise before he became unconscious.

If, therefore, electricity is to be used underground, it is evident that switches for use underground will require more attention both in construction and in use. And as it has been demonstrated that a switch when immersed in oil affords no protection and becomes useless when dirt or coal dust is mixed with the oil, it is clear that switch boxes must be absolutely dust tight, or they must have more frequent attention to ascertain if the oil is in proper condition and that no chemical change has taken place.

The use of electricity underground is much more general on the American continent than elsewhere, and, therefore, it behooves every maker and user of electrical appliances to make these details of installation as nearly safe, as it is possible for human ingenuity to do.

Colliery Notes

The mine inspector's proper work is to overlook the methods adopted, and the provisions made for securing the safety of the men employed in and about the mines, rather than to attempt to examine each working place. The more detailed examinations at a colliery should be made by the mine officials themselves. An inspector accomplishes the greatest good when he succeeds in establishing a high standard of management.

Where wire-rope guides are used, it has been found practically impossible to contrive a safety appliance which can be relied on to hold the cage in case of the rope breaking. Such an apparatus must be effective when needed, and at the same time secure against coming into operation when not needed. Where such an apparatus was recently tried, the usual result happened, one of the grasping hands got hold before the others, with the result that the cage was almost turned upside down.

In developing the coal seams of Scotland, the early method of mining the coal on the pillar-and-room system has practically disappeared, except where the surface must be protected. Even the thickest seams are now worked by the longwall method. In one district where the bed is 25 ft. thick, this latter system is used, and the coal is mined in from two to four horizontal slices, or lifts; in another district where the seam is 11 ft. thick, the longwall method has been adopted, and the coal is taken out in two slices. Even under the sea, the longwall system is used when the depth of the seam exceeds 800 feet.

In the prevention of accidents on haulage roads the more careful colliery managers have provided manholes at specified distances; the entrance to these manholes is kept whitewashed. One disadvantage of this precaution is due to the fact that the warning of a "runaway" is so short that the refuge hole can seldom be reached in time. Therefore, in providing still greater safety, it is advisable to install stop blocks and runaway switches. The most certain way to prevent fatalities on haulage roads is to keep all such gangways in the best of shape, and to drive them higher and wider, so that a person may stand clear of a passing trip at any point.

Now that the use of permitted explosives is becoming more general in this country, it is well to remind shot- firers that it is dangerous, if not illegal, to fire even the permitted explosive near inflammable gas, or in any place where the safety lamp shows the slightest cap. If a charge of permitted explosive is put in coal already partially broken down by a previous shot, or if it is placed in a thin layer of top coal which easily breaks away, a rapid flash of flame is the result, and any inflammable gas that is present will surely be ignited. The advance of the coal-mining industry in this country to the use of permitted explosives is most fortunate and to be commended; however, many fatalities will result if miners attempt to interpret the use of these safer explosives to mean that greater liberties may be taken.

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•*Illustrated.*

The Prospects for Copper

With respect to the report of the Copper Producers Association for June, we might simply reiterate the comments that we made regarding the May report. In June there was a further reduction of the visible accumulation in America, which again was more than offset by the increase in the accumulation abroad, showing that the process of transferral was still going on in June. In June also there was a further increase in the production of the American refineries, the average daily output of which was 3,885,583 lb., against an average of 3,817,000 lb. in May.

One thing is now standing out very clearly, namely that no restriction of production (unless it be purely arbitrary and artificial) is to be expected at the present level of prices. For upward of 20 months, the average price for copper has been in the neighborhood of 13c., and production has steadily increased. The number of high-cost mines that have been closed is comparatively few and their aggregate output relatively insignificant. The increasing production at the recent level of price confirms the statement that we have frequently made to the effect that 13c. affords a fair profit on the bulk of the American production of copper. Any natural restriction of the production at the present level of price, or indeed at a little lower level, is therefore not to be expected.

The immediate future of the market depends upon consequently upon the increase in actual consumption. The Copper Producers Association has at this time made a report respecting the domestic deliveries of copper since January 1, which foots up to a total of 302,000,000 lb., or a little more than 50,000,000 lb. per month. For the first four months the average was about 45,000,000 lb. per month. In May the deliveries jumped to 61,000,000 lb. and in June they were 60,000,000 lb. No one seriously believes, we think, that there was any such sudden increase in actual consumption in May. It is well known that some large manufacturers during the heavy purchasing at that time provided for their requirements for a long time ahead. We are inclined to think that the actual domestic consumption during the first six months of 1909 was about 270,000,000 lb., or at the rate of 540,000,000 lb. per annum. In 1908 the consumption was 448,500,000 lb. The maximum domestic consumption was 668,576,000 lb., or an average of a little more than 55,000,000 lb. per month, in 1906.

The world's production and consumption of copper during the last 10 years as reported by the Metallgesellschaft, Frankfurt am Main, are given in the accompanying table. The figures as to production are somewhat different from our own, but we use them as given in order to match the statistics for consumption as reported. These statistics show an arithmetical average of 15.47c. per lb., and a weighted average of 15.50c. In other words the world has been willing to pay about 15½c. for 6,120,200 metric tons of copper used during the last 10 years. The average is, of course, inflated by the extraordinarily high prices that were realized in 1907-08, and we should, therefore, hesitate to say that because the world has bought its requirements for copper during the last 10 years at about 15½c., the chances are that it will do approximately the same during the 10 years next coming. However, it would seem to us that, taking this long view, an average of 13½ to 14c. might conservatively be expected. Over such a long period the criterion is not the cost of production, but rather what the world will be willing to pay.

WORLD'S PRODUCTION AND CONSUMPTION OF COPPER.

(In tons of 2204.6 lb.)

Year.	Production.	Consumption.	Price.[1]
1899	478,200	467,700	16.67c.
1900	499,200	512,700	16.19
1901	534,800	494,200	16.11
1902	553,300	582,500	11.63
1903	591,300	586,700	13.24
1904	647,900	662,400	12.82
1905	693,900	727,400	15.59
1906	717,800	727,600	19.28
1907	703,000	657,300	20.00
1908	738,900	701,700	13.21
Totals	6,167,300	6,120,200	15.50c.

[1]Quotational averages, cents per pound, at New York.

However, the question of immediate concern is not the price for copper in the long run, but the prospect for the near future, say the next 12 months. This as we have already remarked depends almost entirely upon the further development of consumption. In order to take care of the current production and absorb the surplus, consumption must exceed the largest on record, of which it is at present still very far short. Notwithstanding the admitted revival in business, it is impossible to see any indications that will quickly cause the consumption of copper to jump above the maximum of 1906. While history, especially that of the last 10 years, has shown a rather steady forging ahead in production, consumption

has experienced a succession of bounds and rebounds, which unbalancing of conditions is, of course, precisely what has been responsible for the great fluctuations in price.

The erratic development of consumption is easily explained by a little reflection. Many years ago there was a very large requirement of copper for sheathing ships. As wooden ships went out of use, a large consumption of copper was cut out, but in the '80s this was much more than made good by the electrical development of the world—first with telephone and lighting plants, next with power plants, then with trolley lines, and finally with long-distance transmission of power. Now this development cannot be expected to go on in geometrical ratio. The most fruitful fields for telephone, lighting, power and trolley plants have already been exploited, and the cream has been skimmed off of hydroelectric development. Undoubtedly there will be a new wave of important electrical development—perhaps, indeed very likely, the electrification of the steam railways—but this is not yet fully in sight. We may have to wait several years for such a leap in consumption as we had from 1903 to 1905, and even in the event of such a leap it may not be until a year later that the effect upon price will be fully evident. The over-production in 1901 caused a fall in price which ranged at a low level until 1905, although consumption increased handsomely and was not greatly out of balance with current production. It was not until 1905 that consumption began sharply to outstrip production and by absorbing accumulations resulted in an extraordinary rise of price.

We must not, therefore, be disappointed by the failure of the market to recover more rapidly from the relatively low average of 1908. We must not even be disappointed if we should have a further relapse, because insofar as basic conditions govern there is no reason why copper should not be produced at as low as in 1902, and if consumption should fail to progress the price will inevitably go lower. The only restraining condition that differs from those of a few years ago is perhaps the more general appreciation of the bearing of capital account upon cost of production and the less tendency to give away capital in order to keep going. The present comparative cheapness of carrying the accumulation helps producers in standing out for the price that they think they ought to get.

In December last we expressed the opinion that 1908 would be a year of small ups and downs in the copper market. The history of the first six months has fully borne out this forecast. The present outlook is for a continuance of the same conditions. But while there is no ground for enthusiasm over the immediate prospects, and there are some ominous factors, there is every reason to believe that in the long run the average price for copper will be higher than at present. In the meanwhile producers have reason to congratulate themselves that they are able to keep going at a profit, and are not compelled to sacrifice their output.

Seismic Disturbances and Colliery Explosions

Whatever may be the effect of seismic disturbances upon the outflow of gas in collieries, there can be no question respecting our Scranton contemporary. In its case, however, the emanations are in the nature of choke-damp rather than fire-damp. With the obtuseness of a $10-a-week clerk in a shoe shop, it insists upon our wearing a pair of shoes that do not fit. Our intelligent readers know that we did not indorse the earthquake hypothesis, but simply with a scientific spirit urged that it is worthy of attention.

In this position we rest with a calm that is not to be disturbed. Besides the attention to the subject by scientists that we have already reported, we are able to say that an enlightened foreign government, through its department of mines, has recently made an installation of seismographs in a deep colliery for the purpose of making scientific investigation; and the officers of another government have made application to their superiors for such instruments. Of course, these are things that our monthly contemporary could not be expected to know.

Respecting the meteorological congress recently held at St. Petersburg our authority was a Reuter despatch published in the London *Mining Journal*, Feb. 6, 1909, as follows:

> St. Petersburg, Jan. 29—A novel proposal was brought before the Meteorological Congress which has just been sitting in St. Petersburg. It was pointed out that vibrations and oscillations of the ground frequently caused the escape of gas in mines, with fatal results. Several delegates, accordingly, suggested that a seismograph should be installed in every mine to record the least earthquake shock, and thereby warn the engineers of the possibility of danger.

We shall prolong this controversy only sufficiently to state correctly the position of Mr. Spalding, whose article was the inspiration of it. We were under the impression that Mr. Spalding had offered his article to our contemporary, whose supposed rejection we dismissed as immaterial. A recent letter from Mr. Spalding, however, explains that our understanding was not correct, his manuscript having been sent to a friend for criticism and suggestion only, and having been shown by this friend to the editor of our contemporary at the latter's request. Under these circumstances the statement that it had rejected the article displays some obliquity. Even if the article had been actually offered and rejected, the announcement of it would have been a breach of faith. Does our contemporary hope by such action to inspire confidence in future would-be contributors?

The Smelting Report

The 10th annual report of the American Smelting and Refining Company, just issued, is an unsatisfactory fulfillment of the promises to take the stockholders of the company more into the confidence of the directors. Indeed, this report is unfavorable in that respect as compared with previous ones. It is, moreover, not exactly of a nature to inspire enthusiasm as to improvement in the prospects of the company, notwithstanding the rosy statements that were given out in advance. The report does not impress us so favorably as Mr. Guggenheim seemed to think of it.

The gross earnings of the company for the year ended April 30, 1909, decreased about $257,000, as compared with the previous year. Net earnings were made to show a small improvement, obviously by economies in general expense and by trimming the account of repairs and renewals. Net income gained about $332,000, practically all of which was effected by cutting the account of new construction and improvements in halves. In the case of this company, as we have previously pointed out, this account is practically of the nature of an amortization account, and in our opinion has never been adequately allowed for. The further reduction, made last year, is, of course, simply a deferral of operating expenses that will have to be made good at some time in the future.

Nevertheless, in spite of the above

criticisms, it must be recognized that this company has fully demonstrated its ability to maintain large earnings during a period of severe depression, and the earnings will undoubtedly increase materially, not only with the revival of business, but also with the expansion in the mining industry that is bound to go on, just as during the last 10, 20 or 30 years. It is gratifying to observe, moreover, that the American Smelters Securities Company, of which the Smelting company owns 177,510 shares of the common stock, that it has not yet thought wise to include among its inventoried investments, is now showing a large gain in net earnings. The report of the Securities company is so brief and unsatisfactory as to defy analysis.

The End of the Broken Hill Strike

The strike at the Broken Hill Proprietary mines in New South Wales, to which several references have heretofore been made, has been declared off by the union. The men, however, do not return to work. The company is operating its smelting works at Port Pirie, in order to carry out existing contracts for custom and other ores, and in time will bring down some ore from its mines to the smelter, though only a limited quantity. The mines will be operated on a small scale, with a limited number of men; and the same will be the case with the zinc separating and sintering plants. The Block 10 Company, the next largest employer of mining labor, will resume work, but will be no longer under contract with the unions.

In this case the strikers carried their point before the Arbitration Court, and its decision was supported on appeal, but the apparent victory has turned out a practical defeat. The decision of the court could not force the Proprietary Company to operate its mines at a loss, and the greater part of the 2500 men concerned in the strike will be out of employment. Many of them are out permanently, and will have to leave the district.

To sum up the case briefly, it may be recalled that the Broken Hill Proprietary Company three years ago made a voluntary advance in wages. Early this year it asked its men to agree to a reduction to the point prevailing in 1906, on account of the fall in prices of lead and silver; offering as an alternative a sliding scale based on the price of metals. The men appealed to the Arbitration Court, and the company's argument there was that with current prices the mines would be operated at a loss, if the higher wages were continued. The court decided for the men, not on the merits of this contention, but because, in its judgment, the advanced scale represented the lowest "living wage" for which men could be expected to work at Broken Hill. The company has decided to reduce the scale of its operations, chiefly because of the diminished profit, but partly also because its best mines are approaching the end of their life.

In this case the company's offer of a sliding scale seems to have been a fair one. No owner of mining property can be expected or forced to operate it at a loss, and the final result is one that might have been expected.

A Texas Bureau of Economic Geology

The Board of Regents of the University of Texas, at Austin, have established a bureau of economic geology and have called Dr. William B. Phillips, of Birmingham, Ala., to the directorship. He has accepted the position and will take charge of the work in September.

It is the purpose of this bureau to collect and distribute information concerning the mineral resources of the State. It is virtually a resumption of the work of the Geological Survey which was discontinued in 1905, after four years of successful operation, for lack of funds. Dr. Phillips had charge of that survey and is now recalled to continue the work. This is an entirely new departure. There are several institutions where the professors of geology, mining, etc., act also as State geologists, but for the first time in the history of education in this country has a university charged itself with the duty of maintaining at its own expense a special department disconnected from the teaching force for the above mentioned purpose.

Texas is an empire in itself. It has a great variety of mineral resources which should be developed—oil, coal, lignite, asphalt rocks, salt, clays, building and ornamental stones, quicksilver, sulphur, silver, lead, copper, zinc, etc. The State has now a greater railroad mileage than any other in the Union and the development of its resources will surely follow. The new bureau will be of great service, and Doctor Phillips, by long training and former experience, is especially fitted to become its head.

Pig Iron Production

The production of pig iron for the first half of 1909, as estimated by the reports of the furnaces, indicates the gradual recovery of the iron trade from the depression of last year. The total for the six months is 11,024,000 tons, which compares with 6,918,000 tons in the first half of 1908 and with 9,018,000 tons in the second half of last year. Moreover, the actual improvement of 2,000,000 tons does not cover the whole improvement, since some heavy stocks of iron carried over have been absorbed. The quantity of these cannot be exactly determined, but some estimates entitled to respect put them at over 500,000 tons.

The increase in production this year, month by month, has come almost wholly from the stacks owned by the steel companies. The merchant furnaces in blast on July 1 had a capacity about the same as those reporting in January. It is quite probable, however, that this condition will change in the second half of the year. The heavy sales of recent months will go far to reduce the stocks in furnace yards and to relieve the Northern producers from the aggressive competition of the Southern makers of foundry and forge iron.

There is likely to be a larger output in the second than in the first half of the year. The weak point in the present situation is the idle capacity, and the number of furnaces that are ready to go into blast as soon as prices reach a point which will pay them.

ANNOUNCEMENT IS MADE that the eleventh session of the International Geological Congress will not be held until 1910. At the meeting in Mexico in 1906 it was decided to hold the next session in Sweden, and the postponement from 1909 until next year is made to suit the arrangements of the Swedish geologists. The session is expected to be one of unusual interest, owing to the variety of the geology of Scandinavia, and to the series of excursions which are being arranged. Especial attention is to be given at this session to the iron-ore deposits of the world. Professor J. G. Anderson, director of the Geological Survey of Sweden, is the general secretary in charge

Views, Suggestions and Experiences of Readers

Comments on Questions Arising in Technical Practice and Debatable Points Suggested by Articles in the Journal

CORRESPONDENCE AND DISCUSSION

Pyrite-Zinc Separation

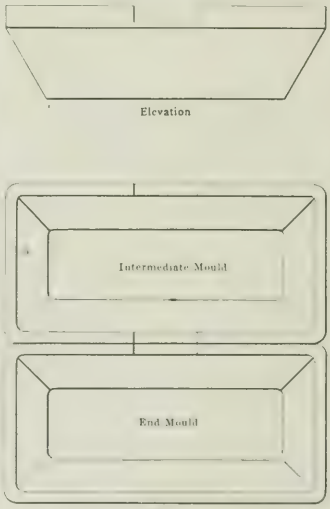
In the JOURNAL of July 3 appears a letter from A. H. Wethey, of Butte, Montana, under date of June 17 which evidences the widespread interest aroused by his article describing the conditions connected with the mining of zinc ores in Butte and published in the JOURNAL of May 1. This interest is sufficient proof that in many localities such complex ores usually known as "refractory," exist in abundance, and are a cross to most operators. Mr. Wethey's letter is not very reassuring to seekers for relief from their troubles, and while with the methods of operation in use at Butte, the secret of success lies in the fact that the ore contains a very small percentage of iron, this has nothing to do, in general, with the possibilities in the treatment of complex ores. The statement may be misleading, and to many will certainly be disappointing, especially reading the continuation as follows: "If the ore here contained much iron pyrite, it would be impossible to concentrate it and bring the zinc product up to 45 per cent. and over." From this it would appear that pyrite-zinc separations are beyond hope, except by the application of some patented process, such as magnetic, static or other device. However, to this statement exception must be taken, since it is not only possible, but practicable to make zinc-pyrite separations by the usually employed concentrating methods when the ore is properly prepared.

Here lies the secret of success. It is not necessary to look for patented processes, but to look to the proper preparation of the pulp before subjecting it to the separating influences, and not to try to do two operations in one, which are mutually incompatible, since founded on opposing principles. We refer to the diametric sizing of ore. With such a feed the capacity of a wet table is not only nearly doubled, but lead-iron-zinc separations follow as a natural result. In this way alone the refractory ore problem can be readily solved, and there is no longer any excuse for a mill operating on mixed ores, to lose the zinc values or store them as middlings for a future generation to work up.

In several mills recently constructed, such zinc-iron separations are now being successfully made. In one case an ore is being treated which carries 18 to 24 per cent. iron and up to 40 per cent. zinc. About 85 per cent. of the zinc is recovered in the form of a concentrate containing from 46 to 50 per cent. and up to 52 per cent. zinc.

It will not be long before many wet mills treating complex ores will be so modified as to permit them to derive a handsome profit from some of the base values which, in many cases, they now eagerly seek to discard.

It does certainly seem like poor business policy to seek to recover only lead and silver values from an ore and to throw away the zinc and iron, when, as is often the case, the market value of the metallic zinc and of the pyrite exceed that of the lead. Provided only that proper means



The Engineering & Mining Journal, N.Y.

ELEVATION AND PLAN OF MOLDS

(Accompanying communication of John W. Tudor.)

are employed, there is no reason why a zinc-pyrite separation should not be practicable, regardless of the quantity of pyrite present, so long as the minerals are physically free from each other. There may be some isolated cases where the particles of the various minerals may be so extremely small that in order to effect a freeing of the particles, the added cost for grinding and the added difficulty of separating extreme fines may seriously operate against commercial results; yet in the great majority of cases, the work can readily be done.

CARL F. DIETZ
DYKE V. KEEDY

Boston, July 8, 1909.

Matte Tapping Cars

The article by Mr. Havard on the Kilker matte tapping car in the JOURNAL of June 26, reminds me of an improvement introduced while superintendent at the Santa Fé Gold and Copper Mining Company's smelter at San Pedro, N. M., in 1907. In the old form of tapping we had six conventional molds placed side by side on a car and when one mold was full the car was pulled manually until the next mold came under the spout. Of course, there was a great deal of spilling, both by bad judgment as to just when to move the car, resulting in overflow, and by splashing when the matte was falling on the edge of the molds. This occurred for each mold and perhaps 10 to 15 per cent. of the matte had to be remelted. To obviate this, I had a mold made, as in the accompanying sketch, slotted at the sides—the two end molds being slotted on one side only. This formed a continuous channel between the molds when they were set on the car for the matte to run through, on the principle of the sow and pigs of an iron blast furnace. The result was most satisfactory. By placing the car under the tap with one mold in position, each mold was successively filled without further attention and a minimum of spillage. This had a further advantage. We were producing a high-grade matte, with considerable metallics. Before the introduction of the new mold our metallics were distributed irregularly through the pigs. As the refiners paid a higher price per cent. for the metallics than for the matte it was desirable to get the metallics in a marketable form, and this we were able to do since most of the copper settled to the bottom of the first and second molds where it could easily be separated in pig form from the overlying matte.

There is a slight leakage of matte at the meeting point of the slots in adjacent molds, and a little clay should be applied at these points when setting up the molds. It will be seen that the molds have straight sides corresponding to the depth of the slots. A slight blow with a hammer or bar will readily sever the small bridge of matte between the molds for upsetting, although it generally breaks of itself during the upsetting. The molds, of course, must be upset successively from one end of the car. It will be seen that this is capable of almost infinite extension by increasing the number of molds used according to the amount of matte tapped at one tapping. A slight difference in

elevation of the slots of each mold, the adjacent slots of adjacent molds being, of course, at the same level, will give all the fall necessary. This is not needed in a short run of six molds, provided the slots are deep enough.

The improvement is not patented and I offer it to the profession for such use as can be made of it. The sketch is simply illustrative and does not show the supporting and pivot bars for use on the car.

JOHN W. TUDOR.

Boston, July 6, 1909.

Ownership and Taxation of Mining Claims

Our mining interests need legislation, but A. C. Veatch, of the U. S. Geological Survey, is more radical than wise in the way he has taken to get it. We are individualistic; no nation is more so, and if there are any signs of our having surrendered the freedom of will inherent in individualism for the compulsive authority of collectivism I have not noticed them. State ownership may be preferable, but all of our laws relating to possession—wealth, or land, the source of it—are based on the principle of private ownership, and any and every measure will be overwhelmingly voted down without further consideration the moment a State legislature or Congress discovers it is in conflict with that principle. Vitally important, however, as this is, Mr. Veatch ignores it completely.

In his writings and addresses before Eastern audiences he dwells on and makes much of the fact that mining conditions under the leasing system in Tasmania are prosperous. Being a convert to that theory, he now advocates a policy that is equivalent to the abolition of all private ownership to our own mineral lands and the substitution of the Tasmanian system by the government of the United States. This, in brief, is his proposal, and mining men knowing what the prevailing sentiment is concerning public ownership—especially that of land—should not support it.

Rejecting, however, what I believe to be an impracticable plan for the bettering of mining conditions does not mean that we are without remedy, but we must first know of what we are complaining. Personally, I am in no doubt whatever, either of what must be done, or why, a confidence that I believe is justified by many years' connection with the industry. Speaking, therefore, as one who knows, if I were asked what in my judgment is wrong with the industry with which I have been so long identified, I would say it is the withdrawal of our mineral lands from use. There are in every mining district throughout the West hundreds of mining claims that do not cost their owners $1 to hold year after year, and upon which no work is ever done. And for this the State, not the United States, is responsible. While title rests in the latter an annual outlay of $100 must be made on each claim, and it is to evade making this outlay that a United States patent to the ground is applied for. A company, we will say, has 100 claims, only two of which are producers; but to hold them all there must be an expenditure of $10,000 every year, and as this is sure to become burdensome in a few years, it would in all probability surrender all of its holdings except the paying properties, were there no way of escaping this tax, which amounts to $5 an acre. But there is, and here is where the whole trouble lies. They apply for and are granted a patent and are then subject to the laws of the State, and are thenceforth relieved from making any payments whatsoever; and as often as not are not even assessed a nominal property tax.

Now what should be done is this: If that ground was worth $100 a year before it was patented it must be worth it after the patent is granted, and the State should insist that it is paid. Whatever the jurisdiction, State or United States, the owner of a mining claim should be made pay that $5 an acre tax.

WILLIAM GREENWOOD.

Atolia, Cal., June 26, 1909.

Production of Phosphate Rock in Florida During 1908

BY E. H. SELLARDS*

The first attempts at using Florida phosphate as a fertilizer were made by Dr. A. C. Simmons, of Hawthorne, Fla. Doctor Simmons is said to have recognized the phosphatic character of certain deposits lying near Hawthorne as early as 1879, and to have operated a mill for grinding a phosphatic-pebble conglomerate, for direct application to the soil, as early as 1883. This mill was subsequently abandoned, and the production of phosphate is commonly accepted as dating from the first shipment of river pebble from Peace river in 1888.

The phosphates of Florida are known in the market as hard-rock, land-pebble, and river-pebble phosphate. The plate-rock phosphate now being mined near Anthony is included in this report with the hard rock. The soft phosphates, of which there is a considerable quantity intermixed with other varieties, are unfortunately under existing methods not recovered.

The hard-rock phosphate now being mined occurs along the Gulf side of the Florida peninsula from Suwannee and Columbia counties on the north, to Citrus and Hernando counties on the south. The hard-rock deposits lie in pockets of irregular occurrence and extent and rest usually upon limestones of Vicksburg, lower Oligocene, age. The land-pebble deposits are of Pliocene age and are less irregular in their manner of occurrence than are the rock phosphates. The land-pebble region, at present productive, lies in Polk and Hillsboro counties, to the south of the hard-rock region. River pebble has been obtained chiefly from Peace river and its tributaries.

The production of river pebble increased gradually from the beginning of the industry in 1888, to 1893 when the maximum production of 122,820 tons was reached. From the year 1893 to the present time there has been, with some fluctuations, a decrease in the output of river pebble, the total for 1908 being 32,950 tons. River-pebble mining near Arcadia in De Soto county, which has long been the center of this industry, was discontinued at the close of 1908.

The discovery of hard-rock phosphate was made soon after the beginning of the mining of river pebble. The first shipment of hard rock was probably made in 1890. The output has gradually increased from the beginning of mining to the present time. The total hard rock mined during 1908 was 768,011 long tons, which is a considerable increase over the production of any previous year.

The first shipment of land pebble was probably made in 1891, although development began somewhat earlier. In 1892 the production according to the statistics of the United States Geological Survey amounted to 21,915 tons. The rate of increase in the production of land pebble was at first gradual, but in late years has been very rapid. In 1896 the output of land pebble for the first time exceeded that of hard rock. The amount of land pebble mined during 1908 is greatly in excess of that mined during any previous year, amounting to not less than 1,150,000 long tons.

The total amount of phosphate mined in Florida during 1908 was 1,950,961 long tons. The limit of error in this total is slight and is concerned chiefly with land pebble, the production of which may vary slightly from the amount calculated. The total amount of phosphates on hand at the close of 1908 was exceptionally large, and mining operations during 1909 will undoubtedly be curtailed.

Practically all of the hard-rock phosphate produced in Florida is exported, the home consumption of this grade being insignificant. During 1908 only 9000 tons of hard rock was consigned for use in the United States and 6000 tons of this is reported as used in Florida. The river pebble, although not used in Florida, is used entirely within the United States, no part of the 1908 output having been exported. Of the land pebble 150,377 tons is reported as having been consigned for use in Florida. The remainder of the total amount shipped was approximately equally divided between domestic and foreign ports.

*State geologist, Tallahassee, Fla.

The Ore Concentration Company (1905)

The third ordinary meeting of this company was held June 30 in London, when information was given by Stanley Elmore on the operation of the Elmore concentrating plants and on the position of the company, as regards litigation, with the Minerals Separation Company, which owns a rival process. The ore concentration company has won its case against the Minerals Separation, Ltd., in England, in the lower court and in the court of appeal. The case, however, is to go to a still higher court, the House of Lords.

The cross-action by the Minerals Separation, Ltd., in England, based on the Froment patent, has been withdrawn with payment of costs. In Germany the company has been successful in its opposition to the grant of a patent to the Minerals Separation, Ltd., and no patent will be allowed that company. The most important case to be tried in connection with patent rights is that instituted in Australia against the Sulphide Corporation, which is said to have been using the Minerals Separation process for some two years and to have treated some 500,000 tons. A very heavy claim for damages is being made by the Ore Concentration Company. But whether it wins or not, Mr. Elmore considers it merely an important side issue and that in other directions the prospects of the company are quite satisfactory and encouraging.

The largest Elmore plant at work is that of the Zinc Corporation at Broken Hill, N. S. W., where the plant is now treating 19,600 tons per month, producing 8000 tons of concentrates.

The accounts do not include a profit-and-loss account, but the balance sheet shows that about £4000 were received during the year from royalties, testing fees, interest, etc., so that it is clear that the company's business is not yet established on an extensive or lucrative scale, whatever may be in store for it in the future when lawsuits with other patent processes are out of the way. The issued capital of the company is 224,544 shares of £1 each, and the net expenditure to Dec. 31, 1908, on testing, development and administration, less receipts and fees, is £18,880 in all.

The Alabama Mining School

[illegible]

The University of Alabama, situated at Tuscaloosa, is now completing a fine engineering building to be called Comer Hall, in honor of the governor of the state. The building is constructed of Indiana limestone and St. Louis drab colored brick and has two acres of floor space. In the center of the building are experimental coal and ore washers. Adjacent to these are boiler and gas producer rooms. There are 2 water-tube boilers, 1 equipped with Burke furnaces and the other with automatic underfeed stokers. These boilers will heat the buildings in addition to furnishing steam for machine and woodworking shops and a Corliss engine operating a 150-kw. alternating-current generator. The gas producer furnishes gas to operate a gas engine operating a 45-kw. direct-current generator. These in turn operate various machines in the different shops and laboratories. The machine shop is well supplied with tools; also the wood-working shop. The electrical laboratory is to be well equipped for electrical experiments and the physical laboratory will be supplied with various machines for testing strength of materials. The building contains spacious lecture and recitation rooms, drafting room, an engineering library and instrument room. This building is in charge of Professor Edmund Kay, and will be ready for use by the fall session.

There is also under construction another building about half the size of the former, and of the same material, called Smith Hall, in honor of Dr. Eugene A. Smith, State geologist. This building will be given over to Biology and Geology under Dr. Smith's direction, and will be the headquarters of the Alabama Geological Survey.

These additions place the University of Alabama in the front rank of Southern colleges and will be of great value to the State, not only from an educational standpoint, but as a testing laboratory for the mining, metallurgical, mechanical and electrical industries.

Process of Smelting Zinc Ores

Anson G. Betts has patented (U. S. Pat. 918,648, April 20, 1909) a process for smelting zinc ores, based on the reduction of zinc oxide by silicon and its alloys, and also alloys or carbides of aluminum, calcium and magnesium. With silicon as the principal reducing agent the process is as follows: The ore either before or after roasting is mixed with silicon or a silicon alloy in a sufficient quantity to reduce the contained oxides of zinc, copper, lead and iron. The mixture is heated in a reverberatory furnace to a temperature below that at which the reduction of zinc takes place. The heated mixture is then passed into a highly heated furnace where the reaction commences. The heat of the reaction is so great that the amount of heat required to maintain the smelting temperature in the furnace is small. The slag is tapped off and the distilled zinc is condensed in a suitable condenser.

Mechanical Peculiarities

By D. E. Woodbridge*

Traveling through mining districts one frequently runs across oddities of construction. The following, which I noted in the Southwest, are remarkable examples of "mechanical genius." They were installed at a prospect situated in the mountains 17 miles from a railroad; the shaft was 100 ft. deep on the incline.

The superintendent could not find a hoist that suited him, so he prepared drawings that were submitted to a foundry and machine shop at his home town, about 2500 miles from the mine, in a region where they had no occasion to handle mine machinery, and knew nothing about it. This hoist consists of an 8x12-ft. cylindrical grooved drum mounted rigidly on the shaft, which extends at one end 12 in. beyond the main bearings. Upon this extension is mounted a bevel

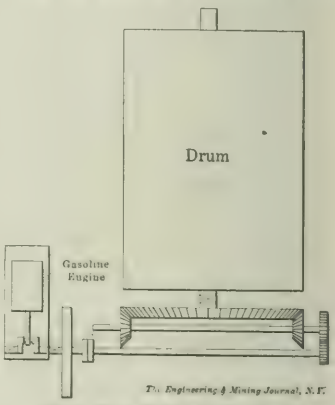


FIG. 1. PLAN OF THE SPECIALLY DESIGNED HOIST

gear 8 ft. in diameter. Parallel with the drum and within 3 ft. of it is a 25-h.p. gasolene engine of a very early Pacific-coast type. To the crank shaft of the engine is attached a friction clutch that engages a shaft running at right angles to the drum and across its end. Upon the far extreme end of this shaft, which is about 13 ft. long, is a spur gear engaging a smaller gear on a parallel shaft. On this latter shaft are two bevel gears operating the bevel mounted on the drum shaft. The accompanying rough sketch, Fig. 1, illustrates the construction. The entire outfit is mounted on a timber frame. The drum is grooved for 3600 ft. of rope. This drum was designed and cast in three 4 ft. sections, each section containing rim, spider and shaft, but it was assembled and hauled to the property as one piece.

Fig. 2 shows another hoist brought in at the same time, for what purpose no one

*Mining engineer, Duluth, Minn.

is able to determine. It resembles the kind formerly used at the top of old-fashioned blast furnaces. This one is designed to be run by belting, the pulley shaft, which ends in a worm gear, engaging a spur gear attached to the shaft of the drum. There is an eccentric device for automatically throwing the belts. That which in the illustration appears to be a cylinder head incloses the worm gear, and the circular box below it surrounds the spur. The proportionate sizes of these give an idea of the speed at which the drum could be revolved—if at all.

The same superintendent also designed a skip, shown in Fig. 3. It consists of a steel barrel 6 ft. high and 4 ft. in diameter (originally it was built 9 ft. high), with a gate in one side for the discharge of material, and equipped with four pairs of small wheels, two on each side, each pair set with ½ in. clearance. Steel plates 20 ft. long, 6 in. wide and ½ in. thick were bolted to timbers on the sides of the mine shaft, and the barrel was hung in the shaft between these plates which formed a track between each pair of wheels. Needless to say, this skip was used but once. On that memorable occasion it stuck in the shaft and the services of the engine, a heavy winch and many men were required to get it out again. It was expected that this skip would be used for hoisting material taken out in sinking, but as it could not be lowered beyond the timbering, or until steel tracks 20 ft. long had been bolted to the sides of the shaft, and as it was originally built 9 ft. high, there might be occasions when the opening in the skip would be 30 or 40 ft. above the muckers in the bottom of the shaft!

Other parts of the plant at this mine, such as underground dump cars of the blast-furnace charging-barrow type are as curious as those described, but the main features have been covered. I know of no more interesting mine equipment anywhere, unless it be that old one of the Ray Consolidated, Arizona, where the former English management hitched 13 gasolene engines of diverse types and different speeds and horsepowers to one main line of mill shafting.

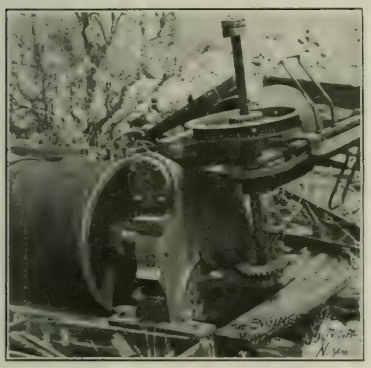


FIG. 2. WORM-GEAR HOIST

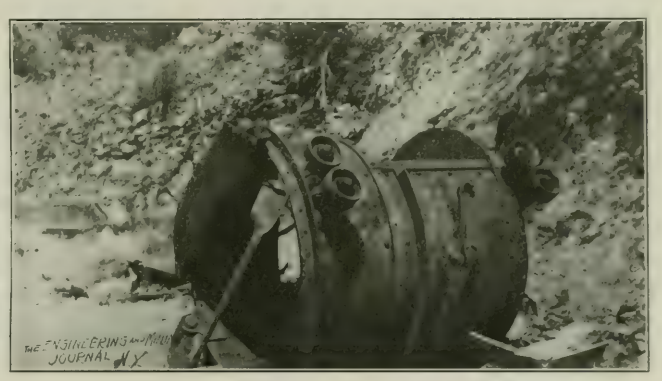


FIG. 3. SIDE-DUMPING BUCKET SKIP

Transportation of Explosives

As a further step toward adding to the safety of railroad operations, the lines comprising the American Railway Association operating 246,172 miles of line in the United States, Canada and Mexico have, beginning July 1, 1909, put into effect revised rules for the transportation of inflammable articles and acids. These are supplementary to the rules of the Interstate Commerce Commission, effective April 13, 1909, for the transportation of explosives. These regulations for the transportation of dangerous articles have been formulated by Col. B. W. Dunn, U. S. A., chief inspector of the Bureau for the Safe Transportation of Explosives for the American Railway Association, and are based upon an act of Congress approved May 30, 1908, and they are designed to emphasize the dual responsibility in the interest of public safety, that rests upon the shipper and the carrier.

The particular purpose is that the shipper shall know the true characteristics of his shipment and familiarize himself with the requirements of the regulations in order that he may inform the carrier by use of prescribed certificates and labels. The thoroughness with which this campaign for safety has been pursued may be indicated by the fact that special supervision is given not only to the transportation of powder, dynamite and other heavy explosives, but it is now provided that special care shall be pursued in the handling of any material that gives off inflammable vapor at or below a temperature of 80 deg. F.; materials subject to spontaneous combustion; materials other than acids, that are liable to cause accidents by friction, concussion, absorption of moisture, contact with organic matter and otherwise. Special rules also govern the handling of compressed gases, as well as a list of eight of the more virulent acids and corrosive compounds. Illustrative of the detailed care with which the various rules have been formulated to govern the packing of different articles, are the following regulations:

"Nitro-cellulose wet with solvent must contain not less than 30 per cent. of a solvent whose flash point is not less than 40 deg. F.; and must be packed in strong, tinned or galvanized iron vessels, of the milk-can type, with a satisfactory means for keeping them securely closed.

"Metallic sodium or potassium, in quantity not greater than 1 lb., must be placed in neutral oil, and this in a well stoppered bottle protected by a tin box, or these substances may be packed in a hermetically sealed tin cylinder."

It is stipulated that every article of a hazardous character, when offered for shipment, must bear a prescribed red label to indicate to the railroad employees the method of handling.

An important new development in American mining practice is the substitution of compressed air for steam in large surface hoisting plants. The new system is being developed by the Nordberg Manufacturing Company, of Milwaukee, Wis. The only change that has to be made in existing hoisting engines is in their cylinders. The new system of hoisting by compressed air is to be adopted by the Amalgamated Copper Company, at Butte, Mont., and by the Miami Copper Company at Globe, Ariz. The object of the change is simply increased economy. At Butte the mines will be able to take advantage of comparatively cheap hydro-electric power. At the Miami mine the power will be developed originally in a steam plant, from which it will be transmitted electrically to the hoisting engines, the economy in this case being due to the greater efficiency of a large central steam plant.

American Smelting and Refining Company

The annual report of this company for the year ended April 30, 1909, shows little change in the balance sheet. The capital stock remains at $100,000,000; the bonded debt is $237,000, a decrease of $112,000 during the year. A comparative statement of the income account is as follows:

	1907-8.	1908-9.	Changes.
Net earnings....	$ 9,403,282	$ 9,146,387	D. $ 256,895
Gen. exp. & taxes	$ 836,866	$ 637,335	D. $ 199,531
Repairs, etc.....	933,129	797,073	D. 136,056
Total charges.	$ 1,769,995	$ 1,434,408	D. $ 335,587
Surplus..	$ 7,633,287	$ 7,711,979	I. $ 78,692
Profit sharing fund	.....	$ 47,695	I. $ 47,695
New constr'tion	$ 622,097	321,234	D. 300,863
Dividends.....	7,000,000	5,500,000	D. 1,500,000
Total approp..	$ 7,622,097	$ 5,868,929	I. $1,753,168
Balance.....	$ 11,190	$ 1,843,050	I. $1,831,860
Bal. from prev. year.....	13,397,028	13,408,218	I. 11,190
Total surplus.	$13,408,218	$15,251,268	I. $1,843,050

Ordinary repairs and improvements were cut down considerably. Dividends were reduced by the lower payment on the common stock. The report says:

"Attention is specially called to the fact, that, notwithstanding business operations in general during the period covered by this report were markedly depressed, and corporation earnings almost universally declined from the preceding year, yet after paying quarterly dividends, amounting to 7 per cent. on the preferred stock and 4 per cent. on the common stock, there has been carried to surplus account for the year $1,843,050. This increase of surplus is largely shown in the increase of cash and demand loans amounting to $1,730,205 in all.

"All expenditures on the plants of the company, on account of repairs and betterments, as well as improvements and new construction, have been, as usual, charged to profit and loss account and every necessary expenditure has been made to improve the efficiency of the plants and their ability to operate economically. It will be noted that expenditures for new construction and improvements were $300,862 less than the previous year.

"There is inclosed with this report a copy of the fourth annual report of the American Smelters' Securities Company. Your company owns 177,510 shares of the common stock of that company of the par value of $17,751,000. This, being the majority of the common stock, places your company in control of the Securities company, and it has always been believed by your directors that this asset would in time prove to be of very great value. As yet, it has not been thought wise to include this asset among the inventoried investments of the company, but the successful development of the Securities company has had the most earnest and careful thought on the part of the officers and directors of your company. The success of the past year has been most encouraging and leads us to expect the fulfilment of all of the hopes of the past. At the time of the organization of the American Smelters' Securities Company it was believed that your company would be obliged to advance, under its guarantee, some portion of the dividends accruing on the series B stock until the Securities company was able to fully operate its projected smelting plants. Your company, however, has not been obliged to make any advances on account of such dividends.

"The statement so frequently made that the Smelting company and the Securities company would give a good account of themselves in times of depression has been fully justified.

"Under the requirements of the mortgage, the outstanding bonds issued by the Omaha & Grant Smelting Company, maturing in 1911, have been reduced by the sum of $112,000, leaving $237,000 now outstanding."

The German Potash Syndicate

A despatch from Berlin, Germany, July 8, says: "The attempt by American fertilizer interests to break the German potash monopoly has failed. The German trust, after having its life endangered for a week was renewed tonight for five years.

"This means that America, which is the heaviest foreign consumer of German potash, will have to continue, as in the past, to buy of the syndicate at syndicate prices. The Americans, however, succeeded in making contracts for a heavy supply of potash below the syndicate price while the fate of the syndicate hung in the balance. The contracts for this supply have been taken over by the syndicate, which will make deliveries at the contract price, the difference being borne by the Sollstedt mine, which made the sale.

"The Americans, therefore, have secured only a temporary relief. The Sollstedt mine, which entered into negotiations with the Americans, was frightened back into the syndicate by Government threats of a prohibitive export duty on potash."

It now appears probable that the American interest which was reported in the despatches published last week to have bought the Sollstedt mines—the identity of which was not then made clear—was the syndicate generally known as the independent fertilizer combination. This was much discussed a few months ago, but its formation, it was supposed, had been postponed for the present. This, however, seems to have been done largely for the purpose of keeping quiet the negotiations for the German potash property. The full organization of the new trust has now been announced, its name being the International Agricultural Corporation. So far as the supply of potash salts is concerned, the company will now be on an equality with the other large interest, which had previously held an advantage through its contracts.

The American Smelters' Securities Company

The first published report of this company is issued with that of the American Smelting and Refining Company, and covers the year ended May 31, 1909. The balance sheet shows capital stock, $77,000,000; current liabilities, $6,418,999; unearned treatment charges, $1,548,921; deferred liabilities, $2,557,360; surplus, $554,752; total liabilities, $88,080,032. The assets include property, $78,846,677; metal stocks, $6,964,093; material on hand, $984,527; cash, $1,285,335; total assets $88,080,032. The income account for the year is as follows:

Net earnings.....	$5,430,066
Interest, taxes and general expenses	$1,112,261
Ordinary repairs and betterments	691,379
Total charges ..	$1,803,640
Surplus for the year.....	$3,626,426
New construction and improvements	$585,384
Dividends on A and B preferred stock	2,520,000
Total appropriations.....	$3,105,384
Net surplus..	$521,042

Adding $33,710 brought forward from previous year, made a total surplus of $554,752. The report says:

"The general condition of mining and smelting business during the past year has been encouraging, but not equal in volume to the years immediately preceding when the price of metals was considerably higher; nevertheless the net earnings of the company amounted to $3,626,426 in comparison with earnings of the preceding year amounting to $1,536,965. Projected new construction has been nearly completed at your plants and mining properties have kept in excellent repair and are doing efficient and economical work. To this end, expenditures for ordinary repairs, betterments, new construction and improvements charged to profit and loss have amounted to $1,276,762 in all.

"Regular quarterly dividends have been paid, amounting to 6 per cent. on the preferred A stock, and 5 per cent on the preferred B stock, and the surplus account for the year amounts to $521,042. It is encouraging to note, also, that the earnings above reported for the twelve months' period were divided as follows: For the first six months, $1,318,146; for the last six months, $2,308,280

"Although the Securities Company, when first started, consisted almost en-

tirely of mining properties, the stockholders will doubtless be interested to know that for the past year more than two-thirds of the profit of the company was made at its various smelting plants. This ratio is likely to increase for the future.

"The production of copper from mines and smelters of your company has so largely increased that the directors believed it advisable to build or purchase a copper refinery. They were able to effect a purchase by contract of the stock of the Baltimore Copper Smelting and Rolling Company, representing the oldest electrolytic copper refining plant in the United States. This contract requires semi-annual payments continuing until Jan. 1, 1916, and the deferred liabilities on account of this contract now amount to $2,553,360. The profits of the plant accruing to this company undoubtedly will continue to be more than sufficient to pay the instalments with interest. Your directors believe that this contract was a most advantageous one for obvious reasons."

Stratton's Independence, Limited

In the course of a speech made before a recent meeting of stockholders of Stratton's Independence, Ltd. (mines and mill at Victor, Colo.), the chairman of the company said in part:

"You will have noted that the whole of the new company's capital was applied for and allotted, thus providing the £50,000 working capital which it was proposed to raise by means of the assessment of 1s. per share under the reconstruction scheme. We are informed by cable received from the consulting engineer that the general outlook of both mine and mill is good. During the 10½ months to April 30 last, 14,060 tons of ore were produced, of an average value of 25¼ dwt. per ton, from which was derived a new working profit to the company at the mine of $54,915. From this amount funds were provided amounting to $11,250 for new development work totalling 1100 yd. So much for the records of the mine department up to the date mentioned.

"With regard to the new mill, it will be remembered that there are two departments—namely, one, the wet mill, for treating the dump ore formerly deposited at the surface, the other, the dry crushing mill, for dealing with the low-grade ore from the mine, and incidentally the rich ore produced by the lessees, and also the rich concentrate from the wet mill. With regard to the first, the main objective the directors had in view in the construction of the mill was the treatment of the dump ore, and this may be regarded as quite satisfactory, although, owing to the short time during which it has been running, it is too soon to obtain a complete clean-up. Judging from the results for the months of April and May, Mr. Argall's original anticipations as to the successful and profitable treatment of the dump should be realized in the immediate future. During the month of April, 3100 tons of dump ore were milled. The production in concentrate therefrom amounted to 91 tons, containing 173 oz. of gold, or nearly 2 oz. to the ton which Mr. Argall rightly describes as most satisfactory. In addition, there remained the gold to be cleaned up in the cyanide department, concerning which he wrote it was getting down to good work for higher extraction and lower cost. Four thousand tons of dump ore were put through the mill during May, and the rate of extraction is now quite satisfactory, so that after cleaning up on July 1 next, Mr. Argall hopes to be able to advise the directors to increase the dump milling capacity to 6500 tons per month. From those remarks I think it is only fair to expect that we may soon see the first unit of the dump mill working on full capacity as originally estimated—namely, 5000 tons per month—with an addition of 1500 tons in the second unit at a profit of $1 per ton; and in this connection it is an encouraging feature that the 3100 tons milled during April averaged $4.30 per ton, the estimated profit of $1 per ton having been calculated on an average of $3.70."

The Dry Mill

"I am sorry to say that I have not such a good account to give concerning the dry crushing mill as for the dump mill. After getting everything ready to start, 1500 tons of ore from the mine, averaging $7.36 per ton, were put through this mill during January and February last. The conditions were adverse, in consequence of defects which developed in the joints on one side of the roasting furnace. In the repairs which were rendered necessary, coupled with the loss which was due to the unsatisfactory nature of the mill run, owing to the mechanical defects described, an expenditure was incurred of $0222. The working of this dry mill has not yet been resumed at present, for two reasons. In the first place, the caved area (the 100- and 200-ft. levels) was found to be more badly crushed than was anticipated; consequently, more work must be done in opening out drifts and crosscuts to get at the low-grade ore lying in these workings. On the other hand, so many men are employed on surface deposits and on outcrops of the veins that the authorities deemed it unsafe to continue the workings in the caved area, so that operations at one or the other of these points had to be restricted, and Mr Argall has decided to suspend most of the low-grade ore extraction in the caved area for the present. Meantime, workings in other parts of the mine will be pushed forward to reach additional sources of supply which have not yet been tapped effectively. Some little time will, therefore, elapse before an adequate accumulation of low-grade ore can be obtained for the purpose of resuming the treatment of this ore on a sufficient scale in the dry crushing mill. Mr. Argall has cabled this week that the estimated profit for the month is $10,000, or over £2000. One of the most hopeful features of the company is the striking of pay ore at the 700-ft. level in the granite area. The ore was followed down in a winze below the 300-ft. level; that ore was again struck at the 500-ft. level, and now comes the news of a discovery on the 700-ft. level, pay ore having been struck on the vein in three different places, covering an extent of nearly 400 ft. of vein. A stope 35 ft. long is being worked on this new discovery."

Lead Mining at Laurium, Greece

Mining operations at Laurium were reduced to such an extent in 1908 that there are signs that mining is rapidly becoming a decaying industry. The vast metalliferous area formerly providing work for more than 15,000 men employs at present only 4500, who are principally occupied in the output of lead and zinc ore. The production of lead in 1908 by the two smelteries was 14,322 tons, one lot of 7822 tons, belonging to the French company, containing 1500 grams of silver, and another lot of 6500 tons, belonging to the Greek company, 1625 grams. A second water-jacket furnace, on the American system, is now in course of construction, capable of producing 30 tons of lead per day, which should increase the annual yield of metallic lead, and reduce the cost of smelting.

Correction

The illustrations of the Mount Elliott and Mount Cuthbert copper mines used in connection with the article on the "Wallaroo and Moonta Mines and Smeltery" in the Journal of July 10, 1909, do not belong with that group of South Australian mines, but are in the Cloncurry district in Queensland. The photographs were received with the Wallaroo & Moonta illustrations and, in the absence of other designation, were inadvertently used and credited to that group.

The oil refinery of the Waters-Pierce Oil Company in Mexico is situated on the north bank of the Panuco river, between Tampico and the sea. The plant now has 10 stills in operation, capable of treating 1200 bbl. of crude oil per day. The crude oil comes from the Ebano oilfields, on the line of railway about 60 miles west of Tampico, and also from the United States, whence it is shipped to Tampico in tank steamers. There are about 250 workmen, mostly Mexicans, constantly employed at this refinery.

Personal

Mining and metallurgical engineers are invited to keep THE ENGINEERING AND MINING JOURNAL informed of their movements and appointments.

S. E. Bretherton has been in Nevada on professional business, returning about July 10 to San Francisco.

J. V. Bohn has gone to Tennessee as general superintendent of mines for the Tennessee Copper Company.

Frank Graham, of Silver Plume, Colo., has gone to Rye, Colo., to accept a position as manager of a zinc property.

C. T. Arkins sailed for Valdez, Alaska, July 8 for a trip of three weeks, returning to Chicago at the end of that time.

Etienne A. Ritter, recently appointed general manager of the Evergreen Gold and Copper Mines Company, is remodeling the Evergreen concentrating mill at Apex, Colorado.

I. W. Guthrie, of Pittsburg, Penn., president of the Republic Iron and Steel Company, has been in Birmingham, Ala., for a few days past, on business connected with his company.

C. S. Herzig, who has been in Nicaragua for the last year in behalf of the Oroya-Brownhill Company, which has purchased a mine there, was in New York this week, on his way to London.

C. H. Rogers, an English mining engineer, who has had experience in Australia and South Africa, has taken charge of the development of the Welsh claims, Gowganda, Ontario.

D. E. Richie, of Columbus, O., has been appointed superintendent of the Blocton division of the Tennessee Coal, Iron and Railroad Company, with headquarters at Blocton, Ala., to succeed F. H. Gafford, resigned.

W. H. MacMahon, chemist of the Oliver Mining Company, at Virginia, Minn., has accepted a similar position with the Republic Iron and Steel Company, and is stationed at the Kinney mine, near Buhl, Minnesota.

P. W. Malloy, of Alderson, Okla., was appointed superintendent of the Alderson division of the Rock Island Coal Mining Company, on July 1, relieving H. C. Booth, who will now confine his attention to the Hartshorne division of the same company.

W. H. Trewartha-James, general manager of the Tyee Copper Company, recently returned to Victoria, B. C., from a visit to the Hidden Creek copper mine, Goose bay, Observatory inlet, near southeast Alaska. He was accompanied north by M. K. Rodgers, of Seattle, Wash., one of the owners of the mine.

Marshall D. Draper, who has been general manager for the Fifty Gold Mines Corporation at Black Hawk, Colo., during the past year, has resigned and will devote his entire time to the financing and management of the cyanide plant to be built at Black Hawk, Colo., for the treatment of heavy iron sulphide ores.

R. H. Morris, chief engineer of the Mexican Coal and Coke Company at Las Esperansas, Coahuila, Mexico, resigned his position July 1, and on July 8, accepted a similar position with the Tennessee Coal, Iron and Railroad Company, with headquarters at Birmingham, Ala., succeeding Robert Hamilton, who has been appointed consulting engineer.

F. B. Keiser, of Thomas, Ala., has resigned his position as general superintendent of Thomas Furnaces of the Republic Iron and Steel Company, to accept a similar position with the Southern Steel and Iron Company, recently reorganized, with headquarters at Birmingham, Ala. Mr. Keiser is succeeded at Thomas by Joseph E. Johnson, Jr. Mr. Keiser has been in charge of Thomas furnaces ever since they were built some 20 years ago, by the Thomas Iron Company, of Pennsylvania. Mr. Johnson is a brother of Guy R. Johnson, of Birmingham, vice-president and general manager of the Alabama Consolidated Coal and Iron Company. The change is effective July 15.

Obituary

George W. Jacques, for many years in the metal business in New York, and one of the oldest members of the Metal Exchange, died suddenly on July 8, while attending a meeting of the board of managers.

Henry C. Hicks, who died in Brooklyn, N. Y., July 7, aged 66 years, was for over 20 years connected with the Consolidation Coal Company, of Maryland. He retired from active business four years ago.

James Stirling died in Riverside, Cal., June 26, aged 57 years. He was formerly government geologist of Victoria, Australia. For several years he was the mining representative of that colony in London. For the past four years he had been engaged in examining and reporting on mining properties in California, Nevada and Arizona.

M. M. Kuffner, superintendent of the Davis Creek Coal Company at Davis Creek, Ala., was killed in the mine July 6. A trip of tram cars broke loose from the cable and rushed back into the mine. Mr. Kuffner was inspecting some pumps in the bottom of the mine and was struck by the runaway cars. His neck was broken and death followed a few moments later. Mr. Kuffner was formerly assistant State mine inspector. He was well versed in mining and had brought the Davis Creek mines up to a fine standard.

Robert Dunn Rhodes died June 25 at Los Angeles, Cal., where he had gone for his health; he was 56 years old. He was born in Quebec, but came to the United States when a boy, and graduated from the School of Mines of Columbia University. Soon afterward he went to the West, securing a position as mining engineer. He was connected for many years with some of the largest mining companies in this country, Mexico and South America, and held heavy personal interests in all of those countries. He was well known in Utah and California. When he first went to Utah he was connected with the Ontario mill and later with the Germania smelter. Mr. Rhodes was associated in his earlier years with his brother, Frank Rhodes, also a metallurgical engineer. Mr. Rhodes traveled extensively throughout Mexico, examining and reporting on some large mining properties. He returned to Utah about seven years ago and built the Murray smelter. He afterward accepted an engineering position with the American Smelting and Refining Company, and was prominently identified with the Guggenheim interests for several years. He built the Mammoth smelter in Shasta county, Cal., six years ago. For many years before his death he was general superintendent of the smelting plant at Bingham Junction, Utah, owned by the United States Smelting, Refining and Mining Company.

Societies and Technical Schools

Alabama Coal Operation Association—On July 17, the association will hold an all-day meeting at East Lake park, near Birmingham, composed of members of the association, superintendents, engineers mine foremen, gas men, etc., for the purpose of discussing the question of greater safety in and about coal mines. A recess of one hour will be taken, at noon, during which time a barbacue will be served. The program will be as follows:

1—Introductory remarks by Chairman George B. McCormack, president Pratt Consolidated Coal Company.

2—Lecture and demonstration on First Aid to the Injuried, by Dr. M. J. Shields, Scranton, Penn., who is connected with the United States Army Hospital Corps, and who has been engaged for some time in the organization of first aid corps in the anthracite mines of Pennsylvania.

3—Discussion by Dr. R. M. Cunningham of Ensley, Ala., and others.

4—Addresses by chief State mine inspector Edward Flynn, and assistant inspectors James Hillhouse and Robert Neill.

5—Remarks by Guy R. Johnson, chairman of the Mines and Casualty Committee of the association, and vice-president of the Alabama Consolidated Coal and Iron Company.

6—Paper on "Prevention of Accidents in Coal Mines," by Edward H. Coxe, of Birmingham, Ala., general superintendent of coal mines and coke ovens, of the Tennessee Coal, Iron and Railroad Company.

7—Short talks by superintendents, mine foremen, and others.

Special Correspondence from Mining Centers

News of the Industry Reported by Special Representatives at Butte, Denver, Salt Lake City, Goldfield, Colbalt and London

REVIEWS OF IMPORTANT EVENTS

Butte

July 8—The United States assay office at Helena, in its report for June states that $166,925 in bullion was received during the month. This is a gain of $47,946 over the same month a year ago. In this production Madison county is first with $55,646; Chouteau county is second with $54,511; Fergus county is third with $46,977, and Lewis and Clark county fourth with $1809.

Oscar Rohn, of Butte, has been appointed receiver for the Pittsburg & Montana Copper Company on application of the Union Trust Company, of Pittsburg. The company was originally headed by Ralph Baggaley, and the reduction works were built with the intention of utilizing the Baggaley process for the treatment of copper ores. After failure to obtain satisfactory results the smelter was changed to operate in the usual way. The application for the receivership is simply a friendly suit instituted to wind up the affairs of the Pittsburg & Montana Company so that a clear title to the property may be acquired by the Pittsmont Copper Company, which already controls it. The Pittsmont company is in turn owned by the East Butte Copper Company.

Notice has been filed with the clerk of the United States court at Helena that an appeal is to be taken in the action of Bliss vs. the Washoe company, generally known as the smoke case. The farmers of Deer Lodge valley had asked for the closing of the smelting plant at Anaconda on the alleged ground that gases ruined vegetation, but the injunction was denied; hence the appeal.

Master in Chancery Crane, of the Federal Circuit Court, is in Butte hearing evidence in the case of the South Butte Mining Company *vs.* T. D. Thomas. The suit involves the title to the Surprise lode claim near Butte, and is based upon the question of whether the placer location made in 1881 includes the lode alleged to exist in the property. Defendant Thomas maintains that the vein being known at the time of the placer location, the patent to the placer did not include the lode on which the quartz location was made.

The June output of the Butte mines is estimated to have aggregated 25,187,780 lb. of fine copper, as compared with a May production of 26,443,244 lb. and an output a year ago of 13,159,000 lb. Last year's small production was due to a serious interruption of operations by floods. The total output of the district for the first half of the current year is given as approximately 156,430,284 lb. as against 101,373,320 lb. for the corresponding period in 1908.

Denver

July 9—At Red Mountain, in the San Juan region, the Carbon Lake mine, of the San Antonio company, is shipping a carload of enargite ore of a value of $25 per ton. The Treasury tunnel, whose portal is about one-quarter mile north of the town of Red Mountain, has been working all winter, and is still pushing ahead with about 10 men and machine drills, its objective point being the intersection at great depth of the Tom Boy and other rich gold veins of Savage basin in the Telluride district. At Silverton it is stated that the Gold King mine, the buildings of which were burned in May, is to start up again, and that when running at full capacity 200 men will be employed.

In the Cripple Creek district, at a meeting of the Doctor-Jack Pot Mining Company a dividend of ½c. per share was declared, payable Sept. 1, amounting to $15,000. They have also authorized the purchase and installation of a 10-drill compressor. The ore output of the Gold Dollar company for last month had a bullion value of $16,500. The output of the Jerry Johnson mine, on Ironclad hill, averaged 40 tons per diem during June. The deep drainage tunnel is now in about 10,000 ft., and is being driven in hard granite at the rate of about 11 ft. per day. The British-American company, leasing on the Dante, shipped upward of 700 tons of 1-oz. gold ore during June; the Findley output is given at 2000 tons of 1-oz. ore.

The Portland Gold Mining Company has reduced its quarterly dividend to 2c. per share, or $60,000. This is $30,000 less than the last dividend paid, and the officers of the company state that this action has been taken on account of the great outlay to be incurred in building the new mill, work on which has now been commenced.

The Vindicator Consolidated Gold Mining Company has declared a dividend of 1½c. per share amounting to $22,500 and payable July 25. This makes a total of $2,002,500 of dividends paid to date by this company.

The Colorado & Southern railway, which taps the Gilpin county pitchblende and carnotite producing district, has agreed to haul these ores free to the State School of Mines at Golden, where a series of tests are to be made with a view to the production of radium.

After repeated experiments and tests made in a 10-ton experimental plant, Marshall D. Draper and P. R. Alsdorf, of Central City, have determined that the Gilpin county ores are amenable to treatment by cyaniding and have had their tests checked up by several of the leading cyanide men of the State. Local and outside capital has become interested and steps will be taken to erect a 300-ton cyanide plant, including sampler, at an estimated cost of approximately $200,000. The plant is to be built at Blackhawk. Messrs. Draper and Alsdorf claim that they will be able to treat iron sulphide ores of the district at a profit. On account of a heavy cloudburst on July 4, several miles of track were washed out on the Colorado & Southern road as well as several miles being covered over with sand and rocks, delaying traffic on that branch for a period of about ten days and interfering with the shipments of Gilpin county ores to smelters, as well as with the receipts of coal for mining and milling purposes. So far, however, regular operations at mines and mills have been maintained.

Salt Lake City

July 9—Dividends aggregating $210,000 will be posted this week by three Tintic companies. The Colorado and the Iron Blossom will pay 8c. per share as heretofore and the Sioux Consolidated will pay 7c. per share. The foundations have been completed for the two main buildings of the International Smelting and Refining Company's new smelting plant at Tooele and the erection of the steel framework is under way.

The last unit of the big mill of the Boston Consolidated company at Garfield was placed in commission during the early part of July, and the plant is now running to full capacity. The entire 15 units of the mill could have been placed in operation some time ago, but the mine has not been in shape to supply the tonnage. While the rated capacity of the mill is 2500 tons per day, A. J. Bettles, who designed the mill, is quoted as saying that when some further adjustments are made he was of the opinion that the mill would treat fully 3000 tons of ore per day.

It is stated that the options which have been held by United States Smelting, Refining and Mining Company interests on

the Godiva, Gemini, Eureka Hill and the Ridge & Valley properties have been extended. The principal interest in these properties is held by the estate of the late John Q. Packard. Engineers have been at work examining the property, and while their reports are in general favorable, it is said that the drawback to the closing of the deal is that the mines did not have sufficient orebodies blocked out to cause the options to be exercised at the present time.

[illegible] Knight has entered the Bingham district and his operations in North Bingham are having a stimulating effect in that section. It is probable that a merger of the Knight and surrounding properties will be consummated in the near future. Preparations are being made for the blowing in of the fourth blast furnace at the Tintic Smelting Company's plant in the Tintic district.

An important strike in the Tintic district has been made in the Grand Central mine where an orebody has been opened on the 2000-ft. level. The company is drifting for the same orebody on the 1800 level, and a drift is to be started below the 2000-ft. level. Tintic people believe this new ore to be a part of the famous Centennial-Eureka ore system. Since the strike was made, there has been an increased demand for the stock of the company and the price has reached $2.90 per share.

The Boston-Sunshine Gold Mining Company which began operations last April will declare its initial dividend during the next few days. The amount will probably be 5c. per share. This company was organized last fall to acquire the old Sunshine property in Mercur, which was bought at sheriff's sale. Under the direction of Manager George H. Dern, the mill was reconstructed with a capacity of 150 tons per day and placed in commission in April. In May, $13,400 worth of gold bullion was sent to the Salt Lake Assay Office and the results for June were even better.

Indianapolis

July 12—As a result of several differences existing between operators and miners at the Summit mine, near Linton, the district board ordered the men to quit work and 300 men are out of employment. Both sides are determined to [illegible] the connections and the strike promises to be a long drawn-out affair. The trouble started two weeks ago when the miners came in contact with some slate in the centre of the coal bed. They applied to the mine foreman to have the slate [illegible] but the operator refused to grant the request. The miners refused to work the machine [illegible] and finally the foreman [illegible] with the miners at the mine. The miners then [illegible] the operators [illegible] the mine with the [illegible] distance of [illegible] feet [illegible] pay for time out, a strike would be called. The operators refused to do this, resulting in the shutdown of the mine.

The report of the Master in Chancery in the Southern Indiana Coal Company and the Indiana Southern Coal Company receivership suits, on the sale of the properties of the two corporations, was filed with the Federal Court July 8. The first named company's property was sold for $1,500,000 and the second named for $1,000,000 and the sale of both properties to the Alliance Coal Company, of Chicago, was ratified by the Court.

Cobalt

July 10—The fire which swept over the northern part of the town, last week, has given the mining companies the much desired opportunity to prospect the ground. The company owning the largest part of the burned area is the Nipissing, and it now has 100 men at work trenching. Whether or not permission will be given to build on this land, depends upon what is discovered. In any case, if rebuilding is allowed the mining companies will have the land properly surveyed into lots, and will try to avoid having the haphazard collection of buildings that existed before.

Work on the Nipissing Central railway, an electric line to run between Cobalt and New Liskeard, is being vigorously pushed. Yesterday an additional hundred men were started to work on the right of way. It is stated that the line will be completed to North Cobalt by October 1, and to Haileybury by the end of the year. It is not expected that work will be started on the portion between Haileybury and New Liskeard before the spring of 1910.

The Taylor Hydraulic Compressed Air Company, which is installing a plant at Ragged Chutes on the Montreal river about nine miles from the town of Cobalt, has one of the intake shafts completed, and there is only about 100 ft. of work still to be done on the other. The outlet shaft has also been completed. In the tunnel, which will be 1000 ft. long, there are 400 ft. of work still to be done. The nine miles of 20-in. main pipe from the plant to the town will also be completed in a short time. This company is putting in the plant, which will have a capacity of 5000 h.p., to supply air to the mines of the district. It is also intended to put in a separate plant to supply electric power, but it is understood that no agreement has been reached whereby this will be handled by Beech Brothers, who are putting in an electric power plant at Ragged Chutes.

Much interest has been created by the new discovery in the Nova Scotia [illegible] it is stated that with the exception of the Lawson gold [illegible] & Dome Rock there is no [illegible] showing in the camp. The [illegible] has [illegible] a distance of [illegible] feet [illegible] an average width of about 4 in., and carries very high-grade ore. Two cross veins have also been uncovered, and a shaft has been started at the point of intersection of the main vein with one of these. An interesting feature of the discovery is the fact that the main vein was crossed by a trench dug several years ago, but the vein was overlooked at that time.

The International Nickel Company has had for some months four diamond drills and one churn drill, at work, testing the big nickel deposit at Mileage 222 on the Temiskaming & Northern Ontario Railway. Work was stopped a short time ago and it is believed that the results obtained were satisfactory.

Since the alteration in the mining laws of the province there has been much interest manifested by prospectors and, judging from the number going in, the country will be thoroughly explored. In the month of June there were 50 prospecting parties passed through Ville Marie. The district of South Lorraine is claiming a good deal of attention at the present time and judging from the results so far obtained, it is liable to become an important section. On practically every property within a radius of two miles of Loon lake, work is being done and many discoveries have been made. The principal minerals of the district are those of cobalt, but in nearly every instance silver is also found. The diabase is the favored formation, although finds have been made in the Keewatin, particularly when near a contact with the diabase. Unlike Cobalt, the Huronian conglomerate has proved so far to be practically unproductive. During this summer there will be a great increase in the amount of work being done.

The remainder of the 830 acres of the Gillies Limit mining lands, that were unsold under the recent tenders will be again offered for public sale. The capital of the Silver Cross Mining Company is to be increased from $500,000, to $1,000,000 and the by-law has been passed allowing the directors to sell the issue at 10c. per share. There was a great deal of opposition to the increase and a stormy meeting resulted. Formal application has been filed in the provincial secretary's office at Toronto for permission to increase the capitalization of the Temiskaming & Hudson Bay Company to $3,500,000.

Diamond drilling at the City of Cobalt mine has been stopped and the results obtained have been satisfactory. The drill was operated in the bottom of the shaft and, when the hole was in about 300 ft. in the Keewatin formation, the boring passed into diabase, the discovery of which underneath the Keewatin is considered of great importance. Diamond drills have lately been the means of giving a great deal of information regarding the different properties. Only a short time ago the shaft working on the Foster located the diabase dyke underlying the Keewatin. A [illegible] was continued, however, the

slates were found to give way to the Keewatin again.

The annual report of the Buffalo mines for the year ended April 30, 1909, has been issued. During the year a total of 931,991, oz. of silver was produced and the total amount realized from the sale of ore was $478,867. The net profit accruing to the company was $204,289. The board of directors has authorized the enlargement of the present concentrating plant to a capacity of 200 tons per day. The question of power will, it is expected be solved by the hydroelectric companies that are preparing to bring power into the district.

Toronto

July 9—The bounties on iron and steel paid by the Canadian government for the fiscal year ending March 31 last, amounted to $2,467,306, being a decrease of $330,555 as compared with the previous year. On pig iron the bounties paid amounted to $693,423; on steel to $838,100; on wire-rods to $333,090. The production of pig iron was 609,431 tons, a decrease of 74,348 tons, and of steel 570,588 tons, a decrease of 91,351 tons.

The output of coal of the Dominion Coal Company operating in Nova Scotia for the first six months of the year was 1,618,470 tons against 1,922,236 tons for the corresponding period of 1908. As noted last week, the differences between the company and miners belonging to the United Mine Workers of America resulted in a strike on June 6, the company's representatives refusing to meet the executive of the union. The majority of the men employed in the mines came out, those remaining at work being members of the Provincial Workmen's Association, a purely local body. Most of the mines closed down. Contradictory statements as to the numbers of the strikers are given, but the daily output of the mines has fallen off from the normal figure of about 12,000 tons to about one-third of that amount. Some rioting occurred during the earlier days of the strike, and on June 8 a force of 500 troops was despatched from Halifax to maintain order, in spite of the protests of Mayor Douglas, of Glacé Bay, who asserted that the civil authorities were able to deal with the situation. The original question at issue was the recognition of the United Mine Workers, which has been steadily refused by the company, on the ground that as its headquarters are in the United States, it is practically a foreign organization. In this they were upheld by the Conciliation Board appointed by the Government under the Lemieux act. The strikers now demand in addition increased pay and a reduction of hours.

Mexico

July 10—The Greene-Cananea production for the month of June amounted to 3,530,000 lb. of copper, carrying 68,816 oz. of silver and 424 oz. of gold. During the greater part of the month only four of the eight furnaces were in operation, six being the most operated at one time.

The Alvarado Consolidated Mines Company, controlling Pedro Alvarado's famous Palmilla mine in the Parral district is offering 200,000 shares to the public to secure funds for the erection of a 1000-ton mill. James I. Long, of Parral, is one of the directors.

The Greene Gold Development Company, has been formed with a capital stock of 50,000 shares of $5 par value, to acquire the properties of the Greene Consolidated Gold Company. It is stated that sufficient subscriptions have been guaranteed to insure the acquisition of all the old properties. Stockholders in the old company are entitled to subscribe for one share of new stock at par for every ten shares of old stock that they deposit before Aug. 14, 1909, at Room 6, 36 Broad street, New York. The entire assets of the old company were purchased at the bankruptcy sale by J. Thomas Reinhardt, 38 Broad street, New York, who states that all titles have been cleared, debts paid, and the assets turned over to the new company.

Nacozari, Sonora

July 9—Operations at the concentrator and in the mine of the Moctezuma Copper Company have been greatly impeded by the continued drought. The concentrator is working at less than half capacity and the lack of water at the mine is being felt greatly. Should the summer rains be late in coming it will mean a curtailment of operations on the part of many of the properties in this section. The El Aguaje mine of the El Aguaje Mining Company is being pumped out for an examination by W. P. Belding, of Nacozari. A shipment of ore from this property was made several months ago and under capable management much could be expected from the resumption of mining operations.

The railroad situation below Nacozari is progressing about as before with 10 miles of the grade completed excepting three bridges. About 125 men are still at work. On the southern end of the work, tracklaying has been completed as far as El Alamo and grading gangs are now in La Concentracion. From La Concentracion to Tonichi is a distance of about 35 miles over rough country over which, the engineers state, the road will be completed as soon as possible to allow of a spur into the Barranca coalfields. This is said to be the point at which the Cananea, Yaqui River & Pacific is aiming. Bids are now in for a line from Cananea to Agua Prieta, Son., and Douglas, Ariz., and it is expected that work will be started on that line in the near future.

The Washington mine owned by Bostwick & Dickson near Cumpas in the Moctezuma district is reported to have been sold to the Calumet & Arizona interests of Bisbee for a sum approximating $250,000 with a 10 per cent. cash payment. Several hundred feet of development work on this property is said to show an average copper content of 6 per cent., with some ore of a shipping grade. The mine is situated on the divide between the Moctezuma river at Cumpas and the Sonora river at Huepac and is about 20 miles from either place. The development of a large property in this section that would result in the construction of a branch line from the Southern Pacific at Cumpas or in the construction of a new line south from Cananea would open up a practically virgin territory rich in copper and silver prospects.

London

July 2—On the first day of July the new regulations limiting the working hours of coal miners, except in the counties of Northumberland and Durham, came into force. In the excepted counties the rules will not be in force until Jan. 1 next. The act, which is known as the Eight Hours Act, introduces State interference with labor which is condemned by many as unnecessary and of no advantage to the workman. It imposes on mine owners the obligation of keeping additional registers and returns, all of which cost money, and its effect cannot fail to make the working of a mine more difficult. On 60 days in the year the eight hours may be extended to nine hours, reckoned from bank to bank. Such extensions are allowed to take place at the discretion of the manager and need not be on consecutive days. All that is required by law is that the total number of days on which an additional hour is worked does not exceed 60 in any one year. The bill also provides that the King, by an order in council may suspend the operation of the act, "in the event of war or of imminent national danger or great emergency, or in the event of any grave economic disturbance due to the demand for coal exceeding the supply available at the time."

The coming into force of the act threatened at one time to lead to a general strike of coal miners throughout the country, owing to differences between operators and men engaged in the South Wales coal mines. The new statutory regulations have called for alterations in the wage scales, and in the arrangement of shifts, changes which cannot be made without causing dissatisfaction to one side or the other. After many conferences in which no agreement could be arrived at, on the night of June 30 a settlement was reached. Thus, a strike of Welsh miners, which would have been supported by all the rest of the coal miners in Great Britain and would have led to a great trade disturbance, has been averted.

Mining News from All Parts of the World

New Enterprises, Installations of New Machinery, Development of Mines and Transfers of Property Reported by Special Correspondents

THE CURRENT HISTORY OF MINING

General Mining News

Phelps, Dodge & Co., Incorporated—The production of the properties embraced in this recently organized corporation, during the first six months of the current year, amounted to 66,400,000 lb. of copper, or at the rate of 132,000,000 lb. per annum. This output was apportioned as follows: Copper Queen, 54,000,000; Detroit, 12,400,000. The Copper Queen figures include the production of the Moctezuma Copper Company, which ships its product to Douglas. The average cost of producing the copper made by the subsidiary properties is stated to be 9c. per lb., including depreciation and ordinary construction. Electrolytic copper for the first six months of this year averaged close to 13¼c., which would indicate a profit of 4¼c., or $2,822,000. This sum is equal to $5.64 per share. On a capital of $50,000,000, the company is paying quarterly dividends of 2½ per cent., which would call for the disbursement of $2,500,000 for the half year. It is evident that the dividend has been considerably more than earned. The company also receives a commission on the sale of copper produced by the Calumet & Arizona and Superior & Pittsburg companies, for both of which companies it acts as selling agents. Furthermore, the Copper Queen smelts a considerable amount of custom ore and all the Phelps-Dodge subsidiary companies maintain mercantile establishments which are profitable undertakings.

United States Smelting, Refining and Mining—A Boston despatch states that for the first time in many months, no "red ink" figures were necessary in making up the earnings of constituent properties of the company for May, when net earnings [illegible] $[illegible]80,000. The profits for May were contributed not only by the Real del Monte company in Mexico and the Mammoth property in California, the Utah mining and smelting operations, but [illegible] profit in the lead operations [illegible] the Chrome [illegible].

Arizona

[illegible]

[illegible]r & Pittsburg—From the production of this property, between $[illegible] and $[illegible] per month, are being paid to the Calumet & Arizona treasurer to apply upon the debt to that company.

Graham County

Arizona Copper—Production for the month of June amounted to 2,496,000 lb. of copper.

Detroit Copper—Referring to the accident at one of the oil-burning boilers, mentioned in the Journal of June 26, 1909, the company writes that this accident was not so serious as first reported. The facts were as follows: "Some oil had accumulated in the firebox of a reserve boiler and when the boiler was started, this oil, not the boiler, did explode and with sufficient force to blow open a cleaning door which struck the forehead of a man standing in front, cutting it rather severely. No other injury was done."

Maricopa County

Dixie Queen—This mine has been bonded to B. T. Hickman, of Los Angeles, and C. H. Scheu, of Salt Lake City. A 25-ft. ledge of copper ore is said to have been encountered at the property on the Bill Williams fork of the Colorado river, 17 miles from Bouse.

Pinal County

Arizona Commercial—The new headframe has been completed and extensive development work is to be carried on, especially on the fifth and sixth levels. The steelwork for the smelter building is in place, and a considerable proportion of the power equipment is on the ground.

Globe Consolidated—Drifting is in progress on the orebody recently discovered, and conditions appear favorable for the development of a good body of ore.

Old Dominion—An orebody 90 ft. long and about 15 ft. wide has recently been developed in virgin ground in the west end of the mine on the 12th level.

California

El Dorado County

Grit—Hyatt & Stietz, of Spanish Dry Diggings are putting up a roller mill at this mine, with a crushing capacity of 100 tons daily.

Wizard Mining Company—St. Louis men have bonded the property at Greenwood and are preparing to unwater and develop it. D. L. Shepherd, manager.

Humboldt County

Klamath River Mining Company—The company, in which Thomas Blair, of Arcata, is a large owner, is preparing to work the Mammoth claims on the Klamath river with dredges.

Inyo County

Newsboy—The mine near Cerro Gordo, one-half mile from the old Union mine, is yielding high-grade silver-copper ore. The property was formerly known as the Crowning Glory and is now owned by the Four Metals Mining Company, Lloyd Skinner, superintendent.

Nevada County

Gaston—The tunnel in this Nevada City mine, Claude Ferguson, superintendent, is now in 2600 feet.

Brunswick Consolidated—This Grass Valley company has purchased the Matteson ranch at Union Hill. It is the intention to sink a new shaft on the property. C. H. Mallon is superintendent.

McDonald Ranch—Capt. S. H. Dills and others are sinking a shaft to reach the gravel channel, 250 ft. below the surface.

Sierra County

Gold Star—A. A. Charronat and H. L. Englebright, of Nevada City have bonded this mine at Alleghany. There are both gravel and quartz deposits on the 150 acres bonded. The old drifts on the gravel claims will also be cleaned out and further development work done.

Empire—Mendenhall & McIvor will start the old chlorination works and treat the sulphurets now on hand.

Secret Cañon—Work has been resumed on the long tunnel near Forest City. W. H. Weldon, manager.

Goodyear Bar—There is much activity at this old camp and many relocations of abandoned claims are being made.

Siskiyou County

Siskiyou Syndicate—In the Borden claim at Snowden, high-grade gold ore has been discovered and in the Balfrey & Addison group in Liberty district, the company has also made a rich strike.

Atterberry—The new mill on the property in Quartz valley is ready for operation. J. M. Morrison is one of the owners.

Yuba County

Red Cross and Golden Star—C. S. Warren, of Butte, Mont., W. W. Warren, of Gold Circle, Nev., and others have purchased the Laymarce placer between Indian ranch and Dobbins. The mines included in the purchase are the Red Cross, Golden Star, Good Templar and 80 acres owned by the Yuba Gold Mines Company. New machinery and pumps are to be put on the Red Cross at once.

Colorado

Boulder County

Livingston Leasing Company—The mill on North Boulder creek is to be remodeled into a cyanide plant to treat the ores from company mines at Sugar Loaf. Screens and other mill supplies will be required. W. R. Doty, manager, 1635 Champa street, Denver.

Wood Mountain—Manager J. B. Annear, of Boulder, reports opening up a high-grade streak of smelting ore and a 12-ft. vein of lower grade, in the winze workings at a depth of 800 ft. Some improvements will be made in the company's mill.

Copper Consolidated—Developments in the Fourth of July mine, near Arapahoe peak are said to warrant the erection of a 50-ton mill at the portal of the tunnel. The company also contemplates installing an aërial tramway over a mile in length to transport the ores over the divide. Mr. Johnson, of Eldora, Colo., is president of the company.

Alton Mining and Milling—Extensive tests are being made on the ores of the company at Cardinal, Colo., and it is reported that the company will erect a mill. Large orebodies are said to have been opened in the tunnel workings.

Smuggler—Dopp & Warren, lessees on this mine at Ballarat have recently been shipping exceptionally high-grade ores.

Utica Hill—It is reported that this company operating at Ward will soon commence work on their proposed cyanide mill.

Myrtle Mining Company—The cyanide plant at Ward, Colo., which was destroyed last year, is to be rebuilt.

Milwaukee—This property at Sunnyside is to be equipped with new machinery and resume operations after a shutdown of several years.

Reppy—Manager J. Bailey, of Sugar Loaf, who is making a business visit in the East reports that operations are to be resumed at once, and that additional machinery will be required.

Gilpin County

Mountain Monarch—Centerville, Ia., people have become interested and operations have been resumed under the management of M. S. Shanks, Rollinsville, Colo. An air-compressor plant may be installed.

Pendleton-Gomer Mines Company—This company has acquired the Gomer and other property, comprising 17 acres in the Russell district. A. A. Johnson, Equitable building, Denver, is general manager. A heavier hoisting plant and a compressor are to be installed. Work is to be carried on through the shaft as well as from the Newhouse tunnel lateral, which gives a vertical depth of 1700 feet.

Nebula—The Maumee Valley company has sold to George D. Begole during the last week, a group of eight lode claims and a tunnel site in the Russell district, near to the famous War Dance. Liberal development is to be carried on at the property.

Bullion—Jacob Schmidt, of Central City, has taken a lease on this group in Eureka district and will install machinery.

Incidental Mining Company—This company has secured a lease and bond on the Hall claim, adjoining the Incidental. W. L. Shull, Russell Gulch, Colo., is manager.

Las Animas County

Cedar Coal and Coke Company—An explosion occurred on July 6 in the mine at Tollerville, near Trinidad. Nine men, descending on a cage, were killed.

Colorado Fuel and Iron—The new coal washery at Sopris has been placed in operation after waiting three weeks for power, the plant of the Southern Colorado Power Company, which supplies part of the power, having been damaged by fire.

Lake County—Leadville

Highland Mary—At a depth of about 50 ft. a body of gold-bearing ore has been opened. The property is situated between the Little Jonny and the President, and in early days shipped considerable ore from the old shaft, south of the recent strike

Vinnie—Instead of operating through the Yak tunnel, in the future the work will be carried on through the main shaft, and all ore hoisted to the surface. The mine has recently been well equipped with electrical machinery.

Star of the West—A good grade of iron and lead ore is being shipped from this claim. Development work is being pushed with the hopes of catching the south orebody opened last fall.

London—The winter's supply of ore stacked as it came from this mine in the Mosquito district, is now being sent to the smelters at Denver. A number of ore-wagons are busy hauling to Alma from the mine.

Twin Lakes Placer Mining Company—A full force of men are at work for the season and the company is using three little giants and washing a large amount of ground. N. N. Loggin is manager, with headquarters at Granite.

Ouray County

Revenue—Leasers on the Glacier vein of the Revenue tunnel have shipped 100 tons of smelting ore. Another 100-ton shipment is also to be sent out by leasers on the old Virginius mine.

Mono-Baltic—The erection of a smelter for this property at Ironton is contemplated. M. T. Chestnut, manager.

Teller County—Cripple Creek

Robert Burns—George Hawkins et al., of Cripple Creek, have taken a two-year lease on this property on Guyot hill. A new shaft will be sunk near the center of the claim.

Jay Bird and Maid—These two claims on Bull hill, adjoining the War Eagle, have been leased to R. G. Harrison and associates, of Colorado Springs. The lease is for two years on graded royalties of from 15 to 30 per cent.

Idaho

Shoshone County

Tamarack & Chespeak—A body of shipping ore recently encountered in the Leonard tunnel is holding up well under development.

Carney Copper Company—A 6-ft. vein of copper sulphide ore has been encountered in a drift about 60 ft. from the intermediate tunnel. John Foss, of Mullan, is in charge of the work.

Granite & Allie—Two shafts have been sunk on the property, near Murray, to a depth of 100 ft., in drifting from which a body of ore of good milling grade has been opened. The 10-stamp mill of the company is being converted into a 40-ton silver-lead concentrator.

Hypotheek—Ore has been encountered at this property near Kingston. Octave Guay is manager.

Moonlight—A 3000-ft. adit is to be driven from Cañon creek to develop this property. The flow of water in the intermediate workings has caused a cessation of work in the orebody there.

Caledonia—Eight cars of ore were taken out during June in the development of this property, no ore being stoped. About 35 men are working under the directions of Charles McKinnis, of Wallace.

Indiana

Clay County

Operators in the block-coal district are now preparing for the annual mid-summer rush of orders, which usually commences near the middle of July. A number of mining companies are making repairs at their shafts so as to be in readiness for the rush when it comes. The work in this district has been good in comparison to that of some districts in western Indiana. Most of the mines are getting in only a day more than half time and a rush will be welcomed by all concerned. A peculiar thing is that while many of the block-coal mines have been working from half to two thirds time the Miami Coal Company's mines have been running full blast all summer. This company is fortunate in being connected with other large concerns and consumers in Chicago which insures a steady sale of coal. The United States Steel Corporation takes 1500 tons per day.

Sullivan County

W. B. McClellan general superintendent of the Consolidated Indiana Coal Company, and receiver for the Deering

company, appeared before the county board of review and asked for a reduction in valuation on mine property in the county, which has been idle for two years.

Louisiana

Oil production during June was 286,200 bbl., being 20,070 bbl. more than in May. Shipments by rail were 147,095 bbl.; by pipe-line, 18,884; total, 165,979 bbl. There were 15 new wells completed in June, 9 being oil producers, 2 gas producers and 4 dry holes. There were only two wells under the drill at the end of the month.

Massachusetts

FRANKLIN COUNTY

Massachusetts Talc—About 12 men are employed at the mine and 6 at the mill. The talc is hauled from the mine at Rowe to the mill at Zoar by wagon. The mill is turning out 20 tons of finished product daily.

Davis Sulphur—The ground between shafts Nos. 1 and 2, about 300 ft. long, caved from the surface to the first level. The picking floors, bins and loading chutes are badly damaged. Shaft No. 1, now 1400 ft. deep, is endangered. The mine is shipping 75 tons of ore daily. Sixty men are employed. H. R. Craig, superintendent, Davis, Mass.

Michigan

COPPER

Wyandot—The company has resumed crosscutting from the 700-ft. level of its exploratory shaft. This work has been temporarily suspended while preparations were being made to start drifting on the amygdaloid lode that was exposed in the crosscut. It is the intention to complete the crosscut from the 700-ft. level to the eastern boundry of the tract and also the one at the 350-ft. level which is being driven westward. When these crosscuts have been completed, attention will be given to the various lodes exposed with the hope of developing paying ground.

Superior—Operations are to be resumed at the No. 2 shaft, which has been at a depth of about 200 ft. for some time. The machinery from No. 1 shaft which was replaced by that of larger capacity, has been moved over to this shaft and will soon be ready to go into service. The drifts south from No. 1 shaft toward No. 2 is in good stuff of rock and with this shaft in operation a much larger tonnage will be handled.

Keweenaw—The company continues diamond drilling throughout its tract with the view of disclosing the various lodes traversing these lands. Sinking has been discontinued at its Medora shaft, but the west lateral vein is to be explored at the 17th level and its condition fully determined at that depth.

Transportation—The improved condition that was noticed some months ago in this company's four shafts is being maintained. All four shafts are being sunk and the ground opened at depth is yielding better than previously. Rock shipment of from 900 to 1000 tons daily are being sent to the mill.

Mohawk—The new shaft on the southern portion of the tract and to be known as No. 6, is down about 40 ft. in the overburden and it will require nearly another month before the shaft is well established in the ledge. Drifts from shaft No. 5 are revealing a better grade of rock than elsewhere in the mine. Rock shipment of about 2700 tons, averaging about 15 lbs. of copper, are being sent to the mill, daily.

New Baltic—The company has reached the ledge with its sand pipe through which the second drill core will be taken to reveal the formation at depth; the drill will go down at an angle of about 47 deg., and perpendicular to the lode. The first hole was put down vertical, but encountered a shattered zone and the results were unsatisfactory.

Ojibway—Both shafts are bottomed at the 950-ft. level, where stations are being cut, ready to begin crosscutting to the formation, and as soon as this work is under way, sinking will again be resumed.

Hancock—At a meeting of this company held recently, John L. Harris, formerly superintendent, was made general manager. The company also exercised its option on a piece of land bordering on Portage lake for a mill site, but nothing will be done in regard to the erection of the mill for some time. Conditions at the mine continue favorable. The winze that is being sunk from the 13th level of No. 1 shaft on No. 3 lode is down below the 15th level and is in the same good ground that has been in evidence throughout. At the 11th level a sump is being put in to take care of the water down to this point. Sinking is in progress at No. 2 shaft, below the 18th level.

Missouri

JOPLIN—ZINC LEAD DISTRICT

Cleveland Faucet Company—H. R. Williams, of St. Louis, has purchased 40 acres at the mouth of Gordon hollow, southwest of Joplin, and has developed 16 ft. of sheet ore at a depth of 156 feet.

Fuel Gas—The Natural Gas Company has served notice on all mills using natural gas for fuel that gas will not be furnished them after Dec. 15, 1909.

Montana

BUTTE DISTRICT

British Butte—Col. M. H. De Hora, general manager, according to London advices, is negotiating with San Francisco manufacturers for the construction of five more dredges to be installed at the property near Rocker. No figures of the clean up have been made public, but it is announced by Colonel De Hora that the returns have been satisfactory. A diamond drill is to be placed upon the property shortly for the purpose of exploring the depth of the ground that is being worked.

GRANITE COUNTY

Bi-Metallic—Three shifts are at work on the new cyanide plant at the mill and several of the large concrete tanks are almost completed. A new motor is also being installed.

JEFFERSON COUNTY

Montana-Corbin Copper Company—The company has recently acquired the property of the Corbin-Wickes company, consisting of the Hidden Treasure and Copper King lode claims, at Corbin, near the Boston & Corbin property. Options are also held on the Park No. 1, Park No. 2, Black Eagle, Black Eagle No. 2, Dorsey and K. & R. quartz claims. The following are the directors of the new company: Charles A. Clark, George F. Bartlett, William B. Arnold, Arthur P. Hawes and Norman J. MacGaffin, of Boston, Charles W. Andrews, of Chicago, and Edwin L. Mayo, of Butte.

LEWIS AND CLARK COUNTY

Missouri River Power—Ex-governor S. T. Hauser has recently returned from New York and states that work will shortly be begun reconstructing the Hauser lake dam. The dam was destroyed by the extraordinary floods of 1908.

Nevada

ESMERALDA COUNTY—RAWHIDE

Kearns No. 2—This lease has been let to San Francisco capitalists who are to sink the shaft to the 1000-ft. level. The new company took charge on July 1.

Codd Mines Company—The company has secured an extension of five years on the St. Ives lease, on the Rawhide Queen, and now has funds to sink to the 1000-ft. level. Air compressor, drills and a new hoist will be required.

Grutt Balloon Hill Lease—High-grade ore carrying gold and silver in about equal proportions was recently struck on the 185-ft. level.

North Rawhide—A new strike of gold ore has been made five miles north of Rawhide, rich ore has been found in pockets.

LINCOLN COUNTY—PIOCHE

Ely Valley—The shaft at this mine is to be sunk from the 300-ft. level to a depth of 500 ft. Manager Edward Thomarson is leaving to consult with English shareholders regarding further equipment. He will return in September.

LYON COUNTY

Nevada Douglas—While enlarging the

main incline from the 400- to the 500-ft. level, the copper orebody developed was sampled every five feet and is stated to average about 7 per cent. copper for the 100 ft. The lower-grade orebodies of the mine were recently sampled by Consulting Engineer Duncan McVichie to ascertain whether it would be more economical to mill these than to smelt them direct. S. S. Arentz, Yerington, is superintendent.

WHITE PINE COUNTY—ELY

Ely-Central—Work will shortly be commenced on the three-compartment shaft to be sunk on the Eureka Fraction claim. The drill on the Clipper claim, about 2000 ft. northwest of the Nevada Consolidated's steam-shovel pit, is down about 400 ft., and is still in the oxidized formation.

Nevada Consolidated—The fifth steam shovel for the open-pit operations of this company has been received and will in a measure counterbalance for the Steptoe works, the curtailment of production at the Cumberland-Ely as the result of the strike.

Cumberland-Ely—On July 1, 400 miners at the Veteran mine struck, tying up this company's operations temporarily. The men objected to the contract system in vogue and asked a straight $3.50 per day for miners.

Giroux Consolidated—Preparations are being made for the sinking of a new five-compartment shaft to be put down about 700 ft. southeast of the old Alpha shaft. It is expected that the work will be prosecuted by raises from both the 1000- and 700-ft. levels, in an effort to have the shaft completed within six months. Two Prescott pumps are being installed in the Alpha shaft. Operations with Keystone drills are continuing in the vicinity of the Giroux shaft, where it is claimed that an orebody has been developed containing, approximately, 7,000,000 tons of ore averaging 2.25 per cent. copper.

New Mexico

LUNA COUNTY

National Mining and Smelting Company—A Tucson, Ariz., despatch quotes President Robert E. Powell as authority for the statement that the smelter at Deming would resume operations about Sept. 1, with increased capacity, including both copper and lead furnaces. The plant has heretofore confined its operations to lead smelting.

Pennsylvania

BITUMINOUS COAL

Pittsburg Coal Company—The local board of the United Mine Workers has ordered a strike of all the miners employed by the Pittsburg Coal Company, on July 15, all efforts to settle matters by agreement having failed. The grievances that have brought about the rupture include objections by the miners to the new safety explosives the company is now using, which the men claim break the coal too much and reduce their earnings, as well as allegations that the company had broken the agreement on the eight-hour law, on the dead-work scale, and on the check-off system. At latest reports, President Lewis, of the United Mine Workers, was trying to bring about a settlement with good prospects of success.

Vesta—Fire started in this mine, near California, on July 10. At latest accounts all the local appliances had failed to check the fire, and all the men available had been set at work to lay a 4-in. pipe from the Monongahela river, three miles away. The water from the river will be used to flood the mine.

South Dakota

LAWRENCE COUNTY.

Minnesota Mines—This company at Maitland has completed a 1500-ft. tramway from its open cuts to the mill; a new Chilean mill has been installed bringing up the capacity from 100 tons to nearly 200 tons daily. The open cuts are to supply the increased tonnage.

Columbus Consolidated—A meeting was held on July 13 in Denver to consider a long-time lease of the property. The proposition is presumed to come from Frank Gardner and Cincinnati capitalists who recently visited the property.

Southern District—The Altia Mining Company is sinking below the quartzite horizon to open up bodies of ore which may exist in the underlying schists. The Anaconda company, on Elk creek, is deepening its shaft. The Golden Girl shaft is now down over 80 ft. The Custer Peak company is making its shaft a double compartment and sinking below the 200-ft. level. Operations are to be resumed on the Lucky Strike property.

Homestake—The company has completed and is now operating the creosoting plant in Lead. The plant was formerly at Englewood and was built as a government testing plant. The present capacity is 3000 ft. per day. The treated timber will be used underground, and is expected to last from 10 to 15 years longer than untreated timbers.

Tennessee

POLK COUNTY

Ducktown Sulphur, Copper and Iron—At the recent annual meeting of this company in London, Managing Director Gordon stated that the "ore in sight" in the Mary mine was 311,000 tons, much of which would average 2.3 per cent copper, and that they may reasonably expect that 600,000 tons may be extracted from this mine. The Isabella mine is being prepared for a small output for experimental purposes. The East Tennessee mine is now about ready for production, the railroad having been completed and placed in operation. The ores developed in this mine are reported as averaging 3.5 per cent. copper. Present ore resources provide for continuous operations until well into 1913, assuming no new discoveries which have been constantly taking place during the 19 years of the company's operations. The smelting plant was closed during a part of May to connect the dust chambers and flues with the new sulphuric acid plant, at which time some alterations were made in the furnace construction.

Utah

BEAVER COUNTY

Erie—A strike of high-grade lead ore carrying some silver and gold has been made in this property which adjoins on the northwest the main group of the Utah Gold and Copper Company. A 3-ft. orebody has been opened at a depth of only eight feet.. J. S. Grow, general manager, Beaver, Utah.

Utah-Gold & Copper—The first vein cut by the main tunnel has widened from 6 to 12 ft. as disclosed by drifting southward on the vein. The north drift is encountering improved conditions. The hydroelectric plant is almost completed. J. T. Breckon, manager, Beaver, Utah.

JUAB COUNTY

Tintic Standard—In the last 22 days, the shaft has been sunk 100 ft. and the raise has covered the same distance. E. J. Raddatz, manager, is in Salt Lake to arrange for electrical equipment for the shaft.

Chief Consolidated—A large number of eastern stockholders visited the properties last week. The mines are being actively opened and the shareholders were pleased with the results already gained.

SALT LAKE COUNTY

Bingham Mines Company—A contract has been entered into with the Yampa Smelting Company for treating the output of the Commercial mine; the shaft is to be pumped out and production commenced at the rate of 150 tons per day. An electric-haulage system is being installed in the tunnel. The Dalton and Lark mines of the company are also producing.

Utah Leasing Company—This company has been organized in Salt Lake to take over a lease from the United States Mining Company to J. C. Dick of a portion of the Old Telegraph mine in the West Mountain mining district at Bingham. J. C. Dick is president and general manager; F. C. Dern, vice-president and treasurer; A. Thomas, secretary, and these with Samuel S. Porter and E. F. Price are the directors.

Flagstaff—Work is progressing on this old property at Alta and it is figured from the latest survey that connection from the tunnel can be made with the 900-ft. level of the former workings within the next 30

days. An assessment was made to complete this work. A. J. Beveridge, manager, Alta, Utah.

SUMMIT COUNTY

New York Bonanza—Pumping is to be resumed and the shaft sunk from the present depth, 825 ft., to the 1000 level. M. G. McGill, manager, Park City.

UTAH COUNTY

Miller—D. R. C. Brown of Aspen, Colo., and David Taylor of Salt Lake, lessees of this American Fork mine, have secured an option to purchase the property.

Mountain Dell—J. H. Wooten, a large shareholder, reports that there is ore on the dump ready to ship as soon as the road is repaired from the damage done by the recent washouts. He states that the tunnel to the old workings has been completed and that much ore has been blocked out.

WASATCH COUNTY

American Steel and Fuel Company—This company has been organized for the purpose of developing iron deposits covered in claims known as Sunset Iron, Nos. 1 to 16 inclusive, and Red Devil Iron, Nos. 1 to 8 inclusive. B. F. Bauer, of the Salt Lake Hardware Company, is president.

Vermont

ORANGE COUNTY

Vermont Copper—The repairs which were necessitated by the burning of the smelter building last February are nearly completed. The furnace will be ready for operation about Aug. 1. The smelter and mine are equipped with electric power throughout, supplied by a hydroelectric plant, 10½ miles from the mine. Under normal conditions the plant will generate 800 h.p. Two diamond drills are now in use to prospect new ground. Charles Of, South Strafford, is general manager.

Washington

SNOHOMISH COUNTY

Index—This region is experiencing a revival of a former mining fever. Eastern capital is seeking investment through several emissaries. George H. Cook, a Minneapolis lumber dealer, is investigating a number of properties.

Wisconsin

DANE COUNTY

[illegible] *Mining*—Drilling operations carried on by this company two miles [illegible] on the John McCormick farm are said to have passed through 15 ft. of ore.

ZINC-LEAD DISTRICT

[illegible] Three additional ore producers will shortly be added to the camp; the Wisconsin Zinc Company has resumed the Bunker mill in the Mitchell Hollow, the Trego is pumped out and will be operated by the Big Four Mining company, under the management of P. R. Grey, of Cuba City; the Weigle has been re-opened by the Standard Zinc Company. It is reported that the Big Jack will be re-opened by the Wisconsin-Missouri company.

Bessie—A milling plant will be purchased at once for the Bessie and Maid of Erin properties, at Shullsburg; northern Michigan capitalists, represented by C. E. Lawrence, of Iron Mountain, Mich., hold fee to 400 acres on which these properties are located. The territory adjacent to Shuilsburg produced much lead in the early days but has been slow in developing zinc properties. New activity is now in evidence, however; the Brown-Croft has resumed and the Lake Superior is preparing to re-open.

Beloit-Elmo—The company has produced its first car of concentrate, which assays 60 per cent. zinc; the ore occurs in a fractured formation and carries considerable lead, but is almost entirely free from iron.

Fields—R. S. Landers, of Galena, Ill., is negotiating for a 100-ton mill for this property at New Diggings, 4 miles southeast of Benton.

Mexico

CHIHUAHUA

American Smelting and Refining—Owing to damage to the blowing equipment, this company's plant at Chihuahua was obliged to close down its furnaces for a short period during June, but the plant is again operating. It is again reported that the work of adding two additional lead furnaces will begin shortly.

Guadalupe y Calvo—In this section lying in the extreme southwestern part of the State there is increased activity, the leading operators being Harlan Brothers, of St. Louis, and M. W. Lafayette. The nearest railroad point is now Ojite on the Parral & Durango railway. Mr. Lafayette is preparing to install a small cyanide plant.

Parral—The approximate production of this camp for the week ended July 2 was 5060 tons of milling ore and 3540 tons of smelting ore, as compared with a total tonnage of 9300 for the preceding week.

Mexico Mining Company—This is a newly organized English company that has begun operations at Santa Eulalia. A 1000 ft. shaft has been started under the direction of Manager Frank Holmes. The acquired property is that known as the Carmen Negrete located in the Mina Vieja part of the camp. Walter Maclachlan, identified with the San Francisco del Oro mines in the Parral district, is a leading spirit in the enterprise.

SONORA

Pedrazzini Mines—Manager E. L. Dufourcq, of New York, recently visited the property in the Arizpe district and states that the 4-mile aërial tram is finished and the wagon road about ready for the transport of ore to Nacozari, thus saving the 90-mile pack to Querobabi on the Sonora railroad. The mill has been shut down through lack of water for some months but the second-class ore has been piled on the dump and mining operations continued as usual.

Transvaal Copper—Work is continuing on the Cobre Rico, Buckeye and Transvaal mines with a force of about 100 men. Some milling ore is being encountered but the smelter is idle and no shipments are going out. H. C. Beauchamp, manager.

Minneapolis Copper—Development work is being done with a small force, after a shutdown of several months. Thomas L. West, of Cumpas, is in charge.

Canada

ALBERTA

The McGillivary Coal and Coke Company, at Coleman, and the West Canadian Collieries, Ltd., at Bellevue, have each contracted with the C. O. Bartlett & Snow Company, Cleveland, O., for a new steel tipple; both contracts being placed through F. C. Greene, mining engineer for the companies. Each contract includes a steel tipple with all the necessary machinery, including Greene patent transfer dump, type No. 4, for each plant, as well as a complete power plant equipment and haulage system. The plants will be electrically operated entirely and are to be in operation by Nov. 1 of this year.

West Canadian Collieries, Ltd.—A new coal-handling plant is being installed at the Bellevue colliery, near Frank, and 15 more cottages for company employees are being erected. C. L. Rameau, Blairmore, is general manager.

BRITISH COLUMBIA—BOUNDARY

Lexel—Another hoisting engine and a six-drill air compressor are being added to the power plant. The installation of the stamp mill is nearly completed. R. Roberts is manager, and the mine and mill are situated in Long Lake camp, Greenwood mining division.

New Dominion—It is announced that the New Dominion Copper Company has appointed P. F. Roosa, manager, and Charles Rundberg, superintendent of mines, and that copper mining and smelting will be resumed in August.

ONTARIO—COBALT

Temiskaming—Seven inches of high-grade ore has been encountered in a drift from a winze sunk 50 ft. below the 250 ft. level. A crosscut is also being driven from the bottom of the winze to tap the No. 1 vein. The winze is the deepest working of the mine.

Badger—Work has been started rebuilding the plant destroyed by fire last week.

Metal, Mineral, Coal and Stock Markets

Current Prices, Market Conditions and Commercial Statistics of the Metals, Minerals and Mining Stocks

QUOTATIONS FROM IMPORTANT CENTERS

Coal Trade Review

New York, July 14—Coal trade in the West is improving steadily, though gradually. Good reports continue to come from most of the central States. The demand for steam coal is increasing. The chief drawback is the tendency—always present when trade is improving—to overproduction, which tends to clog the markets at the chief distributing centers, and so keeps down selling prices.

The Eastern bituminous trade is improving, although rather more slowly than in the West. A competition is making itself severely felt in the Seaboard trade and, as noted below, the Clearfield operators have asked for a reduction in the mining rate to enable them to meet the sharp competition of the West Virginia operators, who are offering coal at very low prices throughout eastern consuming territory.

Anthracite trade is quiet and steady on the usual summer basis. The June production showed a smaller decrease from May than was generally expected. The prolonged drought is making trouble at some of the anthracite collieries, where water supply is beginning to run short.

Wage Troubles—A conference was held in Philadelphia, July 7, between a committee of operators from the Clearfield and other central Pennsylvania mining districts, and representatives of the United Mine Workers from those districts. The operators ask the miners to consent to a reduction of 16c. per ton on the mining scale, claiming that otherwise it will be impossible for them to compete with West Virginia coal at the prices at which it is now offered. The present scale, which took effect April 1 last, is 66c. per ton. It is understood that the miners' representatives were willing to accept a reduction, not naming the amount. The question, however, will have to be referred to a district convention of the miners.

The Anthracite Combination Suits—In the suits brought under the Sherman law against the anthracite carrying roads, the taking of testimony for the companies has been closed. The taking of testimony in rebuttal for the Government has been postponed until September, the date to be fixed by the examiner.

Coal Traffic Notes

Tonnage originating on Pennsylvania railroad lines east of Pittsburg and Erie, year to July 3, short tons:

	1908.	1909.	Changes.
Anthracite	2,753,037	2,585,965	D. 167,072
Bituminous	16,267,127	17,752,713	I. 1,485,586
Coke	3,418,434	5,058,694	I. 1,640,260
Total	22,438,598	25,397,372	I. 2,958,774

The total increase this year to date was 13.2 per cent.

Coal and coke tonnage of Chesapeake & Ohio railway, 11 months from July 1 to May 31, short tons:

	Coal.	Coke.	Total.
New River	6,085,061	252,248	6,337,309
Kanawha	4,667,253	27,633	4,694,886
Kentucky	310,295	.....	310,295
Connecting lines	206,303	74,429	280,732
Total	11,268,912	354,310	11,623,222
Total, 1907-08	9,699,620	316,465	10,016,085

Deliveries this year to points west of mines, 5,751,305 tons coal and 200,572 coke; points east, 1,405,302 tons coal and 153,738 coke; tidewater, 4,103,443 tons coal; anthracite to line points, 8862 tons. Total increase in tonnage this year was 1,607,137 tons, or 16 per cent.

Anthracite shipments in June were 4,904,858 long tons, being 159,015 tons less than in May, and 799,994 tons less than in June, 1908. For the six months ended June 30 the shipments were, in long tons:

	1908.	1909.	Changes.
Reading	6,080,172	6,174,873	I. 94,701
Lehigh Valley	5,657,264	5,273,683	D. 383,581
N. J. Central	4,327,781	4,016,017	D. 311,764
Lackawanna	5,051,814	4,721,969	D. 329,845
Del. & Hudson	3,275,120	3,399,367	I. 124,247
Pennsylvania	3,105,226	2,980,672	D. 124,554
Erie	3,723,436	4,016,129	I. 292,693
N. Y., Ont. & West.	1,447,629	1,369,920	D. 122,291
Total	32,668,442	31,952,630	D. 715,712

The total decrease was 2.2 per cent. Three companies—the Philadelphia & Reading, the Delaware & Hudson and the Erie—showed increases; the others had decreases from last year.

Coal tonnage originating on the Southern railway, four months ended April 30, was: Tennessee district, 436,983; Alabama district, 755,264; total, 1,100,247 short tons, an increase of 381,443 tons over last year.

Coal receipts at Boston, six months ended June 30, reported by Chamber of Commerce:

	1908.	1909.	Changes.
Anthracite	882,058	875,989	D. 6,069
Bituminous	1,522,880	1,627,686	I. 104,806
Total domestic	2,404,938	2,503,675	I. 98,737
Foreign	224,950	143,102	D. 80,848
Total	2,628,888	2,646,777	I. 17,889

The foreign coal reported comes chiefly from Nova Scotia.

Shipments of Broad Top coal over the Huntingdon & Broad Top railroad for the six months to July 1, were 303,047 tons in 1908, and 211,485 in 1909; a decrease of 92,162 tons.

Cola passing through Sault Ste. Marie canals, season to July 1, short tons:

	1908.	1909.	Changes.
Anthracite	364,914	448,397	I. 83,483
Bituminous	1,396,961	1,893,135	I. 496,174
Total	1,761,875	2,341,532	I. 579,657

The total increase for the season this year was 32.9 per cent.

New York

Anthracite

July 14—The Anthracite market is dull and quiet; about the usual business is being done with no particular incident or change. All sizes are in good supply.

For prepared sizes prices are unchanged, at the regular schedule of $4.55 for lump and $4.80 for egg, stove and chestnut, f.o.b. New York Harbor. For steam sizes quotations are; Pea, $3.15@3.25; buckwheat, $2.25@2.50; No. 2 buckwheat or rice, $1.75@2; barley, $1.35@1.50, all f.o.b. New York Harbor. Some washery pea and buckwheat are offered at 10 or 15 cents less.

Bituminous

The bituminous trade improves slowly, but operators are living in hope, and there has been some actual improvement. There is more buying in New England territory, the far east doing much better than the Sound ports. New York Harbor is pretty quiet, and buyers seem to be spending their time shopping around for cheap coal. Prices are not much changed, ordinary grades of steam coal selling at $2.40@2.50 f.o.b. harbor points, while better grades command up to $2.60@2.70. Gas coal is in fair demand with slack still inclined to be scarce and bringing a better comparative price than run of mine.

The Coastwise trade is improving a little but vessels are still in good supply. Larger boats predominate, smaller ones not being so plentiful. Rates continue unchanged at 60@65c. from New York to points around Cape Cod and 35@35c. to Providence, New Bedford and Long Island Sound.

Birmingham

July 12—Coal operations in Alabama are taking on some life again. The output, however, has not yet reached a stage to attract particular notice, but it is much better than it was a couple of months back. It is given out on good authority

that some good contracts for fall and winter delivery have already been placed in this district and that there should be a steady output in the near future.

Chicago

July 12—Quiet conditions continue in the coal market, with the harvesting trade increasing and the steam trade using more and more fine coals, to the weakness of the demand for lump from western mines generally. Screenings from Illinois and Indiana mines are the most active commodity in the market, except smokeless, over which retailers are waging a sharp war with the result of low retail prices. The situation as regards smokeless, however, is not relapsing into the conditions of a few weeks ago, when shipments were much too large and demoralization of the wholesale trade resulted. Domestic coals are naturally at a low stage; wholesalers are trying to better the demand for lump by offers of low prices, but with few purchasers. Demurrage coal is plentiful at times, including western lump, smokeless and Hocking.

Illinois and Indiana coal brings $1.75@2.15 for lump and egg, $1.00@1.75 for run-of-mine and $1.50@1.75 for screenings. Smokeless lump brings $3.05 and smokeless run-of-mine, $2.95 for Pocahontas and New River, with lower-grade smokeless 10 or 15c. less, the freight on smokeless being $2.05. Hocking lump is still in large supply though finding a steady sale at $2.00. Brazil block is strong at $2.80. Anthracite still lags, with the result that considerable independent coal is being sold at low prices. Youghiogheny is in light demand at $3.15 for ¾-in gas, moving chiefly on contracts. Pittsburg No. 8 sells at $2.05 and has a quiet market.

Cleveland

Lake trade is going on steadily, and the coal accumulated on the railroad tracks is being diminished.

Local trade is better. There is a sharp demand for slack, which is in short supply, while lump is too plentiful. The quotations for No. 8 district coal are $1.00@2.05 for lump, $1.70@1.80 for run of mine, and $1.40 for slack. Middle district coal can be had at $1.85@2 for lump, $1.05@1.75 for run-of-mine, and $1.30 for slack. In some cases so much has been paid for slack.

Indianapolis

July 13—There has been no perceptible change in the mining industry of the State during the past week. The output was about the same as the previous week, although the railroad companies are there has been a decided decrease in empty coal cars. Operators are discouraging orders because so many in last July, at the great rush on the part of retail dealers.

Pittsburg

July 13—It is understood that the labor difficulty which threatened a strike against the Pittsburg Coal Company has been settled. Operations by the railroad mines are slightly increased, due to a somewhat heavier movement to the Lakes. The stage in the rivers is the lowest of the season, and river mines are not working as well, as there is no prospect of a shipping stage for some time. Nominal prices remain at $1.10 to manufacturers and $1.20 to retail dealers for mine-run, these prices being shaded 5 or 10c. as formerly. Slack remains at 60@65c. per ton.

Connellsville Coke—The coke market is dull, there being little demand for prompt, while contracts for the half-year have all been made. Nothing interesting has been heard the past week of the proposed coke merger, and it is not altogether improbable the movement will die of inanition.

Prices on standard Connellsville coke remain: Furnace coke, prompt, $1.55@1.60; contract, $1.65@1.75; foundry, prompt, $1.80@2; contract, $1.90@2.25.

The *Courier* reports the production in the Connellsville region in the week ended July 3 at 324,181 tons, a gain of 4000 tons. Shipments are reported at 4709 cars to Pittsburg, 7250 cars to points west of Pittsburg and 825 cars to points east of Connellsville; a total of 12,784 cars.

Foreign Coal Trade

Belgian Coal Trade—Imports of coal into Belgium, five months ended May 31, were 2,310,000 metric tons, an increase of 162,000 tons over last year. Exports were 1,087,000 tons, an increase of 149,000 tons from 1908. The excess of imports over exports this year was 329,000 tons, or 13,000 tons more than last year.

Welsh Coal Prices—Messrs. Hull, Blyth & Co., London and Cardiff, report current prices of coal as follows, on June 19: Best Welsh steam, $4.32; seconds, $4.08; thirds, $3.96; dry coals, $4.14; best Monmouthshire, $3.60; seconds, $3.48; best small steam, $2.70; second, $2.58. All per long ton, f.o.b. shipping port.

Iron Trade Review

New York, July 14—Notwithstanding that summer is now well upon us, when a quiet market is looked for, the iron and steel trades continue to show a condition of activity which is encouraging. The strongest point is that buyers seem to have passed the tentative stage and are inclined to make contracts running well over the second half of the year.

In pig iron the size of new transactions has shown a marked increase. Some heavy contracts have been made by large consumers, such as the International Harvester Company and the American Radiator Company; and the volume of smaller orders has reached a pretty large total. In foundry iron these orders have come from over a considerable territory; and it is especially to be noted that many New England machinery manufacturers who have heretofore been holding back, are now coming into the market. The reasons for this are twofold, one being an increase in orders received and the other a conviction that prices cannot be expected to go any lower under present conditions. Basic iron has also been in good demand, and several large contracts have been placed. The furnaces are correspondingly stiff in their ideas of prices and are asking advances wherever possible. Shading is now out of the question and some makers will not name prices for any contracts running beyond December.

In finished material there has been rather a lull in new business, especially in structural steel. The aggregate of structural orders, however, during the past month has been so large that the mills are well filled for some time to come. In sheets, bars and plates, on the other hand, new business has been quite active. Bridge-building and ship-building orders have kept up to a large amount of business and manufacturers generally look forward to active fall work.

The strike of the Amalgamated Association is making very little commotion in the trade. Both parties seem determined, but the American Sheet and Tin Plate Company seems to have an advantage in that its non union plants are running full, and these, with the accumulated stocks on hand, seem to be sufficient to supply all current requirements. The independent barmakers who made terms with the Association are generally running full.

Lake Superior Iron Ore—Shipments of iron ore from the Lake Superior region in June were 5,393,255 long tons, more than double those of June, 1908. For the season to June 30 the shipments by ports are reported by the Cleveland *Iron Trade Review*, as follows, in long tons:

	1908.	1909.	Changes.
Escanaba	260,245	1,132,239	I. 871,492
Marquette	119,014	420,224	I. 301,210
Ashland	271,577	612,024	I. 340,447
Superior	478,833	1,464,577	I. 985,944
Duluth	1,164,809	3,184,725	I. 2,019,916
Two Harbors	566,193	1,888,540	I. 1,322,347
Total	2,860,967	8,702,323	I. 5,841,356

As compared with 1907, the total shows a decrease of 3,983,307 tons.

Pig Iron Production—Reports from the furnaces, as collected by the *Iron Age*, show that on July 1 there were 239 coke and anthracite furnaces in blast, having a total weekly capacity of 403,700 tons. This is an increase of 17,100 tons over June 1, and of 61,700 tons over Jan. 1. The gain has been wholly in the steel company stacks, the merchant furnaces remaining about stationary. The estimated production of pig iron in June, making allowance for the charcoal furnaces, was

1,945,000 tons; for the six months ended June 30 it was 11,024,000 tons.

Baltimore

July 13—Imports for the week included 150 tons ferro-manganese from Germany; 1050 tons manganese ore from Great Britain; 10,800 tons iron ore from Cuba.

Birmingham

July 12—Southern pig-iron manufacturers are selling more than their make. Quotations have hardened to $12.50 per ton, No. 2 foundry, with an indication of a further advance in prices. The make in June showed a decided falling off, less than 100,000 tons being manufactured in Alabama. The stock reductions in June were heavy. Figures given out show that June 1 there were 170,000 tons of iron on furnace yards in this section, of which amount 90,000 tons belonged to brokers, consumers and others and awaited orders for delivery. On July 1 the figures showed 125,000 tons of iron on the yards, of which amount 50,000 tons belonged to the producers. One furnace has been blown in already this month and two others are nearly ready.

Work has started on getting plants of the Southern Iron and Steel Company ready for operation and by fall it is believed that the various plants will be in operation.

Chicago

July 13—General conditions in the pig-iron market are improving, the increased sales of last week being followed by a holding to higher prices by the leading furnace agents, and an awakening of the foundrymen to the fact that there will be no relapse, in all probability, the bottom of the market having been touched and passed. Large interests as well as the small are figuring on heavy supplies of both Northern and Southern iron. Contracts now being made are for fourth-quarter deliveries, with a few running into 1910. Aside from the few sales of large amounts to large consumers, the average sales have increased in size as well as in numbers. It seems to be realized that the improvement reflects at last the upward tone that has been manifested by the wholesale markets generally of this territory. Southern iron holds to $12.50, Birmingham ($16.35, Chicago), and Northern to $16.50@17 on No. 2, with the demand increased more strongly, perhaps, for Northern than for Southern.

The increase of sales of iron and steel products continues, with structural material and railroad supplies leading. The coke market is more active, with the best Connellsville remaining at $4.70, Chicago.

Cleveland

July 13—More buying of iron ore is reported, indicating that furnaces are seeing the necessity of providing for their future work. The June shipments of ore were nearly 5,400,000 tons. This was all done practically by the contract boats.

Pig Iron—There has been more selling locally and inquiries have been more numerous. Prices continue around $16 for bessemer; $15.50@15.75 for No. 2 foundry; $14.75@15 for gray forge.

Finished Material—One or two good bridge contracts have been closed. Plates are in demand. Bars are also active, and some independent makers have put up prices to a basis of 1.30c., Pittsburg.

Philadelphia

July 14—In a general way the pig-iron market has not begun to show signs of vitality. Iron for pipe-making purposes is an exception. Large orders have been placed and pipe-makers are now figuring on their purchases to see them through the later months of the year. The sales of basic iron are few. In other lines only trifling sales are reported. A few interior bar mills have just closed for forge iron for late delivery. The general view is that buying will soon set in and that the firmer tone in the market will be maintained. No 2X is $16.50; forge, $15.50; basic, $15.25 per ton.

Steel Billets—The market has quieted down and no transactions of moment are noted.

Bars—The work of repairing is drawing to an end and all mills in this territory will soon be on. Most mills have fair assortments which enable them to fill orders as fast as received. Store demand is light.

Structural Material—Several eastern railroads have placed orders within a few days for shapes aggregating 3800 tons. Further business is in sight.

Scrap—Dealers are not selling, and are not making any effort to increase their supplies. Railroad scrap is held too high.

Pittsburg

July 13—New business in steel products since the first of the month has been larger than was expected, considering the heavy buying and specifying before that date. There has, of course, been a decrease, but it is not as large as was expected, and with the large amount of business already booked the position of the market is favorable.

The Carnegie Steel Company's advance of $1 per ton in bars, plates and shapes has been followed by one or two concerns which were making occasional concessions, and the minimum of the market is now 1.25c. on bars and 1.35c. on plates and shapes, a clear advance of $1 per ton in the past 10 days. Some manufacturers will not book even at these prices. The minimum price of the Republic Iron and Steel Company is 1.30c. on bars.

There have been no important developments in the labor situation at the American Sheet and Tin Plate Company's plants. The Amalgamated Association has about a dozen organizers of its own, and half a dozen furnished by the American Federation of Labor, at work in the company's non-union mills, but without definite results. Officials of the tinhouse organization claim that their men will go out on the expiration of their scale, July 15. This organization has controlled the tinhouses at two or three of the plants now operating, though they are non-union as to the hot-mill department.

Pig Iron—New inquiry for foundry iron has been light, but the market is firm, on the basis of $15@15.25, Valley, for No. 2 foundry, $15.25 for malleable and $13.75@14 for gray forge. There is a possibility of some large transactions in bessemer, as it is thought probable the Jones & Laughlin Company will need some outside iron, in addition to the 25,000 tons recently purchased. Its new furnaces at Aliquippa are not likely to come in much before the close of the year and its present stocks are wholly or almost wholly basic. It is even rumored that the Steel Corporation may buy a large block of bessemer, but it can be stated that there are no active negotiations to this end. A sale of 500 tons of bessemer for prompt shipment is reported at $15.50, Valley, the price quoted in last report as the market. Inquiries for about 10,000 tons of basic have come out this week, for western consumers. The minimum on basic is $15, Valley, and this price is available only on early delivery, later deliveries commanding $15.25 or higher.

Steel—The market is firm, bessemer being at a minimum of $23 for billets and $25 for sheet-bars, with little available at those prices, while open-hearth steel is 50c. or $1 higher. With the recent withdrawal of the 1.30c. price by two or three interests the minimum of the plate market stands at 1.35c., Pittsburg.

Sheets—The market has grown still firmer, and prices of 2.20c. for black and 2.25c. for galvanized, for some time quoted as the nominal market, are now practically the minimum; there is still a little shading in corrugated material.

Ferromanganese—The market is stronger, $41, Baltimore, or $42.95, Pittsburg, being the minimum for prompt delivery, while prices range up to $42 and higher for deliveries extending into next year. The Jones & Laughlin Steel Company's purchases of ferromanganese in the past fortnight exceed 10,000 tons, covering the company to the middle of next year.

Foreign Iron

Belgian Iron Production—The production of pig iron in Belgium for the five months ended May 31 was 470,780 metric tons in 1908, and 601,950 tons in 1909, an increase of 131,170 tons.

Metal Markets

New York, July 14—The metal markets generally are inclined to be slow and rather uncertain in tendency. Consumption is on the increase, apparently, which is the encouraging feature.

Gold, Silver and Platinum

UNITED STATES GOLD AND SILVER MOVEMENT

Metal.	Exports.	Imports.	Excess.
Gold:			
May 1909..	$11,171,265	$ 2,263,721	Exp. $ 8,907,544
" 1908..	26,555,913	3,104,002	Exp. 23,451,911
Year 1909..	55,487,801	17,767,857	Exp. 37,720,034
" 1908..	44,891,257	22,958,223	Exp. 21,933,034
Silver			
May 1909..	4,428,448	3,857,388	Exp. 571,060
" 1908..	4,028,344	3,469,568	" 558,766
Year 1909..	23,854,629	18,532,453	" 5,322,176
" 1908..	21,077,185	17,688,150	" 3,389,035

Exports from the port of New York, week ended July 10: Gold, $2,995,000, chiefly to Argentina; silver, $961,648, principally to London and Paris. Imports: Gold, $130,896; silver, $70,790, both from the West Indies, Central and South America.

Gold—There was no special demand for gold in the open market in London this week, and the price continued at the minimum, 77s 9d. per oz. for bars. Most of the gold arriving was taken for Vienna account, a special demand having developed there. In New York $2,850,000 was taken for shipment to Argentina.

Platinum—The market continues very dull. While quotations are nominally $21.50@$22.50 for the refined metal, it is probable that orders of good size could be placed for the lower figure. The demand seems to be very slight at present, and manufacturers who are using much platinum appear to be well stocked up. Well informed persons in the trade do not look for any change until later in the year. Hard metal—platinum-iridium alloy—is higher, owing to the scarcity and high price of iridium, the advance over refined platinum being $3.75 instead of $2.50 as formerly. Hard metal is quoted $26 per oz. Scrap is $18 to $19 per ounce.

Silver—The London market has continued dull with some improvement the first of the week by buying on the Chinese banks. Upon cessation of this Chinese demand silver closes at 23 7/16d. in London, but is firm on buying by the Indian bazars.

SILVER AND STERLING EXCHANGE

July	8	9	10	12	13	14
New York....	51⅞	51	51	51⅛	51	50⅞
London	23½	23	23⅛	23⅛	23⅛	23⅛
Sterling Ex	4.8700@4.8725	4.8675@4.8725	4.8675@4.8725	4.8675@4.8725	4.8700@4.8725	4.8700@4.8725

New York quotations cents per ounce troy, fine silver. London pence per ounce sterling silver, 0.925 fine.

Exports of silver from London to the East, Jan. 1 to July 5, as reported by Messrs. Pixley & Abell:

	1908	1909	Changes
India..	£ 4,178,158	£3,060,900	D £1,117,258
China	516,400	1,185,100	I 668,700
Straits	80,500	82,800	D 2,710
Total	£ 4,775,058	£4,328,800	D £ 446,268

Copper, Tin, Lead and Zinc

July	Copper. Lake, Cts. per lb.	Copper. Electrolytic, Cts. per lb.	Copper. London, £ per ton.	Tin. Cts. per lb.	Lead. New York, Cts. per lb.	Lead. St. Louis, Cts. per lb.	Zinc. St. Louis, Cts. per lb.
8	13½ @13½	12⅞ @13	58½	28⅞	4.30 @4.35	4.17½ @4.22½	5.22½ @5.27½
9	13⅜ @13½	12⅝ @12⅞	58½	29⅛	4.30 @4.35	4.17½ @4.22½	5.20 @5.25
10	13½ @13½	12⅝ @12⅞	.	29⅛	4.30 @4.35	4.17½ @4.22½	5.17½ @5.20
12	13½ @13½	12⅝ @12⅞	.	29⅛	4.30 @4.32½	4.15 @4.17½	5.17½ @5.20
13	13½ @13½	12⅝ @12⅞	58	29	4.30 @4.32½	4.15 @4.17½	5.20 @5.22½
14	13½ @13½	12½ @12⅞	58½	29⅛	4.30 @4.32½	4.15 @4.17½	5.20 @5.25

London quotations are per long ton (2240 lb.) standard copper. The New York quotations for electrolytic copper are for cakes, ingots and wirebars, and represent the bulk of the transactions made with consumers, basis, New York, cash. The price of cathodes is usually 0.125c. below that of electrolytic. The quotations for lead represent wholesale transactions in the open market. The quotations on spelter are for ordinary Western brands; special brands command a premium.

Copper—During the week of July 8-15, the copper market has continued dull, sales having been of comparatively small value. The Calumet & Hecla is understood to be freely offering Lake copper at 13½c., and sales of some fancy brands have been made by other interests at that figure, but ordinary brands of Lake copper are easily obtainable upon lower terms. The market for Lake has been well sustained for the reason that comparatively little of this quality of copper is pressed for sale. This has led to an increased disparity between the price for it and electrolytic, conditions in the market for the latter kind of metal being quite different. The protracted dullness and the unfavorable statistics appear to have got on the nerves of some sellers, who have brought out some business by making sharp cuts in their previous quotations. However, the transactions have not been large, as consumers, either here or in Europe, do not yet show much interest. Although certain of the selling agencies continue to ask nominally a price that is far above the present market, the majority are free sellers at the concessions, and are anxious to take up such business as is offered.

The close is unchanged at 13⅛@13⅜c. for Lake and lower for electrolytic in cakes, wirebars, or ingots, at 12⅝@12⅞c. The average for casting copper during the week has been 12⅝@12⅞ cents.

The London standard market has been under pressure right along, but considering the light volume of consumptive business, has held its own fairly well. The close is cabled steady at £58 1s. 3d. spot and £58 15s. for three months.

Refined and manufactured sorts we quote: English tough, £61 10s.; best selected, £60 10s.@£61 10s.; strong sheets, £72 10s.@£74 10s.

Copper Producers' Association—The report of the Copper Producers' Association gives the following figures for June and the six months ended June 30, in pounds:

	June.	Six months.
Stocks, Jan. 1 and June 1	109,848,141	122,357,296
Production in U. S.	116,567,493	681,392,609
Total supplies..	226,415,634	803,749,875
Deliveries, dom., and exp.	131,557,573	648,891,814
Stocks, July 1..	154,858,061	154,858,061
Inc. or dec. in stocks	D. 14,990,080	I. 32,500,795

A supplementary statement from the Association gives deliveries for export and domestic use separately as follows, in pounds:

	June.	Six Mos.
Domestic deliveries	60,591,116	313,613,157
Export deliveries	70,966,457	335,278,657
Total	131,557,573	648,891,814

Tin—The market has been an uninteresting affair. Quotations here have ruled slightly below the London parity. Fluctuations have been narrow throughout the week, but there is a better tone perceptible at the close, same being cabled at £131 12s. 6d. for spot and £133 for three months. The market here is quiet at 29⅛ cents.

Lead—A great deal of pressure to market lead was exercised from St. Louis, and in the absence of demand from consumers prices gave way quickly, the close being quoted at 4.15@4.17½c. St. Louis, and 4.30@4.32½c. New York.

The London market has shaded off further, and the closing quotation is cabled at £12 11s. 3d. for Spanish and £12 13s. 6d. for English lead.

Spelter—The movements in the market have been rather erratic, due to the operations of speculators. Their selling brought about a decline, but after they had liquidated their holdings, the market showed good rallying power and closes firm at 5.20@5.25c. St. Louis, and 5.35@5.40c. New York.

New York quotations for spelter on July 8 were 5.37½@5.42½c.; July 9, 5.35@5.40c.; July 10, 5.32½@5.35c.; July 12, 5.32½@5.35c.; July 13, 5.35@5.37½c.; July 14, 5.35@5.40 cents.

The London market is quoted at £22 for good ordinaries and £22 5s. for specials.

Other Metals

Aluminum—The American producer offers ingot at 23c., but the metal is readily obtainable from abroad at 20½c., duty paid. We quote 20@23c. In Europe aluminum has lately sold at 12c., but there has been a little stiffening and the present price is about 12½c. There is talk of reviving the convention among the European producers.

Antimony—Business continues dull, chiefly on account of uncertainty as to the final decison on the tariff. In the absence of any but retail transactions, quotations remain nominal at 8⅜c. per lb. for Cookson's; 7⅝c. for Halletts; 7⅞c. for U. S., and 7⅜c. for outside brands.

Quicksilver—The New York price is $43.50@44 per flask of 75 lb. Business is fair. San Francisco quotations are $43.50 for domestic and $41.50 for export orders. The London quotation is lower at £8. 5s. per flask, but jobbers sell at £8 1s. 3d. @ £8 2s. 6d. per flask.

Nickel—Large lots, contract business, 40@45c. per lb. Retail, spot, from 50c. for 2000-lb. lots, up to 55c. for 500-lb. lots. The price for electrolytic is 5c. higher.

Cadmium—Current quotations 75c. per lb., in 100-lb. lots, at Cleveland, Ohio. In Germany, 450@475 marks per 100 kg. at factory.

Magnesium—Quotations for this metal are $1.25 per lb., New York, in 100-lb. lots; for 5-lb. lots, $1.40 per pound.

Sault Ste. Marie Canal Traffic

The total tonnage passing through the Sault Ste. Marie canals, to and from Lake Superior, for the season to July 1 was, in short tons:

	1908.	1909.	Changes.
East-bound	3,937,509	9,334,789	I. 5,397,280
West-bound	2,064,816	2,782,578	I. 717,762
Total	6,002,325	12,117,367	I. 6,115,042

As compared with 1907 there was a decrease of 5,670,952 tons this year. Mineral freights included in the totals were, in short tons, except salt, which is in barrels:

	1908.	1909.	Changes.
Coal	1,761,875	2,341,532	I. 579,657
Iron ore	2,733,430	8,073,482	I. 5,340,052
Pig and man. iron	86,966	128,125	I. 41,159
Copper	27,484	34,731	I. 7,247
Building stone	.....	880	I. 880
Salt, bbl	199,915	280,381	I. 80,466

Iron ore was 66.6 per cent. of the total freight this year, and coal 19.3 per cent.

Zinc and Lead Ore Markets

Platteville, Wis., July 10—The base price, this week, of 60 per cent. zinc ore was $44@44.50 per ton. For 80 per cent. lead ore $58 per ton was paid; one lot of 300 tons, mostly chunk lead, sold at $58 per ton.

SHIPMENTS, WEEK ENDED JULY 10.

Camps.	Zinc ore, lb.	Lead ore, lb.	Sulphur ore, lb.
Platteville	716,753	.....	489,100
Hazel Green	399,500	.....	.....
Days Siding	264,000	.....	.....
Cuba City	238,115	.....	.....
Benton	207,650	.....	.....
Linden	205,350	.....	.....
Livingston	140,000	.....	.....
Harker	124,110	.....	.....
Galena	88,000	.....	.....
Strawbridge	66,000	.....	.....
Total	2,449,478	.....	489,100
Year to July 10	62,641,463	2,787,145	5,425,915

Highland is not reported. In addition to the above there was shipped to the American Zinc Ore Separating Company, 80,000 lb. and to the Joplin Separator Works, 64,000 lb. zinc concentrates.

Joplin, Mo., July 10—As high as $48 per ton was paid for one carload of zinc ore, the base price ranging from $45 early in the week, down to $42 at the week-end, with offerings of ore by sellers at $42 and no takers. No week for months has shown such light buying. Zinc silicate sold from $17 to $24.50. The average price, all grades, was $41.02 per ton. Lead ore declined to $52 at the week-end, the highest settling price being $53, with one sale made for next week's delivery at $54. The average price, all grades, was $52.14 per ton.

With the exception of the third week of January, the shipment of both zinc and lead ore was the lightest of the year and the value exceeds that week alone. It was a decrease of 1563 tons of zinc and 291 tons of lead ore, compared with the previous week.

SHIPMENTS, WEEK ENDED JULY 10.

	Zinc, lb.	Lead, lb.	Value.
Webb City-Carterville	2,674,290	236,490	$ 63,645
Joplin	2,230,360	163,570	53,362
Galena	526,320	73,660	13,257
Prosperity	312,500	167,400	11,070
Aurora	611,390	.....	10,014
Duenweg	443,710	16,260	9,496
Oronogo	459,360	5,090	7,828
Badger	344,270	4,490	7,349
Granby	392,340	5,440	5,780
Alba-Neck	232,520	.....	5,231
Quapaw-Baxter	239,410	.....	4,908
Spurgeon	178,280	56,530	4,696
Carthage	168,800	.....	3,220
Zincite	113,190	.....	2,498
Sarcoxie	111,760	.....	2,398
Miami	122,440	.....	2,143
Stott City	44,940	19,940	1,484
Jackson	57,080	.....	1,199
Totals	9,262,960	748,870	$209,578
28 weeks	315,281,930	48,788,750	$7,174,325
Zinc value, the week, $190,050; 28 weeks, $5,862,560			
Lead value, the week, 19,528; 28 weeks, 1,311,765			

MONTHLY AVERAGE PRICES

Month.	Zinc Ore. Base Price. 1908.	Zinc Ore. Base Price. 1909.	Zinc Ore. All Ores. 1908.	Zinc Ore. All Ores. 1909.	Lead Ore. All Ores. 1908.	Lead Ore. All Ores. 1909.
January	$37.60	$41.25	$35.56	$38.46	$46.88	$52.17
February	36.63	36.94	34.92	34.37	49.72	50.50
March	36.19	37.40	34.19	34.71	49.90	50.82
April	35.40	38.63	34.08	37.01	52.47	55.63
May	34.19	40.06	33.39	37.42	56.05	56.59
June	33.06	44.15	32.07	40.35	60.48	57.52
July	34.55	.....	31.67	.....	59.90	.....
August	36.53	.....	33.42	.....	60.34	.....
September	37.63	.....	34.44	.....	54.59	.....
October	35.95	.....	33.28	.....	52.63	.....
November	39.13	.....	35.02	.....	54.53	.....
December	42.75	.....	39.63	.....	49.68	.....
Year	$36.63	.....	$34.31	.....	$53.73	.....

NOTE—Under zinc ore the first two columns give base prices for 60 per cent. zinc ore; the second two the average for all ores sold. Lead ore prices are the average for all ores sold.

Chemicals

New York, July 14—The general market is quiet, with only a moderate amount of business doing. Contract deliveries are fair.

Copper Sulphate—The market is steady and prices unchanged at $4.22½ per 100 lb. for carload lots, and $4.32½@4.47½ for smaller parcels.

Arsenic—This article is held at higher prices, on account of the duty of 2c. a pound proposed in the new tariff bill. Holders are firm and are asking 3.25@4c. per lb. for white arsenic. Sales have been light.

Nitrate of Soda—A good business is still being done and prices are firm at 2.15c. for spot and 2.12½c. for futures.

Potash Salts—The continuation of the German Potash Syndicate for five years and the part taken by American interests are noted elsewhere.

Phosphates—The new fertilizer trust, the organization of which was postponed some months ago, has now been completed. It will control a number of mines in Florida and Tennessee with manufacturing plants scattered throughout the South and East. A full list of these has not yet been published. The name of the company is the International Agricultural Corporation. Its capital stock is $15,000,000 and the officers chosen are: Waldemar Schmidtmann, Germany, president; H. C. Sickler, Wilkes Barre, Penn., vice-president; John W. Fry, Columbia, Tenn., secretary; R. M. Rownd, Buffalo, N. Y., treasurer; T. C. Meadows, New York, general manager.

Mining Stocks

New York, July 14—Summer time and a dull market are not always synonymous, but they seem to be so this year. On the Stock Exchange, fluctuations have been quite small and business has not been large. Prices, however, have been held pretty firmly, and no great changes can be reported. As a whole, the market has been devoid of interest. The only special feature was the strength of United States Steel.

On the Curb the same course was followed. The copper stocks were dull and in one or two cases fractional losses were made, although it cannot be said that there was any general downward candidship. Such losses as were recorded were only small. The Cobalt stocks were strong, and generally in better demand than any other securities. In the Nevada gold stocks there were large sales but considerable weakness developed in Goldfield Consolidated and some other stocks, which lost in price.

At auction sale June 30, in New York, 74 shares of Lanyon Zinc Company common and 111 shares of the preferred stock sold at $9 for the lot.

Boston, July 13—Sharp declines in North Butte again upset the market during the week, although there is little likelihood that prices would have done much had not the North Butte affair again presented itself. Fresh liquidation set in, which caused the stock to break to $47.25

Saturday, representing a decline of $8 in five days' time. It rallied to $51 the following Monday, but again became weak and settled to $48.50. The Street is as much perplexed at the antics performed by this stock as it has been at any time. One thing is certain and that is that bear manipulation has been a large factor in the continued weakness of the stock. The belief also predominates that the decline is not over yet.

Mohawk also had a bad break on the halving of the dividend to $1 for the six months. The stock records an extreme decline of over $8 for the week. This action was conservative, as earnings did not warrant a greater amount. Prices are all off for the weak from $1 to $3; it was not on account of any particular pressure, but rather from lack of demand. Summer dullness is at hand and not much can be expected.

Nipissing Mining stock has been placed on the regular list of the Stock Exchange, and showed slight hardening in price. Up to the present time this has been a Curb stock.

Ahmeek Mining made a new high on the Curb at $102 per share. There are but 50,000 shares and Calumet & Hecla owns all but a majority of the stock. Goldfield Consolidated had a $1.25 decline to $5.75 on free offerings of the stock due to diminished earnings. The Alvarado Mines' public offerings of 200,000 shares of treasury stock was undoubtedly successful and the stock all subscribed for, although formal announcement has not been made.

STOCK QUOTATIONS

NEW YORK July 14	
Name of Comp.	Clg.
Alaska Mine	.12
Amalgamated	81 1/2
Anaconda	47 1/2
Balaklala	‡2 1/16
British Col. Cop.	7 3/8
Buffalo Mines	3 1/2
Butte Coalition	24
Colonial Silver	1 3/8
Cum. Ely Mining	7 7/8
Davis-Daly	5 1/2
Dominion Cop.	7
Douglas Copper	2
El Rayo	2
Florence	3
Foster Cobalt	.32
Furnace Creek	.06
Giroux	8 5/8
Gold Hill	[illegible]
Goldfield Con.	6 3/4
Granby	101
Greene Gold	1/2
Greene G. & S.	9
Guanajuato	1 1/8
Guggen. Exp	‡196
Hanapah	‡15
Kerr Lake	7 1/2
McKinley Dar	.84
Miami Copper	15 1/2
Micmac	1/4
Mines Co. of Am.	[illegible]
Montezu. of C. R.	30
Mont. Sho. C.	[illegible]
Nev. Utah M. & S.	1 7/8
Newhouse M. & S.	‡1 1/4
Nipissing Mines	11
Old Hundred	1/2
Silver Queen	35
Stewart	[illegible]
Tennessee Cop'r	‡38 1/2
Tri-Bullion	[illegible]
United Copper	9 1/2
Utah Apex	6 1/2
Utah Copper	‡49 1/4
Yukon Gold	4 1/4

†Ex. Rights

BOSTON July 14	
Name of Comp.	Clg.
Adventure	6 3/4
Allouez	41
Am. Zinc	28 1/8
Arcadian	4
Arizona Com	39
Atlantic	8 1/2
Boston Con	13 3/4
Calumet & Ariz	101
Calumet & Hecla	635
Centennial	30
Copper Range	79 3/4
Daly-West	7 3/4
East Butte	11 1/8
Franklin	16 1/2
Greene-Can	9 5/8
Hancock	10 1/4
Isle Royal	23 3/8
Keweenaw	3 1/2
La Salle	11
Mass	7 3/8
Michigan	10 1/4
Mohawk	58
Nevada	23 5/8
North Butte	48 3/4
Ojibway	10 3/8
Old Colony	‡.60
Old Dominion	51 1/8
Osceola	129
Parrot	30
Quincy	88
Rhode Island	14 3/4
Shannon	14 1/8
Superior	39 1/8
Superior & Bost	14
Superior & Pitts	15 1/8
Tamarack	66
Trinity	11
U. S. Smg & Ref	48 3/4
U. S. Sm. & Re. pd	49 1/4
Utah Con	41
Victoria	4 3/8
Winona	5
Wolverine	148
Wyandotte	2

‡Last quotation

N. Y. INDUSTRIAL	
Am. Agri. Chem.	‡46 1/8
Am. Smelt. & Ref.	95 3/8
Am. Sm. & Ref., pf.	112 1/4
Colo. Fuel & Iron.	44 1/8
Federal M. & S., pf.	88 3/4
National Lead	86 5/8
National Lead, pf.	‡107
Pittsburg Coal	‡11 3/4
Republic I. & S.	31 3/4
Republic I. & S., pf.	105
Sloss-Sheffield	82 1/2
Standard Oil	‡685
U. S. Steel	69 7/8
U. S. Steel, pf.	125 1/4
Va. Car. Chem.	54 3/4

BOSTON CURB	Low.
Ahmeek	187
Chemung	14
Chino	7 3/4
Corbin	7 1/2
Globe Con	4 1/2
Helvetia	5 1/2
Ray Central	2 1/4
Ray Con	16 1/8
San Antonio	10 3/4

Furnished by Hornblower & Weeks, N. Y.

ST. LOUIS July 10		
N. of Com.	High.	Low.
Adams	.40	.30
Am. Nettie	.10	.07
Center Cr'k	1.75	1.50
Cent. C. & C.	82.00	81.00
C. C. & C. pf.	81.00	80.00
Cent. Oil	105.00	100.00
Columbia	9.00	8.00
Con. Coal	19.00	18.00
Doe Run	110.00	100.00
Gra. Bimet.	.28	.20
St. Joe	13.00	12.00

LONDON July 14			
Name of Com.	Clg.		
Dolores	£1	5s	0d
Stratton's Ind.	0	3	1 1/2
Camp Bird	1	9	0
Esperanza	3	0	0
Tomboy	1	1	3
El Oro	1	5	3
Oroville	0	12	6

Cabled through Wm P. Bonbright & Co., N. Y.

NEVADA STOCKS. July 14. Furnished by Weir Bros. & Co., New York.

Name of Comp.	Clg.
COMSTOCK STOCKS	
Belcher	42
Best & Belcher	‡ 40
Caledonia	‡ 22
Chollar	.19
Comstock	26
Con. Cal. & Va.	77
Crown Point	‡ 47
Exchequer	‡ 27
Gould & Curry	17
Hale & Norcross	25
Mexican	1 03
Ophir	1.40
Overman	‡ 32
Potosi	31
Savage	.21
Sierra Nevada	26
Union	.47
Utah	04
Yellow Jacket	77
TONOPAH STOCKS	
Belmont	85
Extension	.48
Golden Anchor	‡ 51
Jim Butler	09
MacNamara	24
Midway	.20
Montana	.60
North Star	.02
Tono'h Mine of N.	6.62 1/2
West End Con	.20
GOLDFI'D STOCKS	
Adams	.01
Atlanta	.10
Blue Bell	.02 1/2
Booth	.11
C.O.D. Con	.11
Columbia Mt.	.10
Comb. Frac.	.60
Con. Red Top	‡.57
Cracker Jack	.02
Dia'dfield B. B. C.	.03
Goldfield Belmont	.04
Goldfield Daisy	26
Great Bend	05
Jumbo Extension	.10
Kendall	02
Lone Star	03
May Queen	03
Oro	06
Red Hill	.05
Sandstorm	08

Name of Comp.	Clg.
Silver Pick	10
St. Ives	10
Triangle	01
BULLFROG STOCKS	
Gibraltar	02
Homestake King	01
Mont. Shoshone C.	1.50
Tramp Cons	.05
MISCELLANEOUS	
Cumberland Ely	7.87 1/2
Giroux	7.62 1/2
Greenwa'r Copper	05
Nevada Con.	23.12 1/2
Nevada Hills	.87 1/2
Nevada Smelting	1 00
Nevada Wonder	.40
Nevada-Utah	1 87 1/2
Penn-Wyoming	...
Pittsburgh S. Pk.	47
Ray Central	2 43 3/4
Ray Con	16.75
Round Mt. Sphinx	10

COLO. SPRINGS July 9	
Name of Comp.	Clg.
Acacia	.07
C. C. Con	‡ 03 1/8
Dante	‡.05 1/2
Doctor	.09 1/4
Elkton	.65 1/4
El Paso	.54 1/2
Findlay	‡.14
Gold Dollar	.11 1/8
Gold Sovereign	.03 3/4
Isabella	.22 1/2
Jack Pot	.07
Jennie Sample	‡.07 1/2
Jerry Johnson	.06 1/4
Lexington	‡.02
Mary McKinney	.40 1/2
Pharmacist	.03
Portland	75
U. G. M.	.05 3/4
Vindicator	61
Work	‡06 1/4

Assessments

Company.	Delinq.	Sale.	Amt.
Alpha, Nev.	July 15	Aug. 6	$0.05
Best & Belcher, Nev.	July 20	Aug 10	0.10
Brunswick Chol., Nev.	July 10	Aug 2	0.01
Brunswick Potosi, Nev.	July 10	Aug 2	0.01
Bullion, Nev.	June 14	July 13	0.05
Caledonia, Nev.	July 23	Aug 13	0.05
Challenge Con., Nev.	June 22	July 13	0.05
Gold Mt. Champion, Utah.	July 26	Aug 10	0.00 1/2
Mexican, Nev.	June 28	July 14	0.10
Mountain Dell, Utah	July 19	Aug. 5	0.01 1/2
N. Y. Bonanza, Utah	July 10	July 31	0.03
Potosi, Nev.	July 9	Aug 3	0.10
Progressive, Utah	June 23	July 14	0.01
Scottish Chief, Utah	July 7	Aug 4	0.01
Seg. Belcher, Nev.	July 7	July 29	0.03
Seven Troughs Min., Nev.	June 23	July 10	0.00 1/2
Sierra Nevada, Nev.	July 15	Aug 10	0.10
Silver King Con., Utah	July 6	July 17	0.10
Union Con., Nev.	June 28	July 19	0.10
W. Con. Va., Nev.	July 16	Aug 10	0.10
Yellow Jacket, Nev.	July 13	Aug. 5	0.25

Monthly Average Prices of Metals

SILVER

Month.	New York. 1908.	New York. 1909.	London. 1908.	London. 1909.
January	55.678	51.750	25.738	23.834
February	[illegible]	51.472	25.855	23.706
March	55.365	50.468	25.570	23.227
April	[illegible]	51.428	25.133	23.708
May	52.795	52.905	24.377	24.343
June	53.663	52.538	24.760	24.166
July	53.115	.....	24.514	.....
August	51.683	.....	23.858	.....
September	51.720	.....	23.877	.....
October	51.431	.....	23.725	.
November	49.647	.....	22.933	.....
December	48.766	.....	22.493	.....
Year	52.864	.....	24.402	.....

New York, cents per fine ounce; London, pence per standard ounce.

COPPER

	NEW YORK.				LONDON.	
	Electrolytic		Lake.			
	1908.	1909.	1908.	1909.	1908.	1909.
January	13.726	13.893	13.901	14.280	62.386	[illegible]
February	12.905	12.949	13.098	13.295	58.786	61.198
March	12.704	12.387	12.875	12.826	58.761	56.231
April	12.743	12.56 1/4	12.928	12.93 1/4	58.331	57.363
May	12.598	12.893	12.788	13.238	57.387	59.338
June	12.675	13.214	12.877	13.548	57.842	59.627
July	12.702	.....	12.933	.....	57.989	......
August	13.462	.....	13.639	.....	60.500	......
September	13.388	...	13.600	.....	60.338	.
October	13.354	..	13.646	.....	[illegible]	. .
November	14.130	. . .	14.386	...	63.417	......
December	14.111	....	14.411	.....	[illegible]	..
Year	13.208	......	13.424	......	[illegible]	......

New York, cents per pound. Electrolytic is for cakes, ingots or wirebars. London, pounds sterling, per long ton, standard copper.

TIN AT NEW YORK

Month.	1908.	1909.	Month.	1908.	1909.
January	27.380	28.060	July	29.207	.
February	28.978	28.290	August	29.942	.
March	30.577	28.727	September	28.815	.
April	31.702	29.445	October	29.444	.
May	30.015	29.225	November	30.348	.
June	28.024	29.322	December	29.154	
			Av. Year	29.465	.....

Prices are in cents per pound.

LEAD

Month.	New York. 1908.	New York. 1909.	St. Louis 1909.	London. 1908.	London. 1909.
January	3.691	4.175	4.025	14.469	13.118
February	3.725	4.018	3.868	14.250	13.313
March	3.838	3.986	3.835	13.975	[illegible]
April	3.993	4.168	4.051	13.469	13.297
May	4.253	4.287	4.214	12.938	[illegible]
June	4.466	4.350	4.291	12.600	13.031
July	4.744		.....	13.000	.
August	4.580		......	13.375	....
September	4.515		....	13.125	......
October	4.351		......	13.375	......
November	4.330		......	13.538	. .
December	4.213	.....	......	13.156	.
Year	4.200	......	......	13.439	......

New York and St. Louis, cents per pound. London, pounds sterling per long ton.

SPELTER

Month.	New York 1908.	New York 1909.	St. Louis. 1908.	St. Louis. 1909.	London. 1908.	London. 1909.
January	4.513	5.141	4.363	4.991	20.563	21.425
February	4.788	4.889	4.638	4.739	20.875	21.563
March	4.665	4.757	4.527	4.607	21.075	[illegible]
April	4.645	4.965	4.495	4.815	21.344	21.531
May	4.608	5.124	4.458	4.974	19.906	21.975
June	4.543	5.402	4.393	5.252	19.000	22.000
July	4.485	..	4.338	.	19.031	......
August	4.702	.	4.556	.	19.350	.....
September	4.769		4.619	.	19.563	.....
October	4.801	.	4.651	.	19.750	......
November	5.069	.	4.909	.	20.875	......
December	5.137	.	4.987	....	[illegible]	......
Year	4.726	.....	4.578	......	20.163	......

New York and St. Louis, cents per pound. London, pounds sterling per long ton.

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Economic Possibilities of American Oil Shales—I

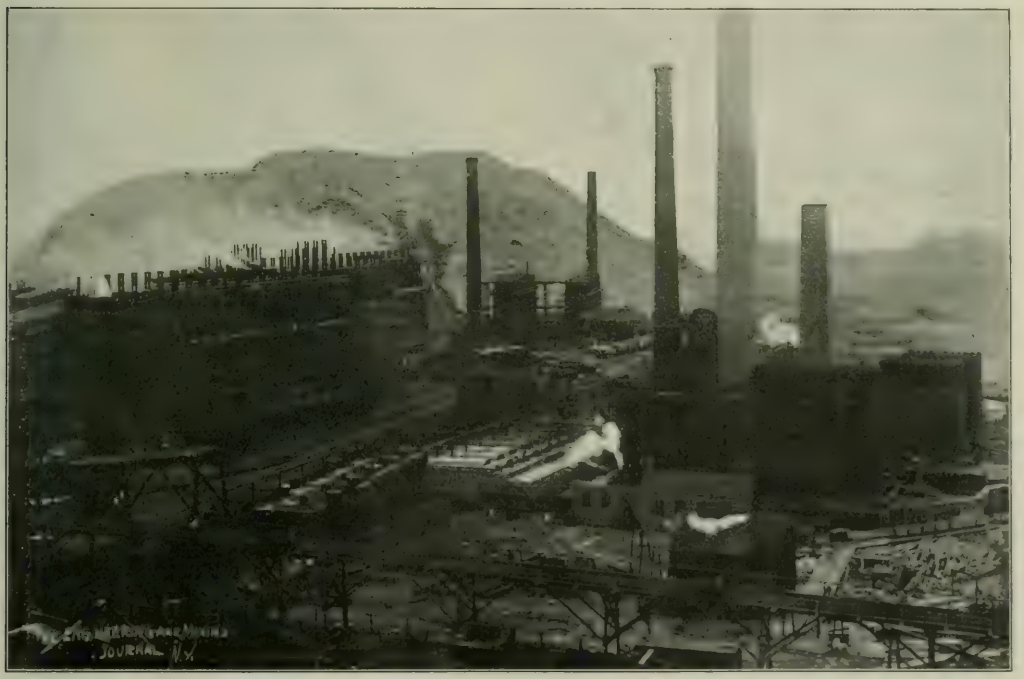
This Industry, Extensively Developed Abroad, May Be Revived in America, Particularly in New Brunswick. By-Products Often Pay Entire Expense

BY CHARLES BASKERVILLE*

In 1694, Ele, Hancock and Portlock made "pitch, tar and oyle out of a kind of stone from Shropshire," England[1]; and in 1681 Becher and Searle took out a patent for making pitch and tar from pit coal[2]. Clayton, however, was the first to investigate the spirit produced by the distillation of coal[3]. In 1761, oils were distilled from black bituminous shales for medicinal purposes[4], it being found that they may be used instead of oil of turpentine and "oil of petre."

The Earl of Dundonald obtained oil from coal by destructive distillation as early as 1781, and later took out a patent for extracting various products from coal[5]. Prior to 1820, it was well known that an oil resembling turpentine could be obtained from coal tar by destructive distillation[6], as well as red and black varnishes[7]. In 1815, a works near Sunderland, England, belonging to Messrs Featherstone, produced "petroleum" and ammonia from coal[8].

Laurent obtained paraffin by the distillation of bituminous shale in 1830, and in 1833 he suggested working the Autun shale in Saône-et-Loire, France. Selligue manufactured products from this shale, and obtained patents[9] for the manufacture of paraffin on a commercial basis. The process of Selligue for distilling bituminous schists reached considerable perfection before 1845. It is important to note that sulphate of ammonia was produced. The shale industry still exists in France, and five companies are working Autun and Buxiere-les-Mines shales. Four out of six works in France are now constructed on the Scotch system, and about one



CRUDE-OIL DEPARTMENT OF THE BROXBURN COMPANY'S OIL-SHALE WORKS, NEAR EDINBURGH, SCOTLAND

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[1]English Pat. 330, 1694; Ele, *Phil. Trans.*, 1697, XIX, No. 228, 544; *Phil. Trans. Abridged*, IV, 168.

[2]Becher: "Fossil Fuel," 1683, 404.

[3]*Phil. Trans.*, 1739, XLI, 59.

[4]Lewis' "Materia Medica."

[5]"Description of the Estate and Abbey of Culross," 34; Williams' "Mineral Kingdom," 1789, I, 253.

[6]Hodgson's "Account of the Felling Explosion," 1813, 25.

[7]Surtee's "Durham," 1820, II, 85.

[8]Holmes' "Treatise on the Coal Mines," 1846, 18.

[9]French Pat. 9467, Nov. 14, 1838, addition Mar. 27, 1839, English Pat. 10726, 1845. The latter patent was taken out under the name of de Buisson, Storer.

tenth as much shale is retorted in France as in Scotland[10].

Scottish Shale Oil Industry

Dr. James Young, of Kelly, Scotland, was the first to manufacture paraffin oil from bituminous minerals on a commercial scale in Scotland, and it is to him that the shale oil industry in its present form owes its existence. In December, 1847, Young learned of the Alfreton, Derbyshire, petroleum, and, in company with Meldrum, started work in 1848 manufacturing oils from this material. The supply of petroleum was soon exhausted, however, and Young attempted to imitate the natural processes by which he thought the oil had been produced.

It was learned that an oil containing paraffin could be produced from bituminous coals by slow distillation, and Young made this "invention" the subject of a patent[11]. In 1850, Young, Meldrum & Binney erected the Bathgate works for the distillation of Boghead coal, and oil was produced at this plant in 1851. About this time works were established for producing paraffin oil from shale in Prussia; the most important was the plant of A. Wiesmann & Co., at Augustenhutte, near Bonn.

In 1851, two oil works were running in Scotland, the Bathgate works and the Crofthead oil works, but in 1852 the latter works was closed. In 1857, three oil works were in existence, and this number was increased to 10 in 1862, the year in which the Torbanehill mineral became exhausted, and the shale was resorted to. While the former yielded about 120 gal. of crude oil per ton, the shales first used furnished only 45 gal.

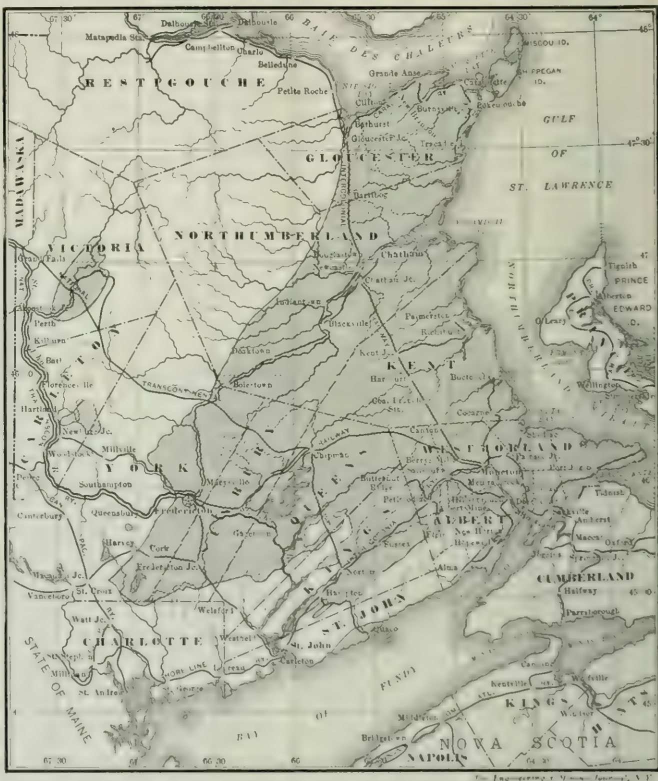
Young's patent expired in 1864, in which year 38 new works were erected; but the industry, which appeared so promising, was doomed to receive a severe check, as the discovery of oil wells in Pennsylvania was followed by the importation of kerosene into the British Isles. In addition, competition had caused prices to fall greatly; the price of burning oil was 2s. 6d. per gallon from 1850 to 1864, and 1s. 6d. soon after the expiration of Young's patent. In 1871, 51 works were in operation in Scotland, while in 1880 only 19 were running, and in 1895 twelve.

At the present time the number of shale oil companies in Scotland is seven; these are as follows: Young's Paraffin Light and Mineral Oil Company, Ltd., which was organized in 1866, and has works at Addiewell, Bathgate and Uphall; Oakbank Oil Company, Ltd., which was registered in 1886 to take over the properties of a company of the same name established in 1869; Broxburn Oil Company, Ltd., which was started in 1877 and has works at Broxburn and Roman Camp; Pumpherston Oil Company, Ltd., which was started in 1883, and which has works at Pumpherston, Seafield, and Deans; these four companies are refiners as well as producers of crude oil; the Dalmeny Oil Company, Ltd., was started in 1871, but was reconstructed in 1896; Jas. Ross & Co., started in 1883 and located at Philipstoun; Tarbrax Oil Company, Ltd., organized in 1904 and is really a part of the Pumpherston Oil Company, Ltd.

The three latter companies are producers of crude oil only. The Dalmeny product is refined by the Oakbank company, the Ross product partly at the Pumpherston works and partly at Oakbank, and the Tarbrax product at the Pumpherston works. At the Pumpherston main plant, 50,000 gallons of crude shale oil are refined daily. This is done in four batteries of 55 pot stills and 15 boiler stills. The Dalmeny, Oakbank, Pumpherston and Tarbrax companies use the Bryson, or Pumpherston, retort; the Broxburn company uses the Henderson retort; the Young Company uses the Young & Fyfe retort, and the Ross company employs the Crichton retort.

The development of the Scotch shale oil industry has been carried out with skill and energy, and it is to be regretted that the industry has not met with the entire commercial success it well deserves. Ever since 1850, it has only been by skillful management and the constant and intelligent application of science to the improvement of processes and to the utilization of waste products, that the oil manufacturers of Scotland have been able to hold their own. The success of the companies now in operation, however, is shown by the following list of dividends paid annually, 1904-07: Young's, 6 per cent.; Oakbank, 15; Broxburn, 15; Pumpherston, 30, 30 and 50; Dalmeny, 10, 25 and in 1906-7, nil.

Shortly after Young's process of producing paraffin from bituminous substances was patented, various companies were organized in Flintshire, England[12].



MAP OF EASTERN NEW BRUNSWICK. ROCKS OF CARBONIFEROUS AGE PREDOMINATE IN SHADED AREA

[10] The companies in operation in France are [illegible] Société [illegible] Marcommet et Cie [illegible] and Société des Mines de Boghead Saint Hilaire.

[11] [illegible] 1850.

[12] These companies, which were all of small proportions, were as follows: Robottom & Co., Lenney Company, Flintshire Oil Company, Williams Oil Company, Coppa Colliery Company, Coppa Oil Company, and Padeswood Oil Company. About this time, a company, the Bituminous Shale Company, was organized in Dorsetshire and a plant was erected in Weymouth. In 1854 the works were removed to Wareham, and the company dissolved in 1872. The yield of oil, etc., from Kimmeridge shale will be mentioned later. An inferior cannel coal was distilled in Wales about the same time.

Immediately after the development of the Pennsylvania oilfields, retorts costing $300 were sold for $15 to scrap-iron dealers.

Shale Oil Industries of Other Countries

The oil shales in the Wolgan and Capertee valleys, New South Wales, Australia, are being developed by the Commonwealth Oil Corporation, of London. About 20,000,000 tons of oil shale have been proved in the properties of this corporation, and there are presumably 30,000,000 tons more. The mines and works are located at Newnes, Hartley Vale, Torbane and Ultimo Road, all in New South Wales; and about 60 products are manufactured from the shale, which yields up to 3½ times as much oil as the Scottish shales.

In 1909, a plant was erected at Orepuki, New Zealand, for the distillation of New Zealand shale and the manufacture of products therefrom. The low-grade shale and high development charges resulted in this company discontinuing its work. Oil shales also occur in the Ronda district in southern Spain, in Tasmania, in Austria-Hungary, in the Machada plain, Turkey, in Gasa Land, Mozambique, and Orange River Colony, Africa, on the coast of Brazil,[13] in Natal[14] and in Italy.[15] The brown-coal tar industry of Saxony, Germany, resembles the shale oil industry in the methods used in the distillation of the brown coal and lignite, but is in reality a separate industry.[16] Pyropissite affords 62 per cent. of paraffin on dry distillation. It was distilled in Saxony.

The Industry in America

Dr. Abraham Gesner claims to have been the first to produce illuminating oil from bituminous materials in America; he states[17] that at public lectures delivered in Prince Edward Island in August, 1846, he burned in lamps the oil obtained by distilling coal. Patents granted to Gesner nine years later[18] passed into the hands of the North American Kerosene Gaslight Company, who manufactured the oil at their works at Newtown Creek, Long Island, and sold it under the name of "kerosene oil."[19] The agents of this company encountered considerable difficulty in selling their product.

In 1853, the United States Chemical Manufacturing Company began working coal tar for the manufacture of lubricating oil at Waltham, Mass., and in 1857 the Downer Kerosene Oil Company[20] first made mineral oils from Albert coal mined in New Brunswick. The large works of Downer in Boston were erected at a cost of half a million dollars, and at Portland, Me., Downer erected a smaller works for distilling imported coal. About this time, the New Bedford Company, of New Bedford, Mass., commenced the distillation of Boghead coal, imported from Scotland, but later substituted domestic Breckenridge coal and West Virginia coal for the imported material.

In 1859, six plants were erected by various companies near Pittsburg, Penn., and one of these (the Lucesco Company) had a distilling capacity of 6000 gal. of crude oil per day. This company had $120,000 invested in its works, and in 1860 ten large revolving retorts were in operation. Sixteen 2000-gal. stills were used in the refinery. Many of the companies in operation worked under licenses from the Young Company, of Scotland. In 1860 there were 55 coal oil companies in existence in the United States; these were as follows:

Adair & Veeder, Pittsburg, Penn.
Aladdin Company, Kiskiminitas, Penn.
Anderson Company, Darlington, Penn.
Atlantic Company, New York, N. Y.
Beloni & Co., New York, N. Y.
Boston & Portland Company, Boston, Mass.
Breckenridge Company, Cloverport, Ky.
Brooks Company, Zanesville, O.
Carbon Company, New York, N. Y.
Cornell & Co., Canfield, O.
Covington Company, Covington, Ky.
Cox Company, Zanesville, O.
Dean Company, Cleveland, O.
Downer Company, Boston, Mass.
East Cambridge Company, East Cambridge, Mass.
Empire State Company, New York, N. Y.
Enon Valley Company, Enon Valley, Penn.
Eureka Company, New York, N. Y.
Excelsior Company, New York, N. Y.
Falling Rock Company, Kanawha, Va.
Forest Hill Company, Kanawha, Va
Franklin Company, New York, N. Y.
Glendale Company, Boston, Mass.
Grasseli Company, Cincinnati, O.
Great Kanawha Company, Kanawha, Va.
Great Western Company, Newark, O.[21]
Greers Company, Kanawha, Va.
Hartford Company, Hartford, Conn.
Hinchaugh & Co., Coshocton, O.
Kerosene Company, New York, N. Y.
Knickerbocker Company, New York, N. Y.
Long Island Company, New York, N. Y.
Lucesco Company, Kiskiminitas, Penn.
New Bedford Company, New Bedford, Mass.[22]
New York and Wheeling Company, Wheeling, W. Va.
New York Coal Oil Company, New Galilee, Penn
North American Company, Kiskiminitas, Penn.
Orion Company, New York, N. Y.
Page & Co., Boston, Mass.
Palestine Company, Palestine, Penn
Peasley Company, Boston, Mass
Picton Company, New York, N. Y
Pinkham Company, Boston, Mass
Phoenix Company, Cincinnati, O.
Preston Company, Virginia.
Ritchie Company, Ritchie county, Va
Robinson Company, Perry county, O
Sherwood Company, Canfield, O
Stamford Company, Stamford, Conn
Staunton Company, Kanawha, Va.
Union Company, Maysville, Ky.
Western Company, Cincinnati, O.
White-Day Company, Monongalia county, Va.
Zephyr Company, New York, N. Y.

Many of the above-mentioned companies were of small capacity and most of them were not more than fairly started when the discovery of petroleum paralyzed the industry. The owners were threatened with considerable loss, from which they were rescued, however, by converting their oil works into petroleum refineries, this being accomplished with little outlay of time or money.

Minerals Used in Oil Production

The following minerals,[23] with the yield of crude oil in gallons per ton, have been used for the production of crude oil in the United States: Albert coal (Albertite[24]), 90-110 gal. per ton; asphalt rock, New Brunswick, 64; Pictou shale, Nova Scotia, 47; Stellarite, 50-130; Breckenridge cannel coal,[25] 130; Erie Railroad coal, 47; Newburg coal, 72; Faling Rick coal, 80; Pittsburg coal, 49; Kanawha coal, 71-88; Elk River coal, 60; Cannelton coal, 86; Coshocton coal, 74; Ouachita brown coal,[26] 68; Ouachita bitumen, 64; Ritchie County bitumen (grahamite), 170; Union Oil coal, W. Va., 32. During 1859 the North American Kerosene Gaslight Company imported upward of 20,000 tons of Boghead coal for the supply of its works at Newtown Creek, Long Island, at an average cost of $18 per ton. It was found that a ton of this mineral run in common retorts yielded 120 gal. of crude oil per ton, which gave 65 gal. of lamp oil, 7 gal. of paraffin oil, and 12 lb. of paraffin wax. The cost of the oil was estimated at 63c. per gallon.[27]

The bituminous shales of New Brunswick, or the "Albert shale," first came into prominence through the discovery at Albert Mines of the peculiar mineral albertite.[28] The discovery of albertite was followed by a contention as to its nature, as this involved its ownership.[29] The testimony offered in the trial was of the most discordant character, and it was concluded that the material was of the nature

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[13] Concerning the oil shales of Brazil, see Cameron's "The Bituminous Deposits of the Camamu Basin, Province of Bahia, in the Brazilian Empire," London, 1884; and Branner, *Trans. A. I. M. E.*, 1900, XXX, 18 pp. (advance reprint). A plant capable of retorting 50 tons of shale per day was erected several years ago in Brazil, but was unsuccessful.

[14] Dunstan, *Bull. Imp. Inst.*, 1903, I, 74.

[15] Murrie, *Journ. Soc. Chem. Ind.*, IV, 182.

[16] See Schadler's "Technologie der Fette und Oele," Leipzig, 1892; Schultz's "Die Chemie des Steinkohlentheers," Braunschweig, 1890; and Lunge's "Die Industrie des Steinkohlentheers und Ammoniaks," Braunschweig, 1900.

[17] "A Practical Treatise on Coal, Petroleum and Other Distilled Oils," 2d Ed., 1865, p. 9.

[18] U. S. Pat. 12612, March 27, 1855.

[19] The North American Kerosene Gaslight Company, which was organized in 1854, first worked under the patents of J. H. and G. W. Austin

[20] This Company was founded by Samuel Downer, of Boston. The latter first put an oil on the market using the process of Luther Atwood, which consisted in distilling coal tar (1850). The product was sold under the name "coup oil" and was used for lubrication Chandler, *Journ. Soc. Chem. Ind.*, XIX, 612.

[21] *Min. Mag.*, 1857, IX, 175.

[22] *Proc. Boston Soc. Nat. Hist.*, Sept. 1859.

[23] See Gesner, "A Practical Treatise on Coal, Petroleum, and Other Distilled Oils," 1st Ed., 1861, p. 34; and T. Antisell, "The Manufacture of Photogenic or Hydrocarbon Oils from Coal and Other Bituminous Substances, Capable of Supplying Burning Oils," 1859.

[24] This material was retorted at the Downer Kerosene Oil Works in South Boston; at the Downer Kerosene Oil Works in Portland, Me.; and at the New Brunswick Oil Company's Works in St. John, N. B. These companies were under contract with the Albert Mining Company from 1860 to 1864.

[25] This material was mined in Breckenridge county, Kentucky. The crude oil yielded 58 per cent. burning oil and 12 gal. paraffin. For the yield of crude oil of various Kentucky coals, see *Second Report Geol. Surv. Ky.*, 1856-7, 211.

[26] The crude oil from this brown coal was semi-solid at 80 deg. F. It is said to have yielded 143 lb. of paraffin per ton. The material was mined along the Ouachita River, Ark.

[27] Report of the committee, North American Kerosene Gaslight Company, New York, 1860.

[28] See C. T. Jackson, *Proc. Boston Soc. Nat. Hist.*, III, 279.

[29] Suit of A. Gesner vs. Halifax Gaslight Company.

of coal.[29] This supposition was soon abandoned, however, and the material was regarded as a highly altered pitch or bitumen.[31]

ANALYSES OF ALBERTITE

	Wetherill.[32] Per Cent.	Gesner.[33] Per Cent.
Carbon	86 307	85 400
Hydrogen	8 962	9 200
Nitrogen	2 930	3 060
Sulphur	trace	trace
Oxygen	1 971	2 220
Ash	0 100	0 120
	100.000	100 000

Albertite yielded 90-110 gal. of crude oil per ton, of which 70 per cent. was made into lamp oil and 10 per cent. into heavy oil and paraffin. As might be expected from its low sulphur content, the oils produced from albertite were almost without offensive odor, and the burning oil was admirably adapted for burning in paraffin lamps. Albertite was also used for gas enriching, and, to a limited extent, in the preparation of cements.[34]. Between the years 1863 and 1874, 154,800 tons of this mineral were mined, and it is estimated that in all over 200,000 tons were yielded by the veins in Albert county. The high price obtained, from $15 to $20 per ton, rendered albertite one of the mineral assets of New Brunswick. The large vein has not been entirely worked out, and several smaller veins have been proved.

The "black band" shales of New Brunswick were distilled at the Caledonia works, in Albert, and yielded 63 gal. of crude oil per ton, while a poorer bed on the Memramcook in Westmorland was found to give only 37 gal. Numerous leases were taken out in 1865 for operations on the bituminous shales of New Brunswick, and a company in Westmorland county erected 100 retorts, with the design of subjecting 100 tons per day to distillation.[35] These shales produced 7500 cu.ft. of gas per ton (about one-half the quantity yielded by albertite), and 1230 tons, valued at $3075, were exported in 1865. The Utica shale was distilled in the township of Collingwood, Ontario, in 1850 as a source of oil, and it was learned that similar shales occur in the Devonian formation in Bosanquet, Lambton county, Ontario. In 1871, D. C. Glen exhibited samples of these shales in England.[36]

Over 2000 tons of "oil coal" were raised near Pictou, Nova Scotia, in 1859, mostly from Fraser's mine. The following were found to be the yields from the "oil coals" worked in Nova Scotia at this time: McLellan's brook, yielding 40 gal. of crude oil per ton; Coal brook, 53; McCullock's brook, 77. This oil coal has been described by H. How.[37] Oil shale has been found more recently at Macadam's lake, on the north side of East bay, Cape Breton, Nova Scotia. This shale yields but 15 to 20 gal. of crude oil per ton. Near Deer lake, in the east of Newfoundland, occurs a dark gray shale which is highly bituminous in parts.[38] This deposit has never been worked to any extent.

BATTERY OF POT STILLS AT THE PUMPHERSTON WORKS

Old Methods of Retorting Shale

In this connection a brief description of the methods of retorting the coal and shale, and refining the crude oil obtained thereby, may be found of interest. About 1800, two types of retorts were in use in the United States and Canada, viz., the horizontal D-shaped retorts and revolving retorts. The former were made of both iron and clay, and were from 30 to 45 in. in width, and 8 to 10 ft. in length. A retort 10 ft. in length was capable of distilling three charges of cannel coal, of 450 lb. each, in 24 hours, at a heat not exceeding 415 deg. Two or three of these retorts were heated over one furnace, and often as many as 10 discharged into a common main. The discharge pipes leading from the retorts to the main were about 8 in. in diameter, and they were inserted into the end of the retort opposite the head and furnace. The main was generally 3 ft. in diameter.

The revolving retorts were iron or clay cylinders, 6 ft. in diameter and 8 ft. in length, sustained upon an axle at each end, the vapors passing through the axle opposite the furnace. The cylinders were kept in motion by machinery, and made two or three revolutions per minute. One of these retorts ran six charges of 1 ton each in 24 hours. In using this retort a saving of fuel was found, but they were more expensive and more liable to get out of order. Consequently the horizontal D-shaped retort was favored.

The largest stills for refining were about 8 ft. 6 in. in diameter and 4 ft. 6 in. in hight. The condensing worms were about 100 ft. in length, with a diameter of 6 in. where they left the necks and 4 in. throughout the middle parts, tapering down to 2 in. at the tail pipes. The oil was refined as follows: After the water had settled from the oil and had been drawn off, the crude oil was generally distilled in a common iron still. When the oil had been "run off" to four-fifths of the whole quantity, steam was let into the still, and frequently superheated steam was used.

The first distillate was separated into two parts, the first being that which distilled over from the commencement until the specific gravity reached 0.843. This oil, which constituted the lamp oil, was placed in an iron cistern and agitated from one to two hours with from 4 to 10 per cent. of sulphuric acid, and then allowed to settle for eight hours. The oil was then washed with 10 to 20 per cent. water and afterward with 5 to 10 per cent. soda solution (sp.gr. 1.40). After settling

[29] See C. T. Jackson, "Report on the Albert Coal Mine," Boston, 1851; and R. C. Taylor, "Demonstration Respecting the Asphaltum Mine at Hillsborough, N. B.," Philadelphia, 1851. Also, Bailey, *Trans. Roy. Soc. Can.*, VII, 77; Church, *Chem. News*, VI, 122.

[30] Taylor, *Proc. Am. Phil. Soc.*, V, 241; Hitchcock, *Am. Journ. Sci.*, 2, XXXIX, 267; Peckham, *Chem. N.*, XLVIII, 362; Gemitz, *Stz. nat. Ges. Isis*, 1871-87; Honeyman, *Min. Mag.*, VII, 77; Blake, *Trans. A. I. M. E.*, XVIII, 563; Rutherford, *Journ. Fed. Can. Min. Inst.*, III, 40, and III, 7; "The Geology and Mineral Resources of New Brunswick," 1907, 107.

[31] Trans. Am. Phil. Soc., 1852, 353. Wetherill referred to albertite as "melan-asphalt", the present name was given by Robb.

[32] *Loc. cit.*, p. 23.

[33] Some specimens of wood and brick cemented by a material composed partly of albertite have been in the museum of the University of New Brunswick for 60 years, and show no visible change in texture or cementing power.

[34] W. Dawson, "Acadian Geology," Edinburgh, 1865, 2d Edition, 111. "Summary Report, Geol. Surv. Can.", 1902, A 93. Tables that were on the extraction of oil from the black shales of Robinson and Albertville were erected in 1861, and that the industry was carried on for several years. Crude oil from Albertville was also exported to Boston in 1865 and sold for $6 per ton.

[35] "Geol. Mag.", VIII, 88.

[36] *Am. Journ. Sci.*, 2, XXX, 74. "Mineralogy of Nova Scotia," 1868.

[37] J. P. Howley, "Report to the Newfoundland Government on the Humber Valley," 1893, 16.

for six hours the oil was again washed with water and run into a still for final rectification. When the specific gravity reached 0.819, the distillation was stopped, and the residue was transferred to the heavy oil.

The heavy oil was that portion of the crude oil which formed the second part of the first distillate. It was generally distilled off in steam to the end of the distillation. The heavy oils were purified in much the same manner as the lighter oils, excepting more acid and stronger alkali solutions were employed. The paraffin wax was crystallized from the heavy oil by exposing it in tanks in a cool place. The oil was pressed out from the wax, which was then purified by acid and alkalies, pressed, and finally cast in molds. Certain alterations of these general methods of retorting and refining were made in New Brunswick in 1864-5. Whether they were improvements or not, we are not able to ascertain.

Geology of New Brunswick Shales

The great body of peculiar black, brown and gray shales, which occurs in Albert and Westmorland counties, New Brunswick, has long been known under the name of "Albert shale." This body of shales has been thoroughly investigated by Dr. R. W. Ells, of the Geological Survey of Canada, during the last 25 years, and it is from his published reports and private communications[20] that we derive much of the following information on the geology of the deposits. The author has been over a part of the field.

The mode of occurrence of the heavy oil shales is quite distinct from that of albertite. In the case of the latter, the mineral occurs in the form of true veins, which sometimes follow the lines of stratification of the enclosing shales, but which also frequently traverse them at well defined angles. The oil shales, however, occur as true interstratified beds in the bituminous shale series. As to the geological position of the shales as a whole, it may be remarked that somewhat diverse opinions have been held from time to time by different geologists. In the early days of the investigation of these shales, it was supposed that they represented an integral part of the Lower Carboniferous portion. This conclusion was reached from the presence in certain bands of shale of remains of fossil fishes and plants, which were then supposed to have a lower carboniferous aspect and to definitely fix their horizon.

From investigations made in 1876, however, it was found that the shales should stratigraphically be assigned to a lower horizon or be regarded as of Devonian age, owing to their nonconformability to the true Lower Carboniferous sediments. In certain areas, the shales are underlaid by a hard, green conglomerate, which is made up of the débris of mountain rocks; and some of the beds are comparatively sandy, constituting in some places a bituminous sandstone. Occasionally, thin bands of a hard dolomitic limestone form interstratified layers, but the bulk of these is small. As a rule, the shales and sandy layers are bituminous throughout the formation, but certain portions have this feature much more largely developed than others.

The belt of bituminous shales is well exposed in that part of Westmorland county between the Memramcook river, near Upper Dorchester, and the Petitcodiac river between Dover and Beliveau. In Albert county, they are at first covered over and concealed by Lower Carboniferous rocks in which gypsum is abundant, but reappear at Albert mines, about five miles west of Hillsborough. Here they lie against the flank of Caledonia mountain, and can be traced with several gaps to the western limit of the county near Elgin. Beyond this they continue through Kings county, south of the Intercolonial railroad for some miles, but disappear between Apohaqui and Hampton, being well seen at several points south of Sussex and Norton.

Principal Areas

The principal areas most readily accessible at the present time, are at Taylorville, Albert mines, and Baltimore. In all these localities, the outcrops have been examined. These areas will be described briefly.

(*a*) *Taylorville*—The area of shales exposed in this locality is somewhat limited, due to the overlying beds of later date. This area was examined recently by James Robertson, of Albert mines, for the Albertite, Oilite and Cannel Coal Company, Ltd., and for the Canadian department of mines. Four beds of high quality shale have been uncovered. Of these, two measured 22 in. in thickness, one 36 in., and a fourth 60 in. The shales in these beds equal in quality the best found in Albert county.

(*b*) *Albert Mines*—The oil shale bands in this locality outcrop along Frederick brook. At least six bands have been uncovered at a distance of a quarter of a mile along the stream. These may be described as follows:

Bed No. 1. This bed, the most easterly, was opened several years ago, and has an exposed thickness of 6½ ft. It is largely of the curly variety of shale, and is rich in oil. A few yards to the northeast, apparently the same bed is disclosed, and it continues down stream for some distance.

Bed No. 2. This bed was uncovered on the side of a ridge, on the north side of the brook. It has a thickness of about 3½ ft., and the shale is of good quality, containing numerous black streaks of bituminous matter.

Bed No. 3. About 430 ft. west from No. 1, bed No. 3 is observed at a small fall in the brook. This bed has a thickness of 5 ft. and the shale is of good quality, although it is not so curly as that in No. 1 and shows a pronounced shaly structure on weathered surfaces.

Bed No. 4. This bed is located 150 ft. west of No. 3. It has a thickness of 4½ ft., but the shale is not of the curly variety.

Bed No. 5. West of No. 4, 290 ft., is located bed No. 5, which consists of laminations of brownish shales, with thin beds of oil shale.

Bed No. 6. About 650 ft. farther on is bed No. 6, which shows a solid front of 6 ft. Most of the shale in this bed is of good quality.

According to Ells, these beds are all easy of access, but the contained strata show an anticlinal structure a short distance north of the brook, and it is probable that they are repeated in this direction. The shafts of the Albert mine were carried down 1500 ft. in close proximity and, judging from the material on the dumps at this old mine, other bands of oil shale were passed through. In fact, work was discontinued in a shale bed.

(*c*) *Baltimore*—Going west of Albert Mines, along the north flank of Caledonia mountain for several miles, the bituminous shales are concealed by Lower Carboniferous sediments, to within one mile of Baltimore, at which place they reappear on the headwaters of Weldon creek. On the upper part of Forsythe and Baizley brooks, the shales are seen, however, and on the latter the beds are of the curly variety of oil shale. The beds in this locality have been investigated with the following results:

Bed No. 7. This bed, which is located on Baizley brook, contains black curly shale 4 ft. thick, and a lower portion of black oil shale of the plain variety from 2 to 2½ ft. thick. This seam may be traced to the west for nearly half a mile. It is considered that several beds of similar shale occur running in a direction to the Baizley seam.

Bed No. 8. This bed is about 75 yards north of the house of E. Stevens, at the top of the road running to the west branch of Turtle creek. It shows a thickness of 5 ft., and the shale is mostly of the black curly variety.

Bed No. 9. This bed, which lies 100 yards to the south of Stevens' house, is composed of rich curly shale, 7 ft. thick.

Bed No. 10. Irving's seam, or No. 10, is situated north of the main road, and about 1000 ft. east of the opening on Stevens' land. It is opened by a drift for about 75 ft., and at the inner end shows a thickness of about 6 ft. This seam varies

[20] *Annual Report, Geol. Surv. Can.*, n.s., I, 1885, *Report E*, 63; *Summary Report Geol. Surv. Can.*, 1902, A 363-69; *Trans. Roy. Soc. Can.*, XII, 276; "The Geology and Mineral Resources of New Brunswick," 1907, 107; *Trans. Nova Scotian Inst. of Sci.*, XI, part 4, 612; *Journ. Can. Min. Inst.*, XI, 12 pp. (advance reprint); *Summary Report, Geol. Surv. Branch, Dept. Mines, Canada*, 1908, 132; and a forthcoming report to be published next autumn by the department of mines of Canada.

in quality, and is inferior to the Baizley and Stevens seams. The shale is generally massive.

These beds have been explored by two diamond drills and one churn drill through a depth of 900 ft. Shales were encountered at intervals throughout the borings. Outcrops of several other beds of this shale have been observed near Rosevale postoffice, and it is considered likely that at least two other beds may be found in this area. About two miles west of Rosevale corner, the shales are well exposed. Several bands are grayer in color than the bands already described, and one at the old road crossing to Stewart's has a thickness of about 15 ft., although it has not been opened up.

On the west branch of Turtle creek, three-fourths of a mile west, is found the "gray shale," which has an exposed thickness of about 3½ ft. Other bands also cross this stream. Further west, on Hayward brook, a branch of Prosser brook about four miles distant, three other bands of brownish oil shales have been observed. The thickness of the first band is 5 ft., and the other two, although not well exposed, seem to be not very different. The shale in these bands is soft and resembles the Scottish shale in character.

Still further west, in Coverdale, Mapleton, and near Elgin corners, the Albert shales are seen in several seams. Portions of the original vein of albertite remain in certain parts of the old workings, and recent investigations have disclosed the presence of other veins of albertite. The dumps of shale, aggregating over 100,000 tons, contain large quantities of the mineral. It will thus be observed that the quantity of shale which yields oil on distillation in this district is enormous, if not beyond measure. The Petitcodiac river, which cuts the beds, offers tidewater facilities nearly the year around, and piping to St. John, 110 miles distant, would be a simple matter.

The Nundydroog Mine, India

SPECIAL CORRESPONDENCE

Both as regards tonnage treated and gold won, the report of the Nundydroog mine for the year 1908 shows a record. The value of the gold won from the treatment of 87,000 tons was £303,807, or an average return, in round figures, of 70s. per ton. The ordinary expenditure was £149,659, or 34.4s per ton, a figure which compares unfavorably with the costs of gold mines in other parts of the world. An examination of the revenue account shows that the item mine costs, including wages, materials and electrical power, amounts to £98,044, or over 22s per ton, which, taking into consideration, the low price of Indian labor seems extraordinarily high. Milling and cyaniding costs, on the other hand, do not show so great a variation from costs in other parts of the world. Mill and cyanide costs figure at £16,880, or 3s. 10d. per ton.

As is usual with the companies controlled by John Taylor & Sons, new capital expenditure is paid for out of profits and considerable sums are also written off for depreciation of plant and machinery—a sound financial policy.

The dividend distribution for 1908 amounted to 3s. 1d. per share, or £87,258, which is somewhat below that of the previous year. It is, however, explained that in consequence of a fire that broke out in the mine in January of this year the last dividend for the year 1908, was reduced from what it might otherwise have been, as the directors deemed it necessary to retain part of the profits for repairing the damage done, estimated at £7000.

The fire took place subsequent to the year under review, and, therefore, belongs to next year's report. Particulars, however, of its extent and the effect on the returns of the mine were given in the chairman's speech at the general meeting held in London on March 17. The actual damage done in the mine was not great and the main loss to the company will be in the loss of profit on account of the reduced output in February and March. It is believed that the fire was due to a lighted candle end having been carelessly left on some timber by a coolie. Flooding was resorted to in order to extinguish the fire. All the employees in the mine at the time of the outbreak were safely brought out, but four men, one Englishman, two Italians and a coolie lost their lives as a result of the conflagration.

British Columbia Mining Litigation—Star vs. White

BY E. JACOBS*

One of the most important and costly cases of mining litigation ever before the courts of British Columbia has recently been finally settled as regards the issues involved, by the refusal of the Judicial Committee of the Imperial Privy Council of Great Britain to grant the defendant party to the suit the requisite special leave to appeal to the Privy Council against the judgment of the Supreme Court of Canada. That court sustained the judgment of the Full Court of British Columbia in reversing the decision of the chief justice of that province in the matter of the Star Mining and Milling Company *vs.* Byron N White Company, of Milwaukee, Wis., long known as the Star *vs.* White case.

The action was on respecting the extra-lateral or apex rights of the owners of the Slocan Star group in the Slocan district of British Columbia. It was commenced in July, 1901, by John M Harris, of Sandon, B. C., in the name of the Star Mining and Milling Company, of which he is president; he sued for the value of all ore taken out of his company's Heber Fraction and Rabbit Paw mineral claims by the defendant company, and for a declaration of title to all ore in those claims, and a perpetual injunction against the defendant company. The action has been the subject of a number of appeals, and has been before the different Canadian courts about 74 days in all. At the first trial, at Nelson, B. C., which lasted 22 days, W. J. Elmendorf and Professor Parks, both of Spokane, Wash., were the chief expert witnesses for the White Company, while Frank L. Sizer and R. M. Atwater, of Helena, Mont., gave evidence in support of the plaintiff company's claims. Later S. S. Fowler, of Nelson, was also employed by the Star company to prove its contentions.

The first trial at Nelson was adjourned to permit certain experimental work to be done on the ground, to test the conflicting theories of the expert witnesses, but owing to the continued illness of S. F. Parrish, then manager of the Le Roi mine, Rossland, who was chosen by the court to superintend it, and the opposition of the White company to the appointment of another engineer in his stead, the work was not done. By arrangement, however, the chief justice of the Supreme Court of British Columbia, accompanied by the leading expert of each side, examined the workings that were the subject of the dispute, and afterward gave judgment in favor of the White company. Later the Full Court of British Columbia, on appeal of the Star company, ordered certain work to test the opposing theories of the litigants, and it was done under the supervision of W. E. Zwicky, of Kaslo, B. C., manager of the Rambler-Cariboo mine, Slocan. The result was that the Full Court reversed the judgment of the chief justice and gave a decision in favor of the Star company. An appeal to the Supreme Court of Canada by the defendant company also resulted favorably to the plaintiff company. Then came the application to the Judicial Committee of the Imperial Privy Council for special leave to appeal to that court, and this has now been refused. Mr. Harris has, therefore, a judgment giving him a clear title, a perpetual injunction, full damages for the ore taken from the Star company's claims by the White company, and costs of trials and appeals. The amount of the damages and costs to be paid by the White company is, however, yet to be determined.

It may be added that the defendants did not deny having mined in the plaintiff's ground, but justified it by contending that they were following the dip of the Slocan Star vein from its apex within their own location. The British Columbia law under which their extra-lateral rights were claimed was repealed in 1892

The Cloncurry Copper District, Queensland

Region Highly Mineralized but Inaccessible; Fuel and Timber Scarce; Payable Ore Must Carry from 6 to 25 Per Cent. Copper

BY GERARD W. WILLIAMS*

Cloncurry, the official and distributing center of the Cloncurry mining field, lies 500 miles west of Townsville, the chief east coast port of North Queensland, and 235 miles south of Burketown and Normanton, the two ports of the Gulf of Carpentaria. Leaving Townsville the railway passes the coastal ranges and 80 miles from the coast reaches the well known gold-mining camp of Charters Towers. This field, where the reefs occurs as true fissure veins in highly acidic granites, will be described in another article. Leaving the Towers the line runs for the rest of the way over gently undulating downs celebrated for the valuable sheep runs into which they have been divided. The township of Cloncurry, a typical mining camp, arid, dusty and generally desolate looking, is the edge of a mineralized belt, which extends roughly 250 miles north and south and averages 80 miles in width.

Geology of the Region

The Cloncurry mineral field comprises the remains of an ancient plateau of Cambrian or Silurian slates and shales resting on a basal granite. These rocks, which have not been submerged since the time when they first emerged from the Archean seas are highly altered, both by silicification and by intrusions of diorites, quartz porphyries and, in my opinion, by the presence of batholytic masses of granite. Exposures of the latter are to be seen in several places and they appear to be quite distinct from the ancient basal granites which are exposed on the edge of the field.

The Cloncurry plateau has been subjected to enormous denudation for the vast area of the downs was entirely derived from the detritus of the old rocks. Today the plateau is represented only by a series of parallel ranges of hills which run in a general north and south direction. The crests of these hills are either ridges of silicified slates, dikes of highly acidic rocks or else they are crested with the desert sandstone formation. This deposit, of post Cretaceous age, was formed on the remains of the old plateau, but subsequent denudation has removed it to a very large extent. It is a typical aëolian deposit and is easily fretted by the rains into fantastic shapes. Most of the lodes occur at or near the contact of the Archean rocks and the intrusive rocks.

The Great Australia Copper Mine

This mine is situated in the township of Cloncurry and is one of the many properties acquired by the Queensland Exploration Company during the boom in Cloncurry copper. At that time the field was stated to be another Arizona and Butte was to be far outdistanced when the district was opened up. Unfortunately the flamboyant reports of those responsible for the boom are still unrealized, but from a mining and geological point of view the field presents many points of interest and a short account of the individual mines should be worth while, if only as a basis of comparison with other fields. There is practically no literature available that treats of this locality and the recently issued report by the Queensland Government Geological Department is altogether too sketchy to be of material value, a fault due rather to the limited time at the disposal of the author than to actual errors.

The Great Australia mine was discovered 40 years ago; 20 years back two small circular water-jacketed furnaces were erected and the old company smelted black copper from ore averaging 30 per cent. After a long struggle with low metal prices and high working costs (everything had to be teamed 250 miles from the Gulf of Carpentaria) the company ceased operations and the mine remained idle until a few years ago.

The mine is characterized by a fine ferruginous outcrop which rises as a small hill above the level of the surrounding country. There are several lodes visible on the outcrop, but although all of them were very high grade at the surface only one appears to be holding out in depth. This lode dipped at about 60 deg., and was stoped down to 100 ft. by the old company and a winze was sunk on it for another 45 ft. From the 100-ft. level the lode changed rapidly in character passing from 4 ft. of ferruginous ore averaging at least 30 per cent., the minerals being cuprite, bornite, malachite and native copper, to a mere stringer of quartz-carrying cuprite and glance. At a depth of 160 ft. the orebody opened out to its former width, but the metal contents were low. The gangue consisted of quartz together with pyroxene minerals. Diamond drill bores having shown the existence of payable ore in depth the winze was continued and at a vertical depth of 200 ft. the lode opened into payable sulphide ore in a gangue of quartz, calcite and pyroxene. This ore averages 6 per cent. for a width of 11 or 12 ft. Just below the 200 ft. level a large calcite vein was encountered, which may be the downward continuation of one of those seen at the surface, or a branch off the main lode. This orebody consists of a massive calcite

MOUNT ELLIOTT COPPER MINE—QUEENSLAND

MOUNT CUTHBERT COPPER MINE—QUEENSLAND

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gangue carrying chalcopyrite. At the point of junction of the two types of ore the combined width was 30 ft., and the ore averaged 5 per cent copper over all. Bores have proved the main and calcite orebodies to continue to 370 ft. in depth and shaft sinking is proceeding with a view to opening up a lower level 100 ft. below the present 250 level, which is worked from a winze from the 200-ft. level.

The orebodies are contact deposits between intrusive diorite and quartz porphyry. The main and calcite lodes are crescent-shaped, the convex portions of the two crescents being in contact at the 250-ft. level. As shown in bore holes the main orebody retains its mineralogical characteristics to a depth of 375 ft., where it averages 8 per cent over 19 ft., the gangue being a compact finely crystalline mixture of quartz and augite. The calcite lode extends down to the same horizon and promises to afford a large supply of easily concentrated ore.

Behind the mine the rocks previously described as porphyries rise to a sharp-peaked hill crowned by massive specular iron. Numerous outcrops of a similar nature occur throughout the district. At one time it was believed that these outcrops of massive oxide were the caps of pyritic lodes. Doubtless the wish was father to the thought for in every respect these deposits are typical segregations. Diamond drilling has shown that the orebody outcropping behind the Great Australia merges into the surrounding rock with depth.

The Smelters

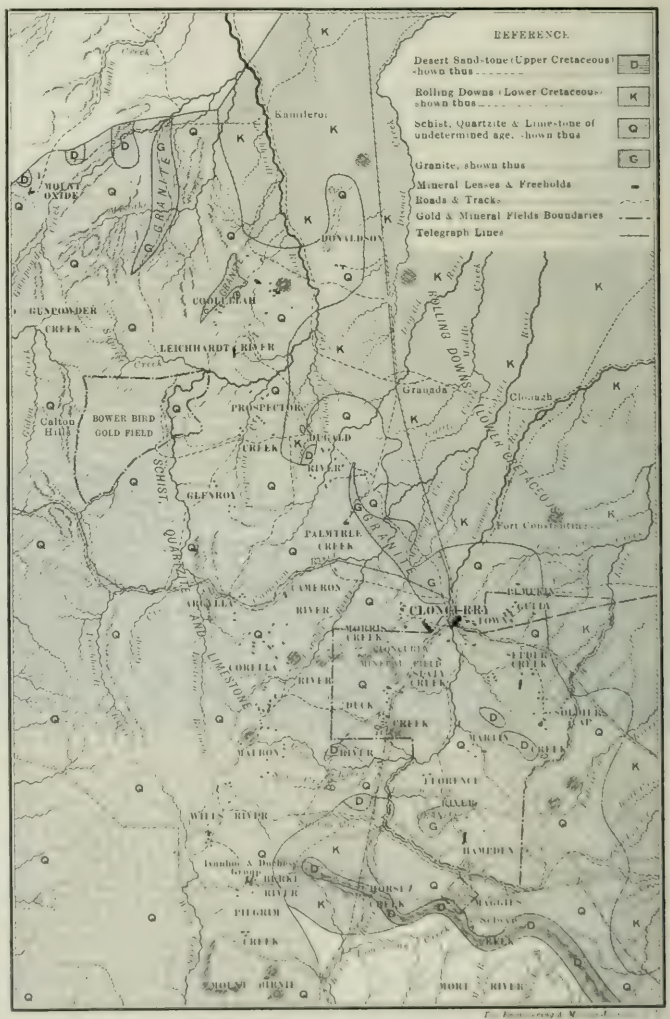
The smelting plant in use today is the old one left by the original company, together with two small reverberatory furnaces recently erected. The water-jacketed furnaces are 36 in. in diameter and average 40 tons of charge per day. The ore averages 6.5 per cent copper and smelting is semipyritic. At present, working costs are high, for the plant is badly designed, is some distance from the shaft, and is generally out of date. Mining, inclusive of development, averages $5 and smelting $6 per ton of crude ore.

The Southern District

The most important mines of this portion of the field are the Hampden and the Mt. Elliott. These mines lie almost due south of Cloncurry and are 54 and 74 miles distant, respectively, from the town. The country consists of the usual series of north and south ridges capped either by bold outcrops of quartzite or fretted carps of desert sandstone. A smaller series of east and west ranges develops around the Hampden district.

The rivers are usually dry in the summer, but in the rainy season they come down as boiling torrents often half a mile wide. The river beds in the dry season are extremely sandy, rocky crossings are rare, and the heavy hauling across the wide, sandy tracts renders transport of stores both slow and expensive. The ridges are sparcely covered with stunted eucalyptus trees and thorny spinifex. Fair mining timber grows along the flats beside the rivers, but the quantity is very limited.

At Hampden the orebody consists of a zone of altered Silurian slates on or near



CLONCURRY COPPER MINING DISTRICT

Drawn by Lionel C. Ball, Assistant Government Geologist

to a diorite intrusion. The lode may be traced for two miles, rising in places in low ridges capped with silicified slate, slightly iron stained, and shows copper throughout its entire length. As a matter of fact, almost every outcrop shows copper stains and the entire country is full of pockets of ore. A large number of prospectors make a very good living "copper gouging," as the working of these small pockets of ore is locally termed. From one end of the field to the other every outcrop is pitted with small shafts, but in no case have the "gougers" sunk below the level of impoverishment which follows the surface enrichments.

At the Hampden mine the outcrop has been attacked by four open cuts and many small shafts over a length of 2500 ft. With the exception of a barren zone about 600 ft. in length, the entire line of the lode is copper bearing, the metallic contents ranging up to 15 per cent. over a width of from 60 to 100 ft., and having an average value of 5 to 6 per cent.. The lode is composed of a shistose rock which appears to have been derived from the

slates that form one wall of the lode. The outcrop is impregnated with carbonate, and to a less extent with glance. In many cases small veins of carbonate of copper run out into the country rock, and in consequence the outcrop appears much wider than it really is. At 50 ft. the levels are in leached country, the slates being partially kaolinized and aluminous in character. The same remark applies to the 100-ft. level where a large amount of work has been carried out. At this level the lode is clearly shown to consist of two approximately parallel formations, each averaging about 30 ft. in width and lying on the footwalls and hanging-walls of a wide ore channel. At this level the ore is a leached kaolinized slate and the copper occurs as a subsulphide averaging 3.5 per cent. metal. At the 200-ft. level the two types are clearly defined, but unite at the northern end of the mine and then gradually diverge until they are about 120 ft. apart, after which they remain approximately parallel. The orebodies, although obviously partially leached, are less aluminous than on the level above, alumina decreasing from 18 to 2.7 per cent., while the iron contents of the gangue increases to 35 per cent. The copper contents are irregular. This ore is almost self fluxing, and there is every indication that in depth it will become pyritic. The Hampden promises to become a large medium-grade proposition and should prove profitable if pyritic ore is obtained in depth. Considering all local conditions, the minimum grade for pyritic smelting will be 5 per cent. with copper at 15c., but the pyritic ore has still to be found in bulk. As a black-copper proposition the prospects of the company are not so very hopeful.

About 40 miles west from the Hampden lies the Duchess mine. There are two parallel lodes about 200 ft. apart; the Duchess lode is a narrow fissure vein about 8 ft. wide occurring in diorite. The ore averages 20 per cent. copper and is easily mined for the hanging-wall of hard diorite stands well. The gangue is silicious, but contains hornblende. The lode strikes north and south and dips 84 deg. to the west. The parallel lode is somewhat wider than the Duchess and of an entirely different nature, the ore being chalcopyrite in a gangue of calcite. The copper contents average 4 per cent. The line of the lodes has been traced for about 1200 ft., and the Duchess has been opened up for 600 ft. along the outcrop. The occurrence of veins of calcite in the intrusive diorites is a marked characteristic of this district. Calcite veins occur in most of the important mines and in many cases they carry a good percentage of metal. The Duchess mine is 41 miles from the nearest point of the projected Cloncurry-Mt. Elliott railway, so that smelting difficulties will be increased owing to the cost of transport of coke and stores. In the neighborhood of the Duchess there are many other small mines, but none of the lodes held with depth, although very rich ore was obtained in the zone of surface enrichment. The Duchess is down 110 ft., but the ore is entirely secondary in nature.

The Mount Elliott

This mine, the leading mine of the Cloncurry field, lies 74 miles from the town and 20 miles south of the Hampden. The country is similar to that around the latter place. The outcrop takes the form of a small mound of hard ferruginous ore standing in a small saddle. The country rocks are altered slates and diorites, but within a few miles of the mine there is an outcrop of the basal granites which underly the slates. The outcrop is crescent-shaped and the center of the crescent rises about 30 ft. above the level of the surrounding country. The outcrop has been proved by trenching for a length of 200 ft., and to a maximum width of 50 ft. The entire outcrop averages 16 per cent. copper and 4 dwt. of gold per ton. Crosscuts run at 50-ft. intervals have proved the lode to run 15 per cent. copper for an average width of 50 ft. over a length of 110 ft. At a depth of 125 ft. the orebody was 120 ft. in width and averaged 21 ft. of ore assaying 14 per cent. copper. The orebody became much smaller at 185 ft. in depth and was virtually cut out, but the cap of a new type of ore was discovered. At the 125-ft. level the kaolinized country-wall slates carried high percentages of copper, the ore being in the form of black subsulphide. This ore, however, was confined to the region of the level and did not extend up or down more than a few feet. On the 185-ft. level the new type of ore discovered on the 125-ft. level opened out into a large body of rich secondary pyritic ore carrying chalcopyrite and secondary pyrites in a gangue of quartz, calcite and pyroxene. A large body of massive calcite averaging 1.5 per cent. copper and overlaid by about 12 ft. of black subsulphide ore averaging 13 per cent. was here intersected. The sulphides were mixed with gypsum and siderite. There seems little doubt that this deposit was formed from the decomposition of the calcite by downward percolating acid waters carrying iron and copper sulphates. In a big vug, which was intersected by a winze from the level above, gypsum crystals 4 and 5 ft. in length and nearly a square foot in cross-section were discovered, together with dendritic copper and some siderite. The works give off large quantities of carbonic-acid gas which collects in the levels.

The calcite orebody appears to underly the pyritic one which is dipping to the west at rather a flat angle. The latter body has an area of about 4000 sq. ft. at the 285-ft. level. On opening up at a depth of 400 ft. the crosscut passed through massive quartz-pyroxene rock carrying pyrites and about 2 per cent. of copper as chalcopyrite. This rock, which resembles the gangue obtained in drill holes from 375 ft. at the Great Australia mine, was supposed to be country rock but it is more probable that it represents the massive calcite orebody of the level above. Similar replacements may be observed in other portions of the field. At this level 200 ft. of crosscutting gave no satisfactory results so a diamond drill was installed. This drill has located pyritic ore at a point 300 ft. to the west of the shaft. The ore may be a new lode, which appears to be unlikely, or it may be the continuation of the orebody opened out on the 285 level. Until it is developed its true nature must remain a matter of conjecture.

There is little doubt that the lodes in this district have been very favorably situated for abnormal secondary enrichment and that in consequence the transition from secondary to primary ore will be very abrupt. The existing lodes are but the roots of the old ones for, as previously stated, the entire district has undergone enormous denudation. I consider that the calcite at the 285 level and the massive quartz pyroxene rock at the 400-ft. level are the true primary ore. The mine being dry there is no water level to afford a clean-cut boundary so the conclusions are not necessarily definite. The reserves are estimated at 110,000 tons assaying 14 per cent. copper and 4 dwt. gold per ton. The bulk of this ore is oxidized or semioxidized while the pyritic ore carries 14 per cent. copper.

The smelter plant comprises a 100-ton water-jacket furnace and two converter stands. The latter were erected at the time the pyritic ore at the 285 level was opened up but unless the unexpected happens in regard to the 400-ft. level it is not likely that they will be of much use for it will scarcely be possible to run a matte as low as 50 per cent.. A smelting company will begin operations within a few months. Water, fuel and timber are all scarce in the district and this fact will add considerably to the cost of mining and smelting. A railway is under consideration between Cloncurry and Mt. Elliott, the line will go via the Hampden mines.

The MacGregor Mines

These mines lie about 60 miles to the west of Cloncurry and are 35 miles distant from the nearest point on the Cloncurry-Mt. Elliott railway. The copper occurs as chalcopyrite in a silicious gangue. The country rocks are Silurian slates. There is some possibility of one of the leases developing pyritic ore but unless this proves true the chances of the mines are very poor for the ore is low in sulphur and highly silicious in character. The copper contents are somewhat variable and, as true primary ore has not yet been encountered, it is not possible to forecast the value of the deposits for the lodes as at present developed are all in leached or

partially leached country. At one lease the primary ore was cut at 235 ft. in depth but proved non-payable at the point where it was encountered. To date, further development has not demonstrated the presence of payable pyritic ore on this level.

Near to the MacGregor there is a remarkably fine outcrop of specular iron oxide. The outcrop, which takes the form of a low ridge of hills about five miles in length is composed of almost pure iron oxide in the center but becomes poorer toward the edge of the deposit. It is a segregation deposit analogous to the outcrop on the Great Australia mine in Cloncurry. At Duck Creek, between MacGregor and Cloncurry, there are a large number of shallow deposits of ore. A 100-ton water jacket furnace, never blown in, stands there as a memorial to the misplaced optimism of the company that started to work these local patches of oxidized ores. Unquestionably the mines of the southern and western portions of the field would be of considerable promise if they had sufficient pyritic ore but not one mine has opened up, or even promises to open up, sufficient pyritic ore to enable it to attempt semi-pyritic smelting.

The Great Australia mine will be able to concentrate the calcite orebody and reduce smelting costs in this way but none of the other mines are in that fortunate position. Coke costs $32 per ton at the railhead in Cloncurry while in a few years all mining timber will be exhausted in the district and will have to be imported from the coast, 500 miles away. Wood for fuel can at present be obtained for $5 a cord but the price must increase rapidly as the supply is limited.

North and Northwest Cloncurry

The most important mines in this district are the Mount Cuthbert and the Mount Oxide, but throughout the entire region and beyond the limits of the Cloncurry belt of country the rocks are all more or less mineralized. Fortunately there had been a rainfall a few weeks before my trip and in consequence the water holes along the rivers and creeks were well filled and the young grass was growing like magic along the flats. From Cloncurry to the Dugald river, about 40 miles, the road runs over rolling pastoral country but from the river onward the appearance of the country changes and ridges of silicified slates and outcrops of diorite predominate. The country is covered with small mines where prospectors raise small amounts of shipping ore. With copper at 15c. it takes 25 per cent. ore to pay expenses as a general rule, so the fact that hundreds of men found remunerative work during the period of high metal prices speaks well for the possibilities of the district.

The Mount Cuthbert mine lies approximately 70 miles from Cloncurry and a few miles north of the Leichhardt river, one of the largest rivers of the Gulf country. The lode lies along, or close to, a large boss of granite which is in contact with a large area of micaceous schists. As the schists are traced away from the granite they become less schistose in structure and within a mile pass into a massive rock containing large quantities of hornblende and feldspar. The mica dies out away from the granite. The lode itself may be described as a series of small, parallel lenses of ore lying on the planes of schistosity of the contact schists. The outcrop is copper stained in places and may be traced along the side of the hill for fully two miles.

The orebody, in the neighborhood of the main shaft, is over 200 ft. wide, but there is a barren portion 50 ft. wide in the center. At a depth of 150 ft. the western orebody (the lode strikes north and south) is 112 ft. wide, the barren portion 21 ft. wide, and the east orebody over 150 ft. in width. The ore varies in value as might be expected for the crosscut is in partially leached country, the schists being kaolinized. Large quantities of 8-, 9- and 10-per cent. ore were taken out during the course of development to a depth of 150 ft., but the ore at this depth is very patchy. The most noticeable feature in the gangue at this level, as compared with that at the 50-ft. level and in the surface workings, is the increase of iron and the decrease of alumina. At 250 ft. the ore is still partially leached and the copper occurs as a black subsulphide. The orebodies, too, are smaller, the eastern zone being 47 and the western 31 ft. wide. The barren ground is reduced to 9 ft. in width. The ore from 80 ft. of crosscutting averaged 8.5 per cent. At this level the ore carries 22.5 per cent. iron mostly in the form of siderite. A complete analysis is: SiO_2, 45.5 per cent.; FeO, 22.3; CaO, 1.5; Al_2O_3, 6; S, 12; Cu, 7.5.

From analogy with other mines in the district it is possible that in greater depth the gangue will carry large quantities of calcite for lenses of calcite and small lodes with calcite gangue occur in the neighborhood of the mine. At both the Great Australia and the Mt. Elliott a quartz pyroxene gangue passes rapidly into massive calcite carrying primary ore, and in still greater depth epidote appears to replace the calcite. The individual lenses of ore which make up the orebodies vary in length from a few inches to several feet, and in width from an inch to 2 or 3 ft. There seems every possibility of these lenses consolidating in depth for the ore at 250 ft. is more compact and assays more consistently than in the upper workings. Comparatively little driving has been done. The company is now sinking to open up a level at 450 feet.

Half a mile from the main shaft and on the same line of lode is the Kalkadoon mine. The lode is narrow but very rich, over 20,000 tons of 40-per cent. ore having been taken from shallow workings and shipped. About 10 miles from the mine there is a small lode of calcite occurring in diorites. This orebody, known as the Surprise, carries a good percentage of chalcoprite. Other smaller prospects in the district have shipped ore ranging from 30 to 50 per cent. The contact deposits in the neighborhood of the granite boss appear to be the most consistent, but the small veins in the diorites are the richest. These veins, however, are of small size and do not hold out below water level.

About 80 miles from the Mt. Cuthbert in a northwesterly direction lies the Mount Oxide copper mine, the most promising looking of all the mines in the region. The mine is reached by following the course of various creeks and rivers through extremely hilly country. As yet there are no roads and it is necessary to travel with packhorses. The hills are extremely regular, running north and south in long equidistant ranges. The country consists of ancient slates and conglomerates which in almost every case have been silicified. These old sedimentary rocks dip at a steep angle and in consequence the majority of the valleys are steep-sided gorges with bare rocks running almost to the edge of the flood bed of the rivers. The country is well within the tropics and the summer's sun beating down from the rocky sides of the valleys renders traveling extremely unpleasant. In some places, as for example at the Mammoth leases near the Mount Oxide, there are outcrops of schists impregnated with copper. At this mine, which has only recently been discovered, the orebody appears to be somewhat similar to that described at the Mount Cuthbert but the entire ore channel is inclosed between walls formed by dikes of some highly acidic rock. The ore channel is about 250 ft. wide but the copper-impregnated portion only extends over about 50 ft. Rich carbonate and oxide ores have been won from surface trenchings.

The Mount Oxide outcrop has the form of a hill about 300 ft. in hight which rises steeply from the creek flowing beside it. The hanging-wall is composed of silicified slates banded with fine-grained hematite and overlain in turn by massive specular iron impregnating a fine-grained, highly silicious rock. The lode itself is about 50 ft. wide and may be traced for about half a mile. The footwall of the orebody is of slate, comparatively unaltered, but showing signs of lateral pressure and induced cleavage. The entire series is conformable with the general series of upturned slates that comprise the visible rocks of the district. The Mount Oxide is well named for the outcrop is vividly colored with red, blue and green oxides and carbonates and copper stains may be traced for nearly a mile along the line of the lode, which is very clearly de-

fined owing to the presence of the hard jaspery rock on the hanging-wall.

The lode has been sunk on for 130 ft. At that point a small level and crosscuts proved ore averaging over 20 per cent. for a width of 30 ft. At this level the ore consists chiefly of glance together with a little red oxide. The gangue is a crushed slate carrying pyrites. A lense of solid glance 50 ft. in length attaining a maximum width of 80 ft. was encountered at the 130 level. At the surface 30 per cent. ore was sacked from several points on the outcrop. Practically no real development work has been done on the property which is still in the hands of the discoverer.

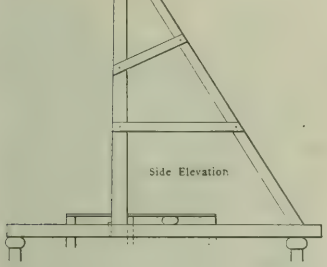
The entire district suffers from lack of railway communication. The country is mountainous, practically unpopulated and, in fact, handicapped in nearly every possible manner. A railway line from the Gulf country, following the course of the rivers would not present any great engineering difficulties and would be the making of the district. But, in this respect, private enterprise is sternly discouraged and the government has not the available funds at present. So the northwest district lies practically idle.

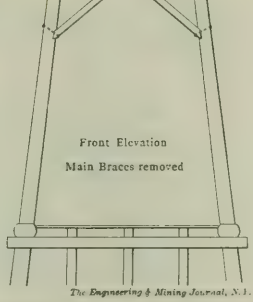
I returned to Cloncurry via the Bower Bird goldfield. This region is characterized by the presence of huge quartz reefs which stand out boldly on the hillsides and may be traced for miles. The field yielded considerable alluvial gold some years ago and several small companies operated on the reefs but without success, which was not surprising considering the primitive methods in vogue. After many years of idleness a new company has taken up the old claims and an attempt will be made to scientifically prove their value. The quartz veins lie conformably in the usual slate formation.

Undoubtedly the visitor to the Cloncurry field must confess to a certain feeling of disappointment after examining the mines but there is little doubt that the day will come when mines which have no hope of paying at present will be worked profitably. The discovery of a large low-grade pyritic formation and the erection of central smelters in the vicinity would effectively solve the difficulty. The chief trouble with the larger mines lies in the absence of pyritic ore and the almost prohibitive cost of coke. The pioneers of this field have labored under exceptional difficulties, and, remote from ports and from civilization, threatened by drought in summer and weather bound for months by the floods in the rainy season, the pioneers have had a very hard fight. Until comparatively recent years the aboriginal natives were a source of considerable trouble and it was not until several of the early ranchers and prospectors had lost their lives that the others took effective steps to prevent any repetition of the trouble.

The north Queensland prospector-pioneers can compare well with the best that the western States produced. It is over 40 years since the discoverer of the Mount Oxide went alone nearly 200 miles into utterly unexplored country and pegged out his find, living for weeks amidst one of the most savage tribes of the Gulf country. As in all sparsely peopled countries the few men one meets in traveling are hospitable to a degree and in every way a trip through the country is made one of the most pleasant journeys one can make in Australia.

The form of headframe shown in the accompanying illustration is commonly used in the district. The plans were kindly furnished to me by the manager of the MacGregor mine. As will be seen from the plans this design requires a minimum of timber and for this reason it may commend itself to those who have to open up mines in a country where timber is costly and difficult to obtain. The construction is fully shown. Round sticks of timber are used.





HEADFRAME MADE OF ROUND TIMBER

Taxing "Ungotten Minerals"

SPECIAL CORRESPONDENCE

In the British budget for 1909-10, the Chancellor of the Exchequer proposes to levy a tax on "ungotten minerals." This proposal has raised a storm of opposition, and no one, including the Chancellor himself, is able to explain what are minerals and what are not, and in what way they are to be valued. When interrogated as to what minerals mean, the Chancellor declines to give a precise definition, and says that it will be left to the courts to decide. If this is to be the situation, the way seems open to plenty of litigation. The subject is a difficult one, as was shown in a recent case which was noticed in the JOURNAL when the question to be decided by the courts was whether china clay was a mineral or not. It is possible to argue that stone, clay, chalk, etc., are all minerals; in which case everyone who owns land will be liable for the tax. Has a man who lives on clay soil "ungotten minerals" in the shape of undeveloped bricks? And what is the position of a land owner with coal or iron or other mineral under his land at a depth at which profitable mining is impossible. Difficult questions like these must arise and the valuations which the imposition of the tax calls for cannot fail to lead to interminable litigation.

The clauses in the finance bill relating to "ungotten minerals" are so intolerable and unworkable that it is probable they will be withdrawn and some tax based on more tangible material such as rents or royalties substituted. A more impossible impost for raising money than that now proposed has surely never before been put before Parliament for sanction. Even in the case of mines that are unquestionably such, the experience in States of this country, where the law requires them to be assessed like real estate for purpose of taxation, has shown the impossibility of doing so with any degree of accuracy, and out of the vexatious troubles arising from this, the result has been, like that in the case of our iniquitous personal tax levies, a compromise upon what the property owner is willing to pay.

Consul H. A. Johnson reports that the important Belgian steel works of the Cockerill company, in Liège, has just started an electric furnace. This furnace is built on the Girod system, with one electrode, and has a charging capacity of from 2 to 3 tons of steel.

In 1908 the United States produced 59,180 short tons ($319,570) of feldspar, according to statistics of THE MINERAL INDUSTRY. The 1907 production was much larger, amounting to 92,799 short tons ($558,944). Maine, Pennsylvania and Virginia were the leading producers.

Pumping Plant at the Tombstone Consolidated

Main Pumping Station Now at 1000-ft. Level. Daily Flow in 1908 Averaged 5,040,000 Gallons, Occasionally Nearly 7,000,000 Gallons

BY ELTON W. WALKER*

When the Tombstone Consolidated Mines Company was organized to take control of and operate the principal mines of the Tombstone district, which had been heavy producers in the early days of the camp and had laid practically idle since the latter part of the '80s, it was expected that a large quantity of water would have to be pumped and provision was made to do so, but the amount of water encountered as the work of sinking the shaft progressed, was much larger than had been anticipated.

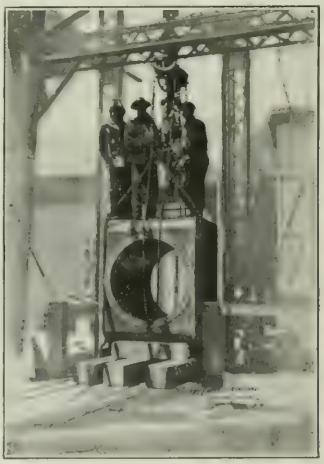
The data, upon which calculations were made, was taken from the operation of two large Cornish pumps which were in use at the Contention and Grand Central mines, and which had later been destroyed by fire. At the Contention mine there was a double line of 12-in. pumps, and at the Grand Central a double line of 14-in. pumps. These pumps were run at 20 strokes per min. and the stroke was 8 ft. With the assumption that the efficiency was 75 per cent., the capacity of both pumps was 1065 gal. per min. As a matter of fact, the present company has had to contend with a flow of water which has amounted to as high as 4500 gal. per min. for 24 hours and at times has undoubtedly been considerably over this amount. Since pumping operations were commenced in 1903 the average water pumped has been about 2590 gal. per min. During 1908, approximately 3500 gal. per min. were pumped.

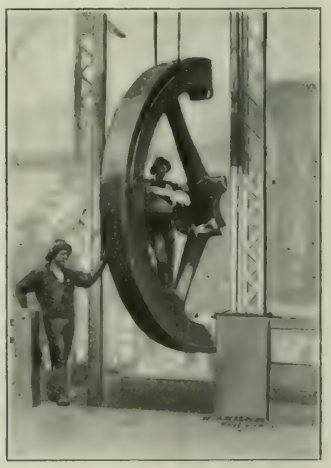
Original Water Level

It should not be inferred from the above that conditions are worse than formerly, as the reverse is true, for during the year two new pumps were installed on the 1000-ft. level, and with the increased capacity it was the intention of the management to open up the ground on the 1000-ft. level, letting in more water and thus drain the ground more rapidly than had been done. The original water level stood at a depth of 570 ft. below the collar of the shaft and in January, 1909, a winze sunk from the 800-ft. level, encountered water at a depth of 40 ft., showing a total drainage of 263 ft. below the original water level.

The pumping plant, as first planned, consisted of one 15-, 23- and 30x13x24-in. Prescott direct-acting duplex pump with a capacity of 1700 gal. per min., to be placed on the 600 level and to deliver to the surface. A similar pump of the same size was to be placed on the 1000 level to deliver the water to the pump on the 600 level. In addition to the above, two similar pumps having the same size steam end but with a 9¼-in. plungers were to be placed on the 1000 level to throw to surface, thus giving a maximum capacity of 3400 gal. per min. with this double line of pumps.

This plan was carried out with the two 13-in. pumps, but the increased flow of water necessitated a change in plans when the 700 level was reached with the shaft and the two 9¼-in. pumps were placed on this level. A 11½-, 18- and 30x14x24-in. Prescott duplex pump of the "Missabe" low-lift type was placed on the 800 level, throwing the water to either the 700 or 600 level as occasion required. In addition to the above pumps two 10- and 16x10½x12-in. Dow direct-acting duplex pumps have been used on the various levels. At the present time they are both on the 1000 level and serve as auxiliaries.



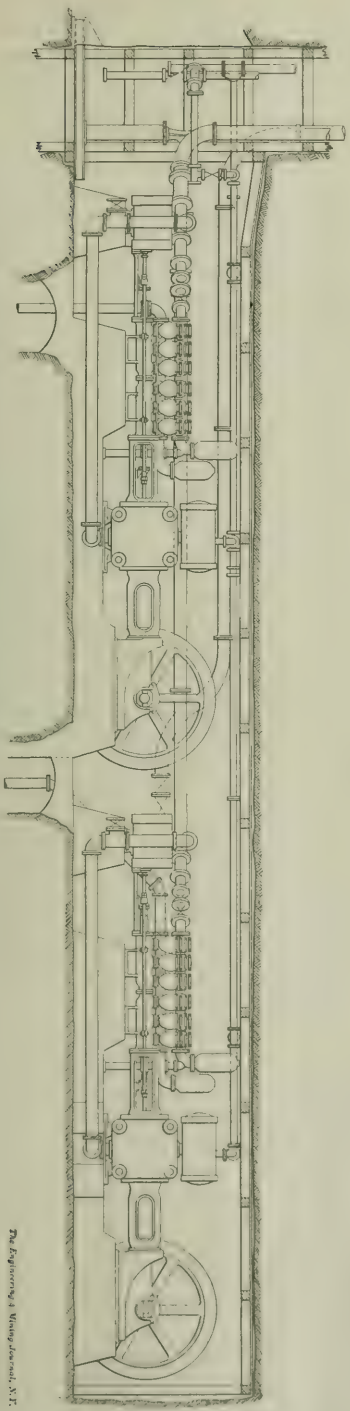


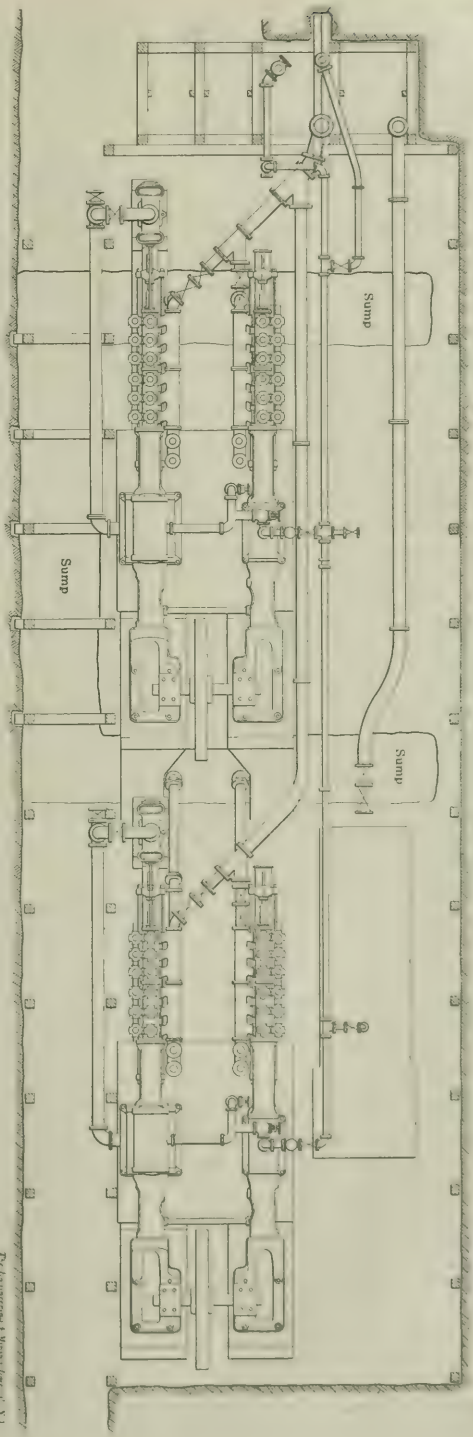
LOWERING A PILLOW BLOCK, LOW-PRESSURE CYLINDER AND HALF OF A 25,000-LB. FLYWHEEL FOR THE TOMBSTONE PUMPING STATION

The Main Pumping Station

The 1000 level was to be the main pumping station, and as soon as the shaft reached this depth a station 30x110 ft. was cut and the 13-in. pump installed. As the sinking pumps were still pumping a considerable amount of water, one of the Dow pumps was also installed. Inasmuch as the 9¼-in. pumps were still on the 700 level and could not be moved, it was decided to install two pumps of a more economical type, thus increasing the pumping capacity and lowering the pumping cost. The pumps selected were of the

*Consulting mining engineer, Detroit, Mich.





PLAN AND ELEVATION OF THE 15-, 23-, AND 30×14×24-IN. DUPLEX PRESCOTT PUMPS ORIGINALLY PLANNED FOR THE 600 AND 1000-FT LEVELS OF THE TOMBSTONE CONSOLIDATED MINES AT TOMBSTONE, ARIZ.

The Engineering & Mining Journal, N.Y.

cross-compound Corliss, crank and flywheel type made by the Fred M. Prescott Steam Pump Company. The steam cylinders are 22 and 42 in. in diameter with 36-in. stroke and the plungers 6½ in. diameter. The flywheels have a diameter of 12 ft. and weigh 25,000 lb. each. The pumps run at a piston speed of 348 ft. per min. and have a capacity of 1200 gal. per min. under a head of 1000 feet.

The duty of these pumps is guaranteed by the makers to be 125,000,000 as against 80,000,000 foot-pounds for the duplex direct-acting pumps. In order to check up the latter figure as a basis for estimating the economy to be derived by using the cross-compound pumps, I was engaged to make a duty test of the pump on the 600 level which had been in steady operation for about 4½ years. The result of this test gave a duty of 78,000,000 foot-pounds per 1000 lb. of dry steam. Owing to difficulties encountered in making this test it was necessarily of very short duration and the result obtained subject to some error, still it gave figures approximating those given by the maker and was considered sufficiently accurate to base calculations upon.

Setting the New Pumps

The pumps were placed tandem to each other as shown in plan and elevation and were set on concrete foundations which were built high enough to allow the bottom of the flywheel to clear the floor line of the station and be in no danger of running in water. As a further precaution, a pit was constructed of concrete below the flywheel and rising above the floor line to keep out the water if it should accidentally rise over the floor. In building the foundation considerable difficulty was encountered from water which flowed from crevices in the floor of the station. These were successfully taken care of by piping embedded in the concrete and no difficulty has thus far been experienced from the water.

The anchor bolts were held in place by railroad iron passing through eyes in the bottom of the bolts. The foundations were further reinforced by using pieces of old flat hoisting cable and the arches above the sumps were strengthened with curved iron rods, and bound to the sides of the sump by iron pins driven into holes bored in the rock. The foundations for both pumps are practically in one continuous piece from end to end of the station. This was found necessary as some difficulty was experienced in one of the earlier pump foundations by a slight movement of a part of the foundation, probably due to water pressure which made it extremely difficult to hold the concrete in place until it was properly set and bound to the rock.

The Discharge Column

Each pump is provided with two 9-in. discharges and the discharge piping as well as the steam piping, is so arranged that in case of necessity it is possible to use either side of the pump independently of the other. In designing the discharge piping, care was taken to avoid any sharp turns as shown in the drawings. All fittings in the discharge line such as valves, ells, etc., are made of cast steel. The column is of 15-in. O. D. pipe with cast-steel male and female flanges. The thickness of the pipe varies from ⅞ in. at the bottom to ⅜-in. at the top. Two expansion joints were placed in the column to take up the slight expansion and contraction as well as to divide the column into three sections which facilitates raising the column to make possible repairs. By means of the expansion joints any section of the column can be raised independently of the others. To further facilitate repairs, each length of pipe was made 20 ft. long, thus allowing any length to be readily replaced.

The column is supported by clamps made of flat iron, placed one on each length of pipe. The column, being located in the corner of the compartment, allows the ends of the clamps to rest on the wall plates and dividers of the shaft and lateral movement of the clamps is prevented by using a shoe made of flat iron which is bolted to the shaft timbers. The column is further held in place by U-shaped clamps of round iron which are fastened to the timbers with lag screws or bolts.

As the weight of the water in the column is about 32 tons, it was necessary to provide a solid foundation for the column and still leave it possible to continue sinking the shaft when desirable. This was accomplished by placing two 12-in. built-up I-beams side by side across the shaft and embedding the ends in concrete in hitches cut in the solid limestone. Above the I-beams is a piece of 15-in. pipe filled with concrete. Resting on the pipe is a base ell having a long sweep. There are two 8-in. extra heavy steam pipes from the surface to the 1000 ft. level, either of which may be used to furnish steam to the pumps on any of the stations. These pipes are supported in the same manner as the column pipe.

Overcoming Water Hammer

When the pumps were first started considerable difficulty was experienced in obtaining quickly a sufficient air cushion in the air chambers of the discharge to prevent an annoying water hammer. This was overcome by using an air charging device. This consists of a length of extra heavy pipe with blind flanges on each end and placed in a nearly horizontal position alongside the pump. Connections were made from the air chambers to the pipe and also from the column pipe and the air line in the mine. A drain was also placed in the lower end of the pipe.

In using the device all connections are closed except that to the air line which charges the pipe with an air pressure of 90 to 100 lb. The air connection is then closed and that to the column opened. This allows the pressure of the water in the column to compress the air. The column connection is then closed and that to the air chambers opened which allows the air under pressure in the pipe to gradually work into the air chambers. After charging the air chambers the pipe is drained of water and the operation can be repeated. This sounds like a complicated operation, but in practice it is readily accomplished, and proves very efficient in quickly overcoming the water hammer.

The pumps were originally provided with cast-steel valves faced with hard rubber working on brass seats. The rubber has now been replaced with sheet steel which is proving much more satisfactory, the valves seating without noise and wearing much longer. It is also possible to face the valves off in a lathe a number of times before they become too thin for service. The pumps have now been in operation for a number of months and are giving excellent satisfaction. They run quietly, about the only noise heard in the pump station being that of the dash pots and the tripping of the Corliss gear.

The general arrangement of the station with piping, etc., is shown in the accompanying drawing. Up to the present no duty tests of the pumps have been made, but the economy shown in the decreased fuel and labor cost has more than fulfilled the original expectations. The present pumping plant is capable of handling a maximum flow of about 5500 gal. per min. from a depth of 1000 ft., and is sufficient to take care of any flow that may reasonably be expected.

The famous Dos Bocas gusher of S. Pearson & Son, Limited, in Mexico, had an original production estimated at 90,000 bbl. per day, and but for the unfortunate occurrence of the well catching fire almost immediately after it was struck and burning continuously for 48 days, it would have been the largest producer of fuel oil in the world. Since the bringing in of this well, all the oil lands in this district have been rapidly acquired by the two large rival companies of S. Pearson & Son, Limited, and the Mexican Petroleum Company, who own and operate the oil-fields at Ebano. Both of these companies have large staffs of engineers in the field, and are pushing forward the drilling of new wells. The oil produced in this district is a strictly fuel oil of from 12 to 18 deg. B.

According to a consular report, the national cement factory is in operation at Caracas, Venezuela. The material for the manufacture is found close to the works. The cement, which is said to have shown good quality in the tests, is sold at 16.5 bolivars—$3.19 per barrel, which is about 5.5 bolivars—$1.06—less than imported cement.

The Electrical and Coal Mining Industries*

By F. C. Albrecht†

I believe I can say, without fear of successful contradiction, that with the exception of some special cases, the days of animal haulage in coal mining will before long be a thing of the past.

Electricity is practically independent of distance. There is no other form of energy that is transmitted as efficiently and conveniently as electrical. The coal-cutting machine is no longer an experiment. A practical electrically-driven drill has been devised. Also a puncher, which can be operated either by direct or alternating current, has been manufactured and is now operating on a commercial basis. Fans which the mine owners were originally afraid to drive by electricity are now replacing the steam-driven kind with their long and uneconomical and expensive steam line. We also have electrically-driven tipple machinery, and the electrically-driven pump in wet mines. Some of our most satisfactory box-car loaders are electrically driven, while at many plants, the coke-drawing machines are also electrically operated.

The power house of today is rapidly evolving itself into an alternating current proposition, becoming the central source of power for a number of mines. The difficulties that attended the initial introduction of alternating current have been largely eliminated, with the result that the polyphase system, which means either a two-phase or a three-phase system, of alternating current transmission—with its adaptability to large units and long distances—has proved itself a commercial success.

Steam turbines as prime movers have long since passed the experimental stage. The turbine can be operated both non-condensing and condensing, the latter giving the best results. One of the merits of the turbine is the small amount of floor space required; another, that it is economical and efficient.

The modern switchboard will be equipped with its oil circuit breakers and oil switches, its various safety devices, together with meters, including voltmeters, ammeters, frequency meters, power factor meters, etc. We must not forget our exciter set, consisting of a direct-current compound-wound generator, usually wound for 125 volts and used for excitation of the generating units. This exciter set may be either engine or motor driven. We also have transformers, which are used to raise the original generator voltage to the proper transmission voltage. In addition, there are installed lightning arresters, choke coils, disconnecting switches with their details, for protective apparatus, so that we now have our alternating-current power house most complete.

The Saving in Copper

Among the principal advantages of a central power station there is the great saving in copper, and also the maintenance of a steady-working voltage—especially where the workings are located considerable distances from the power house. The saving in copper more than balances in many instances the entire cost of the sub-station during the life of the equipment. In transmitting the power, alternating current is used. The main power house generally furnishes current at approximately 2400 or 6600 volts, although 3300, 13,000 and other voltages are used. This current being for power service, should be a 25-cycle, 3000-alternation, polyphase circuit, preferably three-phase. The current is transmitted from the power house to sub-stations where it is transformed to a lower voltage, and then in turn by means of a rotary convertor or a motor generator is transformed from alternating into direct current.

The lowering transformers are generally arranged to transform from 2400 or 6600 volts high tension to approximately 440 volts low tension. The approximate ratio of the alternating current to the direct-current voltage is about 7 to 10. If the alternating-current voltage on the rotary convertor is approximately 160 volts, then the direct-current voltage will be around 250 to 275 volts. Generally speaking, it is considered advisable to put in lowering transformers, even with motor generator sets, as that makes it safer for the operator. A further advantage is that the lowering transformers act as additional protective apparatus—having the high tension and low tension sides separated. This arrangement also has the additional feature that taps may be taken from the transformers to operate independent alternating-current circuits. The sub-station equipment requires practically no attention and is almost automatic, easily adjusting itself to the various loads and conditions. Sub-station equipment require no special foundation and no anchorings. It is also true that the floor space required is considerably less than an engine and generator unit.

It is feasible to operate two circuits at a mine. Both alternating and direct current are used. The alternating current will operate the fans, crushers, tipple machinery and pumps. Alternating currents have the additional advantage that any number of alternating-current voltages may be obtained from the same generator, it being only necessary to use the proper transformer taps. The direct current will operate the locomotive and the direct-current cutting machine. By this means, the operations are independent of each other. The sub-station, therefore, feeds both kinds of current simultaneously to the same mine.

A well known engineer connected with one of the large coal-mining companies of West Virginia, has summed up the advantages of a central power station and its sub-stations for mines as follows:

1. Minimum outlay for copper.
2. Maintenance of good working voltage.
3. Flexibility in mining operations.
4. Better conditions in rail bonding.
5. Expensive foundations are not required at substations.
6. Water and fuel are not required at substations.
7. Adaptability for lighting at remote places together with local lighting.
8. Permits the use of high voltage a.c. motors.
9. Reduces number of station employees and consequently affects the labor expenses.
10. Low cost for oil and waste.
11. Capacity may be less than combined capacities of a number of small d.c. stations.

Electric Mine Locomotives

As to mine locomotives, it is a better practice to have two 10-ton or two 13-ton or even two 15-ton locomotives, which can be operated either separately or together in what is known as a "tandem arrangement," than to have a locomotive of 20-ton capacity or more. Too heavy a locomotive means heavy iron for the track, and such an engine is often unwieldy and inefficient.

There is also the reel and the gathering locomotives. This latter type known as the "traction reel" or "crab type," does not go into the room at all, but a wire cable of from ⅜ in. to ⅝ in. thick and about 500 ft. long, is easily pulled in the room and fastened to the loaded car, which is then pulled out by means of a separate motor with its equipment of controller, resistances, hose and wire and other details. Both of the gathering types of locomotives are now being built so as to use one of the main hauling motors of the locomotive for gathering also.

Cost of Haulage

As regards the cost of operating with electric haulage, it is obviously difficult to give exact figures which will apply in all cases, but it has already been pointed out that electrical haulage is cheaper than animal haulage. The life of the locomotive in the first place is longer than that of the mule, there being locomotives today in actual service, which were installed 10 or 12 years ago. Against this, two or three years is the average life of a mule. The lengths of the haul and speeds required are also in favor of the locomotive. I do not consider it necessary to go into a comparison of the relative costs of mule and electric haulage. It has been tried out and the growth of electric haulage speaks for itself. I have been unable to find any cases where electric haulage has been used and then again abandoned, unless it was where very gaseous mines developed.

The motors used for the operation of fans must be perfectly reliable, as on the

*Abstract of paper read before the summer meeting of West Virginia Coal Mining Institute, Elkins, W. Va., June 1, 1909.

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successful operation of these, depend the lives and efficiency of the men underground. In connection with electrically-driven fans, I was recently told by a prominent mine manager that only once in the last five years has he had to call his men out of the mine on account of trouble from this source.

The Form of Drive for Fans

As regards the form of drive for fans, that is whether the fan should be geared or belted or chain driven, that should be carefully studied in each instance. Where there is a great fluctuation in voltage, either a belted or chain drive is desirable. If floor space is an item, then between these two the chain drive is the proper one. If the voltage is constant and good regulation secured, then a geared fan is proper. Coupled fans can also be seriously considered, and these are in actual operation. Variations in speed can be obtained by either variable speed motors or in the case of belted machines, different pulley combinations can be used.

As regards the direct-current voltage in the mine itself, there has been and still is considerable discussion. Many are of the opinion that the voltage should not exceed 275 or 300 volts. On the other hand there are just as many if not more, who consider 550 to 600 volts not excessive. Certainly there is no getting away from the fact that with the higher voltage, there is a great saving in copper and also that in most cases a better working voltage will be maintained. Looking at the question from the standpoint of safety, it is true the high voltage is more likely to kill a man than the lower. But the point is to keep away from the wire. Especially in high coal this should easily be arranged. In many instances, the trolley wire can be placed from 5 to 7 ft. above the rail and should always be placed from 4 to 8 in. to the outside of the rail. With ordinary precaution this should be entirely safe. Where the coal is low, it might then be considered proper to put in the lower voltage, although it is by no means considered absolutely necessary.

It has been pointed out at various times by some operators that they consider the higher voltage safer than the lower. Their argument is that with the lower voltage the men get familiar and careless. On the other hand, they have considerable respect for the higher voltage and are more careful and have less accidents. Local conditions will largely determine what voltage should be installed.

Bare Wires Should Be Used

No matter whether 250, 275 or 550 volts is used, the conductor should be bare, uninsulated wire. Insulated wires in a mine are treacherous. The insulation will not last in a mine more than six months or a year at most. It deteriorates rapidly and becomes a menace instead of an additional safeguard.

A system of wiring that meets with much favor where conditions will permit is the "three-wire system." By this means 550 volts can be taken from the generator or rotary converter and divided in half, using two circuits of 275 volts each.

The "three-wire system" was originally introduced in order that a saving in copper might be obtained. The system has become in general use for both lighting and power distribution. It permits of a saving of 25 per cent. in copper in the feeder, when figured on a basis of current capacity; or a saving of 62 per cent. when figured on a basis of drop of potential, when the neutral wire is considered as equal in size to one of the outside wires.

The three-wire, direct-current generator is similar in appearance to the two-wire, direct-current generator—except that it also has collector rings, somewhat like a rotary converter, but in the case of the three-wire generator, it has its collector rings on the same side as its commutator. Three-wire generators may be operated in parallel with each other, or in parallel with two-wire generators if required. By means of the three-wire system, it is possible to use the higher voltage, that is 550 volts, for the stationary motors, such as pump motors and 275 volts for the locomotives, considering the track as the neutral and return.

The sooner mining and electrical men get together and adopt a system of standards mutually agreeable and understood, the better it will be for all concerned. I am glad to say that some steps in this direction have already been taken. At the last meeting of the American Mining Congress in Pittsburg, a resolution was passed which authorized the appointment of a standing committee for the purpose of standardizing mining practice and making necessary recommendations for electrical work in the mines.

This standardization can apply not only to the voltages employed in the mine, but can be followed out further, in for instance, the gages of the tracks in the mines. Likewise, a certain standard for horsepower per ton and speed in miles per hour for locomotives might be at least approximately arrived at.

In time past, it was considered that a fairly good armature winder or repairman was sufficient to place in charge of the electrical and mechanical departments at a mine, it is now rapidly being recognized that with the growth of these equipments there must also be a growth in the capabilities of the men in charge. The man who can cut down the cost of production is the man who appeals to the mine manager.

In 1908 electric cutters furnished 1,428,160 tons of coal in New South Wales against 484,127 tons by compressed air machines (*Aust. Min. Stan.*, May 26, 1909). Of the cutters used 82 were operated by electricity and 59 by compressed air.

Indiana Coals and Coal Lands*

Special Correspondence

According to advance sheets of the annual report of State Geologist W. S. Blatchley, which includes the report of State Mine Inspector James Epperson, Indiana coal production during 1908 showed a decrease of 1,253,411 tons or 9.4 per cent, as compared with the production for 1907. This decrease, the officials say, was due principally to the financial depression. This depression was felt most keenly in the production and sale of bituminous coal. Of the total loss, the block coal fields sustained only 22,273 tons and the bituminous fields 1,231,138 tons.

The total number of tons of coal produced in the State by all mines working over 10 men was 11,979,304, and the amount of wages paid by the operators to the miners was $10,304,867. Mr. Blatchley's report will be issued Sept. 1, next.

An exhaustive report or treatise on Indiana coals and coal lands, to be included in the geologists report has been prepared by Dr. George H. Ashley, of the United States Geological Survey, and is the most extensive study of Indiana coals that has ever been prepared for distribution. Since the previous coal reports were completed, a number of new bores have been sunk and consequently the investigation has included data drawn from a much larger field. The important parts of the discoveries have been collected in the form of questions and answers, designed to impress more emphatically what the investigator has to say. Dr. Ashley's work is supplemented in a large measure by data collected by State Mine Inspector James Epperson and his deputies.

Some of the important statements recorded in Dr. Ashley's treatise concerning the coals of Indiana are the following:

"Indiana coals are the peer of any with which they are called on to compete. Recent experiments with coals from the Linton or Greene county field promise great success in coking. All Indiana coals will coke. Indiana coals will generate producer gas of high mechanical value.

After naming the 16 coal producing counties in the State, Dr. Ashley makes further favorable points as follows:

"The coal measures in the State are approximately 1,300 ft. in thickness, but the main coal-bearing divisions are included in 500 ft. Indiana coals can be mined successfully and economically. Indiana, on a conservative basis, has 50,000,000,000 tons of coal 'in sight,' or that can be safely mined. Of what is at this time considered a workable coal, the supply is about 24,000,000,000 tons. If mining continues at the present rate the workable supply will last about 1000 years, but if mining continues to increase at the rate

* Note. Abstracted from the "Annual Report" of the State Geologist.

it has increased in the last decade, the workable supply will be exhausted in about 150 years. Indiana coal lands cost from $25 to $150 an acre, and royalties run from 2 to 12½c. a ton. The cost of the mining ranges from 55 to 85c a ton. The average selling price is $1.08. The best evidence that Indiana coal is able to hold its own in competition with other States is that it does."

Dr. Ashley says it is plainly foreseen that in the producer gas industry there is a great opening in the market for the low-grade coals of the Indiana fields, which until recently have been regarded as practically valueless and given away or thrown aside as waste. These low-grade coals can be used in the manufacture of producer gas for use in gas engines.

Dr. Ashley concludes his report by showing how smokeless combustion of Indiana bituminous coals is possible. The elimination of the smoke nuisance where Indiana coals are used is not only possible but a demonstrated fact.

An Important Coal-mining Decision

SPECIAL CORRESPONDENCE

The Indiana Appellate Court has decided that a property holder is not entitled to damages inflicted on her house and grounds in the town of Linton by reason of coal mines beneath them from which coal had been taken, making the ground sink to the depth of the coal removed. The court said that a mere grant of the coal underlying the surface would bind the grantee to leave enough of it, and put in enough props where the coal was taken out to support the surface. But where the deed to the coal mining company granted all the coal beneath the surface and released it from all liability for damages to the surface, a subsequent purchaser of the surface ground could not collect damages for the removal of all the coal. This case was advanced ahead of other cases on account of the large number of interests involved by reason of similar cases pending in the coalfields.

Coal Mining at Gary, West Virginia

In our issue of July 3, on page 10, the statement is made that the 1907 production of coal by the mines under the management of Thomas Lynch was over 80,000,000 tons. This should have read 18,000,000 tons, or 80,000,000 tons for the five years ending with the year 1907.

There are very few engineers at present who still contend that direct-current is as safe as three-phase current in gassy mines.

The Value of Efficient Engineering in Coal Mining*

BY L. B. ABBOTT†

Coal mining is the most dangerous of all the different kinds of mining. In addition to this, the problems of coal mining are becoming more difficult each year, and these facts, together with the wasteful methods of past years and the keen competition of the present day, have brought operators and managers to realize that there should be efficient engineering methods applied to the planning and development of their properties.

In reporting on an undeveloped piece of coal land, the engineer in his examination, should bring out the following points:

1. Thickness and quality of coal seams.
2. Location and market.
3. Labor conditions.
4. Extent of coal seams.
5. Nature of roof and bottom, and freedom from faults.

With this data available, the engineer can estimate the value of the property and the operator can develop it in a systematic manner. The chemical engineer is necessary in the complete examination of any coal territory. The services of the chemist are also necessary in the future development of the field; his services are indispensable in order to supply the different kinds of trade and to meet successfully certain specifications under which much of the coal today is sold.

Before any permanent devlopment is started in the field, it is important that an accurate survey of the property be made. Many tons of coal have been lost and much money spent in unnecessary lawsuits over encroachments, because of lack of knowledge of the proper mining rights, inaccurate surveys and crude methods of engineering. The property map must not only be a true plan of the underground working, but should also show the outside features, as the two bear a close relation in the working of a coal seam. In large properties, the most accurate results are obtained by triangulation, and this method should be adopted whenever practicable. In the underground work, all rooms and headings should be driven on points set by the engineer. In order to work any coal seam successfully, it is necessary to drive the rooms of uniform width and at certain distances apart, so that the weight of the overlying strata may be distributed equally over the pillars.

Having determined the maximum output desired at the proposed plant, and before actually locating the buildings, it is best to have a topographical map of the proposed site drawn to a large scale. On this map, it will be easier to locate the buildings to better advantage, both as to cost of erection, in which foundations form a big item, and future operation, where time and labor are important, than by locating them on the ground without any prearranged plans.

In designing an opening of the drift or slope variety, the engineer should take into consideration not only the character of the ground in which it is made, but the life of the plant, and it is the latter which should determine largely the material to be used in construction. It is true that a brick, stone or concrete arch opening will have a considerably higher cost than the timbered one, but it will last for all time, and the additional expenditure is more than offset by the lessened cost of maintenance and its safety from runaway trips on slopes, which sometimes cause costly delays from the knocking out of timbers and the resulting falls.

Much care should be exercised in the purchase of boilers for the power plant. In some instances, boilers have been purchased by merely specifying the horsepower desired, a method which has led to the installation of many uneconomical ones. We often see several small units where one large unit could do the work; a low steam pressure where a high steam pressure would have been better; a small heating surface where a large heating surface would have been more economical.

VENTILATION

Ventilation is a factor that has great bearing on the cost of production, as pure air means increased energy for the men who enjoy it; also with good ventilation the danger from gas is greatly decreased. It is also a fact that the most desirable men will not work where the conditions are unfavorable, making it necessary to fill the mine with poor, incompetent and unsatisfactory workmen.

A fan of high efficiency, and a properly designed system of ventilation having been established, the best results will be secured by placing this work in charge of a competent person. In some instances, the quantity of air at the face is not over 40 or 50 per cent. of the air entering the mine. The cause of this in nearly every case may be traced to poorly made, leaky brattices, airways of insufficient area, accumulation of dirt in airways, and the use of trap doors instead of overcasts. If it could be demonstrated to the operator that these conditions all tend to increase the cost of his output, it is possible that he would put this important matter into the hands of a person who could give it constant attention.

In arranging an efficient system of haulage, it is essential to drive the haulage road as straight as possible, using curves of long radii where the direction must be changed, and connecting all cross-headings with curves.

*Abstract of paper read before the West Virginia Coal Mining Institute, Elkins, W. Va., June 1, 1909.

†Chief engineer, Consolidation Coal Company, Frostburg, Md.

Pumping

The installation of a pumping plant should not be made in a haphazard manner, but should be designed by the engineer with a view of being able to cope with the increased amount of water after the coal becomes more worked out. In the problem of pumping, concentration is the only solution. To bring the water to a central pumping plant where the number of pumps can be decreased by using pumps of large capacity, should be the object of a well-planned system of unwatering. To accomplish this, there will probably be considerable money expended in ditching, but the operator who has had a section of his mine drowned out through failure of a pump, or who has been obliged to abandon temporarily certain sections in wet seasons, should realize that this is money well spent. In many instances, it is advisable where operators work adjoining properties, to combine and arrange for the drainage of all the mines by a single system.

An important feature not always observed in buying pumping machinery and other equipment, is standardization. The wisdom of this is apparent to those who have had breakdowns and been obliged to wait for parts to be sent from the factory. The value of adopting standards, making equipment interchangeable as much as possible, cannot be overestimated.

Every operator should have at regular intervals, and at least once a year, statements in regard to the amount of coal worked out and the percentage of recovery. Correct results can only be obtained in these reports, when maps and surveys are accurate. A large output at low cost does not always indicate a good recovery, as it is only from surveys made at regular intervals, followed by calculations of the amount of coal mined, that the manager can tell whether there is a fair recovery of coal, and adopt such methods, when the recovery is below normal, as will prevent waste, with the accompanying danger from squeezes when the pillars are not all removed.

The Reduction of Fires in Mines*

By A. G. Morse†

Means for the control of fires in mines have been a matter of such great importance that much time and money have been expended in the solution of the problem. In the presence of fires, in modern times, the first thought is that water is the one agent at hand and that its application, in abundance, is the best as well as the first hope. In some cases water has been found to be a dangerous agent, as practically its whole volume is reduced to steam.

Some of the disadvantages attending the use of water in fighting mine fires may be summarized as follows:

1. Countercurrents are often established.
2. Cracking of the roof and consequent falls of rock, causing expensive delays and not infrequently, loss of life.
3. Such obstruction of vision of the men engaged in the control of the fire as to render the task most difficult and hazardous.
4. Interference with respiration of the men, sometimes driving them from the scene.

The Use of Chemicals

Perhaps the most scientific method of fire reduction is the use of chemicals. Comparatively few anthracite mines are now without a number of small chemical extinguishers. The ordinary 3-gal. "upset" machine carries water, bicarbonate of soda and sulphuric acid, often called oil of vitriol, mixed in the proportion of 1 lb. of acid and 2 lb. of soda to 5 gal. of water. When the acid is spilled into the soda solution by inverting the machine, a violent chemical reaction takes place, producing a sufficient heat to dismember the soda, free the carbon dioxide, or carbonic-acid gas, and furnish a propelling force for the discharge of the contents of the machine. As there is an excess of soda, that no free acids may escape in the stream, a considerable amount is thrown onto the fire, the heat of which releases the gas where it is needed on the fire.

Thus, with the gas with which the stream is charged, and the refrigerating character of the water, which is the body of the stream, provides a fire-fighting agent of the first quality, many times more effective than plain water. The gas produced blankets the fire, and when the oxygen of the air can no longer reach the material in combustion, the fire is suffocated. Arguing that "if some is good, more is better," some operators in both anthracite and bituminous fields have provided their mines with chemical fire engines (adapted to underground conditions), which have a capacity of 8 gal. in each of two tanks, which are loaded side by side on a mine car. They are connected so that they may be used alternately, providing a practically continuous stream of this effective agent as long as may be necessary.

It has been stated that carbon dioxide, in the presence of intense heat, will give up one atom of oxygen and so become carbon monoxide, more dangerous in the mine chamber than the heavier CO_2, which is about 1½ times the weight of air. This objection has no scientific basis. If any carbon dioxide has been dismembered momentarily, it is again reconstructed; but this dismemberment can take place only in the hottest heat, and then in unappreciable quantities.

Use of Sulphur Dioxide Not Satisfactory

Theorists suggest the use of sulphur dioxide instead of the bicarbonate of soda, because it is practically refuse and therefore cheap. However, the presence of sulphur does not especially hinder combustion, and methods for the production of SO_2 are crude and cumbersome.

Soda, on the other hand, offers no base for combustion, and the comparative cost offers no reason for discarding it on that ground alone. In one of the great mines at Calumet, Mich., a most disastrous fire was brought under control by stopping off the entry and filling the room with CO_2, and the cost was considered so low that that method has been in use there ever since.

The cost of an engine and the necessary chemicals is approximately $1500. Had such an apparatus been used years ago, it would have been sufficient to extinguish fires in some of our anthracite mines, which were finally reduced at a cost of $60,000 or more.

So long as the human element of carelessness, whether stupid, ignorant or vicious, is to be dealt with, just that long shall we have subterranean fires. Every operator who has to endure the affliction should certainly consider the question of a method for the successful reduction of fires, and summon to his aid such scientific results as have been found to be effective and economical.

*Abstract of paper read before the summer meeting of the West Virginia Coal Mining Institute, Elkins, W. Va., June 1, 1909.

†Elmira, N. Y.

Explosions in Switch Boxes

By Sydney F. Walker*

James Ashworth has raised an important point in connection with the recent explosion at the West Stanley colliery. He suggests that the explosion of the hydrocarbon gases and coal dust in the mine, was caused initially by an explosion which took place in a switch box in a pump house, in the neighborhood of the spot where it is agreed the explosion commenced. One of the difficulties in connection with destructive phenomena caused by electrical action is that the cause is nearly always destroyed by the results, and it is difficult to build up the original conditions from what remains. In the collieries of the United Kingdom, it has been decreed by the Home Office that switches in-bye and at distributing connecting points, should be inclosed in gas-tight boxes; notwithstanding this, more than one explosion is stated to have been caused by the ignition of gas inside the supposed gas-tight box.

There are two possibilities here. In the first place it is an exceedingly difficult matter to construct a gas-tight box, and still more difficult to insure that it shall remain so. As mining engineers know only too well, gas will creep through the very smallest capillary aperture, and the provision for opening the box when necessary, also the provision for carrying the cables through to the working parts of the switch and for the handle of

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the switch are all points where it is only too easy to leave capillary spaces and sometimes spaces of even greater size.

One requirement for getting over this part of the difficulty is careful fitting. The boxes are nearly always of cast iron and a warped casting is exceedingly difficult to make into a gas-tight box. India-rubber washers are resorted to largely to make good the failings in the fittings. But india rubber perishes and sometimes the men who go to attend to a switch are in a hurry and cannot stop to make sure that they have left everything quite gas-tight. Further than this, they have no means of knowing if the box is gas-tight. They can only use the means at their disposal, the closely fitting box and the rubber washers when provided, and follow the instructions as closely as they can, and hope that the box is gas-tight, each time they leave it.

Sparking Inside a Switch

But outside of all this, there is another point, that with reference to sparking, which I think Mr. Ashworth intended to suggest. When sparking or arcing takes place inside a switch, or distributing box, gas may be generated from the material of which the insulating envelop of the cables, or the insulating substance employed to mount the parts of the switch, are composed. Under certain conditions, it may easily happen that a spark will pass between two parts of a switch, or between two conductors in a distributing box. And it may also happen, under favorable conditions, that the spark may be pulled out into an arc. We have then the enormous temperature of the arc, within the confined space of the iron box, and we have the insulating substances, which are composed of hydrocarbons, and if sufficient heat is present, they are converted into gas, and again if the necessary quantity of air is also present, as it would be in the ordinary condition of the box, an explosion would follow, followed by flame, and again followed by ignition of coal dust, or the gases of the mine if present.

The same thing has been met with in connection with street cables, and has led to some very serious accidents. My attention was called to the question by the gas engineer of a large city in the North, whose service had been blamed for an explosion, which it was pretty clear from the evidence, was caused by the gassification of the insulating envelop of the cables, and ignition of the explosive mixture so called. The Manchester Corporation had also to foot a rather heavy bill, which arose in something the same way. Gas was formed from the insulating envelop of a pair of cables in the street, a short-circuit having occurred between the cables, followed by an arc, which converted the hydrocarbon into gas. The gas so formed, found its way into a house, and becoming mixed with air, was ignited, an explosion following. Other cases have occurred in some of the streets of London. It appears to me therefore, perfectly possible that some of the hitherto unexplained explosions have been caused in this way.

It should be remembered, that if two conductors, between which a certain difference of pressure exists, come into contact, and are then either pulled apart, or burned apart, an arc is liable to be formed, with all the disastrous results that follow.

Colliery Notes

In the North Wales district, the complete returns from each colliery show that during the year 1908, the number of shots fired totaled 3,378,049; the quantity of explosive used was 1,262,735 lb. The whole of the shots were fired by electricity, with the exception of about 60,000, where ordinary gunpowder fuse was used.

The great saving that comes from properly preserving mine timbers does not result so largely from the prevention of decay, as it does from the elimination of the high labor cost of replacing timber sets. Only about one-fourth of the total cost of mine timbering goes for wood, while the remaining three-fourths represents the cost of framing and installing.

There is no longer any question in the minds of well informed coal-mine superintendents, as to the advisability of adopting careful methods for the preservation of mine timbers. An interesting point in this connection is the spread of decay in old workings, caused by infection from nearby timbers. A fresh green post, placed between two props that are already infected, will become sick and decay more easily than if it were isolated. This timber contagion is similar to that of the ills of man, only it works more slowly.

It is practically impossible to provide any rule that will determine whether an electric shock will prove of no consequence, or whether the result will be fatal. Much depends on the individual. It is advisable, therefore, to provide so far as practicable, that no shock shall be received at all. Under normal conditions, all voltages above 150 direct current or 125 alternating current, may be dangerous to life. One authority suggests that in order to provide against the failure of any insulating covering, this latter medium in turn should be inclosed in a metallic sheath which is prevented from becoming alive by being permanently and effectively connected to earth.

Much good might result to mining men in the United States, if they would study the methods of the "Miners Relief Societies" that operate in the different coal-fields of Great Britain. Some of these societies date their origin as far back as 1873. The Lancashire Miners' Relief Society has completed 36 years good work. This society started with a membership of 10,424 and at the present time has an enrollment of 55,444 members. It is interesting to note, from the figures of the Lancashire Society, that in the year 1893, the proportion of accidents per 1000 members per annum was 127; in 1897, the proportion had increased to 184; in 1908, the proportion of acidents per 1000 members was 240. These figures are surprising as they indicate a gradual increase in mine accidents, so that at present, one miner in every four employed, sustains some sort of an injury. In the face of these facts, it is useless to contend that the risks attending coal mining are only normal.

A mining engineer in South Africa has recently constructed a device for automatically registering signals given in the shaft and in the engine room as well as the travel of the skip or cage. The records are obtained by means of a specially constructed clock between the face of which and the mechanism is fixed a cylinder about 6 in. in length by 2 in. in diameter. A paper band, sectioned into time spaces, is placed over the cylinder, and a small disk recorder with a separate needle attachment is adjusted in close proximity to one side of the cylinder. The disk and needle are both operated electrically, but separately. The disk which records the cage journeys is brought into contact with the sectional paper on the cylinder by means of a small motor driven from the winding drum, marking a line on traveling paper as long as the drum is in motion. When the drum ceases to revolve the contact is cut off automatically and the disk is raised from the paper, which continues to travel without being marked until the drum commences to revolve anew, when the process is repeated. The signal registrations are attained by means of a separate wire connected with the signal bell. Immediately a signal is given, the needle is simultaneously projected upon the traveling cylinder barrel and perforates the paper, the perforation being repeated each time the bell is rung. The time sectional paper thus records each and every signal given, and the times at which they occurred. The clock and registering apparatus is inclosed in a glass case which permits observation of the movements to be made when desired. A separate instrument is, of course, required for each engine. The machine need not necessarily be placed in the engine room, but in any place which may be deemed convenient, such as the engineer's or manager's office; it is only a matter of wire connection. With a recording machine attached to each winding engine at work, at the conclusion of every shift the whole of the work is perforated, *i.e.*, every journey made and every signal given during the shift can be read off the register and logged. No room for dispute is left.

Hunting Metals for Their Hides

By Hiram W. Hixon*

The condition of the copper industry at the present time reminds me of the days when the hide hunters on the plains pursued the bounding buffalo with relentless industry. It was customary for a skilled hunter to follow a herd for days and kill the stupid beasts as fast as he could load and fire and sneak up for another shot. The skinners followed the hunter and removed the hides and allowed the carcass to remain a festering prey to the overfed coyotes and vultures.

The inexhaustible, countless multitude of buffalo quickly became the inexhaustible supply of bleaching bones on the boundless prairie, and when I saw the plains for the first time, in 1873, the principal industry west of Topeka seemed to be hauling in buffalo bones to the Kansas-Pacific for shipment to the fertilizer factories in the East.

Hide Hunting in the Copper Industry

The point in common with the copper industry at the present time and, in fact, with the metal industry generally, is the exhaustion of great natural resources without adequate compensation. Outside of the iron industry there are not a dozen metal mines in the world that have an ore supply that will last 20 years at the present rate of production, unless new discoveries are made. According to the testimony of the president of the Calumet & Hecla Mining Company, given in a suit with the Bigelow crowd, to restrain them from controlling the Lake copper mines, it developed that the Calumet has only ore enough to last 15 years. This is one of the mines that, like the buffalo of past memory, has been supposed to be inexhaustible.

The Meat and Bones of Butte

The Butte mines have been producing copper for about 25 years, and, at the present rate of exhaustion, if they last 20 years more it will be because of the difficulty of getting the ore out from around the numerous mine fires that have been smouldering there and spreading over a larger area from year to year. When the fire started in the Anaconda mine in 1889, the mine was filled with water, after it had stood in that condition for a time thought sufficient to put the fire out, the water was pumped out and in a short time it became evident that the fire was burning again and filling the mine with sulphur fumes.

The plan of [illegible] the workings and [illegible] the burning zone has been followed since with the result that it has been necessary, especially, to shut down the [illegible] and do a great amount of difficult and expensive work before mining operations could be resumed. There are two or more fires of the same nature in the Butte mines at the present time, and it seems that the ultimate fate of Butte is to extract the copper from the veins and old workings by means of mine fires and water poured down through them and pumped to the surface to have the copper precipitated on scrap iron.

A Notable Water Lease, a Mine Fire and a Fired Chemist

In 1893, Marcus Daly gave a lease on the mine water of the Anaconda and St. Lawrence mines and at that time there was not much copper in the water. A short time after the leaser had constructed his boxes for precipitating the copper from the mine water, Mr. Daly started diamond drills boring holes down through the hanging-wall of the Anaconda vein to run water from the surface to the mine fire, in hope that they by that means would put it out. During the four years that the fire had been burning, a large amount of sulphides had been roasted and when the water was started down through the drill holes, the leaser of the mine water found himself suddenly flooded with strong copper solution, to such an extent that his plant was unable to handle it for a time, or thoroughly precipitate the copper.

The leaser, being a man of sporting tastes and suddenly flushed with money, proceeded to buy diamonds and race horses and all the other things that he thought money was meant to buy. This was too much for Mr. Daly and he took counsel of a young chemist in his employ as to the best means of reducing the copper contents of the mine water before it went to the pumps. He was advised to make a large chamber at the bottom of the mine and in it to put a series of boxes containing scrap iron and run the water through these before it went to the pumps.

Naturally, the effect on the finances of the leaser was immediate, and he brought suit against the Anaconda company and received judgment in some thousands of dollars in due course. The young chemist was rewarded by being fired for getting Daly into trouble, so the story goes, and then all was peaceful again. This last bit of the legend may not be strictly true, but it isn't it ought to be, for so many other things equally absurd were true.

Value of the Tenderfoot

But to go back to days of the buffalo, for I wander from the point. Before the days of railroads in the West it was the custom for a man who desired to go anywhere to get in the road and simply walk if he could not afford to ride. As a consequence, he frequently arrived at his destination [illegible] with his feet in a tender condition. This gave rise to the expression, "tenderfoot," as meaning a person who had but recently arrived from the East. It was a term of derision and was freely applied to the recent arrivals in new mining camps. Owing to the "petering out," or rapid exhaustion of most new camps, it came to be recognized that one of the easiest ways of making money was to sell prospects, called mines, to the tenderfoot. In recent years this has been changed to selling mining stock to the tenderfoot in the East, by this means saving his feet, but also depriving him of the experience to be gained by their liberal use.

Value of a Mining Stock

It has come to be recognized by men of experience that a mine is of value only so long as it can be made to yield a profit, and also that a worked-out mine is of no more value than any other hole in the ground. Mines that have 10 years' ore supply ahead of them are exceptional and, speaking generally, should yield not less than 15 per cent. per annum on the investment in order to repay capital with interest during the life of the ore supply.

Taking the stock-market prices of shares in copper companies, how many of them will repay the capital with interest during the life of the ore supply? Amalgamated at 80 pays 2 per cent., and may, at the present price of copper, earn 4 per cent. Divide 15 per cent., which the stock should earn, into 4 per cent., which it does earn, and we get $26.66, as the value of the shares, assuming the life of the mine to be 10 years, and the present price of copper as being the average price for that time.

There are several conditions in this supposition which are likely to be upset and, as a consequence, the value placed on the shares may be more or less than their actual value. The cost of producing copper is fixed at about 11c. under Butte conditions. When copper sells at 15c. the producer makes twice as much money as when it sells at 13c. Doubling the profit in the case of Amalgamated would yield 8 per cent. on the investment, which is only about half what a mining stock should yield. At that rate of return it would require to double the profits twice, or make four times as much as at present, which would make it appear that when copper is selling at 10c. Amalgamated shares are worth par, or $100. It looks as if the tenderfoot was paying a lot for his experience in mining in Wall Street.

Gamblers and Tenderfoot Investors

People in mining towns like Butte would naturally be supposed to be good judges of the value of mines and mining stocks, but history does not bear that out. They play their own game, just as a faro dealer will often blow in his own wages against the game when he is off shift.

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There is a story of a faro fiend illustrating this point. He came to a town where he had a friend who was "wise" to all the brace games in that particular town. Mr. Faro Fiend lost his friend for a time; when discovered he was playing a game that the "friend" knew to be crooked. Said the "friend:" "Why are you playing that game? Didn't I tell you that it was not on the square?" To which Mr. Faro Fiend replied: "I know it, but it's the only one in town." This story illustrates the attitude of the average citizen of a mining town and explains why when copper is up and copper shares are booming they are prosperous, and when the reverse comes they are all poor. Measured by their earnings and the necessity of paying back the price of the shares within the life of the ore supply, as well as the interest on the capital for the time employed, mining shares are, as a rule, the poorest sort of investment. This condition of affairs is due to the fact that the average tenderfoot mine investor in Wall Street and, in fact, all over the world, treats income from ore mined as if it were all earnings, whereas in 99 cases in 100 the dividends declared never equal the price of the shares, not to mention their par value.

The optimism born of inexperience, that the deeper mining is carried the richer and larger will be the orebodies in the particular mine in which the tenderfoot has shares, is responsible for his willingness to buy Amalgamated and all other shares of a similar character on a 2 per cent. basis. One can get good railroad bonds below par that pay 4 per cent., and in times of panic good securities that pay 7 per cent. sell as low as 80 per cent. of par. Notwithstanding these facts, the lure of mining stock is strong upon the mind of the tenderfoot investor, and before his feet get hard from chasing the pot of gold at the end of the rainbow he gets many a long wait for the return of his capital and many a hard fall with nothing softer than assessments to light on at the bottom of the pit. I ought to know, for I own some myself. Mining men are not responsible for this condition of affairs. It rests entirely with the promoters and the gullible public who back their own judgment as being superior to the accumulated experience of men in the business of mining.

It is a well known fact that shares of small par value, say $1, are more readily salable, even in large sums, than shares of $100 par value. This is an illustration of the fact that if you wish to catch small fish the bait must be made small enough so that they can swallow it easily.

Conservation of Natural Resources

We have recently heard a lot about the conservation of natural resources and a chill is beginning to run up and down our spines as to what posterity is going to do for coal and iron and copper and lead and zinc, etc., after the present prodigal generation gets through squandering the stock on hand. Just at present we are hunting metals for their hides, so to speak, and the time may not be far off when neolithic man will make his reappearance on earth. Copper and all other metals are being sold at a ridiculously small profit to the producer, and if there is no other restriction to be placed on waste, then the restriction of higher prices ought to be. The treatment of the large accumulation of tailings at Butte and Anaconda by leaching will in a few years be profitable, owing to the partial oxidation of the sulphides, and this illustrates the hide-hunting principle practised at Great Falls, Mont., where all tailings are swept away by the river. When they go into the river they contain as much copper as many of the ores mined in the Lake Superior region, and if properly stored would in a few years yield a large portion of their copper contents at a small cost.

Selling Copper

When there is a large number of producers all trying to sell their copper independently of each other, it results in competition and price cutting and wider fluctuations of prices than when the copper is marketed by fewer sellers.

This tendency to have common selling agents has been developed to a point of practical monopoly by agreement among the several agents, and, for some time past, the metal quotations on the New York market have been simply the price at which the agents agree to sell.

Signs of friction and disagreement have recently become apparent, and the announced intention of Amalgamated to enter the field of the American Smelting and Refining Company indicates that it is war to the knife over the selling of the copper produced by the Smelting Company and its allied mining companies. Apparently the Amalgamated, through its selling agents, wishes to be able at any time to advance or break the price of copper for the sake of the effect it might have on the price of copper shares.

Since the Smelting company is rapidly becoming a large producer of copper, it threatens the supremacy of Amalgamated in that respect. This may or may not be the motive behind the International Smelting Company, but any person who is up on the history of the American Smelting and Refining Company knows that it has only recently dismantled several plants in the West and also that there are more plants than there is ore to smelt. It is quite evident that the business is not so flourishing that a new competitor is going to have a rosy time of it.

No one has yet written a book to prove that the Amalgamated people are a lot of frenzied philanthropists, and it is not doing justice to their business ability to think that they would be content with a beggarly 2 per cent. in dividends on the stock when they might rig the market by manipulating the price of copper and the shares so as to sell the shares when the price of copper is high and buy when they have put the price of copper down a few points.

I should like to know what sort of chance the tenderfoot mine investor would have against such a combination as that. No more than an oyster would have against a dredge! Any security or stock in any company that depends upon the mining and smelting of ores for its income is bound to be highly speculative.

The cyanide process has cut the heart out of the smelting business by taking away the margin on silicious ores and the price of silver is so low that the production of ores has greatly diminished. As a result of these conditions it is difficult to see how two smelter trusts are going to make a living unless they divide the atom and pay dividends in electrons.

[There is a lot of sense in what Mr. Hixon says in this article, and the tenderfoot, squanderer, etc., may read his semi-humorous remarks with profit if they will but reflect upon them. However, Mr. Hixon is a little confused in his ideas about the selling of copper, the ability of the Amalgamated or anyone else to control the price, or the existence of any agreement among the selling agencies, either now or at any time.—Editor.]

The Australasian Institute of Mining Engineers

This society held its first general meeting at Kalgoorlie, Western Australia, May 26-28. The meeting was successful, over 100 members being present, and there were several interesting discussions. The address of the president, Richard Hamilton, was devoted chiefly to the development of mining at Kalgoorlie. Among the other papers read were, "The Disposal of Residues at Kalgoorlie," by H. Adams; "The Geology of Kalgoorlie," by C. O. G. Larcombe; "Some Geological Considerations Relating to Western Australian Mineral Deposits," by A. Montgomery; "Modern Methods in Mining Surveying," by H. W. Gartrell; "Notes on Different Methods of Stoping in Use on the Kalgoorlie Field," by J. Cheffirs; "Treatment of Sulphide Ores in Victoria," by S. Radcliff and J. Drevermann; "Economic Geology of New Zealand," by J. McIntosh Bell; and "Nomenclature of Shoots," by W. C. Walworth Pearce.

Visits of inspection were made to the principal mines and reduction works of the district.

The Institute has established reciprocal corresponding relations with the Institution of Mining and Metallurgy, London, the Canadian Institute of Mining Engineers and the Chemical and Metallurgical Society of South Africa.

Non-Metallic Minerals in the Philippine Islands*

Coal has been found on nearly every island of the Archipelago, in many places associated with petroleum, and is of very much the same character throughout the Philippines. It is sub-bituminous with the appearance and specific gravity of lignite, but has the low carbon content and streak of a bituminous coal. That coal which is mined from beds near the surface is inferior, having only 50 per cent. of the efficiency of Australian coal, but in the Comtpostela, Danao, and the western end of the Batan island coalfields, a much better grade is found. The coalfields which at the present time seem to give promise are as follows: Cebu, in the region behind the towns of Comtpostela and Danao, the Island of Polillo, on the east coast of Luzon about opposite Manila; the southern portion of the Island of Mindoro, near Bulalacao; a small island just south of Bulalacao; Vapan island, about 12 miles northeast of Legaspi in Albay province; the northern portion of Dinagat island, just north of Surigao, Mindanao; and near Escalante, in the northeast corner of the island of Negros.

Experiments conducted by Dr. Cox, of the Division of Chemistry, seem to indicate that these coals are of a satisfactory character to be utilized for gas producer engines.

As stated above, petroleum is often found associated with coal. The localities in which petroleum has been found in appreciable quantities are on the east coast of Tayabas province, where prospecting is now going on, on the west coast of the island of Cebu near Toledo, and also near Alegria. The Cebu field seems to be the most promising, but geological conditions have not been investigated to a sufficient extent to judge of the commercial value of the district. In Rizal province and on the island of Marinduque a small amount of natural gas has been detected.

Materials of Construction

The raw materials from which cement is made, limestone and clay or shale, are found in considerable quantities and in close proximity to each other at a number of places on the islands. At Danao, Cebu, good limestone, clay and shale are found close together and transportation facilities are good. Cotabato, Moro province, is well situated for a cement plant. At Binangonan, on Laguna de bay, near Luzon, Luzon province, and on Romblon island, all the ingredients necessary for the manufacture of cement are found. The cement used in the Philippines is re[illegible] to be imported, and on this account it particularly suited for the manufacture of cement.

The Manila supply of lime comes from two sources, the limestone quarries near Binangonan, and from oyster and other marine shells near Malabon. The annual output of the Binangonan quarries is about 600 tons, nearly all of which is shipped to Manila in a water-slaked condition. This lime is very fat and swells to about three times its original volume in slaking. About the same amount of lime is burnt annually at Malabon, but this is of a poor quality and commands a lower price in Manila. Binangonan slaked lime fetches in Manila about $0.60 per cavan, (about 80 lb.) the Malabon line only bringing about $0.35 per cavan. The greater portion of both of these varieties is used in the making of motar.

Practically all the marble produced on the islands comes from Romblon, and this is not well adapted to the finer grades of work, being of a rather poor quality. A great deal of marble is imported from the United States, Belgium and Italy. There is at present no good-quality building stone on the market in Manila. Volcanic tuff is chopped out by the natives and used, more on account of its cheapness than for any good quality. It is very soft and has small crushing strength.

Other Minerals used in the Industries

A number of occurrences of the non-metallic minerals used in the chemical trades have been reported from various portions of the islands, but on account of the inaccessibility of most of these localities little development work has been carried on to prove the deposits. Gypsum has been reported from several localities; one deposit in the Loboo mountains, east of the town of Batangas, appears to be quite promising. Sulphur in small quantities has been found on Leyte, Mindanao and Luzon practically wherever there has been any recent volcanism. It is needed for the manufacture of paper, but as yet no commercial deposits have been located.

Hot saline springs are known to exist at Maimit, near the town of Bontoc, at Asin, near the boundary line between Lepanto and Nueva Vizcaya, and near the town of Bambang in Nueva Vizcaya. These springs would seem to indicate the existence of natural salt deposits.

Some yellow and red ochre is found in Ilocos Norte and in many other places throughout the Archipelago. A fair quality of scrap mica and actinolite, greenish in color, also is found in several localities. This mica might be used in the paint trade or for the manufacture of micanite. Some asbestos is also reported from Ilocos Norte, but the extent of the occurrences does not seem to be great. Some promising specimens of chrysotile have been received but the major portion of the asbestos so far found is an amphibole, anthophyllite, or fibrous serpentine.

In Ilocos Norte nodules of manganese ore are found scattered all over areas of ground and in some places in depressions between hills, they are concentrated to a thickness of over a foot. These deposits are essentially blankets of natural concentrates. Some other manganese ores have been found in places in the islands, but as yet none of the deposits have proved of any commercial value.

Fertilizers

No phosphate rock is found in the Philippines, but in nearly every extensive cave a dirty coarse granular soil is encountered on the floor, varying in depth from a few inches to several feet, and sometimes to the extent of a thousand tons or more in one deposit. This is a bat guano. The island Marinduque is said to have many caves containing such deposits.

* Condensed from "The Mineral Resources of the Philippine Islands," by Warren D. Smith.

Mining Costs and Profits on the Witwatersrand

Special Correspondence

Critics of present mining policies on the Rand are so frequently heard to deplore the practice of "making a fetish" of low working costs that the impression has become rooted that the improvements claimed for 1908 have been more apparent than real. During the period, average working costs were reduced from 19s. 9d. to 17s. 2d. per ton, and the yield from 31s. 11d. to 29s. 7d. per ton. Thus the profit per ton has remained practically constant. On the other hand, the return of confidence in financial circles and the arrival of more settled political conditions has enabled fully 90 per cent. of the companies to increase their tonnage. The aggregate tonnage milled has been increased during the year by 200,000 tons per month, 46 out of 62 representative mines recording a higher capacity today than a year ago. The total net profits have been augmented at the cost of comparatively small outlays on capital expenditure owing to improvements in metallurgical systems.

In making these broad comparisons, however, it is necessary to consider that six new producers are included in the list. These companies on account of the low grade of their ore and high costs, owing to the usual difficulties of initial operations, give the general average for the Rand a less favorable appearance. The results of these mines for January were as shown in the accompanying table.

Mine	Stamps Working	Tons Milled	Yield
Aurora West	60	10,332	£11,478
Geduld	50	10,120	13,848
Main Reef West	40	6,696	8,000
Jupiter	90	15,872	19,268
Simmer Deep	190	40,093	40,113
West Rand Con	80	17,500	23,146
Totals	510	100,613	£116,148

The average yield is, therefore, only 23s. per ton of ore milled.

Considering the old producers alone, working costs have been reduced 18 per cent., bringing large tonnages of ground formerly unpayable within the limit of payability. The profit per ton has actually been increased by from 6d. to 1s. per ton. In certain instances the call for reduced expenditures and the establishment of unfair comparisons may have led to abuse, but reviewing the industry as a whole the "fetish of low costs" has produced results satisfactory for every point of view.

The reduction of costs, roughly 3s. per ton, has been brought about primarily by the increased scale of operations. The relation between higher capacities and lower costs can be traced from an analysis, given by W. W. Mein in his presidential address before the Mine Managers' Association, in which he showed that the companies increasing their capacity over 10 per cent. decreased their costs 16 per cent.; those increasing under 10 per cent. decreased costs 9 per cent.; those showing no change in capacity decreased costs 6 per cent., and those with lower capacities increased costs 6 per cent.

Analyzed according to the cost of labor and stores, a saving of from 1s. 6d. to 2s. per ton may be credited to the former item and 1s. to the more economical use of the latter. With the exception of dynamite, the cost of which has lately been reduced owing to trade competition so as to result in a saving in explosives costs of nearly 2d. per ton of ore mined, there have been no substantial reductions in the price of stores. Therefore the lowering of costs must be almost entirely attributed to improved working efficiency and to a better return from labor for the high rates of pay still ruling. The ore produced per white man underground has risen from 2150 to 2350 tons per annum. Since the strike the standard of underground control and organization has been greatly elevated, and well trained technical men are now in charge where previously work was under the tyranny of rule of thumb.

Although the strike ended decisively against the men, it is satisfactory to perceive that recent economies have been effected without inflicting injuries upon the wage earner, who, indeed, still commands a higher pay than is obtainable in almost any other mining field. At the same time he works under immeasurably less risk of unemployment, resulting from such menaces as metal market collapses, mine failures, seasonal interruptions or the disturbances created by aggressive trades unionism, than is usual in other regions. The earnings of machine men (day's pay and contract) still average 29s. per shift, and of hand stopers and developers 20 to 22s. On the tonnage basis, however, total wages of white and colored men, now amount to roughly 11s. per ton milled as compared with 13s. for the previous year.

Power at Cobalt

SPECIAL CORRESPONDENCE

An interesting phase of the situation in Cobalt at the present time is the question of power, and several companies have been formed to supply air and electricity on a large scale to the mines of the district. It is believed that this will mean a great saving as the present price of steam-generated power is very high. This is due largely to the high price of coal which averages about $5.50 per ton on the cars at Cobalt. It is difficult to obtain reliable figures on the cost of power in the camp, but it is estimated that it will run from $125 to $175 per horsepower-year, while the general average will probably be above the $125 mark. The advent of the power companies into the camp is being followed with close interest as the rates they offer are expected to greatly reduce working costs.

A company that is attracting a good deal of attention at the present time, is the Mines Power Limited, which is now installing a plant. This corporation has been financed by Montreal capitalists and the head office of the company is in that city. The capital is $3,000,000, and, as this sum has been advanced by the promoters, there is no stock or bonds on the market for sale. The president is E. A. Wallberg and F. J. Bell is general manager.

The power house will be situated on the Matabichewan river close to Lake Temiskaming, about 25 miles from Cobalt, and the company has obtained the right from the Government to dam up the waters of the lakes above the falls, if they see fit, to supply sufficient storage capacity in case the water in the river should fail. The dam above the power house is being built of solid concrete and will have a length of 800 ft., and a hight of 45 ft. There will be two 5-ft. steel penstocks while the working head will be 312 ft. It is estimated that a total of 15,000 h.p. can be generated.

The power house will be a solid concrete building, 40x90 ft., and will be fitted with traveling cranes. At present there are four separate generating units being installed, each being rated at 1875 kw. with a large overload capacity and provision is being made for extensions to the power house equipment. The units that are now being installed will, however, supply the present requirements of the district. The generators are 3 phase, 60 cycle and 2300 volts. The wheels are spiral-case turbines with a capacity of 2750 h.p. each. These will be directly connected with the generators. There will be two exciter units each with a capacity of 100 kw., and each exciter will be directly connected to a water wheel. To insure perfect regulation, high-power governors are being installed. The step-up transformers are also of the 3-phase type and there will be four in the continuous service, with an extra for use in case of accident. These transformers will increase the pressure to 44,000 volts. Two separate 3-phase transmission lines are being constructed, each having a separate circuit. Aluminum is being used for the conductors and these will be supported by high tension porcelain insulators.

The right of way is being cut 100 ft. wide through the woods and all high trees on either side in close proximity removed. For the delivery of the power, three substations will be built. One will be in South Lorrain with a capacity of 1000 h.p., one at Kerr Lake with a capacity of 2500 h.p., and the other at Cobalt. These stations will consist of three-phase step-down transformers with the usual lightening arrester and switchboard equipment. The distributing system from the different substations will be 3-phase, 60-cycle, 2200 volts. At the Kerr Lake and Cobalt stations there will be electrically-driven compressor plants with spare units. At Cobalt the plant will consist of three direct-connected, motor-driven, three-stage compressors, each having a capacity of 4200 ft. of free air per min. The plant will have extra large intercoolers. The air will be delivered at 100 lb. pressure, through radiation pipe lines from the central station to the surrounding mines, and will be sold to the consumer on a meter basis.

On the upper lakes, dams are now being built while on the power house and the concrete dam there is a force of 400 men employed. On the right of way, three separate gangs are at work. The whole plant consists of practically duplicate units and every precaution is being taken by the company to insure continuous service. It is expected that power will be ready for delivery by September 30.

This company intends to extend its transmission lines to Elk lake and Gowganda. It controls the Kakake water power, on the river Quinze, estimated at 40,000 h.p., which is being held in reserve for development as the market extends.

In the stope-drill competition being held at the Cason, Crown Deep, Robinson Deep and Village Deep mines on the Witwatersrand all the machines change from face to face so that each will in turn be run by all the operators in the employ of the committee managing the contest. According to the *So. Afr. Min. Journ.*, June 5, 1908, the Murphy, Wough and Westfalia drills have decided to withdraw from the contest. At the close of the day shift May 25 (the competition was recommenced May 10) the average footage per shift drilled by the leading machines was: Holman 2.8 m. (9.2 ft.), Holman 2.5 m. (8.2 ft.), Siskol 4.7 m. (15.4 ft.) and Chersen, 4.3 m. (14.2 ft.).

Mining in Siberia

SPECIAL CORRESPONDENCE

The reports of the Orsk Goldfields Company, Ltd., and of the Troitzk Goldfields Company, Ltd., which have recently been issued in London, give some information as to gold mining in Siberia. Both companies started life some two years back as flotations of the Siberian Proprietary Mines, Ltd., and all three companies won notoriety on account of the extravagant reports that were made about their value. The financial and social standing of some of the directors led to a large demand for the shares by the public, and a good deal of good money was exchanged for worthless or next to worthless paper. The Siberian boom did not last long. The properties did not return the profits which were expected and the value of the shares suffered a heavy fall. Operations have so far been carried on at a loss. Since the formation of the companies several changes have been made in the directorate and a serious attempt is now being made to make the mines a success. The Orsk company has surrended its lease of the Orsk mines in the Orenburg district, but holds 11 alluvial claims on the Suvunduk river, covering an area of 2416 acres. "These claims," the report says, "are being economically prospected and a full report as to their value will probably be received before the end of the present year, when the board will be in a position to decide whether the results are sufficiently satisfactory to justify the exploitation of the property on a large scale." A paragraph of this character will hardly be considered very encouraging. It is, however, satisfactory to find that the directors are dealing with the property in a business-like manner and no longer misleading the shareholders by holding out prospects of profits which they are unable to realize.

Since the last report a new alluvial property in Eastern Siberia has been acquired on lease, which has been favorably reported on by C. W. Purington. This property is situated in the Coastal Province of Eastern Siberia, 50 miles northwest of the town of Nikolaievsk. The alluvial claims lie along the river Kolchan. The gold reserves in Mr. Purington's report are classified under three headings, namely, positive reserves (which might otherwise be termed gold in sight), probable reserves and possible reserves. The positive, probable and possible reserves are estimated to have a total gross value of £1,207,000 and a net value of £707,000. The net profit from the positive reserve is estimated at £85,000.

Some dredging has been done by primitive methods and an up-to-date plant is expected to be in operation about the end of July, 1909, to which Mr. Purington expects to get a net working profit of from £15,000 to £17,000 during the present season. The capacity of the new plant will be over 2000 cu.yd. per day of 20 hours. The yield is estimated at 1.60 rubles per cubic yard. It was at first proposed to install a dredge, but this method of working is to be postponed until fuller information as to the value or nature of the deposit has been obtained from the sluicing operations. The net loss incurred in working the Orsk mines has amounted to £112,279. These mines, as mentioned above, have been abandoned and the company is now looking for its profits from the alluvial deposits that it has leased.

The Troitzk company is working a mine in the Kotchkar goldfield, province of Orenburg. The report for the year ending Jan. 13, 1909 (Dec. 31, 1908, Russian style), says that during the past year 20,618 short tons were mined and milled, yielding gold to the value of £16,199. From the treatment of tailings and concentrates a further gold production of £6302 was obtained. On working account a loss amounting to £679 was incurred, or adding depreciation and London administration expenses, a total loss of £8424. During the year 3851 ft. of development work was done. The deepest point reached in the mine is 564 ft. The 500-ft. level on the main lode was established about the middle of the year, but owing to the bad ground encountered in sinking the main shaft and in cutting out the station at the 500-ft. level, driving on the course of the orebodies was not commenced until September last. The ore reserves developed above the 500-ft. level amounted at the close of the year to only 5900 tons of an average value of 11.50 roubles (24s.). At the end of May the reserves were increased to 21,710 tons, valued at 16.2 roubles (34s.).

A new reduction plant consisting of six Chilean mills, together with cyanide works and a power plant, has been erected and it is hoped to commence permanent running about the end of July. It is expected that the new plant will deal with 4000 tons a month at first, but later with a larger tonnage. Last year the working costs, including development redemption, were 10.82 roubles (23s. or 5¾ dwt.). The manager, H. C. Bayldon, hopes, however, to reduce this cost when treating 4000 tons per month to 15s. (3¾ dwt.). The company has borrowed £30,000 from the parent company, the Siberian Proprietary Mines, Ltd., and has been promised a further loan of £10,000, which amount appears to be still required to make the company self supporting.

As pointed out above, the promotion of Siberian mining companies has not been a creditable business, and has resulted in a heavy loss to those who listened to the plausible arguments put forward two or three years back by those interested in the sale of properties. The reasons why the goldfields had not been previously exploited with success were several and were referred to last year in the JOURNAL of June 16. The difficulties of communication which the new Siberian railway was to a great extent to remove; the absence of local capital, the Russians and inhabitants of Siberia having lost all their money in the war with Japan—such arguments as these were sufficient to make it almost a certainty—according to company promoters—that an investment in the country would be a brilliant success. Two years have passed and two of the principal companies have to tell their shareholders that the operations, commenced with so much flourish, have resulted in a loss.

Siberia no doubt contains rich goldfields, but, as in other parts of the world, the establishment of successful mines requires a large amount of hard work, careful investigation, scientific development and skilful management. Companies which expect immediate returns and no difficulties, as appears to have been the case with those floated during the Siberian boom in 1905, are likely to meet, as indeed has been the case, with disappointment.

It is perhaps too much to expect that the public will profit by the experience of the victims of this Siberian boom. On the next discovery or reported discovery of mineral wealth in some out-of-the-way corner of the globe—it must be inaccessible or it would meet with proper exposure—there will again for a certainty be numbers of foolish people ready to believe what the imaginative and not always too scrupulous company promoter chooses to tell them. Whenever there is mystery the company promoter is ready to make money out of the simple and avaricious. Inaccessible mines in central Africa, gold in sea water, sunken treasure ships, radium mines and such like schemes form the material that lends itself to the production of booms. They all have their turn and invariably end in disaster for the speculator as has been the case in the Siberian boom. But it is right to call attention to these, if the result is only to save a few persons from losing their money when the next boom comes along.

According to A. H. Brooks, of the U. S. Geological Survey, in the whole Territory of Alaska, covering nearly 600,000 square miles, there are but 452 miles of wagon road, 397 of sled road, and 255 of improved trail. A few railways have been built, but the total present mileage is little more than 300 miles, and parts of this are out of repair and not in use. About 50 miles of track were laid in 1908. The steamboat service is being gradually improved, and military telegraphs, wireless stations and long-distance telephones are helping the mining industry, but these facilities must be regarded simply as adjuncts to a good system of railways.

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British Coal Mining Troubles

It was hoped that the settlement reached by the Welsh coal mines and operators would end the labor troubles in the British coal trade, but that has not been the case. The Welsh difficulties arose from the adjustment of conditions resulting from the new eight-hour law, and were settled by a compromise at the last minute, almost, after the conciliation board had failed to bring about an agreement. This being out of the way, however, another controversy has arisen, which may result in serious trouble.

The Scotch coal miners have been working under an agreement whereby wages were adjusted from time to time, according to the price of coal, the settlements being made by a committee of operators and miners. Under this scale the minimum wage for miners was 6s., or $1.44 per day; and for some time past this minimum has been the ruling wage. Recently the operators submitted a new proposition, claiming that under the present conditions they were unable to pay even this minimum and cover their expenses. The coal trade has been affected by competition and by the depression in the iron trade, so that prices realized are now very low. They, therefore, asked the miners to accept 5s. 6d., or $1.32 per day, a reduction of 6d. from the present minimum, at least until conditions improve. The miners have positively refused to accept this reduction, claiming that the 6s. represents the lowest "living wage."

A deadlock exists, therefore, and the Scotch miners have appealed to the Miners' Federation of Great Britain. The officers of that body have failed to reach any agreement with the coal operators, and have decided, under the rules of the organization, to submit to all its members the question whether a general strike shall be ordered to support the demands of the Scotch miners. A ballot is now being taken, nearly 1,000,000 members of the Federation being entitled to vote; the result has not yet been ascertained.

A strike of the Scotch miners alone would be of comparatively small importance, as it would affect only a minor part of the British coal trade, and even local demands could be easily supplied from other districts. A general strike, however, would result in a general disturbance of trade of the utmost importance, and add seriously to the depression already existing. It seems to be generally expected that the Miners' Federation will support the Scotch workers, and strong efforts are being made to induce the Scotch operators to give way. Their case seems to be a hard one, if their representations are correct.

Mining as an Investment or as a Gamble

We feel some hesitation about so often decrying the inducements that are held out to lead investors into mining enterprises. We should not do so did we not think it to the advantage of the real mining industry to have a correct understanding of the conditions. This is distinctly to the advantage of the engineering profession and the class of operators who are engaged in serious mining, who are the members of the mining industry that we specially represent. They and we are anxious to see mining regarded in the same way that manufacturing and real estate enterprises are considered, conducted and valued. We want to see the elimination of the irresponsible and ignorant promoters, fakers, and visionaries. If the public does not squander its money among them there will be more for legitimate purposes.

The offerings of mining investments to the public may be classified under five heads, as follows:

1. Developed mines, whereof the orebodies actually disclosed, promise definitely a return of the principal and an adequate interest (at least 6 per cent.) upon it in the meanwhile, the data as to ore reserves being furnished by engineering reports of the highest character. Individuals or small partnerships are seldom able to afford the expense of developing such properties, or the engineering advice that is required, and in performing those things the development companies and banking houses perform a useful function for which they are legitimately entitled to a profit.

Mining investments offered under such auspices are of the highest class, and are especially attractive inasmuch as the orebodies are seldom delimited and there is frequently a chance for enhancement in the value of the principal. Nevada Consolidated and Miami were shining examples of this kind of mining investment.

2. Developed mines, whereof the ore-

bodies promise good dividends for a longer or shorter time, but whereof the return of the principal is shirred over, or not talked about at all perhaps on the theory that the devil will take the hindmost—the chief purpose of the promoters, backers and managers being to effect a distribution of the stock. We refrain from citing any examples of this class, but feel free to express the opinion that the majority of the names that are well known in Boston and New York come under it.

3. Good prospects, whereof nothing definite can be said except that there are promising chances for making a mine. Sometimes the hopes are realized and we have a Trimountain or Ahmeek, which pay the original investors 50 or 100 for 1. Such returns are those to feel proudest about, but they are conspicuous by their infrequency. The development of the good prospects usually falls into the hands of the development companies and banking houses and they are eventually presented to the public under class 1.

4. Developed mines of doubtful profit. (There are many operators who are honestly ignorant that their mines are really losing money, all things considered.) Some of these are good little properties when regarded on a proper basis of capitalization. Mines of this class from the investment standpoint merge into those of class 2.

5. Wildcats. These are advertised in the newspapers, and present reckless claims and glittering generalities. Reports by reputable engineers are always absent. The bloodsuckers who father these things take the money of seamstresses, servant girls, small tradesmen, and fools. We heard of a man who bought 100 shares of every mining company that he saw advertised in the newspapers. He said "It *may* be good." So it may.

> By wondrous accident peychance one may
> Grope out a needle in a bond of hay;
> And though a white crow be exceeding rare,
> A blind man may, by fortune, catch a hare.

The possibility is amply exemplified by the original bringing out of Greene Consolidated. But as we think over the thousands and thousands of similar promotions for 10 years before and after we can recall no other. Our friend would have had a better chance of buying lottery tickets. An idea of breaking the bank at Monte Carlo would have been comparatively. Seriously, we need a law that will prevent the circulation by newspapers of advertisements that are chiefly designed to catch suckers.

Mining in Siberia

Mining in Siberia is not a new industry; it has been carried on for many years, perhaps with many losses and reverses, but on the whole not unprosperously, as is proved by a continued large production of gold, and by some large fortunes which had their origin in mines. It is trus that in the past many Siberian placers were operated by antiquated and wasteful methods, and that some are still so worked; it is also true that the climatic conditions are unfavorable, though not more so than in our own Alaska and the Canadian Yukon. Transportation to many of the mines is still so costly and difficult as to prevent the extensive use of machinery; though conditions have been much improved since the Siberian railway was built. Nevertheless Russians continue to operate some of the mines with profit to themselves, and foreign engineers—including some Americans—have reported favorably on more than one Siberian mine.

British companies, however, seem to have a hard time in Russia. The article by our London correspondent, given on another page, tells of the unfavorable results of at least two British-owned enterprises; while others which were floated on the Siberian boom brought out in London two or three years ago have done no better. These results served some time ago to put a stop to the boom so far as the London Stock Exchange is concerned, and probably to the investment of British capital in Siberian mines.

It does not follow, by any means, that Siberian mining is to be condemned. Something was contributed to the failures in question by the rather unfriendly tone of Russian bureaucratic administration to foreign enterprises; something also to native aversion to innovations and improvements, and to the general sluggishness in improving transportation and other facilities. The chief reasons, however, seem to lie with the companies themselves and their promoters. The names were not what they were represented, and it is quite possible that Russians are as about as some other people in unloading improfitable property at a good price when they can do it. Some blame also may be laid upon a management which could not or would not adapt itself to local conditions.

The result militates rather against London promotion and management than against Siberian mines; but it will probably close the pocket of the London investor, at any rate for some time to come.

The strike of the Amalgamated Association of Iron, Steel and Tin Workers has narrowed down to a direct struggle with the Steel Corporation, or very nearly so. Almost all the independent mills have come to an agreement with the association, and this week the Republic Iron and Steel Company, the largest concern having dealings with it, has arranged terms. The American Sheet and Tin Plate Company—the Steel Corporation subsidiary—is the only large interest holding out; and that company persists in its refusal to confer with the association, and its determination to make all its plants non-union. For the time the advantage seems to rest with the company, which has several of its plants at work, and has large stocks of finished material on hand to meet its contracts.

It is natural that Alabama, with its great coal and iron interests, should establish a mining school; and credit is due to the University of Alabama for taking the initial steps in that direction. The school will start with good buildings and equipment, and it will have an intimiate connection with the Geological Survey of the State; Dr. Eugene A. Smith, the head of the survey, will make it his headquarters and also take part in the work of the school.

The difficulties of the German potash salt trust have been settled by a continuance of the trust agreement for five years. This was forced through by a threat from the Government that a heavy export tax would be imposed. In the interim, however, Americans, who are understood to represent the new International Agricultural Corporation, were able to secure important contracts.

The index to Volume LXXXVII of the ENGINEERING AND MINING JOURNAL, accompanies the present issue. Subscribers who do not receive it in their copies, and who desire to have it, are requested to notify this office promptly.

The Mexican Institute of Mining Engineers

The first meeting for the organization of this society was held in the City of Mexico, July 12. It is the result of several conferences and committee meetings previously held. At this meeting the constitution, as prepared by the organization committee, was adopted. The objects of the association are to secure papers, data and information on Mexican mines; to provide a central body through which mining engineers may meet and exchange views; and generally to promote the interests of the profession and those of mining in Mexico. There will be three classes of members: active, associate and honorary, active membership being limited to mining engineers in good standing. The official language of the institute is Spanish, but papers in languages other than Spanish will be accepted for reading before the institute.

A. Grothe was elected president; Bernard McDonald, General Fernando Gonzalez and H. S. Denny, vice-presidents. The council is composed of the following members: Kirby Thomas, E. P. Merrill, Leopoldo Salazer, P. A. Babb, R. E. Chism, Victor M. Braschi, E. Ordoñez, J. J. Reynoso, Robert Hay Anderson, E. Girault, Ferdinand Sustersic and Ignacio Ibarguengoitia.

The institute starts with a good number of members, in all parts of Mexico. It is hoped that before long it may be able to secure a building in the City of Mexico as permanent headquarters. Meetings will be held periodically, as may be arranged hereafter.

After the business had been concluded several papers were read, as follows: "Aims and Objects of the Institute," by H. S. Denny; "Smelting at High Altitudes," by R. O. Lloyd, Teziutlan smelter, Puebla; "Notes on Cyaniding," by A. Grothe; "Cyaniding Slimes," by Ferdinand McCann, Pachuca; "The New Mining Law," by R. E. Chism, City of Mexico.

The Anti-Dredge Agitation in California

SPECIAL CORRESPONDENCE

The mayor of Sacramento, Cal., has called an "anti-dredge" conference or convention, to meet at that place on July 21, and has appointed 130 delegates representing about 20 places in the Sacramento valley. No representatives have been appointed from the points where dredge mining is now carried on, showing that the entire conference is in decided opposition to the dredge miners. The mayor says in his call that he wishes the "representatives" to consider the extent to which dredge mining is injuring homes, farms and towns, and the steps necessary to control, regulate or prevent it entirely. It is intended also to form an organization somewhat similar to the Anti-Débris Association, which succeeded in killing the hydraulic mining industry in the central counties of the State. No mining men have been invited to this convention, so that only one side of the story will be heard, and that from men unskilled in any of the engineering features. The conclusions to be reached, therefore, can be readily predicted. It will bring to a focus, however, the feeling against dredge mining which prevails in the valley towns, where the farmers and others lay all the damages due to floods and overflows to the presence of the dredges. Doubtless, from all this some crucial litigation will result. If the dredge men are to be attacked by an antagonistic association, as the hydraulic miners have been, it will be impossible to enlist capital in dredging operations, no matter how profitable they might be shown to be.

An assistant State engineer recently counted 40 dredges in operation between Oroville and Gridley, in Butte county, a distance of eight miles, and it is his opinion, in a published interview, that the dredgers are responsible for the losses caused by the spring floods, as he says their work and the tailing piles have obstructed the natural flow of the river, causing it to overflow its banks and destroy thousands of acres of cultivated land. He mentions nothing of the fact, however, that these rock piles are being gradually removed for use in macadamizing the roads in the county; nor does he recommend the removal of the obstructions as a preventive of possible floods during the high-water stage of the river.

The Yuba River Tailings Dam

SPECIAL CORRESPONDENCE

Reference has heretofore been made to the work undertaken on the Yuba river in California for the purpose of impounding tailings from hydraulic and other mines. Recently a lot of agricultural people in the Sacramento valley have brought objections against the settling basin and restraining barriers in course of construction on the Yuba river above Marysville, under this plan, and have been urging the Government engineers to abandon the whole project on the plea that it is unsafe and impracticable. The engineers of the California Débris Commission, however, who are in charge of the work, are convinced of the practicability of the plan, and say that no danger whatever can result to those residing below the settling basin.

This basin is a prominent feature of the project for holding back the mining débris. It is entirely independent of the bed of the river and is built at one side. The plan is to divert water from the river into the basin. About 10 miles above Marysville a dam 8000 ft. long is almost completed across the Yuba river. On each side are levees about two miles long, which will confine the river to a comparatively narrow channel. The work is being done by gold-dredging companies, which are given the privilege of dredging the bed of the stream, in return for which they are constructing the levees. Above the dam, in the bed of the stream, are about 30,000,000 cu.yd. of mining débris that has been washed down to that point and which would be gradually carried down the stream, were it not for the dam. Below the dam are from 60,000,000 to 100,000,000 cu.yd. of this material. By confining the stream to a 700-ft. spillway and holding it between the two levees for a distance of two miles, this débris will be cut off from the bed of the river and held back, since the carrying water does not reach it. Thus the heavy material will be kept in place and the lighter material collected in the settling basin. This basin, as at present planned, will hold 7,000,000 cu.yd., but if the plan proves successful, it can be increased to 22,000,000 cu.yd. capacity. The engineers, notwithstanding the objections brought, intend to complete their plans. Those opposed to them have no engineering knowledge whatever, and only object to the project on general principles. The engineers have $210,000 on hand, of which half will be required to complete the work, and the other half may be used for maintenance.

Corporation Publicity

The *Wall Street Journal* says: The Steel Corporation continues to publish statements every three months; but, alas, some other industrial companies no longer do so. This is, perhaps, the most serious retrograde movement since the virtue of publicity began to be appreciated.

Such statements involve considerable trouble; possibly also they are a source of extra expense. It is not always easy to make such figures absolutely accurate. There are plenty of excuses, but what is wanted is not an excuse, but a reason.

The reason is not altogether unassociated with a well defined attempt to restore conditions which had gone greatly out of favor during the Roosevelt administration. There is a very obvious experiment to see how much in the way of return to old methods of improper secrecy and unfair inside privilege the public and the administration will stand. The movement is quite clearly marked and is showing itself in other ways besides the one indicated.

New Publications

ANNUAIRE UNIVERSEL DES MINES ET DE LA METALLURGIE. By Robert Pitaval. Pp. 445, illustrated, 5¼x8½ in.; paper, 15 francs. Paris, 1909: R. Pitaval.

INDUSTRIES DU PLOMB ET DU MERCURE. Vols. 1 and 2. By A. Bouchonnet. Pp. 300 + 356, illustrated. 4½x7¼.; cloth, 10 francs. Paris, 1909: Octave Doin Fils.

DIE DIAMANTFUEHRENDEN GESTEINE SUEDAFRIKAS IHR ABBAU UND IHRE AUFBEREITUNG.. By Percy A. Wagner. Pp. 207, illustrated. 6½x10 in.; paper, 7 marks. Berlin, 1909: Gebrüder Borntraeger.

FLUORSPAR DEPOSITS OF KENTUCKY, WITH NOTES ON THE PRODUCTION, MINING AND TECHNOLOGY OF THE MINERAL IN THE UNITED STATES. By F. Julius Fohs. Pp. 296, illustrated. 7x10 in.; cloth. Lexington, Ky., 1908: Published by the Survey.

LES APPAREILS RESPIRATOIRES ET LA STATION DE SAUVETAGE DE FRAMERIES. Extrait des *Annales des Mines de Belgique*, tome XIV. By S. Stassart and J. Bolle. Pp. 188, illustrated. 6½x9½ in.; paper. Bruxelles, 1909: Ministére de L'Industrie Et Du Travail.

DIE LAGERSTAETTEN DER NUTZBAREN MINERALIEN UND GESTEINE NACH FORM, INHALT UND ENTSTEHUNG.. By F. Beyschlag, P. Krusch and J. H. L. Vogt. 1 Band, 1 Halfte. Pp. 238, illustrated. 6½x10 in.; paper, 7 marks. Stuttgart, 1909: Ferdinand Enke.

THE SMOKELESS COMBUSTION OF COAL IN BOILER PLANTS WITH A CHAPTER ON CENTRAL HEATING PLANTS. By D. T. Randall and H. W. Weeks. U. S. Geological Survey, Bull. No. 373. Pp. 188, illustrated. 6x9 in.; paper. Washington, 1909: Government Printing Office.

EIGHTEENTH ANNUAL REPORT OF THE ONTARIO BUREAU OF MINES, 1908. Part II. Pp. 45, 6½x6¾ in. Paper, illustrated, with maps. Toronto, 1909: King's Printer.

This publication comprises two special reports by A. G. Burrows on the Gowganda and Miller Lake silver area, and the South Lorrain silver area, based on investigations made during the summer of 1908 and during a later visit to Gowganda in April last. Much having been done in opening up the country and in mining development in the meantime, the main interest in the report will be found in its presentation of the topographical and geological features of the district examined, rather than in its description of mining conditions. In the report dealing with Gowganda the writer notes that in the exploration of the Montreal river and Temagami forest reserve areas it has been found that the discoveries of native silver are confined chiefly to the diabase, unlike the area at Cobalt, where the great majority of silver finds have been made in the conglomerate. In the Gowganda country, however, it is not wise to overlook the conglomerate and Keewatin areas, for important finds have been made in these formations in the vinicity of Miller lake, and notably on the Blackburn claim, where a vein carrying smaltite and native silver has been found in the conglomerate near a contact with the diabase. In appearance and texture the diabase of the area is quite similar to that of Elk Lake, Cobalt and South Lorrain, and all are evidently of the same age. It is usually fresh in appearance and rather coarse grained where the outcrop is of any extent. To the west of Gowganda lake all the properties examined were in the diabase, which occurs as a narrow band intruding rocks of the Huronian. Much of the diabase to the southwest of Bloom and Wigwam lakes has the appearance of a large sheet. A good deal of the diabase associated with the Keewatin greenstones and porphyries to the southwest of Everett lake occurs in dike form, usually striking north and south. In the vicinity of Lost lake, particularly to the west, there is an extensive development of a reddish phase of the diabase, always associated with the normal diabase, and in places appearing to shade into the latter. The light red varieties are quite granitic in appearance, with abundant free quartz, and in composition and appearance much of the more acid portions are similar to the narrow aplite dikes, which in parts of the area are found mineralized with native silver. The rocks of the Huronian formation occur over a considerable part of the area, much of the formation between Everett and Miller lakes being a conglomerate, and the Laurentian has a great development to the west of Bloom lake and from the east branch southward to Everett lake. At the time of Mr. Burrow's visit to the properties undergoing development the deepest shafts were not down over 50 ft., and no drifting on any of the veins had been done, but at several of the mines high-grade ore was seen. The veins were usually narrow, but widening in places to several inches, and were seen in some cases to pinch out in a few feet in depth or horizontal extension. There was also a tendency for the high grade ore to be segregated in bunches over a few feet, which will necessitate considerable dead work in following rich cracks and lean portions of veins to other rich bunches or shoots. Cost per ton of ore will be much higher than in Cobalt camp.

The name, South Lorrain, applied by prospectors to the unsurveyed area lying south of the township of Lorrain, and north of the Montreal river has been officially accepted as the designation of that region, which first attracted attention in December, 1907, when a discovery of native silver on a claim now known as the Keeley mine was followed by a rush of prospectors. The central portion of the area is about 16 miles southeast of the town of Cobalt. The surface of the country is rough and hilly and interspersed with many small lakes. The hills and ridges are conspicuous features and generally consist of one geological formation, and in consequence the contacts are usually in the valleys and covered. Much of the area is covered with drift carrying glacial boulders. The diabase of the post-Middle Huronian formation has its greatest development in the central portion of the area extending westward from Lake Temiskaming, around the north end of Loon lake southwest to the east side of Trout lake and north almost to the Lorrain boundary. In this area it occurs as a very prominent ridge. The predominating rocks of the Huronian formation are conglomerates and quartzites, the southern part of the area being composed essentially of conglomerates, varying considerably in appearance. The Laurentian is represented in the northeast portion of the area by a reddish hornblende syenite. The Keewatin rocks occur in several isolated areas and are usually altered basic igneous rocks, both massive and schistose. The largest exposure north-northeast extends from Trout lake for two miles. The principal discoveries have been made near the line of contact of the post-Middle Huronian diabase and the Keewatin in the area to the north of Trout lake. Along this contact, usually within a quarter of a mile, discoveries of native silver or smaltite, have been made in both formations. The Wettlaufer veins are in the diabase, whereas the Keeley veins are in the Keewatin. Toward the north end of this belt the discoveries consisted of smaltite and niccolite. Small showings of native silver had been found in other isolated areas of the Keewatin or diabase. The writer of the report was not aware of any discoveries of native silver in the conglomerate or quartzite though both rocks are seen in contact with the post-Middle Huronian diabase. In this respect the conglomerate of South Lorrain resembles that around Elk lake, in which no native silver discoveries, so far as known, have been made. Calcite veins of the most common type, the calcite being usually associated with more or less quartz and carrying smaltite and niccolite occasionally. The latter minerals have been found in well defined veins. Aplite dikes, which are characteristic of many of the silver showings in James township and vicinity are of little importance in South Lorrain.

High Silica Slags at the Magistral Smelter—II

By C. A. Heberlein*

In my previous article, I described furnace operations in which the charge was so calculated as to produce a slag of 20 per cent. or more FeO. On account of the shortage of our iron flux, I was suddenly compelled to cut the iron on the charge 40 per cent. and replace the same with lime. For 24 hours the furnace seemed to work well, but the grade of the matte gradually rose from 30 to 40 per cent. copper; the tonnage fell off nearly 10 per cent. and the tuyeres became more difficult to keep open, slagging frequently. The bottom of the furnace which had run hot up to this time became colder with the result that the smelting focus went up higher into the furnace shaft, frequently causing overfire.

In spite of precautions taken in feeding, the matte could not be kept below 40 per cent., the total sulphur on the charge remaining the same as before. The blast pressure of 2 in. of mercury was maintained persistently and the coke on the charge never exceeded 9 per cent. The consumption of air per ton of charge ranged from 48,000 to 49,000 cu.ft. as before. The lime in the slag went as high as 26.5 per cent. The average daily slags made during this experiment are shown in the accompanying table.

Slag too Refractory

The slag of May 4 was impossible to run for any length of time, as the furnace showed signs of distress. As it was a matter of great interest to us to gather absolute facts, I declined to help the furnace along with extra slag, matte or coke, particularly the latter, which in my opinion would have made matters worse and at no time did I exceed 9 per cent. coke per ton of charge. When I did make the change I simply raised the iron and reduced the lime to get back to my original charge, in which FeO and CaO are present in nearly equal percentages.

SLAGS AT MAGISTRAL SMELTER.

	SiO_2, Per Cent.	FeO, Per Cent.	CaO, Per Cent.	Cu., Per Cent.	Cu., in Matte.
April 30	49.0	21.4	22.7	0.25	31.1
May 1	48.6	20.5	22.9	0.24	37.7
May 2	51.6	18.0	23.9	0.25	39.7
May 3	49.0	17.9	26.1	0.25	42.3
May 4	50.8	16.2	25.1	0.22	41.0

Taking the slag of May 4, which I consider from personal observation and experience the limit for high silica and low iron, the percentage of oxygen in acid and base is shown in the accompanying tabulation. The oxygen ratio of acid to the combined bases is higher than 2 to 1, considerably above the bi-silicate. I find that the bi-silicate of iron and lime runs well, but above the bi-silicate the furnace becomes strained and requires careful attention. On breaking slag which had cooled in pots on the dump, I found no specific crystallization except a fibrous structure, similar to asbestos.

The Bi-Silicate Slag

The bi-silicate slag is perfectly liquid and hot and separates well from the matte, the second forehearth collecting but little matte in 24 hours. The hight of charge varied between 8 and 9 ft. above the tuyeres and I believe if the charge had been carried higher and the per cent. of coke raised, the result would have been disastrous.

OXYGEN IN SLAG OF MAY 4.

	Per Cent. in Slag.	Per Cent. Oxygen.
Al_2O_3	4.0	1.86
FeO	16.2	3.60
CaO	25.4	7.26
Total oxygen combined with bases		12.72
SiO_2	50.8	28.22

The net result gained by this experiment, which by the way was compulsory, may be summed up as follows: The bi-silicate of iron seems to form more readily than the bi-silicate of lime and if the iron is reduced below the equal proportion of lime, the furnace speed suffers with the result that more coke is required, eventually causing overfire or smelting on top, which, of course, is not conducive to economic smelting. That the bi-silicate of iron is the first natural formation in a copper furnace when silica reacts on the sulphide of iron may be seen in the following equation:

$$FeS + SiO_2 + 3O = FeOSiO_2 + SO_2$$

For the sake of simplicity I took FeS, instead of Fe_7S_8 which may more correctly express the sulphide in the focus of the furnace, where the reaction is taking place. The silica in coarse form acts as a catalyzer. I have experimented with this many times and found that coarse silica will raise the per cent. of copper in the matte more readily than silica in fine form. Fine silica makes a slag higher in silica, while this does not necessarily happen when coarse quartz is used. On the contrary, according to furnace speed and blast pressure the originally formed bi-silicate may be enriched to a sesqui- or even mono-silicate, as a given quantity of silica may be loaded with FeO to form these varying kinds of slag. With a hot top reaction, smelting is practically impossible, likewise economy of coke and blast.

General Results

Using 48,000 cu.ft. of air per ton of charge and running a bi-silicate slag, the actual tonnage smelted per square foot of hearth area was 4 tons. Reducing the iron as in the above described experiment about 3.7 tons of charge were smelted per square foot of hearth area. The average amount of fuel per ton of charge in the former was 6.96 per cent. fixed carbon and in the latter 7.74 per cent. fixed carbon. Smelting with such a highly silicious slag recommends itself particularly if the ore is low in copper, reducing fluxes to a minimum and especially the slag losses. Operating a large furnace with adequate settling facilities, the slag should not run over 0.25 per cent. copper and low-grade silicious copper ores, as low as 3 per cent. copper, when cheaply mined may be smelted at a good profit even at the present price of copper.

*Mining engineer, Zacatecas, Mexico.

Phosphates in Tunis

Special Correspondence

An interesting report lately made public is that of the Societé des Phosphates de Gafsa, the French company controlling the larger part of the phosphate deposits of Tunis. This company is probably the most extensive miner and seller of phosphate rock in the world. The report for the year 1908 shows a marked improvement over 1907. The profits amount to 10,061,559 fr. against 8,128,023 fr. in 1907. A dividend of 130 fr. per share and of 112.50 fr. on founders' shares has been proposed at the annual meeting. These results were obtained with an output of 1,082,650 tons of phosphate rock as against 716,769 tons in 1907. Out of this production, 837,874 tons of rock, carrying 58 to 63 per cent. of phosphate of lime, were produced by the mine of Metlaoui, and 244,776 tons of phosphate of 63 to 68 per cent. by the newly opened mine of Redeyef, which appeared for the first time in the output of the company. Much development was done last year at the Metlaoui mine, to put it in a position to increase the output in proportion to the importance of the sales. An adit 630 m. long was run to reach the deep seams of phosphates close to the middle part of the Metlaoui table-land. It will be used for hauling the ores from this part of the mine. Two new driers, making seven in all, were also put into commission and the 730 h.p. power station was increased by 30 h.p. Various buildings were erected for the miners as well as barracks for 100 soldiers.

At Redeyef, the company has erected a big storehouse for the dry phosphates, and officers, dwellings, infirmary, etc. The driers, power plant and repair shops will be erected this year.

The Metlaoui Sfax railroad, which belongs to the company, had a traffic of 1,[illegible] tons in 1908 against 710,000 tons in 1907. Nine new sidings were put in to enlarge the capacity of the line. The spec

from Metlaoui to Redeyef was completed in 1908. A branch line, 20 km. long, is under construction between a station of the Metlaoui-Redeyef line to Sonatir, the terminus of the railroad built from Sousse by the Bone-Guelma Railway Company. The Gafsa Company also obtained a lease of the proposed Sfax-Bou-Thadi line, which is to be built by the Tunisian government.

The new plant for shipping ores at Sfax was completed in 1908. The sheds under which the phosphate rock is stored cover an area of 25,000 sq.m. Rock is handled by an extensive system of 24-in. Robins belt conveyers, having a total length of 906 m. Three 24-in. conveyers inclined at 23 deg. are able to load at various points 200 tons of rock per hour each. The whole plant at Sfax is driven from a central power plant fitted with two 150-h.p. gas engines. A third engine will be erected later.

The completion of the Sfax-Sousse line will enable the company to utilize this harbor for loading its phosphate rock. The Sousse plant will also be fitted with an extensive system of conveyers.

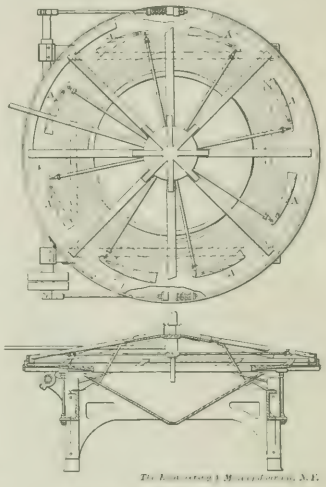
The report of the directors points out the increase of the European stocks of American phosphates, the imports of which increased by 200,000 tons in 1908 while they increased only 150,000 tons in three years from 1904 to 1907. Only a small increase in sales is therefore expected for 1909. The report shows a present steadiness of prices, and notes signs of revival. It claims that the consumption of superphosphates will certainly continue to develop throughout the world for many years, and states that the Gafsa Company has succeeded in supplying 40 per cent. of the increase of European consumption in the last 10 years.

Zinc Smelting in Silesia

Paul Speier, of Breslau, in his latest market report, refers to metallurgical improvements in zinc smelting that are being made in Upper Silesia. Since the rise in the price of coal attention has been directed at all of the smelteries to the introduction of Rhenish furnaces. These are said to be working very economically, with considerable reduction in the consumption of coal. About two years ago experiments were begun at Hohenlohehütte with the object of producing spelter from blende without previous roasting. Spelter has at times been obtained in this way, and so far the results of the experiments are considered to be favorable although there are technical difficulties still to be overcome. The zinc company is now engaged on the erection of a new distillation department wherein the old Silesian furnaces will be displaced. Improved furnaces are also being installed at Lipine.

A New Ore Concentrator

Emil Deister, Fort Wayne, Ind., describes (U. S. Pat. 921,089, May 11, 1909) a concentrating table, consisting essentially of an annular concentrating pan having thereon a number of gradually ascending shoals *A*. These shoals are preferably located at the outer terminals of the helical riffles. Between the partially converging riffles on the shoal is a throat or passage for the concentrates which are discharged at the opening near the head of the shoal.



DEISTER ORE CONCENTRATOR

ONE OF THE SHOALS

There is a feed trough around the entire periphery of the table and the funnel at the center is to collect and remove the tailings. The driving mechanism consists of oppositely disposed eccentrics and connecting rods, attached at points diametrically opposite and operating against a rubber driving head and compression spring.

In the operation of the table the pan is given an oscillating motion by means of the driving mechanism and the ore tends to settle upon the concentrating surface of the pan. The overlying portion of the pulp or gangue works inward over the riffles toward the tailings funnel. Because of the helical riffles and the different motion of the pan, the underlying mineral will be continually carried outward toward the throat of one of the shoals. The material on the shoals carries more or less gangue which is gently washed away as this material progresses above the general ore and water level in the pan. The concentrates are removed through the pipe near the head of the shoals, one of which is illustrated in an accompanying engraving.

Churn Drilling for Blasting

According to the Keystone Driller Company, of Beaver Falls, Penn., the best results have been obtained, in blast-hole drilling, with the 5⅝-in. hole. That size obviates the necessity of "squibbing" charges which must be employed in the smaller holes. It is also more easily and cheaply drilled than a hole of larger or smaller diameter. The larger hole involves more cutting, while permitting no corresponding advantage in size and weight of drill bar; the heaviest practicable tool can be operated in the 5⅝-in. hole. On the other hand, a smaller hole necessitates a reduction in the diameter and weight of the stem and bit, which detracts from their efficiency. It has been proved experimentally that a 6-in. hole can be drilled more cheaply and more quickly than a 3-in. hole.

The effectiveness of the blast is greatly increased by drilling the holes properly. The large holes allow the powder to be well bunched at the bottom. Generally the drilling machine is used for loading the holes. For this purpose the regular drilling bit is removed and in its place a wooden rammer is placed on the drill stem. Five to eight sticks of dynamite having been dropped into the hole, the drilling tool is lowered after them, forcing them into a compact mass at the bottom. The tools are then withdrawn and the process repeated until the hole is filled to within 25 ft. of the surface. At this point the exploding cap and wires are inserted, and the hole packed full of sand and gravel to the top by hand.

The Keystone Driller Company has lately designed a portable blast-hole drilling machine, which is operated by an electric motor instead of the usual boiler and engine. Under certain circumstances this method of supplying power is advantageous.

Work has recently been started on two more magnesite mines at Hermione and Atalanta, in Greece. The one is under the style of the Hermione Magnesite mines (Athens), having an output of 20,000 tons, the other, with an output of 6000 tons per annum, is worked by a private contractor, A. Purman, of Athens. Both mines are yielding an excellent mineral, containing 95.45 and 94.20 per cent carbonate of magnesium, respectively.

Questions and Answers

Inquiries for information are answered in this department as promptly as possible, but more or less delay is often unavoidable. Many inquiries involve a good deal of investigation and these can be answered only when the general interest in the subject is conceived to justify the expenditure of the time required. Correspondents should refrain from asking for advice that ought to be obtained by professional consultation with an engineer. We will not answer questions pertaining to the value of specific mining enterprises. Inquiries should be framed concisely.

Tempered Copper

Assuming that copper could be tempered or hardened without the addition of an alloy that would reduce its electrical conductivity, what would be some of the electrical uses for which it would be superior to ordinary copper? In a general way, how much more would tempered copper be worth for such uses than ordinary copper? Apart from electrical purposes would there be any use for tempered copper, as for bearings, for replacing steel parts subject to crystallization, etc? If tempered copper could be sold at 20c. per lb. would it be able to compete with steel and other metals for such purposes?

CUPRUM.

Hardened copper would be useful in the electrical industry for the commutators and brushes for dynamos. As to the price that it might command for such purposes, we can do nothing but make a guess. It would not be unreasonable to guess that such copper would be worth twice as much as ordinary copper.

Outside of the electrical industry, tempered copper might compete with steel for some purposes, but it is well to bear in mind that the highest grades of ordinary steel are obtainable for about one-fourth the price of ordinary copper. For bearings, etc., it is highly doubtful if tempered copper would be able to compete successfully with the various bronzes made for that purpose.

Black Sand—Gypsum—Manganese Ore

(1) Is black sand used for the manufacture of iron and steel; if so, by whom? (2) Could crude, unground gypsum, be sold in the United States; if so, to whom? (3) What is the market price for manganese ore containing between 40 and 50 per cent. manganese?

W. W.

(1) No. (2) Yes, if offered at sufficiently attractive price. Communicate with J. B. King & Co., New Brighton, S. I., N. Y. (3) The Carnegie Steel Company, Pittsburg, Penn., is the buyer of this grade of manganese ore. Its schedule used to be as follows:

"Above 49 per cent., 30c.; 46 to 49 per cent., 20c.; 43 to 46 per cent., 28c.; 40 to 43 per cent., 27c. Iron is to be paid for at the rate of 6c. per unit. These quotations are based upon ore containing not more than 8 per cent. silica and not more than 0.25 per cent. phosphorus, and are subject to the following deductions: For each per cent. silica in excess of 8 per cent., 15c. per ton is deducted, fractions in proportion; for each 0.02 per cent., or fraction thereof, of phosphorus in excess of 0.25 per cent., 2c. per unit of manganese is deducted. Ore containing less than 40 per cent. manganese or more than 12 per cent. silica or more than 0.27 per cent. phosphorus is subject to refusal or acceptance at the buyer's option. Settlements are based on analysis of sample dried at 212 deg. F., and the percentage of water found by this drying is deducted from the gross weight of the shipment. The prices are per ton of 2240 lb., and per unit of metallic manganese."

This schedule, however, was withdrawn during 1908, and we are not aware of any substitute having been issued.

"Bumps"

I have seen in several articles and reports on coal mining recently, some references to "bumps" in mines. As the term is not used in this part of the mining field, and is not quite clear to me and to others of whom I have inquired, I would like to have an explanation of its exact definition.

P. W.

The term, "bump," is applied to sudden upheavals of the floor in coal mines. It differs from "creep" in that the shale floor bursts upward in rooms and roadways with a distinct shock and the sudden liberation of gas. The shock frequently jars down portions of the roof and slivers off portions of coal pillars. Bumps which have occurred in No. 2 mine of the Crow's Nest Pass Coal Company, have caused the death of several miners; and in July, of last year, 24 men were entombed in the mine and all would have suffocated had it not been for a break in the compressed-air pipes which supplied them with air, enabling 20 men to be saved. The pressure on the coal roof induced by an overburden 2000 ft. in thickness would be about 160 tons per square foot, but as 50 per cent. of the coal is left in pillars they have to support 320 tons per square foot. This they appear so far to have been able to do, according to the Provincial mineralogist in his report to the Minister of Mines in British Columbia: "The measures above the coal consist of very hard sandstone, conglomerates and argillites, so tough and strong they do not cave and fill up the space where pillars are drawn over smaller areas."

These rigid inflexible rocks press down as one solid mass upon the remaining pillars, and the floor, which is shale and softer than the roof rocks, is not able to withstand the pressure, and so bursts upward. It is presumed that the floor contains much gas which, if not materially assisting in causing bumps, at least escapes when they occur.

Plans are proposed for future workings which will curtail the output at these mines for two or three years and recommendations are made which will cause the abandonment of the old workings. The serious nature of the difficulty will cause a large outlay of money, but where life is concerned, the remedy is always heroic in other countries than the United States.

Does Marsh Gas Accumulate In High Places?

I noticed in a recent colliery note the statement that marsh gas does not, as a rule, accumulate in roof cavities and other high places in a mine, also that the general belief favoring this theory is in error. I have always understood, that because of its lightness, marsh gas would invariably be found in such high parts of mine workings. Will you kindly explain in greater detail the argument you advance.

H. F. H.

In the colliery note referred to, it was stated that the "law of diffusion of gases" acted to prevent the accumulation of methane in high parts of coal seams. In proof of this theory it was stated in the note that if a bottle filled with methane was to be connected by a tube to another bottle containing air, the two gases would mix uniformly, even though the bottle containing methane was placed uppermost with its neck directed downward to the bottle containing air. In addition to this explanation, it may be stated that if these two bottles were of equal capacity, it would be found after a time, that the composition of the mixture in each bottle would be 50 per cent. of air and 50 per cent. of methane. What actually occurs underground when marsh gas is given off depends entirely on the rate at which this gas is exuded. If the rate at which the methane is given off exceeds the rate of diffusion, it is of course certain, that temporarily, the gas will be found in greatest quantities in the cavities and high places. However, as soon as the supply of gas given off is reduced, or when the rate at which the marsh gas is exuded does no longer exceed the rate of diffusion, the gas will quickly be carried off and all the methane that has previously accumulated in high places will soon disappear in the mine air. Not only is this theory true in reference to any light gas but it may also be applied to carbon dioxide which is heavier than ordinary air and first falls to the floor and tends to fill the low places.

There are between 20 and 30 mines on the Rand (*Min. Mon. Journ.*, June 5, 1909) which issue hot cocoa to their native "boys" in the early morning to neutralize the evil effect of turning out from a warm compound into the cold air. The usual practice is to make from 15 to 20 gal. from 1 lb. of cocoa. Experience has demonstrated that the extra expense over that of issuing the so-called coffee is more than made up by the reduction of sickness.

Personal

Mining and metallurgical engineers are invited to keep THE ENGINEERING AND MINING JOURNAL informed of their movements and appointments.

S. A. Worcester is in Denver.

R. H. Toll, of Denver, Colo., is examining extensive lodes and placers near Salmon City, Idaho.

James Duce, of Boulder, Colo., has gone to Clifton, Arizona, to report on the holdings of a copper company there.

John Hays Hammond has been visiting La Blanca mines in Pachuca, Mexico, in company with Cortlandt E. Palmer.

H. P. Lowe, a well known Gilpin county, Colo., manager of mines, has returned from a business visit to England.

E. J. Carlyle, of Kyshtimsky Zavod, Russia, was married in London recently to Miss Cora Thomas, of Prescott, Arizona.

G. Harold Grant returned to British Columbia last month from a tour in the Orient and shortly afterward left for Mexico.

Henry S. Washington has returned to New York from Bahia, Brazil, where he has been investigating several mining properties.

J. Volney Lewis left New York last week for Durango, Mexico, to examine some mines. He will probably be absent about three months.

Lucien Cayeux, professor in the Ecole des Mines in Paris, France, is making an extended visit to the iron mines of the Lake Superior region.

William M. Coopér, manager of the Capital Mining and Milling Company at Georgetown, Colo., has gone to Pittsburg, on mining business.

W. H. Harrison, formerly assistant manager, will, it is reported, be made manager of the San Francisco del Oro mines at Parral, Mexico.

Chas. Emmerson, superintendent of the Bellevue colliery of the West Canadian Collieries, Ltd., southwest Alberta, has returned from a visit to England.

F. C. Mugrave, formerly superintendent of the Tyee Copper Company's Tyee mine on Vancouver island, but now of Mexico, has been visiting Victoria, British Columbia.

W. F. Robertson, provincial mineralogist for British Columbia, has been examining mining properties on Moresby island, off the Queen Charlotte group, British Columbia.

F. A. McLellan, of San Francisco, has been appointed chief engineer of the Bunker Hill Steel Company, Seattle, Wash. He has been recently employed in engineering work in Korea.

Fred J. McFarlane, for many years superintendent of the Bunker Hill Steel Company's Cumberland plant in Chicago, Ill., has secured a similar position with the Maryland Steel Company, at Sparrow's Point.

W. Widdowson, formerly superintendent of the Golden Star Mines at Kofa, Arizona, has been appointed superintendent of the Enterprise Mining Company, with headquarters at Cooney, Socorro county, New Mexico.

C. Christopher and W. S. Keith, of Seattle, Wash., have spent two weeks in Los Angeles, Cal., making arrangements for the installation of a Catton furnace in San Bernardino county. Colonel Christopher has returned to Seattle.

H. F. Strangways, for a year past with the Canadian Copper Company in the Sudbury district in Ontario, passed through New York last week on his way to Peru, where he has accepted a position with the Cerro de Pasco company.

James Ashworth, of Manchester, England, visited the Crow's Nest Pass Coal Company's collieries in southeast Kootenay, B. C., last month. He is well known in old-country coal mining districts as an expert on safety lamps for coal miners.

James M. Swank, the veteran manager of the American Iron and Steel Association, Philadelphia, was 77 years old on July 12. Mr. Swank is still energetically conducting the work of that association, as no successor has yet been selected to take his place, although he tendered his resignation last January.

R. B. Morton has resigned the management of the Argo Drainage and Transportation Company, operating the Newhouse tunnel at Idaho Springs, Colo. The management will be under the direction of George E. Collins, who has been consulting engineer for the company and who formerly directed the work.

S. B. Belden has been promoted to the position of sales manager in the mining-machinery department of the Jeffrey Manufacturing Company, with headquarters at Columbus, O. Mr. Belden, who has for many years been manager of the Pittsburg office of the company, succeeds in this position R. G. Hutchins, vice-president, whose resignation has recently been accepted.

Obituary

George E. Putnam, a mining engineer, connected with the Montezuma Copper Company, at Nacozari, Mexico, was killed July 5, it is supposed by a Mexican officer. He was a graduate of the Colorado School of Mines, and had been at Nacozari about two years.

Dwight L. Witherbee, for more than 40 years a successful manager of blast furnaces, died in Durango, Mexico, July 12. His career began about 1865, at Port Henry, N. Y., where he was the first in America to use a chemical laboratory in connection with furnace work. In 1872 he built Cedar Point furnace at Port Henry, N. Y., when he was the first in this country to erect Whitwell firebrick stoves, and introduced several inventions of his own. Among these were the bronze tuyeres which bear his name, the cinder notch cooler, the use of dynamite in removing obstructions in the furnace, and the kerosene blowpipe for opening up closed tuyeres and tapping holes. In 1887 he was called to be superintendent of a blast furnace in Durango, Mexico, in connection with mines at Iron Mountain. In 1895 he took charge of Calumet furnace in Chicago, and the next year went to Mayville, Wis., where he was furnace superintendent for about four years. He was then recalled to Durango, where he died. Mr. Witherbee contributed many valuable papers on iron and steel metallurgy to the American Institute of Mining Engineers. He was naturally an inventor of new methods and instruments, for which he held more than 15 patents, and he was at work on a new invention just before his last illness.

Societies and Techincal Schools

Iron and Steel Institute—The autumn meeting will be held in London, England, Sept. 27 to Oct. 1 next.

Pacific Northwest Society of Engineers—The seventh annual convention was held on the grounds of the Alaska-Yukon-Pacific Exposition at Seattle, July 8-11 next. The opening address was delivered by the president of the society, Milnor Roberts, dean of the School of Mines of the University of Washington, on "The Mineral Industry of the Pacific Northwest."

Montana State School of Mines—The students of the sophomore class have successfully completed the prescribed course of mine surveying under the direction of Prof. Theodore Simons, assisted by A. Adami. The surveys were executed at the disposal of the school by the courtesy of the officials of the Amalgamated company. Two weeks were spent at the mine, surveying the underground workings, the surface plant, street lines and a connection to the Gallatin shaft.

Illinois School of Mines—The new school of mines provided for by the Illinois General Assembly at its recent session will be under the administration of the University of Illinois, of which it will be a part, and will have only a small beginning for the first two years on account of the limited means available. The appropriation made amounts to only $7500 a year, but by providing for coöperation of the geology department and the State Geological Survey with the proposed new department it is believed that the course will be of practical value from the outset. The appropriation was secured largely through the influence of the Illinois Coal Operators' Association.

Special Correspondence from Mining Centers

News of the Industry Reported by Special Representatives at Butte, Denver, Salt Lake City, Goldfield, Colbalt and London

REVIEWS OF IMPORTANT EVENTS

San Francisco

July 14—As might have been expected, the phenomenal richness of the Sixteen-to-One mine at Alleghany, Sierra county, has brought about litigation as to validity of the title of the man who has developed it to a producing point. M. Van der Beugle, of San Francisco, has commenced suit for a dissolution of partnership between himself and E. H. Wilson, who bonded the mine, and asks for an accounting of all ores and money received by Wilson since their partnership commenced over a year ago. On petition to the court, a receiver has been appointed and work in the mine has been discontinued pending a decision. The plaintiff asserts in the complaint that Wilson succeeded in getting possession of the property through false representations concerning its value. The two men were originally partners in the property, which has developed into one of the most valuable in the Alleghany district. Wilson characterizes the action as an attempt to get "blood money." He bought the interest of Van der Beugle, he says, after the mine had been condemned by certain experts, and received a clear deed from him. In view of the wonderful productiveness of the mine, the legal contest is being watched with much interest by mining men.

A 13-mile branch of the Tonopah & Tidewater railroad is to be built from Tecopa to the Tecopah lead mines in Inyo county. A contract for construction has been let. The mines agree to furnish 500 tons of lead ore daily. These mines are the largest lead producers in California.

The North Star Mines Company, of Grass Valley, the largest producer among the gold-quartz mines of the State, has declared a dividend of $100,000 on its capital stock, making 4 per cent. for the quarter, or at the rate of 16 per cent. per annum. The rate last year was 15 per cent. The mine is one of the best equipped in California. A. D. Foote is the superintendent.

The California-Nevada Electric Power Company, of which W. P. Hammon is the head, has paid its final instalment to Fleischaker Brothers for their Truckee river holdings. The property consists of two large power plants on the Truckee river, and a distributing system to Reno, Carson, Virginia City and other towns. Another million is to be spent by the company in building branches to various mining districts in Nevada.

The farmers residing between Vallejo and Benicia, in Solano county, across the straits from where the Selby smelting plant is located, have renewed their suit against the Selby Smelting and Lead Company, and the judge of the superior court of that county has issued a citation ordering the officials of the company to appear in court, July 20, to show cause why they should not be put in jail for contempt of court for disobeying the injunction which forbids the operation of the plant between the months of April and November, when the prevailing trade winds of summer carry the fumes of the smelter into Solano county. The company has a motion for a new trial pending.

Denver

July 16—From the preparations being made in the tungsten district of Boulder county, it would appear that the assurance of a 15 per cent. duty on the ore, to be provided by the new tariff bill, is going to stimulate the production. It is reported that the Primos company will build a big concentration mill, and that the Wolf Tongue will make additions and improvements in its present plant. Great activity exists in the Boulder oilfield, and a new well is reported struck 1½ miles from the gusher. The income of the industry is given at $1000 per diem.

In the Cripple Creek district it is reported that a rich discovery has been made on the surface of Climax No. 1, on Squaw mountain, belonging to the Little Puck company. The Gold Dollar Consolidated has paid a dividend of ½c. per share, amounting to $12,500. The fact that foreign miners have been employed in the district at $2.50 for a 10-hour shift, when the scale for the district is $3 for eight hours, has so incensed the American miners that a body of 35 of them warned the foreigners to leave, and about 25 shots were recently fired, wounding one of the foreigners severely.

It appears that the deep drainage tunnel, which is completed for about 10,000 ft., or, approximately, two-thirds of the distance necessary to drain the camp, will cost about $160,000 more to complete; and the Cripple Creek Drainage and Tunnel Company is endeavoring to induce the mining companies which have not subscribed, the bankers of the district and the mining-stock association to provide this fund, and there seems little doubt but that this will be accomplished. The annual report of the Elkton Consolidated shows that dividends amounting to $237,500 were paid last year, the total paid to date amounting to $2,354,463. The net profit for the year was 43 per cent. of the gross receipts.

In the Silverton district, the 100-ton mill of the Peerless San Juan Mining Company, in Minnie gulch, is being constructed, and is expected to be ready to run Sept. 1. The Vermillion mill, above Animas Forks, is nearly completed and will start next month. The mill of the Sultan Mountain North Star mine is also nearly ready to start. These will add largely to the production of the district. The shipments of concentrates and ore from Silverton for June aggregated 3450 tons.

The Newhouse tunnel has entered easier ground, and is making good headway with two shifts. The breast is now not far from Illinois, Burroughs and California territory. In a lateral from this tunnel a strike of fine ore is just reported in the old Seaton mine. The War Dance, which made a sensational strike a few months ago, is still in litigation, the output being restricted by the court to $1500 per month.

A recent strike of importance has been made in the Leadville district in the Highland Mary on Breece hill. While the shaft at this property has only been sunk to a depth of 27 ft., the lessees have already passed through 23 ft. of solid ore, carrying from one-half to one ounce of gold. The ore in places shows greater gold content, a small streak assaying from 15 to 20 oz., but the bulk of the ore will average about 0.60 oz. Work on the property was started about two weeks ago, and the shaft sunk for the purpose of doing prospect work. The ore, which was discovered only a few feet below the surface, was at first supposed to be a very small vein, but with the subsequent prospecting and sinking, indications now point to a large body of this material. The discovery is one of the most important made in the district for some time, and will probably result in the opening up of a new section. For over 30 years this ground has remained untouched; before that the old discovery shaft was sunk there, but at that time gold ore was not thought of, and while the property was always considered favorable, no one cared to take chances to develop the ground.

Salt Lake City

June 17—Samuel Newhouse reached home last week from a business trip in the East and when confronted with the

news that has come direct from Boston to the effect that a merger of the Utah Copper and the Boston Consolidated had been effected he placed himself on the defensive and avoided committing himself on any point. He evaded the issue by admitting that he had been in conference concerning the project, but that it was impossible to discuss the matter at present. The rumor is also current that a merger is contemplated involving the Newhouse mines and the adjacent Blackbird and Comet properties in Beaver county. Mr. Newhouse admitted that there was some ground for such a rumor. The reorganization of the Newhouse Mines and Smelters Corporation will proceed, however, along the lines planned by the committee, and the operation of the mine and mill will be carried out on an energetic basis.

The International Smelting and Refining Company is making rapid progress on its new smelter in Pine cañon, Tooele county. A vast amount of excavation work has been done, and the laying of the concrete foundations is well advanced. The machine shops are being rushed to completion and the steel framework for these buildings is nearly completed. A number of engineers have been on the grounds figuring on the large stack for the plant. This stack will be 350 ft. in hight.

The new Utah Stock and Mining Exchange will probably be closed for the summer. A meeting to discuss this matter will be called in the near future. The exchange has been disorganized and little trading has been done. An important mining judgment was rendered in the district court in this city by Judge T. D. Lewis, by which F. J. Hagenbarth must pay to Joseph E. Caine and Max Junghandel the sum agreed upon for the option for purchase of the Ludwig mine in the Mason mining district, Lyon county, Nevada, although he never exercised the option. The amount of the judgment, including costs, is $236,000. It will be appealed to the Supreme Court.

Goldfield

July 15—The Goldfield Consolidated Mines Company by a vote of the board of directors has decided to reduce the value of the ore now being treated at the two mills. In the future, the policy of the company will be to stope clean between walls, removing all ore of a payable grade, and thereby reduce the general average but avoid the necessity of again working in the old stopes. This policy results in a reduction of the monthly production but naturally increases the life of the mine. The estimate given by the secretary of the company as the production of June is as follows: Tons produced, 19,110; estimated net value recovered, $247,000; estimated total cost of production, $150,000; estimated net profit, $297,000. The production was somewhat retarded by the breaking of a dam owned by the Nevada-California Power Company which caused a suspension of power for four days.

George A. Bethune is seeking to have set aside the transfer of the Nevada Hills property at Fairview from himself and associates to the Nevada Hills Mining Company. He also asks for a receiver for the property. This is the result of the suit brought by H. B. Lind and G. L. Kaeding against John T. Hodson, W. H. Clark, John A. Kirby, W. H. Webber, James R. Davis, W. V. Rice, the Nevada Hills Mining Company and the Fairview Pyramid Mining Company, in which the former parties attempted to secure a large block of stock by claiming that a grubstake agreement had been violated. The Nevada Hills company has paid about $400,000 in dividends.

Cobalt

July 17—The present week has been remarkable mainly for the number of new discoveries made. In addition to the new strikes at the Nova Scotia, reported previously, two more new discoveries have been made at the same mine. A rather sensational surface find has been made on the Hargrave property. The vein varies in width up to 10 in. and is of very high grade. Another new high-grade vein has been found at the Kerr Lake. The City of Cobalt, while working on its vein, which for some time past has been of little value, encountered a shoot of high-grade ore. The Cobalt Lake, which has been crosscutting from a winze to catch the vein located a few months ago, came into ore carrying high silver content. While excavating for the new addition to the concentrator of the Coniagas, a new vein, which had not been located under ground, was disclosed. On July 16, the vein at the Beaver mine was found to have widened to 10 in. of high-grade ore.

The various dumps of the Nipissing are being treated by the Nipissing Reduction Company, about 75 tons a day being concentrated. The latter company has no connection with the Nipissing mines. The amount of second-class ore on the Nipissing dumps is so large that the mill can be run up to full capacity on it alone. The average content of the mill rock is about 30 ounces.

Judge Tellier has dismissed the petition asking for an injunction to compel the directors of the Crown Reserve to stop the payment of dividends until several thousand shares of the stock now in dispute receive dividends along with the other shares. These disputed shares are the cause of the litigation now in the courts. The statement of the directors of the company, for the six months ending June 30, shows a surplus of $540,250. During that period there was shipped a total of 15 cars of high-grade and 37 of low grade ore.

A large silver nugget, weighing 700 pounds, was found on the property of the Cobalt Dreadnought, formerly known as the Rothschild. The Aguinaco mines, situated on the shores of Lake Temiskaming, and the John Black mine, in Coleman, have both ordered six drill compressors.

The Lewisohns, of New York, have negotiations pending for acquiring control of Kerr Lake-Majestic, which adjoins the Kerr Lake property. The purchase of the Michael claim on the east side of Cross lake has not been made, as reported by the daily press. The Lewisohns hold the controlling interest in the Kerr Lake mine, and it is well known that they have been anxious to increase their holdings by the purchase of other good properties.

Gowganda, Ontario

July 7—A period of quiet prevails in this district now and a great many people are leaving until after the fly season is over. In the town of Gowganda itself, not a single new building is being erected. The shaft of the Bartlett mine is down 75 ft., and there is said to be a 6-in. vein of high-grade ore in the bottom. Two new good veins have been discovered on McRae's property at Shanty Lake, and also two others on the property of the German Development Company, at Everett Lake.

The contract for grading the new wagon road from Elk Lake to Gowganda has been awarded to the firm of Blair & McClennan, of New Liskeard. The department had a great deal of difficulty in placing this contract, as some of the contractors refused to do the work. The deposits of three contractors amounting to about $2600 were forfeited.

A new English company known as the Maple Leaf Syndicate, has been formed to acquire 14 claims in the townships of Corkhill and Brewster, about ten miles from Gowganda. The headquarters of the new company are at Holbrook, London, E. C., and for the purpose of developing the claims the sum of $50,000 has been raised. When the work is further advanced the capital will probably be raised to a higher figure.

There are now two canoe companies, operating between Stoney creek portage and Gowganda, and one of them, the United Mining and Transportation Company, has also 18 large freight canoes in service. The rates are $5 one way for passengers and $7.50 per 100 for freight. Stoney creek is 13 miles above Elk lake, and is reached from the latter place by launches. The new line of boats, operated by J. R. Booth in competition with the Upper Ontario Navigation Company, is making the service much better for passengers. These boats run between Latchford and Elk lake. A wagon road between Elk lake and Gowganda will be built this summer by the Government.

The preliminary surveys have already been made and it is estimated that the distance will be cut down by about seven miles. A. A. Cole, engineer for the Railway Commission, made a trip into the district to see if the resources warranted railway construction. His report has not yet appeared.

There have been several rushes to new places lately. One took place to Smoothwater lake, but there is only a small diabase area, and there is a good deal of staking on the quartzite. There was another to Welcome lake and several promising finds are reported to have been made. Duncan lake also received some attention, but prospectors are not greatly enthused there. This year the Government is strictly enforcing the law that permission must be obtained before work can be done. So far permission has been refused for working around Shining Tree lake, on account of the value of the pine.

Toronto

July 17 The Canadian government has awarded a contract to Doran & Devlin, of Ottawa, for the construction in that city of an experimental plant to be used by the Mines Branch under Director Eugene Haanel, to ascertain the value of peat in making producer gas. It is believed also that peat coke can be utilized for smelting, and if this can be established by tests, iron deposits which are not capable at present of being commercially exploited owing to their distance from the coalfields will be rendered available. The cost of this experimental plant will be about $13,000.

The Canadian Railway Commission has decided that it has jurisdiction over the White Pass & Yukon Railway. Recently upon an application being made by the Dawson Board of Trade for a reduction of freight rates, the company contended that as the road was partly in United States territory the commission had no jurisdiction in the case. The commission finds that under amendments to the Railway act passed last session, it has power to fix the freight charges, the case being left for further consideration.

As a result of the survey of the projected extension of the Temiskaming & Northern Ontario Railway to Gowganda by way of Elk Lake it is estimated that the cost will be about $40,000 per mile or about $2,000,000 for the road complete.

Another sale of mining land on the Gillies Limit, south of the Cobalt area, took place this week, when tenders were received for the properties not disposed of at the previous sale. Twelve tenders out of 83 submitted were accepted and 201 acres disposed of at an aggregate sum of $47,204, an average of $235 per acre. The sale is made subject to working conditions and a royalty on the output. There still remains unsold 392 acres out of the 870 originally offered and it is understood that the remaining portion will again be offered for sale.

Mexico

July 10—The new mining law for Mexico has passed the Chamber of Deputies and is now before a committee of the Senate. Congress has adjourned until October at which time the committee will report to the Senate and the law will be submitted for joint approval. The form in which the law has been approved by the Chamber of Deputies is considered generally favorable to the mining interests of the country and it is expected that the Senate will concur with the law in substantially its present form. The new law is to become effective in 1910.

Considerable interest is shown in the new deal for La Blanca mine at Pachuca. This property has been under option several times in the last few years, lately to interests represented by John B. Farish, of New York. The price to Mr. Farish was 12,000,000 pesos but was later reduced to 8,000,000 pesos taking recognition of the fall in the price of silver. The Farish deal failed of conclusion and the property is now controlled by an option to Hugh Rose, of Guanajuato, who is supposed to represent the same English interests that control the Camp Bird mine in Colorado. The property is being examined by Godfrey Doveton, of the firm of Spurr & Cox, Inc., and John Hays Hammond and Courtland E. Palmer, of New York are now in Mexico presumably in connection with this business. It is reported that the present price is in the neighborhood of 6,000,000 pesos. Also it is rumored that the same interests may acquire the Santa Gertrudis mine on the same vein, at a price not made public. Both of these properties and the Baron mine of the Real del Monte & Pachuca company, are located on a short, isolated vein southeast of the main Pachucha mine area. These mines have been developed in comparatively recent years and they are now the richest and most productive mines in the Pachuca camp. La Blanca mine belongs to a local company headed by Francisco Rule and the Santa Gertrudis is owned entirely by a Mexican company. The Santa Gertrudis has just contracted for a 300-ton cyanide mill to replace the patio process for treating low-grade ores. La Blanca has no mill. It is expected that these deals when concluded will have the effect of attracting considerable capital to the Pachuca camp which contains a large number of unworked mines and a considerable area of undeveloped and unprospected mineral territory.

The mining industry in all parts of Mexico, particularly the northern part, is being stimulated by the advent of seasonable rains that have broken the drought, which has seriously handicapped all mining business in the Republic for many months. In the States of Nuevo Leon and Coahuila the rains have been so heavy that great damage has been caused to the railroads and in some instances to mining properties particularly at Lampazos in Nuevo Leon. However, the heavy rains are welcome and will prove a great benefit to mining. The rainy season on the Pacific slope has been late in starting, but the drought has not been so severe in that locality.

London

July 10—The Dominion Iron and Steel Company, Ltd., incorporated under the laws of the Province of Nova Scotia, Canada, is making an issue of £1,200,000 in 5 per cent. consolidated mortgage bonds at the price of £93 per £100 bond. These bonds are being offered for subscription simultaneously in Canada and London. The proceeds of the present issue will be used first to retire the existing $1,500,000 second mortgage bonds; the balance will be reserved for the proposed extension of the company's works.

In the circular announcing this issue the following information is given respecting the affairs of the company. The works are situated on the shore of the harbor of Sydney, N. S. The company owns iron mines on Bell island in Newfoundland, and limestone properties at Cape Breton. The property has been reported on by F. W. Harbord, who estimates that the iron-ore deposits at Wabana exist in sufficient quantity to supply the needs of the company for 100 years, assuming the present consumption to be doubled. It can be mined at a very low rate and can, if necessary, be sold in the open market at a profit.

As regards fuel supply the Steel company has a contract with the Dominion Coal Company, insuring an adequate supply for the existing four blast furnaces and steel plant for 83 years. The Steel company possesses a modern, well-designed plant and the products are protected against external competition by a tariff. The company has no serious internal competitor in Canada, east of the Great Lakes. Mr Harbord expresses the opinion that there are no iron and steel works in a better position with respect to the supply of cheap raw materials for manufacturing pig iron and steel. An extension of the present plant is now recommended at a cost of £457,000, which will increase the output by 50 per cent.

The present issue of fresh capital is in part for carrying out these proposed extensions. The Canadian government bounties will run out in 1910. The combined bounties on pig iron and steel ingots are equivalent for 1909 to $1.01 per ton on steel ingots and to $1.00 for 1910. The Canadian market has been steadily growing, and it is anticipated that it will absorb the whole of the increased output of the plant.

Mining News from All Parts of the World

New Enterprises, Installations of New Machinery, Development of Mines and Transfers of Property Reported by Special Correspondents

THE CURRENT HISTORY OF MINING

General Mining News

La Blanca—It is reported that English interests identified with Camp Bird, Ltd., have an option on this property in the Pachuca district, State of Hidalgo, Mexico.

E. I. Du Pont De Nemours Powder Company—The Copper Range railroad has completed its branch into the site of the new powder plant that is to be erected during the year near Dollar Bay, Mich., on the shores of Portage lake. Several of the smaller buildings are in the course of erection and with the railway facilities at hand the construction of the main buildings can be hastened. The company owns about 3000 acres of land at this point and the plant is to be the third largest in the country. It will manufacture explosives for the northwest mining regions.

Federal Mining & Smelting—The output of this company's properties in the Cœur d'Alène district for the first six months of 1909 was approximately 60,000 tons of concentrates averaging about 45 per cent. lead and 30 oz. silver. At the Morning mine near Mullan, a shaft has been started at the breast of No. 6 tunnel. This tunnel, which is nearly a mile long, is on a level with the mill. From the Omaha, an isolated claim a short distance north of the Wardner group, the company has been shipping, since May, crude ore running from 15 to 18 per cent lead and with a fair silver content. Recently copper ore running high in silver has been encountered, a recent shipment averaging 4 per cent. copper and 309 oz. silver per ton. This ore is of especial interest as it is unique in the Wardner section, no copper ore having been previously found in this part of the Cœur d'Alène district. The Wardner ores usually carry silver and lead in about the proportion of 25 oz. of silver to 40 to 50 per cent lead.

Cananea Consolidated Copper Company, S. A.—The operating company, of the Greene-Cananea interests, has been granted concessions by the Mexican government for the construction of a railroad in northern Mexico. It is stated that work is to be started at once under the provisions of four concessions, as follows:

Concession No. 1—From Del Rio, near Cananea, east to a point on the line between the States of Sonora and Chihuahua, and touching the international boundary line at Agua Prieta, opposite Douglas, Arizona.

Concession No. 2—From Del Rio westward to Imuris, a station on the Sonora railroad.

Concession No. 3—This line is to begin from the point where concession No. 1 ends, on the Sonora-Chihuahua line, to a point on the Rio Grande, Sierra Madre & Pacific railroad at or near Guzman station.

Concession No. 4—From Guzman station east to a point on the Mexican Central railroad.

Dr. L. E. Ricketts is quoted as saying that the proposed line will be constructed and equipped in the most substantial manner, 80 lb. steel rails to be used, and all timber to be creosoted. The maximum grade, except in the mountain divisions, to be not more than 1 per cent., the topography of the country being exceptionally favorable.

Calumet & Hecla—This company is making preparation to materially increase production on the Osceola amygdaloid lode. The shafts on this lode are being put in shape to handle two skip roads and the rock houses equipped with more crushing facilities to handle the increased tonnage. Nos. 13, 15 and 16 shafts are operating two skips, and this will soon be done at No. 14. At No. 17 and 18 work is also being pushed, but it will be some little time before these shafts can produce on the same scale as the others.

Miami Copper Company—The operations of this Arizona company will be concentrated within a small area, compared with the operations of some of the other low-grade copper properties. Transportation difficulties will be largely eliminated by the location of the mill, power plant and administration buildings practically adjoining the mine. The payable disseminated orebody at this property is limited by barren and leached areas, and the company's engineers report 13,000,000 tons of 2¾ per cent. ore developed to date. The ore is being developed in 50 ft. blocks which will be subsequently removed by the caving system. The development shaft is down 670 ft. and the main shaft has now been sunk to a depth of 425 ft. About 75,000 tons of ore are on the dump, having been taken out during development. In the experimental mill erected at the property, the concentrating tests have indicated a recovery of over 75 per cent. The grading for the 2000-ton mill is about completed, and construction of the first half will be begun in earnest on the completion of the railroad about the middle of August. Contracts for the structural steel and for the engines have been awarded to the Minneapolis Steel and Machinery Company and the Nordberg Manufacturing Company, respectively. The contracts for the reduction machinery have not yet been awarded, the fine-grinding equipment not having been definitely decided upon. Crushers and rolls will be used for the coarse crushing, and Chile mills or some other form of grinding mill for the fine crushing. The reduction experiments are being conducted by H. Kenyon Burch and the entire operation at Miami is under the general direction of B. Britton Gottsberger, formerly general manager of the Tennessee Copper Company.

Arizona

COCHISE COUNTY

Great Western—Three shifts are being employed at Courtland in the sinking of the working shaft of this company, which is now down over 100 ft. Foundations for the joint power house for the Copper Queen and Great Western companies were started this week.

Gleeson—The Southern Pacific Railway has completed its line into this old camp in the Turquois district and increased activity is resulting.

Bisbee Coalition Mining Company—The stockholders of the North Bisbee Company have voted to accept shares in this company in exchange for the property. The Eureka Mining Company is also expected to turn over its property in exchange for stock.

Penn-Arizona—Developments indicate a large amount of ore of good grade in the sulphide body recently disclosed at the 1250 ft. level.

MARICOPA COUNTY

Planet—The Lewisohns through the General Development Company, of New York, have negotiations pending for the purchase of the Planet group of 25 claims in the Harcuvar district on the south side of Bill Williams fork. The property is developed by three incline shafts, the deepest of which is 800 ft. giving a vertical depth of 365 ft. There are approximately 4000 ft. of workings, and there is said to be 75,000 tons of 6 per cent. ore blocked out for stoping.

PINAL COUNTY

Inspiration—It is reported that the company has exercised its option on the eight claims adjoining the property on the north and known as the Black Copper group.

drill holes having shown the same orebody as was encountered from the company's Joe Bush shaft.

Ray Consolidated—Cross cutting between drill holes during last month has greatly increased the ore reserves of this property which are now estimated by the company's engineers to reach 28,000,000 tons. The directors have recently voted to increase the capital to the extent of 200,000 shares, or $2,000,000.

California

California Consolidated Mines—The Wildman, Mahoney and Lincoln mines at Sutter Creek, and two large mills, will shortly be acquired by this company. It is expected that the three-compartment shaft on the Wildman will be sunk to a depth of 2500 ft., and more stamps added to the mill.

Humboldt County

Klamath River Mining Company—As soon as the sawmill is completed a flume will be constructed to bring water to this property which is 50 miles from Eureka. The property is to be operated by hydraulicking.

Lake County

Helen—At this quicksilver mine, the furnaces have been started after an idleness of four months. A. Rocca, superintendent.

Modoc County

Hoag District—J. F. Wall will install a custom mill at Bidwell; the leasing system now in vogue in this district is responsible for this improvement.

Nevada County

Yellow Metal—This new mine, near Bowman Dam, owned by J. G. Richards and others, of Nevada City, is yielding very high-grade ore.

Graniteville—At this camp 60 stamps are dropping on ore from different claims, and 30 more will be added to the number when the Erie mines start the latter part of this month.

Red Cross—E. J. Dean and associates, of Omega, have acquired the mine and 20 stamp mill, and will resume development.

Mammoth—High-grade ore has been encountered at this mine, owned by Frank M. Coombs, of Graniteville.

Shasta County

Fiske-Purcell—E. P. and J. G. Conover, of Redding, have bonded this group at Harrison gulch (Knob, P. O.), near the Midas mine. A mill may be erected.

Uncle Sam—This old mine, formerly the property of the Sierra Buttes Mining Company, has been sold to L. A. McIntosh, of Chico, Butte county, and others, interested in the Hazel Mining Company.

First National Copper—The production of this company for June amounted to 832,000 lb. of copper. Two furnaces only were running during the month.

Sierra County

Sierra Mining—Rich ore has been encountered in the Alaska mines of the company at Pike City, and the mill will be repaired.

Bellevue—At the Drift mine, between St. Louis and La Porte, 40 men are extracting high-grade gravel from soft ground.

Siskiyou County

Dredge—A contract has been let for excavating the pit for the new gold dredge on McAdams creek, two miles north of Fort Jones. The Yuba Construction Company, of Marysville, is building the machinery. George Carr is to be superintendent.

Schreck—Instead of bringing in water by flume and pipe, R. E. Schreck and associates will pump water direct from the Klamath river under high pressure through giants for the purpose of washing the gravel banks near Happy Camp.

Trinity County

Lappin—The strike recently made in the mine at Deadwood, owned by William Bacon, has developed into a good orebody. A gasolene engine has been purchased to run the mill.

West Point Mining Company—The company, having the Lear & Nicholson mine at West Point under bond, has struck the lode on the lower level. The vein is narrow but is of high grade.

Colorado

Boulder County

Richmond Mines—A shipment of high-grade ore has been sent to the Boulder sampling works; second-class ore is also being taken out.

National Fuel Company—Denver people are largely interested with Harry Van Meter, as president, in the purchase and securing of options on the Lucas and Strathmore coal properties near Lafayette, and on the Travda-Llewellyn near Louisville Junction. It is an independent company and will open up the above coal mines on a large scale.

Clear Creek County

Bleated Bond—This group of claims and the Crown Point group which adjoins, have been bought by M. A. Hites, of Georgetown. Active development is to be carried on by the new owner.

Dromedary Mountain—The holdings of this company at Georgetown, Colo., have been sold at trustee's sale by order of the Federal court, for $30,600 and costs to Dr. C. E. O. Marcy, of Boston, Mass. It is reported that operations on the property will be resumed.

Lowell Mill—This 25 ton mill at Silver Plume has been purchased by S. H. Bradley, of Denver, and will be run on ores from the Mendota property.

Honest John—It is reported that the company will increase the capacity of the mill from 25 to 100 tons daily. The mill is to be equipped with an electrochemical process designed by Adolph Maier, of Denver, and cyanide tanks will be added. The office of the company is at Idaho Springs.

Gilpin County

Alps—Local people, interested in this property on Quartz hill, may install an air-compressor plant. James Williams, Bald Mountain, Colo., superintendent.

Diamond Bill—Additional machinery is to be placed at this shaft. J. S. Fagrelius, Rollinsville, Colo., is manager.

New National Tunnel—A new Dietz electric air drill is to be installed at this property. G. Whitney Adams, Central City, Colo., is in charge.

Topeka—It is reported that operations are to be resumed at this old property in the Russell district after an idleness of eight years due to litigation, and the tracks of the Gilpin Tramway Company are to be extended to the mine. Henry P. Lowe, Central City, is manager.

King Bee—High-grade gold-silver ore has been uncovered in the Wellington No. 6 vein in the lateral workings through the Newhouse tunnel. Southern capitalists are interested and R. L. Martin, Quincy building, Denver, is manager.

Lake County—Leadville

Iron-Silver—A large body of smelting ore was recently opened up in the Tucson shaft at a depth of 1150 ft., between the parting quartzite and the white limestone. In Cambrian quartzite a very rich streak of ore was lately discovered, assaying as high as 4000 ounces of silver per ton. This ore was sacked and shipped to Kansas City. Besides this high grade silver the Tucson is producing more zinc than any other mine in the State, the output of that kind of ore being 2000 tons per month.

Interstate-Coal—After being closed down for several months, the work of unwatering has been started. It will be the end of the month before bottom is reached.

Virginius Group—This Sugar Loaf property is being developed through the Dinero tunnel and at a distance of 1350 ft. a vein is now being explored, so far it is too low grade to ship. The company is also developing from the tunnel the H. A., Silver King, G. D., 1901, and Lady Loftus claims.

Ouray County

Camp Bird Extension—Work is to be resumed on this group of mines at an early date.

Calliope—A new orebody has been encountered in a drift about 700 ft. from

the tunnel portal. T. Manion, superintendent.

SAN JUAN COUNTY

Silverton Mining—The mill being erected by this company on its North Star mine on Sultain mountain is expected to be ready for operation by August.

SAN MIGUEL COUNTY

Wagner Development and Mining Company—The property of the Alta Mines Company and of the Tiptop lode in the Turkey Creek district have been acquired by this new company, headed by John M. Wagner, of Telluride.

TELLER COUNTY

Kimball—Work has commenced at the new cyanide plant which is to treat the tailings dump at the site of old El Paso reduction works. George K. Kimball, of Idaho Springs, Colo., is interested.

Portland—The pumps at the 1500-ft. level have been shut down and the water will be permitted to rise to about the 1200-ft. level, awaiting the draining of the property by the deep-drainage tunnel. About 100 miners were recently laid off on account of the Colorado City mill being crowded with ore.

Columbia Mining and Development—This leasing company, under the management of Charles Walden, has encountered good ore at the Chicken Hawk mine of the Katrinka company on Guyot hill.

Vindicator—The No. 3 south vein recently encountered in the 1300 level has been opened by drifting for a distance of 130 ft., with the gold content of the vein still being maintained at about the grade of the original discovery.

El Paso—A lease on block 25 of this property on Beacon hill has been given to Jenson, Halcrow & Taylor, of Cripple Creek.

Idaho

SHOSHONE COUNTY

Black Horse—Good silver-lead ore has recently been encountered in this property, and the completion of the railroad to Murray has stimulated the development of properties on the northern side of the district.

Hercules—The reported purchase by the company of the Tiger mill at Burke is denied by the owners. The mill is situated only a short distance from the Hercules and nine-foot tunnel, which is controlled by Hercules interests, and would afford a convenient outlet at depth for the Hercules ore.

Snowstorm—Stockholders will meet at Lewiston on July 27 to discuss the curtailment of output until differences with the railroad company have been settled.

Tyler—A contract for 350 ft. of development work at this mine, near the Snowstorm, has been let to Arthur A. Hale, of Rossland, B. C.

Indiana

CLAY COUNTY

A movement has been started to build a belt railroad around the city of Brazil, and a company is being organized for that purpose. In addition to reaching 40 factories in the outskirts of the city, the road will reach nearly all of the larger coal mines in the county. This will not only afford additional transportation outlet, but place the factory district practically at the mouth of the mines.

GREENE COUNTY

Summit—The culmination of long-standing controversies between the miners and operators at this mine came on July 6, when the miners refused to work and the mine shut down. The original trouble was over extra pay for the removal of slate; complications caused by the discharge of the mine committee and disagreement over the giving of places have been added to it. Neither side expects an early settlement and in the meantime 200 men are idle. The company claims that the question of the removal of slate was settled long ago on the same basis as the Vandalia mine No. 5 settlement.

Michigan

COPPER

LaSalle—The new shaft is well established in the ledge, the overburden at this point being but a few feet. The shaft will go down in the formation and is located about 1700 ft. south of No. 1 Tecumseh shaft. The hoisting and compressor equipment is being moved from the idle No. 2 Caldwell shaft and will be ready to go into service as soon as this shaft has obtained sufficient depth to require it. Tecumseh shaft is encountering good ground in the lower workings about 2000 ft. from the surface. Up to this point the best showing had been made in the northern extension of the drifts, but now the ground to the south toward the Caldwell shaft is opening more favorably.

Isle Royale—The "A" shaft, sinking on the Baltic lode, is at a depth of 500 ft., at which point a station is being cut preparatory to the starting of lateral workings; particles of copper have appeared in the shaft from time to time and the laterals will be watched with interest. Shafts Nos. 4 and 5 on the Isle Royale lode have passed out of the copper-bearing ground, evidently due to a deflection of the formation.

Lake—This company is carrying on diamond-drill operations underground to determine the width and mineralization of its lode. At the second level, to the south, two holes have been put through the formation and found it to be about 90 ft. wide, and carrying copper for practically the entire length with but a few patches of trap and barren vein rock. Similar work is being carried on at the first level. The shaft is sinking close to the fifth level, in the footwall of the lode. The first diamond-drill hole of the series that is to be put down jointly by this and the North Lake company to locate the northern extension of the Lake lode has been started at a point about half way between the shaft and the northern boundary of the tract.

Superior—The No. 1 shaft is sinking below the 11th level, and from this level a crosscut driven to cut the formation has revealed a state of mineralization equal to that in the levels above. Rock shipments averaging about 400 tons daily are being made to the Atlantic mill.

Adventure—The new vertical shaft that is being put down to open the three lodes that were revealed on this tract by means of drill cores, has obtained a depth of about 50 ft. in the rock. It is calculated that the first lode will be reached at a depth of about 900 feet.

IRON—MARQUETTE RANGE

Cleveland Cliffs Iron Company—This company is about to begin work on its great water-power plant near Eagle Mills, on Carp river. The plant will cost about $1,000,000, and will take over a year to construct. The first work to be done is the construction of several dams on the river. High power-transmission lines will convey the electrical current to the mines at Negaunee and Ishpeming and to those in the Swanzey district, about 20 miles south of Negaunee.

Minnesota

IRON—MESABI RANGE

Buffalo—It has been decided to strip the overburden and operate the mine near Hibbing as an open pit instead of by shaft. Work on the stripping will probably be started soon. The mine is controlled by the Buffalo & Susquehanna Iron Company.

Leonard—Work is well advanced on the stripping of the northern end, and on the approach to the open pit. The southern end will be worked through a shaft, which was completed last season. At that end the deposit dips and is overlaid by a heavy capping of taconite. The mine is between Hibbing and Chisholm and is one of the Hill properties now leased to the Oliver Iron Mining Company.

Monroe Tener—Good progress has been made in removing the overburden, which varies from 80 to 100 ft. in depth. The mine was worked for some time on the milling system through three shafts, before it was decided to strip. The approach to the pit is about half a mile long, extending across the adjoining Longyear 40. The Monroe Tener is west of Hibbing and is Steel Corporation property.

Webb—No shipments will be made this season, since it has been decided to abandon the shafts and to strip the property, in order to operate it as an open pit. The cost of stripping is justified by the proved size of the orebody. The mine is owned by the Shenango Furnace Company and is near Hibbing.

Missouri

JOPLIN—ZINC-LEAD DISTRICT

Granby—This company has opened up 1400 acres of land west of Spring City to prospectors and three drill rigs will go to work at once.

Power Plant—Henry L. Doherty & Co., 60 Wall street, New York, will erect a large power plant to develop 60,000 h.p. near the present Spring River power plant. This will be one of the largest plants supplying power to a mining community.

Independence Lead and Zinc Company—This company has been incorporated with a capital stock of $50,000. L. C. Miller, of Joplin, is one of the stockholders.

Mission Mine—This old lease has been sold to Dean Brothers, of Kansas City and Joplin. A 1000-ton mill will be erected and a double-compartment shaft with skips will be installed. The old mill will be used until the new mill is erected. R. A. Ollis, of Baxter Springs, is local representative. The lease at Baxter Springs has long needed a modern mill of large capacity and good management to make a success of the mine. The company will be called the Kansas City-Quapaw Mining Company.

Mattes Brothers—This company, west of Joplin, is sinking four new shafts near their 500-ton mill, in addition to the two already in operation. These will all be connected with the mill by trams to rapidly develop the sheet ground.

Ping and Robertson—The three-compartment shaft on the line between these two pieces of land at Galena, Kan., is being pushed. Ore from this shaft will supply two 400 ton mills on the two tracts. Excellent ore has been found from the 200- to the 300-ft. level.

Montana

BUTTE DISTRICT

Amalgamated Copper—The Butte & Boston company is planning to increase the depth of the shaft of the West Grey Rock mine 400 ft. The shaft at present is down 700 ft. and the company proposes to raise up from 1100-ft. level of the adjoining East Gray Rock mine and connect with the West Gray Rock shaft. This will materially improve the ventilation of both mines and facilitate the development work now going on. At the Pennsylvania mine of the Boston & Montana company the work of putting down the air shaft from the 1200 to the 1400-ft level, begun the latter part of May, has recently been finished. By means of a new 9-in. air line through the air shaft, an additional 8 lb. of air pressure has been secured throughout the mine. At the Badger State mine of the same company the shaft is now down to the 1250-ft. mark. With another 50 ft. of depth a station will be cut and a crosscut run south to connect with the long crosscut now running from the Speculator shaft to the Jessie lead.

Butte Coalition—Sinking on the Tramway shaft was begun this week. The shaft at present is about 1750 ft. in depth and will be sunk to 1800 ft. to allow plenty of room for the lowering of the skips to the 1750-ft. station.

JEFFERSON COUNTY

Hazel—Daniel Agoa has leased this group, 4 miles southeast of Homestake. The principal shaft is down 185 ft. and is to be sunk to a depth of 500 ft. The surface plant consists of a head frame, a geared hoist and two 80-h.p. boilers.

Boston & Alta Copper Company—This company has been formed for the purpose of acquiring the Alta group near the Boston & Corbin property at Corbin. The officers are John Joyce, president; M. L. Hewitt, vice-presient; Charles H. Innes, secretary and treasurer.

Nevada

ESMERALDA COUNTY—GOLDFIELD

C.O.D. Consolidated—Crosscutting is now progressing from the 450-ft. level of the Victor shaft. The southerly crosscut has entered the dacite formation and low but persistent assays are being obtained daily.

Knickerbocker Lease—This lease on the Blue Bull acreage has not been operated for the past three months, and has been acquired by F. W. Brenneman and other Los Angeles men who intend prospecting the block thoroughly. The work is in charge of J. W. Dunfee.

Nancy Donaldson—A new gallows frame has been erected and a 25-h.p. gasolene hoist installed. The old shaft, having a depth of 100 ft., is being retimbered and will be sunk deeper. J. C. McCormack is president of the company.

LANDER COUNTY—AUSTIN

Austin-Manhattan—The company has purchased the Miller water right in Marshall cañon, assuring a supply of pure water independent of the Austin water system. The station at the 700-ft level of the Frost shaft at the junction with the tunnel is being prepared for the hoisting and pumping equipment. The Frost shaft is to be sunk to the 1100-ft. level.

LINCOLN COUNTY—PIOCHE

Latimer—This property at Atlanta, about 60 miles north of Pioche, has recently been bonded to Los Angeles parties, for whom F. Nugent Cosby, of Pioche, is manager. About 25 men are now at work developing the property, which is a large, low-grade gold deposit. A number of prospectors are going into the vicinity.

Nevada-Utah—Shipments from the Day mine have been curtailed to about 50 tons per day.

NYE COUNTY—MANHATTAN

December Fraction—Barney Francisco, leasing on this claim, near the Nellie Grey, is said to have encountered high-grade gravel near the bed rock in a drift about 20 ft. from the shaft.

NYE COUNTY—PIONEER

Rickard-Garberg Lease—The first car of ore has been billed to the Western Ore Purchasing Company at Goldfield.

Pioneer Leasing and Mining—This company has declared a dividend of 5c. per share, amounting to $44,046, to stockholders of record, July 20, 1909.

WHITE PINE COUNTY—ELY

Butte & Ely—A 60-day option on a controlling interest in this property is said to have been taken by Cole-Ryan interests.

Boston-Ely—A 40-h.p. gasolene hoist is to be installed, and pending this installation, work will be discontinued for the present in the shaft which is now down 840 ft. A 2-ft. streak of high-grade ore was recently encountered on the Matilda claim of the Ely-Western group controlled by this company.

Oklahoma

A Washington despatch of July 14 says: A right of way for the Prairie Oil and Gas Company for an 8-in. pipe line to carry oil from a point in Tulsa county, in the Glennpool field, through the Creek, Cherokee and Choctaw Nations in a southeasterly direction to the Oklahoma-Arkansas State line, a distance of 151 miles, was today approved by Acting Secretary of the Interior Pierce. The new pipe line will extend to Baton Rouge, La. It is to be constructed immediately. Heretofore the pipe-line facilities in Oklahoma were wholly inadequate to take care of the production of oil. The construction of the new pipe line is the outgrowth of Secretary Ballinger's action in amending the oil and gas regulations by striking out the "common carrier" and "confiscatory" clauses, none of the companies being willing to extend their lines under the old regulations. The new line will furnish an outlet for a large surplus of oil, especially from the Glennpool and Muskogee fields, which cannot be handled now.

LE FLORE COUNTY

Sequoyah Coal and Mining Company—The company, recently organized with $300,000 capital, has leased about 3000 acres of coal lands from the government, and expects to develop five mines to a daily capacity of 500 tons each. It has not been definitely decided whether electricity or compressed air will be used for min-

ing purposes. Mr. William G. Metzger, of Sutter, Okla., general manager of the company, is in charge of construction work. Other officers of the company include F. S. Landstreet, 10 Bridge street, New York, president; Chas. Sutter, Carleton building, St. Louis, vice-president; and James Brizzolara, Fort Smith, Ark., secretary and treasurer.

Pennsylvania

ANTHRACITE COAL

Philadelphia & Reading Coal and Iron Company—The statement for May and the 11 months of the fiscal year from July 1 to May 31 is as follows:

	May.	Eleven Mos.
Earnings	$2,545,783	$42,898,555
Expenses	2,588,646	31,198,621
Net or deficit	D. $ 42,983	N. $1,630,934

For the 11 months, as compared with last year, there were decreases of $3,098,781 in earnings; of $2,304,225 in expenses, and of $794,556 in net earnings.

BITUMINOUS COAL

Keystone Coal and Coke Company—This company, at Greensburg, has taken a contract to furnish 50,000 tons of coal to the Italian government railroads. The coal will be shipped by way of Baltimore.

Utah

BEAVER COUNTY

Beaver Carbonate—Plans are under way to install a mill at this property. The latest orebody opened east of the shaft on the 700-ft. level has been crosscut 53 feet.

Hub—The plan of development has been changed and the mine is now being worked from a long tunnel, which connects with the shaft. During the driving of the tunnel, four fissures were encountered, the last one of which is being given considerable attention. Charles T. Bichard, manager, care Utah Mining, Milling and Transportation Company, Salt Lake City.

Minnie—Contracts have been let for an electric hoist and compressor equipment. Electric pumps will also be installed. Power will be obtained from the Telluride Power Company. A. D. Moffat, superintendent, Milford, Utah.

[illegible] COUNTY

Grand Central—The reported strike in the Grand Central has been confirmed by General Manager C. F. Lester. The strike has been made in virgin territory, the ore being encountered about 700 ft. farther west than any of the developed orebodies of the mine.

[illegible] Consolidated—The company has [illegible] on the 450-ft. level and it is said to be the same body which the company has been working on the 400 level for several months.

Chief Consolidated—The double compartment shaft is down to the 1800 level and there are stations at the 1200- and 1400-ft. level where crosscutting is being done. A station is to be started at once on the 1600-ft. level.

TOOELE COUNTY

Boston-Sunshine—The directors have posted the initial dividend of 3c. per share. This company acquired the old Sunshine property about 90 days ago, rebuilt the mill and since then it has been clearing about $6000 per month.

Western Utah—A second new orebody has been encountered since work was resumed on the mine a few weeks ago. The new ore is silver-lead, while copper and gold predominated in the previous discovery in the Gold Hill mine. Duncan McVichie, general manager, Salt Lake.

West Virginia

LOGAN COUNTY

Dingess Run Coal Company—This company, it is reported, has now secured control by purchase and lease of nearly 30,000 acres of coal land lying along the dividing ridge between Guyandot and Coal rivers. The company will lease tracts to coal-mining companies. J. L. Caldwell, Huntington, W. Va., is acting manager.

Canada

BRITISH COLUMBIA—SLOCAN

Hewitt—This silver-lead mine, situated near Silverton, Slocan lake, is to be reopened, with Geo. R. Stilwell again in charge.

ONTARIO—CORALI

Shipments—Shipments for the week ended July 10 were as follows: Nipissing, 197,002 lb.; La Rose, 138,600; Crown Reserve, 118,865; Coniagas, 82,000; McKinley-Darragh, 57,700; Kerr Lake, 62,085; Peterson Lake, 40,570; Buffalo, 44,621; O'Brien, 63,998; Temiskaming & Hudson Bay, 62,000. Cobalt Lake, 79,900. Total, 947,401. Of the 15 cars, five were low grade ore.

Kerr Lake—The No. 7 vein has been cut at the 200-ft. level and found to maintain its value.

Temiskaming-Cobalt—A rich pay shoot has been struck on the main vein at the 300-ft. level. The ore is claimed to be better than that in the same shoot at the 200-ft. and 250-ft. levels.

Union Lake—A new plant is being installed at the Peterson Lake lease and a number of new buildings are being erected.

QUEBEC—BLACK LAKE

Black Lake Consolidated Asbestos Company—This company, capitalized at $5,000,000, will acquire the Union asbestos mines and the Southwick mine, and will have a controlling interest in the Black Lake Chrome and Asbestos Company, and the Imperial Asbestos Company. R. A. E. Greenshields, Errol Languedoc, E. R. Perkins, J. M. Montle and H. W. Beauclerk, of Montreal, are the promoters. E. B. Greenshields, president of the Amalgamated Asbestos Corporation, is authority for the statement that the new merger has no connection with the Amalgamated company, and work on the property of the latter is proceeding briskly at both the mines and mills.

Mexico

CHIHUAHUA

Prieta—Manager D. H. Bradley, Jr., has contracted for the necessary machinery for a 30-ton milling plant for this Parral property.

Dolores—The company recently sent out a shipment of 79 bars of gold-silver bullion. The net monthly earnings of this company are given as about $35,000.

San Toy—This company's new steel tramway terminal at Santa Eulalia is now completed and the four-mile tram is again in commission at full capacity. Donald B. Gillies, general manager, Chihuahua.

Batopilas—This company is now doing considerable exploratory work, both surface and underground, presumably incidental to determining the extent of the low-grade orebodies, on the basis of which the size of the contemplated cyanidation plant will be fixed. Alexander R. Shepherd is manager.

Quebradillas—This Parral property formerly owned and operated by the Veta Colorado Mining and Smelting Company, is now controlled by St. Louis people, who will begin systematic developments on a large scale.

MEXICO

El Oro—During June, mill No. 1 ran 24 days and mill No. 2 ran 22 days, crushing 20,363 tons of ore, yielding bullion valued at $103,170. Working expenses were $67,020, and $22,200 were spent on development, leaving a profit of $73,050, in addition to which there was $7000 profit in the operation of the railway.

SONORA

Lampasos—The Banco de Sonora, of Hermosillo, is reported to have taken over this group of silver mines of the Lopez interests under a foreclosure of the mortgage held against the property for about $800,000. The properties are opened to a depth of about 800 ft. and on that level in the Los Tinos mine are reported to have in sight an orebody 18 ft. in width and of unknown length.

Lampazos Consolidated—Shipping quantities of good ore have been struck in the Silver King claim in the Moctezuma district. Manager W. H. H. Davenport is now in Buffalo, N. Y., where the future policy of the company in this section will be decided.

Metal, Mineral, Coal and Stock Markets

Current Prices, Market Conditions and Commercial Statistics of the Metals, Minerals and Mining Stocks

QUOTATIONS FROM IMPORTANT CENTERS

Coal Trade Review

New York, July 21—The coal trade in the West continues fairly active, showing some gain from week to week. Overproduction, or rather over-shipments, are still a source of weakness in prices. The Lake trade is improving; in fact it has been better than some authorities would have us believe, as is shown by the fact that up to July 1 there was a gain of 33 per cent. in the coal tonnage passing the Sault.

The Keystone Coal and Coke Company has taken a contract to furnish coal for the Italian Government railroads. It is said that this will require the shipment of 100,000 tons of coal this year, which will go through the port of Baltimore.

The Eastern bituminous trade shows slow improvement. The question as to wages in the Central Pennsylvania district is not yet settled, though it is believed that the miners will consent to some reduction in wages.

The anthracite trade is without incident. Shipments are maintained, but quite a number of collieries are working short time.

New Coal Cars—The Pittsburg-Buffalo Coal Company has contracted for 1000 steel mine cars, divided as follows: Standard Car Manufacturing Company, 500; Youngstown Car Company, 200; Connellsville Manufacturing Company, Ohio Ceramic Company and Arthur Koppel Company, 100 each. The Arthur Koppel Company, Pittsburg, in addition reports orders for 500 steel mine cars for the New River Coal Company, of West Virginia, and 600 for coal mines in western Pennsylvania.

Tariff on Coal Slack or Culm—In the appeal of Waterhouse & Co., on certain importations of bituminous coal, the cargoes were assessed for duty at 67c per ton, whereas the importers insisted that a certain percentage should be admitted at 15c. a ton as being "coal slack or culm such as will pass through a ½-in. screen." The Board of General Appraisers has decided in favor of the importers, holding as follows: "The terms 'coal slack or culm' in Paragraph 415 have acquired in the commerce of this country no definite and uniform meaning such as would exclude from it small pieces of bituminous coal such as would pass through a half-inch screen. All bituminous coal which, on test made, will pass through a ½-in. screen at the port of arrival, is held to be dutiable at 15c. per ton of 28 bu. 80 lb. to the bushel." The board also holds that where a cargo of coal composed of lump coal and slack is imported in a mixed condition, a portion being dutiable at 67c. a ton, the cargoes may, for dutiable purposes, be segregated by being passed over a ½-in. screen at the port of arrival.

Coal Traffic Notes

Tonnage originating on Pennsylvania railroad lines east of Pittsburg and Erie, year to July 10, short tons:

	1908.	1909.	Changes.
Anthracite	2,799,960	2,653,289	D. 146,671
Bituminous	16,876,940	18,327,467	I. 1,450,527
Coke	3,540,028	5,237,065	I. 1,697,037
Total	23,216,928	26,217,821	I. 3,000,893

The total increase this year to date was 12.9 per cent.

Bituminous coal and coke shipments, Pennsylvania and West Virginia, five months ended May 31, short tons:

	Coal.	Coke.	Total.
Balt. & Ohio	8,282,447	1,632,584	9,915,031
Buff., Roch. & Pitts.	2,357,464	187,853	2,545,317
Buff. & Susqueh'na	589,971	132,470	722,441
Penn. lines, N. Y. C.	3,015,336	39,008	3,054,344
Pitts. & L. Erie	2,995,085	1,683,816	4,678,901
Norfolk & Western	5,013,412	1,029,339	6,042,751
Ches. & Ohio	5,032,509	195,911	5,228,420
Total	27,286,224	4,900,981	32,187,205
Total, 1908	23,319,562	3,204,133	26,523,695

Total increase this year, 5,663,510 tons, or 21.4 per cent. In addition the Baltimore & Ohio carried 346,283 tons anthracite in 1908, and 379,494 in 1909; increase, 33,211 tons.

Coal tonnage of railroads in Ohio Coal Traffic Association, five months ended May 31, short tons:

	1908.	1909.	Changes.
Hocking Valley	852,546	1,041,259	I. 188,713
Toledo & Ohio Cent.	370,909	421,899	I. 50,990
Baltimore & Ohio	596,035	474,647	D. 121,388
Wheeling & L. Erie	991,397	1,127,971	I. 136,574
Cleve., Lorain & Wh.	938,152	841,540	D. 96,612
Zanesville & Western	407,271	427,698	I. 20,427
Toledo Div., Pen. Co.	636,230	712,587	I. 76,357
L. Erie, Alliance & Wh.	385,129	387,788	I. 2,659
Marietta, Col. & Clev.	24,778	28,683	I. 4,905
Wabash-Pitts. Term.	.....	4,648	I. 4,648
Total	5,201,447	5,468,720	I. 267,273

The total increase in shipments this year was 5.1 per cent.

Total shipments and receipts of coal at all Lake ports, five months ended May 31:

	1908.	1909.	Changes.
Shipments	1,411,480	2,512,536	I. 1,101,066
Receipts	1,058,100	1,973,664	I. 915,564

Shipments include bunker coal furnished to steam vessels; they do not include coal shipped to Canadian ports.

New York

Anthracite

July 21—The anthracite market continues exceedingly quiet, with about the usual summer trade. Current deliveries are mainly to power and lighting plants and similar utilities. No one seems to be putting in stocks.

For prepared sizes prices are unchanged, at the regular schedule of $4.55 for lump and $4.80 for egg, stove and chestnut, f.o.b. New York harbor. For steam sizes quotations are: Pea, $3.15@3.25; buckwheat, $2.25@2.50; No. 2 buckwheat or rice, $1.75@2; barley, $1.35@1.50, all f.o.b. New York harbor. Some washery pea and buckwheat are offered at 10 or 15c. less.

Bituminous

Dealers are willing to admit that there is some improvement in trade, but say that it is very slight. Most of them are inclined to be rather pessimistic; but when brought to the point admit that they are doing more than they did last year at this time, though it is not as much as they hoped for. Conditions are about the same as last week, the far East buying moderately, and the Sound ports on a small scale, while all-rail trade is the best of all. New York harbor trade is variable, business coming in bunches, and buyers still hunting for cheap coal. Prices are about the same, ordinary grades being obtainable at $2.40@2.50, f.o.b. harbor points, with an off-grade or demurrage lot occasionally to be had for a little less. Better grades bring $2.60@2.70. Gas coal is to be had rather cheap, with the exception of slack.

In the Coastwise trade there are vessels enough to be had and rates are unchanged. Vessel owners are living in hopes of a lively business later on to the shoalwater ports, where stocks are reported pretty low.

Birmingham

July 19—Coal production in Alabama continues to show some improvement. More mines are being called into action right along and the general output is picking up. Some healthy contracts have been placed in this district recently; delivery, however, on the better portion of them being for the coming fall and winter. Some improvement is going on at several mines in this State. Further development in the coalfields is in progress also.

Chicago

July 20—The coal market is noticeably better in the demand for lump; fine coals continue strong, with the summer demand

for screenings the chief feature. Country dealers are buying more freely for autumn supplies in the domestic trade, but in steam trade the chief demand is for screenings. The harvesting trade is brisk, and increasing; all signs point to the best season in this branch of the coal business that has yet been known.

Illinois and Indiana lump and egg sell for $1.75@2.15; run-of-mine for $1.60@1.75; screenings for $1.45@1.65. Eastern coals are still over abundant; smokeless run-of-mine sells at $3.20@3.30 for lump and $2.85@2.95 for run-of-mine, for Pocahontas and New River, with lower-grade smokeless at $2.75@2.95. Hocking still has too large shipments, remaining at $2.90@3.15, the latter being the list price. Brazil block is in good demand at $2.80. Youghiogheny at $3.15 for ¾-in. gas, and Pittsburg No. 8 at $2.65 for the same size, are light but steady sellers.

The anthracite market is dull, with a good deal of coal from independent sources at 25 or 50c. off list prices.

Cleveland

July 20—Lake trade is improving. Notwithstanding the pessimistic reports concerning this trade which have been circulated, the coal tonnage passing the Sault up to July 1 was 33 per cent. greater than last year.

Local trade is quiet and steady. Prices are unchanged, Middle district coal bringing $1.85@2 for lump, $1.65@1.75 for run-of-mine, and $1.35 for slack. No. 8 district coal is 5 or 10c. above these prices. Pittsburg coal, f.o.b. Cleveland, is $2.10@2.25 for lump, $2@2.05 for run-of-mine, and $1.35@1.40 for slack. Pocahontas brings $2.80 for lump and $2.35 for run-of-mine.

Indianapolis

July 20—Reports indicate that the betterment of financial conditions is general throughout the State. The past week shows a record of advancing activity in the coal-mining industry, despite the strikes that prevail in some of the bituminous fields. Although there have been many miners out of employment altogether, and others working only part of the time, it is said that the workers in Indiana have been better off than those in adjoining States.

Pittsburg

July 20—President Thomas L. Lewis, of the United Mine Workers, is here today to settle the difficulty between the Pittsburg Coal Company and its miners. Last Thursday District President Frances Feehan ordered the men to leave the company's mines, but President Lewis abrogated the order and the matter is likely to be adjusted without serious friction.

Shipments to the Lakes are well under way, but the season's movement does not promise to reach previous records. The market remains quiet, with nominal prices at $1.10 to manufacturers and $1.20 to retail dealers for mine-run, these prices being shaded 5 or 10c. as formerly. Slack remains at 60@65c. per ton.

Connellsville Coke—Prices have hardened, but are not quotably higher, the chief change in the past few weeks being that through the continued sales the number of sellers for forward delivery has been somewhat reduced. We continue to quote standard Connellsville furnace coke at $1.55@1.60 for prompt and $1.65@1.75 for contract; standard foundry coke being $1.80@2 for prompt and $1.90@2.25 for contract.

The *Courier* reports the production in the Connellsville and lower Connellsville regions in the week ending July 10 at 290,467 tons, a decrease of 34,000 tons from the previous week. This is the first decrease for several months, and was due to the holiday. Shipments are reported at 4026 cars to Pittsburg, 6360 cars to points west of Pittsburg and 727 cars to points east of Connellsville, a total of 11,113 cars, a decrease of 1700 cars.

Foreign Coal Trade

German Coal Trade—Imports and exports of fuel in Germany, five months ended May 31, metric tons:

Imports:	1908.	1909.	Changes.	
Coal	4,437,176	4,187,888	D.	249,288
Brown coal	3,724,952	3,357,229	D.	367,723
Coke	207,486	262,432	I.	54,946
Briquets	76,690	78,388	I.	1,698
Exports.				
Coal	8,200,114	8,711,474	I.	511,360
Brown coal	10,949	12,522	I.	1,573
Coke	1,540,571	1,344,151	D.	196,420
Briquets	678,977	564,410	D.	114,567

Coke exports this year included 12,428 tons to the United States.

British Coal Trade—Exports of fuel from Great Britain, with coal sent abroad for the use of steamships in foreign trade, six months ended June 30, long tons:

	1908.	1909.	Changes	
Coal	30,024,552	30,421,691	I.	397,139
Coke	494,900	520,062	I.	25,162
Briquets	756,557	755,520	D.	1,037
Total exports	31,276,009	31,697,273	I.	421,264
Steamer coal	9,440,660	9,538,993	I.	98,333
Total	40,716,669	41,236,266	I.	519,597

Imports of fuel for the six months were only 1183 tons in 1908, and 2336 tons this year.

British Coal Prices—Messrs. Hull, Blyth & Co., London and Cardiff, report current prices of coal as follows on July 10: Best Welsh steam, $3.60@3.72; seconds, $3.48; thirds, $3.36; dry coals, $3.00; best Monmouthshire, $3.36; seconds, $3.12; best small steam, $2.40; seconds, $2.04. All per long ton, f.o.b. shipping port. There has been a heavy decline since the labor troubles have been settled.

Iron Trade Review

New York, July 21—Conditions in the iron and steel markets continue very much the same as at the date of our last report. There is a certain amount of dullness due to the summer conditions; nevertheless a considerable business is being done.

In pig iron the demand seems to be running more to basic, and considerable transactions in that class of iron are reported, indicating that steel-makers are receiving more orders and find their stocks insufficient. Foundry orders also continue to come in, at present mainly in small lots, but amounting to a considerable total. The merchant furnaces are finding more business, as is evident from the fact that many of them have been buying ore.

In finished material transactions in structural steel have reached a good total, principally made up of small lots. Some large contracts are pending, but none of any considerable size have been closed during the week. The railroad orders are quite extensive for bridges and equipment, but those for rails are not large. Business is not confined to structural material, but is broadening out to include almost all classes of material.

Birmingham

July 19—Southern pig iron manufacturers are going slow in seeking business for the last quarter delivery, there being no doubt that the present prices will improve before the next quarter sets in. Iron prices have been stiffening lately in this section. No. 2 foundry now selling at $12.50 per ton minimum, and $13 being obtained by some companies. One or two small orders, less than 500 tons in all, have been accepted for delivery during the first three months of 1910, the price made being at and above $14 per ton. One furnace was put in operation the past week, making three that have gone in and one to go out this month. Two other furnaces are slated to go into operation before the end of the month. Numerous small orders of from one to two carloads have been received lately for prompt delivery.

An advance of 50c. was announced in charcoal iron during the past week, the prices now being $19.50@20 per ton. There are but two furnaces making charcoal iron in Alabama and their daily output is less than 115 tons.

An order for 50,000 tons of steel rails to be shipped to Buenos Aires, has been received by the Tennessee Coal, Iron and Railroad Company, and the rails will be shipped before the end of the year. Two of the open-hearth furnaces and one blast furnace at Ensley, belonging to this concern have been lighted and will be producing metal by the middle of the week. The prospects are bright for an early resumption in all departments of the steel

plant and the necessity for blowing in of all the blast furnaces of the Tennessee company.

Baltimore

July 20—Exports for the week included 230,740 lb. tin scrap to Rotterdam; 477,165 lb. galvanized sheets and 3,886,500 lb. steel billets to Liverpool.

Chicago

July 20—Steady maintenance of the iron market's recently advanced standards exists, with buying in the small but frequent orders. Once in a great while there comes a large contract, and then the smaller interests proceed to buy more freely. Buying is fairly large and steady for the fourth quarter and in some cases for the first quarter of next year.

Southern No. 2 foundry brings $12.50@13 Birmingham ($16.85@17.35 Chicago); Northern No. 2 $16.50@17, with an upward tendency on both. Northern furnaces are relatively strong.

Coke is in constantly increasing demand, at $4.70 Chicago for the best Connellsville.

Cleveland

July 19—Additional sales of iron ore are reported. The total sales to date are far in excess of estimates made early in the season. Prices unchanged.

Pig Iron—Sales have run up to quite a large total, and many inquiries have been received. Prices hold firm at $15.50@15.75 for No. 2 foundry; $16@16.25 for bessemer, and $14.85@15 for gray forge.

Finished Material—Several contracts for structural steel are pending. Plates are in good demand, and bars are active. Local store and jobbing trade is good. Independent mills are quoting bars on the basis of 1.30c. Pittsburg; plates and shapes, 1.40c., an advance of five points in each case.

Philadelphia

July 21—During the past few days several large consumers came into the market and made purchases of pig iron, part for immediate, but most for later delivery. Makers prefer not to obligate themselves to deliver iron late in the year at present prices. There has been a general advance in prices ranging from 25 to 50c. No. 1 foundry is quoted as high as $17 at furnace, and No. 2X is moving at $16.50 with an upward tendency. Large deliveries are being made on pipe iron and quotations were advanced 50c. this week.

Steel Billets—Large contracts have just been entered into for September and later delivery at a 50c. advance.

Bars—The asking price for summer deliveries of bar iron has been advanced to 1.45c. for best refined. Common iron is selling freely at 1.40c. Stores are stocking up for fall.

Sheets—The placing of orders by three or four large buyers has given a new turn to the market.

Pipes and Tubes—A further improvement has developed this week, especially for tubes. Merchant pipe is selling quite freely.

Plates—Plate-mill capacity has been increased in this territory and large orders are rolling in. Prices on small orders have advanced $2 per ton.

Structural Material—Large orders for bridge material have reached Pennsylvania mills this week. Quotations have moved up on small orders fully $3 per ton.

Scrap—Sales of scrap have improved this week; heavy steel and No. 1 yard are selling high. Buyers are quite ready to purchase but dealers are holding for strong prices.

Pittsburg

July 20—Labor troubles have occupied considerable attention in the past week. The McKee's Rocks plant of the Pressed Steel Car Company was closed last week, the men having a number of grievances. In the early days there was rioting and bloodshed, while this week the strike has continued without bloodshed. The plant was consuming about 500 tons of plates daily, shipments of which have been temporarily discontinued. An outbreak has occurred at the Butler plant of the Standard Steel Car Company, probably a contagion from the McKee's Rocks trouble. Neither strike appears to involve material for a prolonged contest.

The contest with the American Sheet and Tin Plate Company has become more serious than was expected. The Amalgamated Association had walked out of the company's hitherto union sheet and tin mills, with the exception of the Cambridge sheet plant, the night of June 30. The tinhouse men walked out the night of July 15, on the expiration of their scale. The chief developments have been the running of five mills in the 28-mill tinplate plant at Elwood, Ind., where both unions quit work, and the closing of the Pennsylvania works, an eight-mill tinplate plant at New Kensington, this week. It had been non-union in the hot mills, but the Amalgamated Association, aided by the tinhouse organization, succeeded in getting the hot-mill men out. The Amalgamated Association is prosecuting organization work at various of the company's nonunion mills, while the company is making efforts to increase the working force at Elwood, Ind., and to start the Greer and Shenango plants at New Castle and the Sharon plant. These are tinplate plants. The company is making no special effort to start sheet mills which were formerly union, as it has sufficient sheet mill capacity already nonunion. An incident of the partial resumption at Elwood is that the men for the purpose were drawn from the Standard Tin Plate Company's plant at Canonsburg, Penn. This company had just enlarged its plant from 6 to 10 mills, but has not enough men left to operate even the six. Until this week there was no prospect other than that the American Sheet and Tin Plate Company would gain its point without much difficulty, but the bare possibility of a compromise has now arisen, in order to avoid serious complications.

The usual run of small orders for finished steel products has continued this month of larger volume than was expected. The heavy contracting is over for the present, but the mills are well filled with business and without additional bookings can operate full into fall.

Pig Iron—The Youngstown Sheet and Tube Company has contracted with the Bessemer Pig Iron Association for 25,000 tons of standard bessemer for delivery now through October, at $15.50, Valley, this being the first large sale at this figure. There are definite reports that J. G. Butler, Jr., of the Pig Iron Association, is sounding the market with the view of getting together a large block of iron to sell to the United States Steel Corporation. It is represented that the Steel Corporation stands ready to take up to 100,000 tons from the market, preferring to make such a purchase, with its attendant market consequences, rather than blow in some of its detached furnaces, such as Neville Island and Edith. Foundry iron is quiet but very firm, it being difficult to do $15, Valley, on either No. 2 or malleable. Basic is selling in a moderate way at $15, Valley, being strong at this figure.

Steel—Transactions have been light. The market is firm, bessemer billets being $23 and sheet-bars $25, with a premium of about $1 a ton on open-hearth material. Plates are firm at the advanced price of 1.35c., Pittsburg, with 1.40c. quoted by some sellers.

Sheets—The market continues firm at 2.20c. for black and 3.25c. for galvanized.

Ferromanganese—The market has advanced a trifle, due to the recent large sales, and prompt ferromanganese is quotable at $41.50@42, Baltimore, with 1910 deliveries at $43, prices delivered Pittsburg being $1.95 higher.

Foreign Iron

German Iron Trade—Imports and exports of Germany, five months ended May 31, metric tons:

	Exports.	Imports.	Excess.
Iron and steel....	1,544,956	169,388	Exp 1,375,568
Machinery	124,134	30,504	Exp. 93,630
Total	1,669,090	199,892	Exp 1,469,198
Total, 1908.....	1,613,512	272,747	Exp 1,340,765

Imports of iron ore this year, 3,154,016 tons; exports, 1,131,187 tons. Imports of manganese ore, 147,030 tons; exports, 917 tons.

Metal Markets

New York, July 21—The metal markets generally show slight improvement. To some extent they have been affected by speculative considerations.

Gold, Silver and Platinum

UNITED STATES GOLD AND SILVER MOVEMENT

Metal.	Exports.	Imports.	Excess.
Gold:			
June 1909..	$ 8,346,446	$ 2,417,735	Exp. $ 5,928,711
" 1908..	8,626,718	3,449,673	Exp. 5,177,045
Year 1909..	63,834,337	20,185,592	Exp. 43,648,745
" 1908..	53,517,975	21,141,348	Exp. 32,376,627
Silver			
June 1909..	5,504,437	4,339,275	Exp. 1,165,162
" 1908..	4,437,360	3,453,198	" 984,162
Year 1909..	29,359,066	22,872,068	" 6,487,098
" 1908..	25,514,545	21,141,348	" 4,373,197

Exports from the port of New York, week ended July 17. Gold, $2,748,000, chiefly to Argentina; silver, $1,243,908, to London and Paris. Imports: Gold, $106,142; silver, $127,706, both from Mexico, Central and South America.

Gold—Prices in the open market in London continued at 77s. 9d. per oz. for bars and 76s. 4d. per oz. for American coin. There was no special demand and the gold arriving was rather widely distributed. In New York some more gold was taken for shipment to Argentina and the total sent there has reached about $30,000,000 on the present movement.

Platinum—The market continues dull, with sales generally of small amount and to small users. Refined platinum can be had at $21@22.50 per oz. Hard metal is $26 per oz. Dealers are paying $17@19 per oz. for good scrap.

Our special correspondent writes from St. Petersburg, under date of July 7, that the market is generally unchanged. The decrease in production, mentioned in the last report, continues. Crude metal, 83 per cent. platinum, is quoted at Ekaterinburg at 4.30@4.50 rubles per zolotnik, and at St. Petersburg at 17.50@18.500 rubles per pood. There prices are equivalent to averages of $16.54 and $17.04 per oz., respectively. The prices are nominal, however, and subject to negotiation.

Silver—The market weakened on selling by Chinese banks and sold down to 23¾d. in London on July 17 and 19, which is the lowest point touched on recent declines. On buying by India market rebounded to 24¼d. and closes steady at the price on favorable crop outlook in India.

In the JOURNAL of July 17 the price of silver in New York on July 8 was given as 51½c. through a typographical error; it should have been 50½ per ounce.

SILVER AND STERLING EXCHANGE

July.	15	16	17	19	20	21
New York..	51	51	50½	50½	51	51
London....	24¼	24	23¾	23¾	24	24¼
Sterling Ex.	4.87¾	4.87¼	4.87¼	4.87¼	4.87¼	4.87¼

New York quotations cents per ounce troy. London prices pence per ounce sterling. Sterling exchange 60 days.

Exports of silver from London to the East, Jan. 1 to July 8, as reported by Messrs. Pixley & Abell:

	1908.	1909.	Changes.
India.....	£ 4,290,158	£3,186,600	D. £1,013,558
China.....	516,400	1,155,100	I. 638,700
Straits.....	90,510	82,800	D. 7,710
Total.....	£ 4,897,068	£4,424,500	D. £ 382,568

Copper, Tin, Lead and Zinc

July.	Copper. Lake, Cts. per lb.	Copper. Electrolytic, Cts. per lb.	Copper. London, £ per ton.	Tin. Cts. per lb.	Lead. New York, Cts. per lb.	Lead. St. Louis, Cts. per lb.	Zinc. St. Louis, Cts. per lb.
15	13¾ @13⅞	12⅝ @12⅞	58	28⅞	4.30 @4.32½	4.15 @4.17½	5.22½ @5.25
16	13¾ @13⅞	12⅝ @12⅞	58½	29	4.30 @4.32½	4.15 @4.17½	5.22½ @5.25
17	13¾ @13⅞	12⅝ @12⅞	....	29	4.30 @4.32½	4.15 @4.17½	5.22½ @5.25
19	13¾ @13⅞	12⅝ @12⅞	58⅜	29⅛	4.30 @4.32½	4.15 @4.17½	5.22½ @5.25
20	13¾ @13⅞	12¾ @12⅞	58⅝	29⅛	4.30 @4.32½	4.15 @4.17½	5.22½ @5.25
21	13¾ @13⅞	12¾ @13	58¾	29⅛	4.30 @4.32½	4.15 @4.17½	5.22½ @5.25

London quotations are per long ton (2240 lbs.) standard copper. The New York quotations for electrolytic copper are for cakes, ingots and wirebars, and represent the bulk of the transactions made with consumers, basis, New York, cash. The price of cathodes is usually 0.125c. below that of electrolytic. The quotations for lead represent wholesale transactions in the open market. The quotations on spelter are for ordinary Western brands; special brands command a premium.

Copper—The lower prices established last week stimulated buying by manufacturers, and beginning about the 15th-16th, some large sales, both electrolytic and Lake, were made, the aggregate being probably in the neighborhood of 40,000,000 lb. In these transactions most of the agencies were sellers, as were also a number of the important Lake companies, the sales of Lake alone running into the millions of pounds. In consequence of this spurt in demand prices advanced, but the improvement has so far been but slight, considering the large volume of the business that has been placed, and the fact that the largest interests are reported not to be meeting the current prices.

The close is steady at 13¼@13½c. for Lake, and 12⅝@12¾c. for electrolytic copper in cakes, wirebars or ingots. The average for casting copper has been 12¾@12⅞c. cents.

Copper sheets are 17@18c., base for large lots. Full extras are charged, and higher prices for small quantities. Copper wire is 13c. base, carload lots at mill.

In sympathy with the better tone on the stock exchanges in Europe and in New York, buying orders made their appearance in the London standard market, which brought about a light advance, the close being cabled at £58 15s. for spot and £59 8s. 9d. for three months.

Refined and manufactured sorts we quote English tough £60 best selected, £61@62 strong sheet, 17@17½.

Exports of copper from New York and Philadelphia for the week were 9360 long tons. Our special correspondent gives the exports from Baltimore at 3576 tons copper.

During the 12 months ending with June 30, 1909, the Greene Cananea Copper Company is reported to have produced 41,897,000 lb. of copper, which was sold for an average of 13.25c. per lb. The quotational average for the same period was 13.254c. per pound.

Tin—The market has fluctuated within narrow limits, but there is a good undertone both here and in Europe, and a steady business is taking place at current quotations. The close is cabled from London at £132 2s. 6d. for spot, £133 12s. 6d. for three months.

Business in New York is being transacted at 29⅛ cents.

Visible supplies of tin on July 1 are reported by Ricard & Freiwald at 18,388 long tons; a decrease of 982 tons as compared with June 1. The supplies from producing countries during the month are estimated at 5341 tons, and deliveries for consumption at 6623 tons.

Arrivals of Bolivian tin in Germany are reported as follows by Robertson & Bense, of Hamburg; Received direct, 520¾ tons; through England, 284¼; through France, 53; total, 858 tons.

Exports of tin from the Straits, six months ended June 30, were 30,964 long tons in 1908, and 33,680 tons in 1908; increase 2716 tons.

Lead—The market is neglected and unchanged at 4.15@4.17½c. St. Louis, and 4.30@4.32½c. New York.

The London market, after rallying to £13, has reacted again, and closes at the lowest point, £12 11s. 3d. for Spanish, £12 13s. 9d. for English.

Spelter—Business has been quieter than for some weeks past, but in view of the early enactment of the tariff bill and its effect on the supply of zinc ore, prices are holding fairly firm, the close being quoted at 5.22½@5.25c., St. Louis, 5.37½@5.40c., New York.

Quotations for spelter in New York were 5.37½@5.40c., July 15-21, inclusive.

The London market is unchanged at £22 for good ordinaries, and £22 5s. for specials.

Base price of sheet zinc is 7c. per lb., f.o.b., La Salle-Peru, Ill., less 8 per cent. discount.

Other Metals

Antimony—Business is practically dead under the combined influence of the season and tariff uncertainties. Only retail lots are selling. In the absence of business, quotations are nominally unchanged at 8¾c. per lb. for Cookson's, 7¾c. for Hallett's, 7¾c. for outside brands.

Aluminum—Quotations are 20@23c. per lb. for ingots, the higher price being that asked by the American producer.

Quicksilver—The New York price is $43.50@44 per flask of 75 lb., San Francisco, $43.50 for domestic, and $2 less for export orders. London price is £8 5s. per flask, with 2s. 6d. lower asked by jobbers.

Nickel—Large lots, contract business, 40@45c. per lb. Retail, spot, from 50c. for 2000-lb. lots, up to 55c. for 500-lb. lots. The price for electrolytic is 5c. higher.

Magnesium—Quotations for this metal are $1.25 per lb., New York, in 100-lb. lots; for 5-lb. lots, $1.40 per pound.

British Metal Imports and Exports

Imports and exports of metals in Great Britain, six months ended June 30, figures in long tons, except quicksilver, which is in pounds:

Metals:	Imports.	Exports.	Excess.
Copper, long tons	73,760	32,219	Imp. 41,541
Copper, 1908....	82,065	31,511	Imp. 50,554
Tin, long tons....	19,472	20,297	Exp. 825
Tin, 1908.....	22,915	21,024	Imp. 109
Lead, long tons..	109,399	24,254	Imp. 85,145
Lead, 1908.....	117,312	27,793	Imp. 89,519
Spelter, l'g. tons.	54,206	3,461	Imp. 50,745
Spelter, 1908....	53,969	3,810	Imp. 50,159
Quicksilver, lb...	2,913,487	479,652	Imp. 2,433,835
Quicksilver, '08	2,944,722	849,945	Imp. 2,094,777
Ores:			
Tin ore and con.	12,049	.....	Imp. 12,049
Tin ore, 1908...	13,087	.....	Imp. 13,087
Pyrites	383,567	.....	Imp. 383,567
Pyrites, 1908...	435,521	.....	Imp. 435,521

Copper totals include metallic contents of ore and matte. Exports include re-exports of foreign material. Of the imports in 1909 the United States furnished 157 tons copper matte, 26,371 tons fine copper and 17,233 tons lead. The lead was chiefly Mexican lead, refined in this country.

British Iron Trade—Exports and imports of iron and steel and of machinery in Great Britain, six months ended June 30, as valued by Board of Trade returns:

	Exports.	Imports.	Excess.
Iron and steel	£18,300,682	£ 3,817,321	Ex. £14,483,361
Machinery...	13,899,993	2,427,139	Ex. 11,472,854
New ships....	3,306,045	.....	Ex. 3,306,045
Total.....	£35,506,720	£ 6,244,460	Ex. £29,262,260
Total, 1908..	40,020,100	6,365,597	Ex. 33,654,503

Total decrease in exports, £4,513,380, or 11.3 per cent.; decrease in imports, £121,137, or 1.9 per cent. The total quantities of iron and steel of all kinds were, in long tons:

	1908.	1909.	Changes.
Exports.....	2,076,895	2,002,708	D. 74,187
Imports.....	507,693	565,216	I. 57,523

The decrease in quantity of exports was 3.6 per cent.; increase in imports, 11.3 per cent. The changes in values were much greater than those in quantities.

British Iron Ore Imports—Imports of iron ore into Great Britain, six months ended June 30, were 2,926,012 long tons in 1908, and 2,946,687 in 1909; increase, 20,075 tons. Of the imports this year 2,235,084 tons were from Spain.

Zinc and Lead Ore Markets

Platteville, Wis., July 17—The top price paid for zinc ore was $45 per ton; the base price declined from $44.50 to $43.50 per ton of 60 per cent. zinc. The base price of lead ore declined from $58 to $52.

SHIPMENTS, WEEK ENDED JULY 17.

Camps.	Zinc ore, lb.	Lead ore, lb.	Sulphur ore, lb.
Platteville.....	598,810	.....	156,900
Cuba City.....	593,065	.....	84,310
Benton.....	560,510	222,570	.....
Hazel Green.....	406,100	.....	.....
Highland.....	368,500	.....	.....
Days Siding.....	352,000	.....	.....
Harker.....	301,221	.....	.....
Strawbridge.....	220,000	.....	.....
Galena.....	176,000	.....	.....
Linden.....	113,200	55,610	.....
Livingston.....	80,000	.....	.....
Rewey.....	61,700	.....	.....
Total.....	3,831,106	278,180	241,210
Year to July 17.....	68,339,669	3,426,025	5,667,125

In addition to the above there was shipped to the American Zinc Ore Separating Company, 384,160 lb. and to the Joplin Separator Works, 192,000 lb. zinc ore.

There was shipped from Highland during the past month, not heretofore reported, 1,867,100 lb. zinc ore and 200,700 lb. lead ore; from Montfort, 160,000 lb. lead ore.

Joplin, Mo., July 17—The highest price paid was $46.50 per ton for sulphide zinc ore, the base price ranging from $44.50 at the beginning to $40 per ton of 60 per cent. zinc at the week-end, presenting a steadily declining market all week, with unusually light buying. Some shipments reported this week were at prices bid two weeks ago, which holds up the average. Zinc silicate sold at $17@25.50 per ton, on a base of $20@22.50 per ton of 40 per cent zinc, the market for this grade ore advancing with the decline of sulphide ore. The average price, all grades, was $40.76. Lead prices were elevated this week. A few purchases were made a week ago at $54, for this week's delivery. This price was raised to $55 during the week. The average price, all grades, was $53.22 per ton.

Buying orders for the week were curtailed to a point below the decreased output, and, while some of the remaining large bins were partly shipped, there are many small lots accumulating at mines removed from easy shipping facilities.

SHIPMENTS, WEEK ENDED JULY 17.

	Zinc, lb.	Lead, lb.	Value.
Webb City-Carterville	3,047,650	453,330	$ 77,536
Joplin.....	1,668,930	178,990	40,420
Prosperity.....	936,440	56,430	16,120
Duenweg.....	575,090	101,080	13,800
Galena.....	567,140	41,120	13,020
Badger.....	554,630	.....	12,479
Aurora.....	413,980	.....	7,167
Alba-Neck.....	295,540	.....	6,501
Granby	410,980	8,600	5,050
Oronogo.....	216,340	6,080	4,481
Zincite.....	186,360	.....	4,193
Sarcoxie.....	284,940	.....	4,015
Carthage.....	145,020	.....	3,190
Quapaw-Baxter.....	140,430	.....	2,809
Cave Springs.....	85,100	.....	1,787
Stott City.....	67,220	.....	1,479
Spurgeon.....	88,870	11,210	1,317
Totals	9,444,660	856,840	$215,364
29 weeks.....	324,726,590	49,645,590	$7,389,689

Zinc value, the week, $192,558; 29 weeks, $6,055,118
Lead value, the week, 22,806; 29 weeks, 1,334,571

MONTHLY AVERAGE PRICES

Month.	Zinc Ore. Base Price. 1908.	1909.	All Ores. 1908.	1909.	Lead Ore. All Ores. 1908.	1909.
January.....	$37.60	$41.25	$35.56	$38.46	$46.88	$52.17
February....	36.63	36.94	34.92	34.37	49.72	50.60
March.....	36.19	37.40	34.19	34.71	49.90	50.82
April.....	35.40	38.63	34.08	37.01	52.47	55.63
May.....	34.19	40.06	33.39	37.42	56.05	56.59
June.....	33.06	44.15	32.07	40.35	60.48	57.52
July	34.55	.....	31.67	.....	59.90	.....
August	36.53	.....	33.42	.....	60.34	.....
September..	37.63	.....	34.44	.....	54.59	.....
October.....	35.95	.....	33.28	.....	52.63	.....
November...	39.13	.....	35.02	.....	54.53	.....
December...	42.75	.....	39.63	.....	49.68	.....
Year.....	$37.72	.....	$34.31	.....	$53.93	.....

NOTE: Under zinc ore the first two columns give base prices for 60 per cent. zinc ore; the second two the average for all ores sold. Lead ore prices are the average for all ores sold.

Chemicals

New York, July 21—The market is quiet so far as new business and spot sales are concerned. Contract deliveries continue steady.

Copper Sulphate—Not much business is reported, and prices continue unchanged, at $4.22½ per 100 lb. for carload lots; $4.32½@4.47½ per 100 lb. for smaller parcels.

Arsenic—The market is entirely upset over the tariff question, and few sales are likely until that is settled. There are practically no quotations to be had; anywhere from 3 to 4½c. per lb. is asked by holders for white arsenic.

Nitrate of Soda—A good business is being done in this article at current quotations, which are unchanged at 2.15c. for spot sales, and 2.12½c. for futures.

Mining Stocks

New York, July 21—From a rather quiet condition at the beginning of the week, the Stock Exchange developed considerable activity and strength, and on Saturday and Monday trading was on an extensive scale. Steel Corporation issues were exceedingly active, making the larger part of the market, and on Monday Steel common reached a record price at $72.50 per share. Later, however, it lost a little from this high point. Sales of that and other issues were large, but buyers seemed ready to take all the stocks offered, and prices remained generally high.

Amalgamated Copper declared the usual quarterly dividend of 0.5 per cent. This was generally expected and caused no change or comment in the market.

On the Curb, trading was not as active as on the Exchange. In fact business was inclined to be dull, with fluctuations only

moderate. The copper stocks especially were rather slow, with small sales and few changes in price. The Nevada gold stocks were heavy and inclined to fall off a little on moderate sales. The Cobalt shares were the most active section of the market, but gained very little in price. In fact, some showed small losses.

July 20—Sentiment shows considerable improvement regarding mining shares, and the past two or three days have seen a fair amount of public interest in stocks and at advancing prices. The favorites at the present writing are the so-called Calumet & Hecla stocks, which include Superior Copper, Allouez and Centennial. The first named has been persistently bought by leading commission houses and the result is a $7.50 rise the past week to $47 tonight.

Giroux mining has attracted considerable attention by the persistent buying which caused a $1.75 advance to $10.25. At this point considerable stock was met which caused fractional recessions. Helvetia was put on the Stock Exchange list today, being lifted from the Curb. The result has been $1.50 advance to $7.

North Butte has quieted down and there seems to be an accumulation of the stock. The price is now up to above $52. Application has been made to list shares of the Silver King Coalition Company, of Park City, Utah, on the Stock Exchange.

Curb dealings have been quiet. Rhode Island Coal has been a prominent feature at advancing prices.

STOCK QUOTATIONS

NEW YORK July 21		BOSTON July 21	
Name of Comp.	Clg.	Name of Comp.	Clg.
Alaska Mine	.12	Adventure	6¾
Amalgamated	82½	Allouez	44½
Anaconda	47⅜	Am. Zinc	29½
Balaklala	‡2 1/16	Arcadian	4
British Col. Cop.	7⅛	Arizona Com.	40½
Buffalo Mines	3⅜	Atlantic	8½
Butte Coalition	24¼	Boston Con.	15
Colonial Silver	1/8	Calumet & Ariz.	103
Cum. Ely Mining	7¾	Calumet & Hecla	635
Davis-Daly	5⅛	Centennial	32½
Dominion Cop.	7	Copper Range	82
Douglas Copper	2	Daly-West	8
El Rayo	2½	East Butte	12⅛
Florence	3	Franklin	16½
Foster Cobalt	.32	Greene-Can	9⅝
Furnace Creek	.06	Hancock	11
Giroux	9 13/16	Isle Royal	24¼
Gold Hill	½	Keweenaw	‡3⅜
Goldfield Con.	6 1/16	La Salle	14
Granby	‡101	Mass	8⅜
Greene Gold	‡½	Michigan	9½
Greene G. & S.	‡9	Mohawk	‡58
Guanajuato	1⅛	Nevada	23½
Guggen. Exp.	196	North Butte	51¼
Hanapah	‡15	Ojibway	10½
Kerr Lake	8⅛	Old Colony	‡.60
McKinley Dar.	.80	Old Dominion	54
Miami Copper	15	Osceola	133
Micmac	¼	Parrot	31¼
Mines Co. of Am.	‡1	Quincy	88½
Montezu. of C. R.	30	Rhode Island	‡4⅜
Mont. Sho. C.	[illegible]	Shannon	15¼
Nev. Utah M. & S.	2 1/16	Superior	46⅝
Newhouse M. & S.	[illegible]	Superior & Bost.	14⅛
Nipissing Mines	11 [illegible]	Superior & Pitts.	16⅝
Old Hundred	⅛	Tamarack	64
Silver Queen	‡[illegible]	Trinity	11⅛
Stewart		U. S. Sm'g & Ref.	48⅞
Tennessee Cop'r	37	U. S. Sm. & Re., pd.	49½
Tri-Bullion	⅛	Utah Con.	42¼
United Copper	10 [illegible]	Victoria	‡4½
Utah Apex	[illegible]	Winona	‡5
Utah Copper	49 [illegible]	Wolverine	‡148
Yukon Gold	[illegible]	Wyandotte	2½

†Ex Rights. ‡Last quotation.

N. Y. INDUSTRIAL	
Am. Agri. Chem.	‡46⅛
Am. Smelt. & Ref.	94⅛
Am. Sm. & Ref., pf.	112
Colo. Fuel & Iron.	44⅞
Federal M. & S., pf.	‡88¾
National Lead	86⅜
National Lead, pf.	‡107
Pittsburg Coal	11¾
Republic I. & S.	33⅜
Republic I. & S., pf.	107
Sloss-Sheffield	84¼
Standard Oil	‡685
U. S. Steel	71⅞
U. S. Steel, pf.	127⅜
Va. Car. Chem.	52¼

BOSTON CURB	Low.
Ahmeek	195
Chemung	15
Chino	7⅛
Corbin	6½
Globe Con	4½
Gila	5½
Ray Central	2¾
Ray Con	17
San Antonio	10

Furnished by Hornblower & Weeks, N. Y.

ST. LOUIS July 17		
N. of Com.	High.	Low.
Adams	.40	.30
Am. Nettie	.08	.05
Center Cr'k	1.75	1.50
Cent. C. & C.	82.00	81.00
C. C. & C. pf.	81.00	80.00
Cent. Oil	110.00	100.00
Columbia	8.00	7.00
Con. Coal	19.00	18.00
Doe Run	110.00	100.00
Gra. Bimet.	.25	.22
St. Joe	12.00	11.00

LONDON July 21			
Name of Com.	Clg.		
Dolores	£1	5s	0d
Stratton's Ind.	0	3	3
Camp Bird	1	8	6
Esperanza	2	17	6
Tomboy	1	1	0
El Oro	1	5	9
Oroville	0	12	0

Cabled through Wm. P. Bonbright & Co., N. Y.

NEVADA STOCKS. July 21.
Furnished by Weir Bros. & Co., New York.

Name of Comp.	Clg.	Name of Comp.	Clg.
COMSTOCK STOCKS		Silver Pick	.10
Belcher	.53	St. Ives	.10
Best & Belcher	...	Triangle	.01
Caledonia	...	BULLFROG STOCKS	
Chollar	.19	Gibraltar	.02
Comstock	.27	Homestake King	...
Con. Cal. & Va.	.70	Mont. Shoshone C.	1.50
Crown Point	.15	Tramp Cons.	.04
Exchequer	.75	MISCELLANEOUS	
Gould & Curry	.15	Cumberland Ely	7.62½
Hale & Norcross	.21	Giroux	9.25
Mexican	.94	Greenwa'r Copper	05
Ophir	1.20	Nevada Con.	23.37½
Overman	...	Nevada Hills	.75
Potosi	33	Nevada Smelting	.98¾
Savage	.19	Nevada Wonder	.45
Sierra Nevada	.36	Nevada-Utah	1.93¾
Union	.40	Penn-Wyoming	...
Utah	.04	Pittsburgh S. Pk.	45
Yellow Jacket	.70	Ray Central	2.56¼
TONOPAH STOCKS		Ray Con.	16.25
Belmont	.80	Round Mt. Sphinx	10
Extension	.40		
Golden Anchor	..		
Jim Butler	.09		
MacNamara	.23		
Midway	.20		
Montana	.60		
North Star	.02		
Tono'h Mine of N.	6.50		
West End Con.	.20		
GOLDFI'D STOCKS			
Adams	.01		
Atlanta	.09		
Blue Bell	.02½		
Booth	.09		
C.O.D. Con.	.15		
Columbia Mt.	.10		
Comb. Frac.	.56		
Con. Red Top	..		
Cracker Jack	.01		
Dia'dfield B. B. C.	.02		
Goldfield Belmont	.04		
Goldfield Daisy	.21		
Great Bend	.05		
Jumbo Extension	.10		
Kendall	.02		
Lone Star	.02		
May Queen	.04		
Oro	.05½		
Red Hill	.05		
Sandstorm	.08		

COLO. SPRINGS July 16	
Name of Comp.	Clg.
Acacia	‡.07
C. C. Con.	‡.03⅛
Dante	‡.05⅛
Doctor	.10
Elkton	.66⅛
El Paso	.52
Findlay	.13⅛
Gold Dollar	.12
Gold Sovereign	.03⅛
Isabella	.21⅛
Jack Pot	‡.07
Jennie Sample	‡.07⅛
Jerry Johnson	‡.06¼
Lexington	‡.02
Mary McKinney	.40
Pharmacist	‡.03
Portland	.75
U. G. M.	‡.05¾
Vindicator	65
Work	.06

Assessments

Company.	Delinq.	Sale.	Amt.
Alpha, Nev.	July 15	Aug. 6	$0.05
Belcher, Nev.	July 20	Aug. 10	0.10
Best & Belcher, Nev.	July 20	Aug. 10	0.10
Brunswick Chol., Nev.	July 10	Aug. 2	0.01
Brunswick Potosi, Nev.	July 10	Aug. 2	0.01
Caledonia, Nev.	July 23	Aug. 13	0.05
Douglas, Idaho	July 8	Aug. 2	0.002
Gold Mt. Champion, Utah	July 26	Aug. 10	0.00[illegible]
Mountain Dell, Utah	July 19	Aug. 5	0.01
N. Y. Bonanza, Utah	July 10	July 31	0.03
Potosi, Nev.	July 9	Aug. 2	0.10
Progressive, Utah	June 23	July 14	0.01
Savage, Nev.	July 28	Aug. 18	0.10
Scottish Chief, Utah	July 7	Aug. 4	0.01
Seg. Belcher, Nev.	July 7	July 29	0.03
Sierra Nevada, Nev.	July 15	Aug. 10	0.10
Silver King Con., Utah	July 6	July 17	0.10
Tarbox, Idaho	July 29	Aug. 24	0.003
Union Con., Nev.	June 28	July 19	0.10
W. Con. Va., Nev.	July 16	Aug. 10	0.10
Yellow Jacket, Nev.	July 14	Aug. 5	0.25

Monthly Average Prices of Metals

SILVER

Month.	New York.		London.	
	1908.	1909.	1908.	1909.
January	55.678	51.750	25.738	23.834
February	56.000	51.472	25.855	23.706
March	55.365	50.468	25.570	23.227
April	55.505	51.428	25.133	23.708
May	52.795	52.905	24.377	24.348
June	53.663	52.538	24.760	24.166
July	53.115	......	24.514	......
August	51.683	......	23.858	......
September	51.720	......	23.877	......
October	51.431	......	23.725	......
November	49.647	......	22.933	......
December	48.766	......	22.493	......
Total	52.864	......	24.402	......

New York, cents per fine ounce; London, pence per standard ounce.

COPPER

	NEW YORK.				LONDON.	
	Electrolytic		Lake.			
	1908.	1909.	1908.	1909.	1908.	1909.
January	13.726	13.893	13.901	14.280	[illegible]	57.688
February	12.905	12.949	13.098	13.295	58.786	61.198
March	12.704	12.387	12.875	12.826	58.761	56.231
April	12.743	12.56¼	12.928	12.93¾	58.331	57.363
May	12.598	12.893	12.788	13.238	57.387	[illegible]
June	12.675	13.214	12.877	13.548	57.842	59.627
July	12.702	......	12.933	......	57.989	......
August	13.462	......	13.639	......	60.500	......
September	13.388	......	13.600	......	[illegible]	......
October	13.354	......	13.646	......	60.139	......
November	14.130	......	14.386	......	63.417	......
December	14.111	......	14.411	......	62.943	......
Year	13.208	......	13.424	......	[illegible]	......

New York, cents per pound. Electrolytic is for cakes, ingots or wirebars. London, pounds sterling, per long ton, standard copper.

TIN AT NEW YORK

Month.	1908.	1909.	Month.	1908.	1909.
January	27.380	28.060	July	29.207	......
February	28.978	28.290	August	[illegible]	......
March	30.577	28.727	September	28.815	......
April	31.702	29.445	October	29.444	......
May	30.015	29.225	November	30.348	......
June	28.024	29.322	December	29.154	......
			Av. Year	[illegible]	......

Prices are in cents per pound.

LEAD

Month.	New York.		St. Louis	London.	
	1908.	1909.	1909.	1908.	1909.
January	3.691	4.175	4.025	14.469	13.113
February	3.725	4.018	3.868	14.250	13.313
March	3.838	3.986	3.835	13.975	13.438
April	3.993	4.168	4.051	13.469	13.297
May	4.253	4.287	4.214	12.938	13.225
June	4.466	4.350	4.291	12.600	13.031
July	4.744	......	......	[illegible]	......
August	4.580	......	......	13.375	......
September	4.515	......	......	13.125	......
October	4.351	......	......	13.375	......
November	4.330	......	......	13.538	......
December	4.213	......	......	13.156	......
Year	4.200	......	......	13.439	......

New York and St. Louis, cents per pound. London, pounds sterling per long ton.

SPELTER

Month.	New York		St. Louis.		London.	
	1908.	1909.	1908.	1909.	1908.	1909.
January	4.513	5.141	4.363	4.991	20.563	21.425
February	4.788	4.889	4.638	4.739	20.875	21.563
March	4.665	4.757	4.527	4.607	21.075	21.438
April	4.645	4.965	4.495	4.815	21.344	21.531
May	4.608	5.124	4.458	4.974	19.906	21.975
June	4.543	5.402	4.393	5.252	19.000	22.000
July	4.485	......	4.338	......	19.031	......
August	4.702	......	4.556	......	19.350	......
September	4.769	......	4.619	......	19.563	......
October	4.801	......	4.651	......	19.750	......
November	5.059	......	4.909	......	20.875	......
December	5.137	......	4.987	......	20.625	......
Year	4.726	......	4.578	......	20.163	......

New York and St. Louis, cents per pound. London, pounds sterling per long ton.

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Economic Possibilities of American Oil Shales—II

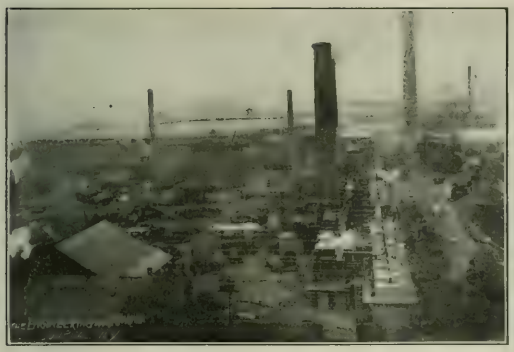
Laboratory and Commercial Tests of New Brunswick Shales; Eight Products by Either of Two Methods; Commercial Considerations

BY CHARLES BASKERVILLE*

The preliminary laboratory examination was conduced with a view of ascertaining the laboratory yield of products from the crude oil obtained from a sample of shale. This shale, which was obtained from near Baltimore, N. B., had the following physical properties: Luster, moderate; fracture, irregular and without natural line of cleavage; cross-fracture, angular, partly inclining to conchoidal; and a specific gravity of 1.44. It was solid and compact. The yield of gas saturated with tarry matters was large when a sample was heated to dull redness in a tube closed at one end.

The average composition of the shale was as follows: Moisture, 0.35 per cent.; volatile matter, 44.77; fixed carbon, 5.95; ash (phosphoric acid, 0.30 per cent.; trace of chromium; light brown color), 48.93; total, 100 per cent.; total sulphur, 1.43; sulphur in coke, 0.20; nitrogen, 1.96. Some difficulty was experienced in selecting a suitable laboratory retort for obtaining the crude oil. Finally, a cast-iron retort in the form of a cylinder, 24 in. long and 4 in. in diameter, was adopted. This retort was closed at both ends by removable caps, and at one end a ¾-in. pipe was inserted for leading the vapors to a coil condenser, to which were attached two supplementary glass condensers. The retort was heated in a furnace to a low red heat, and no difficulty was experienced in condensing the vapors evolved, as all the condensers were kept packed in ice and the distillation was allowed to proceed slowly.

In this apparatus, 41.03 kg. of shale were distilled in 12 charges, each requiring about five hours for a run, and the yield,



BRONBURN WORKS—SHOWING REFINERY STILLS AND TANKS

CONDENSERS AND AGITATORS IN BRONBURN REFINERY, SCOTLAND

BENCH OF PUMPHERSTON RETORTS

CONDENSERS ATTACHED TO RETORTS

NOTE—Published by permission of the Albertite, Ollite and Cannel Coal Company, Ltd.

*Professor of chemistry, College of the City of New York.

including the naphtha condensed, but exclusive of the water which was separated by gravity, amounted to 8.75 kg. of crude shale oil, equivalent to 21.32 per cent. by weight, or 55 gal. per ton of 2000 lb. The ammonia was not recovered. The crude oil was greenish black in color and somewhat tarry; its specific gravity was 0.93. The residue, or spent shale, had the appearance of partly burned coke.

The crude shale oil, exclusive of the naphtha which was condensed during the retorting, was distilled to dryness with the use of steam. Small quantities of the oil were used at a time, and the distillations were conducted in a French oil still. The "coke" was removed from the still after each run. The "once-run oil" was then refined by the method of Tervet[40], with variations, and gave the yield shown in the accompanying table.

SHALEOIL YIELD BY TERVET METHOD.

	Per Cent.	Yield per Ton.	
Naphtha (0.72 sp.gr.)	9 09	6 9	gal.
Light oil (0.79 sp.gr.)	16 57	12 0	gal
Heavy oil (0.916 sp.gr.)	14 00	7 8	gal
Paraffin	7 54	35	lb.
Total yield of products	47 20		
Loss	52 80	280	lb.

This preliminary examination, which was not intended to be exhaustive, indicated that the shales were worthy of more extensive examination. Consequently, it was arranged to retort a large amount.

Testing on a Commercial Scale

In order to ascertain the yield of ammonium sulphate, crude oil, and refined products from New Brunswick shale, 50 tons of low-grade, run-of-mine oil shale from George Irving's farm, Westmorland county, New Brunswick, were shipped to Scotland, where it was put through the experimental plant of the Pumpherston Oil Company, Ltd., at Pumpherston, Mid-Calder, in the presence of Dr. R. W. Ells, representing the Canadian government, and my assistant, W. A. Hamor.

The retorting of the shale was conducted in the experimental Bryson retort, erected in 1894, of which type of retort there are 1130 in operation in Scotland and 272 in the course of erection. This type of retort consists of two portions, the upper of cast iron part, which is 15 ft. in length, and 2 ft. in diameter at the top and 2 ft. 4 in. at the bottom; and the lower of firebrick part, which is 20 ft. in length and 2 ft. 4 in. in diameter at the top, where it joins the cast iron portion, and 3 ft. in diameter at the bottom. At the lower end of the firebrick portion, there is a dish, scraper, or table, which supports the column of shale in the retort. This table is provided with a revolving arm or agitator, which removes the spent shale and facilitates a movement in the shale column by feeding at regular intervals.

At the top of the retort there are iron hoppers, holding 4 tons 10 cwt. each, into which about one ton of broken shale is discharged every hour. The iron portion of the retort is heated to a dull red heat externally, and it is in this part of the retort that the destructive distillation takes place, the oil vapors passing out below the hoppers into an iron main, 2 ft. 6 in. in diameter.

In the lower, or firebrick, part of the retort the shale is subjected to a temperature sufficiently high to burn off all the carbon from the oil-spent shale; this is done in the presence of steam, and ammonia is consequently produced from the nitrogenous matter contained in the shale. At the bottom of the retort, there are hoppers, which converge in such a way that a single line of rails under the center of the bench of retorts receives the spent shale in iron hutches. In retorts of this principle, 4 to 5 tons of shale per day may be worked at a cost not exceeding 1s. 6d. per ton.

Results of Test

The New Brunswick shale was retorted as received, in pieces about 4 in. square. About 4½ long tons of the shale were put through the retort for two days, in order to clean out the interior, and then 36 long tons 15 cwt. were retorted in 17 days. The results of the retorting at the Pumpherston works may be seen in the accompanying table.

RETORTING NEW BRUNSWICK SHALE.

Date, 1908	Shale Used. Tons	Shale Used. Cwts.	Crude Oil Gallons Produced.	Crude Oil Specific Gravity.	Yield per Ton Crude Oil.	Yield per Ton Sulphate of Ammonia.
July 25a	2	4	95 85	0 885	43 57	58 55
26a	2	6	99 45	0 907	43 24	60 51
27	2		74 44	0 920	37 22	75 38
28	2	5	86 13	0 917	38 28	70 62
29	2	7	90 37	0 911	38 88	70 01
30	2	3	81 80	0 920	38 01	83 18
31	2	5	84 63	0 916	37 61	67 46
Aug. 1	2	3	96 87	0 918	15 06	82 93
2	2	3	84 32	0 921	39 22	79 58
3	2	4	89 12	0 927	40 61	81 88
4	2	4	79 56	0 918	34 59	49 27
5	2	3	86 75	0 910	40 35	55 47b
6	2	5	88 70	0 922	39 42	82 81
7	2	3	87 38	0 918	40 64	100 69c
8	2	4	88 13	0 921	40 19	62 45
9	2	3	95 72	0 918	44 52	79 63
10	2	3	91 28	0 911	42 46	81 31
11	2		79 90	0 925	39 95	71 14
12	2		87 58	0 925	43 79	85 03
	36	15	1,173 28		40 09	76 94

a Not included in average as shale in previous test was not all out of retort until July 26th.
b Condenser chest choked.
c Condenser cleaned.

The yield of crude oil amounted approximately to 40 Imp. gal., or 48 U. S. gal., per long ton, and the yield of ammonium sulphate was found to average about 77 lb. per ton. It was found impossible to recover all the naphtha produced during the retorting, as the retort was not provided with an oil scrubber. Notwithstanding the high gravity of the oil, it was not found difficult to separate the oil from the ammoniacal liquor by gravity. The retort was provided with a dependable ammonia scrubber, and the yield of ammonium sulphate was estimated by titrating the liquor each day.

The crude oil possessed a brownish black color, and had a specific gravity of 0.92, a flash point of 194 deg. F. (90 deg. C.), and a setting point of 54 deg. F. (12.2 deg. C.). It was found to contain 0.62 per cent. sulphur. It had a heating value (by bomb calorimeter method) of 18,474 B.t.u. The crude oil is probably of a semi-asphaltic-base nature. When distilled in an Engler distillation flask at the rate of 2.5 c.c. per min. up to 390 deg. C., a 10 per cent. residuum, soluble in carbon disulphide, was obtained. This may perhaps be increased by air blowing. This phase of the investigation is to be prosecuted further.

A considerable amount of uncondensed gas was produced from the shale during retorting; in fact, this gas served to carry out the retorting. Several samples of the gas were taken at a point between the ammonia scrubber and retort combustion chamber, and analyzed with the following results: Carbon dioxide, 29.67 per cent.; carbon monoxide, 5.06; olefines, 1.33; methane, 11.02; hydrogen, 52.02; calorific value, 305.1 B.t.u. per cu.ft. (n.t.p.); sp.gr., 0.613 (air = 1); weight per cu.ft., 0.0492 pound.

For the purpose of obtaining refined products of good quality, the crude oil was dealt with by two different methods. It was found that the products obtained by both these methods were practically identical when finished, except that the color of the crude paraffin wax derived by method *B* (see below) was much superior to that produced by using method *A*, a point of considerable practical importance when the conversion of the crude wax into refined wax comes to be considered. However, further treatment with acid before the soda treatment of the crude distillate obtained by method *A*, would probably give more satisfactory results. The yield of refined products was found to be similar by either method. The following is an outline of the schemes used for refining the crude oil:

Method A. The crude oil was distilled and fractioned into crude naphtha (1) and crude distillate (2). The latter was then treated with sulphuric acid of 1.84 sp.gr. and caustic soda solution of 1.35 sp.gr., and again distilled, fractioning into crude burning oil (3), heavy oil (4), and residuum (5). Product Nos. 1 and 3 were refined further by treatments with acid and soda and distillations. No. 4 was cooled to a low temperature and filter pressed to extract the solid paraffin (6). The blue oil (7), obtained from (4), was treated with sulphuric acid of 1.72 and 1.84 sp.gr., and then soda solution of 1.35 sp.gr. It was next distilled over solid

[40] Tervet: "Petroleum and Its Products," II, 64; Abstr. "Transactions Institute Mining Engineers," 1905, 11, 6-20.

caustic soda, and fractioned into the various products, which were then refined.

Method B—The crude oil was treated with sulphuric acid of 1.72 sp.gr., and then distilled and fractioned into crude naphtha (1) and crude distillate (2). The latter was treated with sulphuric acid of 1.72 and 1.84 sp.gr., and caustic soda solution of 1.35 sp.gr., and again distilled, fractioning into crude burning oil (3), heavy oil (4), and residuum (5). No. 4 was cooled and filtered, giving solid paraffin (6) and blue oil (7). The latter was then treated with sulphuric acid of 1.84 sp.gr. and soda, distilled off solid caustic soda, and fractioned into various products.

All the distillations were conducted with external heat and a current of soft steam, except the distillation of the crude naphtha, in which only soft steam was used. The quantity of steam used was such that the condensed "steam water" was equal in volume to about 30 per cent. of the oil distillate. The only exception to this was in the distillation of the heavy oil, when the steam was shut off and the external heat increased so as to cause "cracking" of the still bottoms, with the production of crystalline paraffin; but the steam was turned on to carry over the last of the bottoms. A tabular statement[41] of the refined products obtained is given in an accompanying table.

PUMPHERSTON OIL SHALE WORKS NEAR EDINBURGH, SCOTLAND

Testing Apparatus and Methods

Having demonstrated practically the value of run of mine shale of a poor grade in one locality, a proved method was pursued to determine the value of shales from a number of localities in the field involving nearly 200 square miles. Detailed information for the whole area cannot be supplied at this time.

The tubes employed for the determination of the yield of crude oil from a given sample, were made of 2 in. wrought-iron tubing, having a length of 6 ft., and being sealed by a cap at one end. The method of procedure is as follows: A selected sample of one pound of the shale in pieces about ½ in. square is put into the tube, which is then inserted in the oven and heated gradually to a dull-red heat. The tube is inserted in the oven about a foot of its length, and is inclined at a convenient angle. No condenser is used in making these tests, so that the naphtha is lost, but by controlling the heat properly, the conditions of distillation are identical with those occurring in a modern retort. In fact, these tubes were designed with this idea in view, and are used extensively in Scotland for experimental purposes.

The method employed for the determination of the yield of ammonium sulphate obtainable from a sample of shale is known as the Bailey method and is used in the laboratories of all crude oil works where Pumpherston retorts are in use. It is essentially as follows: Thirty grams of the shale in small pieces are heated in a malleable-iron tube to bright redness in the presence of a current of steam for 1½ hours, the gases resulting being led into a flask containing 2n sulphuric acid. In this solution the ammonia is determined as nitrogen in a nitrometer and the yield of ammonium sulphate is thereby calculated.

The apparatus consists of a 1 in. malleable-iron tube, of ¾ in. internal diameter, and 28 in. long. Into one end is fitted a cork, through which passes a short brass tube with a stop-cock, the outer end of which is connected with the steam supply. Pieces of previously ignited fire brick, about 5 mm. in diameter, are dropped into the iron tube so as to occupy about 8 in. of the tube next to the stop-cock. Then 30 grams of shale, in pieces about 3 mm. in diameter, are dropped into

[41] The author is indebted to William Fraser, managing director, James Bryson, works manager, and I. M. Bailey, chief chemist, for many courtesies during the investigation at the main works of the Pumpherston Oil Company, Limited.

REFINED PRODUCTS OBTAINED FROM NEW BRUNSWICK SHALE OIL.

Yield by Method A.

Product.	Gallons per 100 Gal.	Sp.Gr. at 60 deg. F.	Setting Point, Deg. F.	Melting Point, Deg. F.
Heavy naphtha	1.62	0.7670		
Burning oil	10.04	0.7954		
Gas oil	14.87	0.8431	25	
Cleaning oil	2.83	0.8713	26	
Lubricating oil	9.58	0.8957	30	
Crude wax	2.26			112.26
Crude wax	0.93			101
Crude wax				
Residuum from blue oil (refined)	0.28			
Residuum from treated crude distillate (refined)	1.27			
Total	43.68			

Total crude wax, containing 4 per cent. oil, was 3.19 gal. or 2.907 gal. refined wax; melting point, 108.98 deg. F. (42.76 deg. C.).

Sulphuric acid used in refining 100 gal. crude oil was 4.705 gal. (1.84 sp.gr.).

Yield by Method B.

Product.	Gallons per 100 gal.	Sp. Gr. at 60 deg. F.	Setting Point, Deg. F.	Melting Point, Deg. F.
Heavy naphtha	1.45	0.7670		
Burning oil	11.50	0.7955		
Gas oil	13.04	0.8450	25	
Cleaning oil	1.56	0.8705	26	
Lubricating oil	11.03	0.8935	30	
Crude wax	2.21			111.34
Crude wax	0.60			104
Crude wax	0.16			81
Residuum from blue oil (refined)	0.57			
Residuum from treated crude distillate (refined)	1.95			
Total	44.07			

Total crude wax, containing 4 per cent. oil, was 2.97 gal. or 2.707 gal. refined wax; melting point, 108.38 deg. F. (42.2 deg. C.).

Sulphuric acid used in refining 100 gal. crude oil was 4.68 gal. (1.84 sp.gr.).

Flash point of burning oil, 117 deg. F. (47.2 deg. C.). (Abel close test.)

Viscosity of lubricating oil, 200 sec. at 70 deg. F. (21 deg. C.). (Redwood's apparatus).

the iron tube, and the tube is placed in a combustion furnace, with the portion containing the shale well in the center of the furnace, so that it may be readily heated to a bright red heat.

Into the open end of the tube next to the shale is fitted a cork, through which a glass delivery tube passes through a cork into a 500—600-c.c. Erlenmeyer flask, the exit tube of which passes to a 200-c.c. flask, which acts as a trap for receiving any liquid which may be carried over from the larger flask; 50 c.c. of *2n* acid are introduced into the larger flask before it is connected with the iron tube.

To start the operation, the furnace is lighted, and the iron tube is brought as rapidly as possible to bright redness, the time being noted when this is attained. It is essential that the time should not exceed 10 to 15 min. As soon as vapors begin to show in the glass tube, the stop-cock is cautiously opened and a regulated and moderate current of steam is allowed to pass through the tube. The proportion of steam should be such that after 1½ hours heating to bright redness, about 400 c.c. of liquid are contained in the larger flask.

During the operation, the large flask should be partly immersed in cold water in a porcelain basin, in which the water is frequently replaced by fresh cold water; and the ends of the iron tube should be kept cold by wet lint or cloth wrapped around them and kept moist, in order to prevent charring of the corks. After 1½ hours, the apparatus is disconnected, care being taken that neither then nor at any other time does any of the liquid in the flask go back into the tube, owing to reduction in pressure, and the flasks are rinsed out.

The liquid is made up to a volume of 500 c.c., or any other convenient quantity, and then thoroughly mixed by shaking. A measured portion—say 200 c.c.—of this liquid is then evaporated in a porcelain dish on a water bath until its volume is reduced to about 5 or 6 c.c., and this residue is rinsed into the cup of a nitrometer, taking precautions that all the ammonia salts are transferred to the cup.

Excess of sodium hypobromite is then added, the nitrometer is shaken, and the volume of nitrogen, temperature and pressure are read off with all the necessary corrections, from which data the total volume of nitrogen from the 50 grams of shale is calculated. One cubic centimeter of nitrogen at 0 deg. is equivalent to 0.0022 gram NH_3, from which the yield of ammonium sulphate per ton may be calculated. Determinations by this method approximately equal the yields obtained by retorting the shale in a Pumpherston retort.

Alternate Methods

At one shale oil plant in Scotland, the yield of ammonium sulphate is determined in the laboratory by collecting the liquor obtained along with the crude oil in a tube test, estimating the amount of ammonia in this, and multiplying by a factor, calculated from the yield of ammonia by a similar shale in a works retort. This method of estimation lacks the accuracy of the Bailey method, but is found to be sufficiently accurate for some purposes[12].

The nitrometer should be employed in determining the amount of ammonia absorbed by the sulphuric acid in these determinations, as various basic substances distil over which would render a determination by titration inaccurate. In this connection it may be interesting to note in an accompanying table the oil and ammonium sulphate yields of shales from other localities.

Commercial Considerations

The economical production of shale oil is dependent upon four factors: (1) The richness of the shale, (2) the amount available for treatment; (3) certain technical details of treatment, as temperature regulation, which need not be discussed in this communication, for experience in Scotland has determined the most suitable methods, readily put into practice in other localities; and (4) the amount of ammonium sulphate produced per ton. From the data obtained in the investigation and given in this paper, it will be observed that all of these factors are satisfied by the Canadian shales.

YIELD OF VARIOUS NEW BRUNSWICK SHALES

Locality	Yield per Long Ton. Crude Oil, Imp. Gal.	Crude Oil, U.S. Gal.	Sp. Gr.	$(NH_4)_2SO_4$ Lb.
Shale retorted in Scotland in works retort	40	48	0.92	77
Geo. Irvings (same as above by laboratory method)	39	47	0.895	76
Baizley's farm, Baltimore	54	65	0.895	110
E. Stevens	49	59	0.892	67
Hayward's brook } Prosser brook }	30	35	0.895	75
Adams' farm	43	51	0.90	93
A. Taylor's farm, No. 1	48	58	0.91	98
A. Taylor's farm, No. 2	37	44	0.925	110
Sample of 85 lb. run in 1907	51	61	0.91	111

HAULAGE INCLINE—TOP OF PUMPHERSTON RETORTS

YIELD OF SCOTTISH AND OTHER SHALES.

Shale.	Yield per Long Ton. Imp. Gal.	$(NH_4)_2SO_4$ Lb.
SCOTTISH SHALES.		
Airdrie shale	33	6
Westfield shale	25	10
Monkland shale	32	6
Oakbank wee shale	36	.....
Oakbank big shale	22	.....
M'Lean shale	38	.....
Lower wild shale*	19	.....
Oakbank new shale*	21	...
Barracks shale*	19	...
Dunnet shale*	7–46	14–34
Pumpherston No. 1*	21	54
Pumpherston No. 2	17	32
Pumpherston No. 3*	29	52–67
Pumpherston No. 4*	27	70
Pumpherston No. 5*	18	29
Raeburn shale	55	7
Mangle shale	36	30
Fells shale	30–51	7–35
Broxburn grey shale*	20–33	34–41
Broxburn curly shale*	19–33	11–24
Broxburn seam shale*	10–40	7–40
OTHER SHALES		
Kimmeridge shale Dorsetshire, England†	50–67	38 (maximum)
Boxmeules Mines shale, France‡	70–80*	5–7*
Alexinatz shale, Servia‡	43–46	.....
Orepuki shale, New Zealand†	20–40	...
Hartley seam shale N. S. W., Australia†	14, 60, 150	Low‡

*Shale now being worked. In the works retorts, the Pumpherston shales yield on the average 24 gal. of crude oil and 50 lb. of ammonium sulphate per ton.

†Liters per 1000 km.

‡Kilograms per 1000 kg.

[12]The method used at this works is to distil 2 lb. of shale in a 2-in. tube such as is used for determining the yield of crude oil, and the ammonia produced is caught in cold water. This water is then titrated and the result thus obtained is generally multiplied by two. The final result approximates the yield of ammonium sulphate obtainable in a Henderson retort.

[1]In this connection, see Williams, *Journ. Chem. Soc.* VII, 97; *Phil. Mag.*, (4) VIII, 209, also, Beaton Green's "Kimmeridge Shale, Its Origin, History and Uses," London 1886.

[2]For information concerning the French shale oil industry, see Maumet's "Nouveau Manuel," Paris 1867; Chesneau, *Ann. Mines*, (9) III, 617; *Trans. Fed. Inst. Min. Eng.* VII, 180; Meom, *Oest. Zeit. f. B. u. H.* XIV, 80, and Bertrand, *Compt. Rend.*, CXXVI, 1677.

[3]A. R. Griffiths (*Chem. News*, XLIX, 107), reported that a sample of paraffin shale from near the Goulburn river in the western part of Victoria yielded on distillation 72 per cent. of a semi-solid hydrocarbon, similar in appearance to ozokerite.

[4]See Dunlop, *Papers and Rep. Min. and Mining*, N. Z., 1900, 03, 52.

[5]The oil shales of New South Wales, Australia, have been described in the following contributions: Clarke, *Quart. Journ. Geol. Soc.*, XXII, 139; Greenwell and Rennie, *Trans. Manch. Geol. Soc.*, XI, 66; Andrews, *Verh. und Ver. Preuss. Rheinl.*, XXXII, suppl., 5; Dawkins, *Report Brit. Assn.*, 1886, 643; Skey, *Annual Report Col. Mus. Lab. N. Z.*, XXIII, 50, XXV, 56, XXIX, 19, XXXI, 10, and Pettie, *Journ. Soc. Chem. Ind.*, XXIV, 996.

[6]The richest Joadja Creek shale contains but 0.28 per cent. nitrogen.

The importance of these large deposits of fuel oil, has been appreciated by far-sighted people, for these shales virtually present an undertaking which means a barrel of oil for each ton of shale raised. The by-product, ammonium sulphate, not taken into account in the early days, will more than bear all the expense of mining and treatment, and the oil product is not governed by the fortuitous discovery of an oil reservoir by boring and the sure exhaustion of the well if it is originally productive.

There are deposits of shales in the United States which, under proper supervision, may also prove to be valuable properties. Oil shales occur on the Humboldt river, opposite to Elko, Nev.; on the Big Blackfoot river and near Great Falls, Mont.; and in the Cholame valley, north of Parkfield, Cal.

The crude oil produced by retorting the New Brunswick shales is essentially the same as petroleum of the Mid-Continent field; therefore the same markets are open for it. As an article of commerce, it must be considered primarily as a liquid fuel. In this connection, it may be stated that during 1907, a total of 18,855,691 bbl. of oil were consumed as fuel by the railroads of the United States, as against a total of 15,577,677 bbl. in 1906. The estimated length of railroad line operated by the use of oil fuel in 1907 was 13,593 miles, and the total length of line covered by oil-burning engines has been estimated at 74,197,144 miles. Most of the oil consumed was crude oil, the remainder being residuum from the refineries. Practically all the oil was from the Mid-Continent, Gulf, and the California fields.

Being cheap and developing great heat on combustion, oil (particularly crude oil) is largely used as a fuel in various industrial plants, especially metallurgical plants. Liquid fuel is decidedly an economical fuel. It occupies less space than coal, it has greater efficiency of evaporation per unit measure of heating surface, more equable generation of steam, greater cleanliness and freedom from ash, avoidance of loss of heat by frequent opening of furnace doors, and instantaneous extinction of furnace fires.

According to the report of the United States liquid fuel board in 1904, the following additional advantages were found to be practically obtainable: ease in filling tanks, rapidity of time in meeting a varying load on boiler, ability to force boiler to extreme duty in case of emergency, absence of smoke under light normal working conditions, short hight of stack, superior personnel available for the operation of the burners, and ability to secure and maintain higher speed with oil than with coal. It should also be noted that in practice one ton of fuel oil is equal in thermal efficiency to about one ton and three-quarters of steam coal.

Although as above stated, liquid fuel is largely applied in metallurgical operations, in which applications the employment is decidedly advantageous, yet it has been impossible to secure adequate supplies of liquid fuel for general employment. In this connection it may be said that Redwood pointed out in evidence before the royal commission on coal supplies in 1903, that "even if the whole of the world's output of petroleum were doubled, and the surplus thus created were used as fuel, this surplus would, taking into account the relative thermal efficiencies, only be equivalent to about 5 per cent. of the world's output of coal." A comparative statement of the calorific values of the liquid fuels available on the world's markets is submitted herewith:

CALORIFIC VALUE OF LIQUID FUELS.

	Specific Gravity.	Flash Point, Deg. C.	Calorific Value by Bomb.		Actual Evaporative Power from and at 100 Deg. C.
			Calories.	B.t.u.	
American residuum	0 886	176 6	10,904	19,627	15 0
Russian Ostatki	0 956	153.3	10,800	19,440	14 8
Texas	0 945	118	10,700	19,242	14 79
Burma	0 920	110	10,480	18,864	14 5
Barbadoes	0.958	99	9,899	17,718	14 2
Borneo	0.936	140 5	10,461	18,831	14.0
Shale oil	0.875	142	10,120	18,217	13 8

Crude oil is especially advantageous to use as a fuel on shipboard, or locomotives, and in stationary boilers. For some time the British Admiralty has been fully alive to the importance of using liquid fuel and remarkable results have been obtained in the smaller vessels. In the British navy, no oil with a flash point below 93.3 deg. C. is allowed on board, although in the German navy and the mercantile marine the limit is fixed at 65.5 deg. C. It is reported on good authority that some of the new vessels of the United States navy are to be fitted to burn liquid fuel.

Zinc Dust Precipitation at the Homestake Mine*

By Robert Linton†

One of the most striking differences between the enormous cyanide plant of the Homestake gold mine and those on the Rand, is the method used for precipitating the gold from the solutions. On entering the plant, one looks in vain for the large boxes filled with zinc shavings we are accustomed to see in the extractor houses of the Rand. In their place he finds large wooden vats into which the gold solution flows. As a rule, the solution runs by gravity from the vat to the filter press.

Zinc dust (the zinc dust used is, by the way, cheaper than shavings) is added to the tank automatically as the solution flows to the filter press. The precipitation of the gold by the zinc dust, and the retention of the precious material by the filter press is almost perfect. One remarkable fact is the rapidity with which the zinc dust does its work.

This zinc dust idea is no new one. It has been up before our society before, namely when Mr. Packard gave a paper on the subject (see Vol. II, p. 720). The discussion which followed the paper was distinctly adverse to the scheme. In many places of the world where it was tried, the zinc-dust idea was a failure, partly through ignorance, but principally through a lack of "stick-at-edness."

Precipitation by zinc dust is a distinct success at the Homestake mine. A. J. Clark, manager of the cyanide works, kindly consented to contribute some interesting figures on the results he has attained, and from these it may be seen how well zinc-dust precipitation shows up in this, the largest cyanide plant in the world. The figures I think are impressive, and I believe the zinc-dust scheme could be taken up with advantage in South Africa. Of course, I do not mean to say that our precipitation boxes should be thrown out in the old plants and the zinc-dust scheme introduced, but in new plants it might be well worth considering some of the advantages of the zinc-dust precipitation.

Besides its cheapness and cleanliness, one of the great advantages over the precipitation boxes is that the danger of theft is greatly reduced. The precious metal is caught in a large filter press, which is securely locked. The gold is cleaned up only once a month, and this is not the laborious operation it is with us. When the press is opened up, the gold slime is taken to the briquet plant, with a minimum amount of handling.

Another point is that the overlap of the cyanide gold from one month to another is reduced to nil. The cyanide clean-up at the end of the month is as complete as in the mill. The differences between monthly theoretical and actual extractions are therefore reduced to a minimum, and you do not get the violent monthly fluctuations we get on the Rand. In using the zinc-dust method, care must be used in getting the right kind of zinc. At the Homestake, they specify that the zinc dust carry at least 2 per cent. lead. A little nitrate of lead is also used. Another important point is to keep the press air tight, so as to prevent oxidation. It is a pleasure to testify to the good work accomplished at the Homestake plant by the zinc-dust method. Their success proves that as good results can be obtained as the precipitation by zinc shavings that we are accustomed to on the Rand.

*Notes published in *Journ. Chem., Met and Min. Soc., South Africa*, December, 1908, under discussion of article, "Zinc Dust Precipitation at Cerro Prieto."

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Review of Fossil Iron Ore Deposits of Georgia

Clinton Ores Best Developed in Dade, Walker, Catoosa, Whitfield and Chattooga Counties; Outcrops Traceable for over 100 Miles

BY S. MAYS BALL*

The fossil or Clinton iron ores of Georgia were laid down during the Niagara period, one of the three subdivisions of the upper Silurian era. This period is represented in New York by many feet of sandstone, limestone and shale.

The sedimentary and replacement theories have been advanced to explain the origin of the Clinton or fossil ore, and each has been strongly advocated by eminent observers. The former theory supposes that the iron is an original constituent of the orebed, being deposited at the same time as the calcareous material of which it is often largely made up, the latter supposes that the iron is of more recent origin, having been derived chiefly from the overlying shales by leaching, and afterward deposited in the calcareous beds below, by replacement.

The Clinton group of rocks with the exception of the Oneida conglomerate and the Medina sandstone constitutes the oldest rocks of the upper Silurian era. The dry land during the deposition of the Clinton rocks, may, therefore, be said to correspond very nearly to the land area at the close of the lower Silurian era.[1]

With the exception of the beds of fossil iron ore, the entire series of Clinton rocks, as seen in Georgia and Alabama, seems to differ in no way from recent deposits laid down in comparatively shallow water during the slow subsidence of the sea floor. The land surfaces from which the Clinton rocks were formed were probably in a large measure granites and other igneous rocks. However, the common occurrence of diorites and diabases throughout the region indicates that more basic rocks with high iron contents were also fairly abundant. In addition to these eruptives, there was also bordering the coast line a narrow belt of ancient clastics, varying in age from early Silurian to Algonquin, which also furnished sediments for the Clinton rocks.

Characteristics of the Clinton Ores

The Clinton ores as they occur in Georgia consist, commercially speaking, of two varieties, namely, the hard and the soft ore. The soft ore which forms the accompanying outcrop of the hard ore, and which differs from the hard ore mainly in the fact of its being carbonate by weathering [illegible] more than a short distance beneath the surface. When the beds are nearly perpendicular and the conditions are favorable for surface erosion the soft ore may be absent entirely while on the other hand, where the angle of dip is low and conditions are unfavorable for surface erosion, the soft ores may extend to great depth. Furthermore, any geological structure such as jointing and faulting which causes deep weathering likewise increases the depth of the soft ore. The free circulation of water charged with carbonic acid is, no doubt, the chief agent which caused the alteration of the hard ore into the soft; however, the depth at which it has been possible for carbonated waters to freely circulate has been conditioned largely by geological structure.

A microscopic examination of thin sections of fossil iron ore shows it to consist of a calcareous matrix and the iron ore proper. In high-grade ore the matrix is reduced to a minimum and the percentage of iron ore is correspondingly increased while in the case of lean ore just the opposite conditions obtain. The ores vary, containing from 40 to 80 per cent. or more of iron oxide. There appears to be every possible gradation in iron contents between the high- and low-grade ores, and furthermore, a like gradation between the low grade ores and ferruginous limestone.[2] Any theory, therefore, which will explain the origin of the iron in the iron ores, must likewise also explain the origin of the iron in the ferruginous limestone.

Extent of Clinton Iron Formation in the United States

The fossil or Clinton iron ores of Georgia form a part of one of the most remarkable iron-ore deposits known. The accompanying map shows that these ores are found as far north as western New York, being well developed in Oneida, Cayuga, Oswego, Madison, Monroe and Wayne counties. There they occur usually in two beds, which are sometimes 20 ft. apart. Below the water level the ores, which are made up largely of lenticular shaped grains, are quite compact and yield from 44 to 48 per cent. iron.

The Clinton ores again make their appearance in central Pennsylvania. Here they reach their greatest economic importance in Montour, Snyder, Juniata, Blair, and Bedford counties where they were formerly worked on a large scale. The ore in these counties shows in a number of nearly parallel continuous outcrops, exposed along the side of adjacent valleys.

Passing south from Pennsylvania these ores traverse the eastern part of Maryland and Virginia and the western part of West Virginia and Kentucky. In Maryland the ores are found in Allegany county in two beds separated by 6 ft. of calcareous shale. The upper bed is 80 ft. thick while the lower bed is only about half this thickness. They occur in the lower part of the Clinton formation, approximately 160 ft. above its base.

The deposits in West Virginia are found chiefly in Grant, Hardy, Pendleton, Greenbriar, Monroe and Mercer counties, but only at a few points have they been worked. The Clinton ores in Virginia have been mined west of the Great Valley in Wythe, Giles, Bland, Tazewell, Russel, Scott, Lee and Wise counties. Southwest of Virginia the Clinton iron ores continue through east Tennessee, northwest Georgia and northeast Alabama, finally disappearing a few miles southeast of Tuscaloosa, Ala. The deposits in Tennessee show an almost continuous series of outcrops from Cumberland gap to Chattanooga. They are confined mainly to the western margin of the valley of east Tennessee, at or near the base of the Cumberland escarpment, where they usually appear in two or more parallel ridges having a northeast southwest trend. These ores, which have been more or less extensively worked in Claiborne, Campbell, Roane, Rhea, Hamblen, Sequatchie and Marion counties in Tennessee, run from 35 to 50 per cent. iron, the percentage largely depending upon the amount of carbonate of lime present.

As shown by the map, the iron-bearing zone or belt in which workable ores occur, greatly increases in width as the Tennessee Georgia State line is approached. The distance from the eastern line of outcrops, in the vicinity of Chattanooga, to the western line is more than 30 miles. This broadening of the belt is due to an increase in the number of outcrops brought to the surface by a series of anticlinal and synclinal folds. In northwest Georgia there are five different lines of these outcrops, crossed in going east from the Georgia Alabama line, in the vicinity of Rising Fawn to Taylor's ridge, a distance of less than 20 miles.

The Clinton or fossil iron ores reach their greatest economic development in the United States near Birmingham, Ala. The ore enters that State from Georgia and Tennessee in the extreme northeast corner in five different lines of outcrops. Further to the southwest in the vicinity

*147 East Tenth street, Atlanta, Ga.

[1] "Fossil Iron Ores of Georgia," Hon. S. W. McCallie, State Geologist.

[2] See Dana's map of "North America at the opening of the Upper Silurian."

of Gadsden, Ala., these outcroppings become even more numerous as the structural geology of the region becomes more complicated. In the Birmingham district there are only two outcrops of Clinton ore. Some of the orebeds there, however, are much thicker, thus giving the deposits great economic value. The total thickness of the Clinton or Rockwood formation of Alabama, usually approximates 150 ft. It is variable in character consisting of shale, sandstone and thin beds of limestone, with from three to five beds of iron ore. The workable orebeds which are usually two or more in number, vary from 3 to 25 ft. in thickness. The ore is generally fossiliferous and occasionally oolitic. Above the drainage level it is of high grade, running from 45 to 52 per cent. iron, but below this level it becomes calcareous and leaner.

The Clinton iron ores as above described, show an almost continuous line of outcroppings from central Pennsylvania to Alabama. In Virginia and upper Tennessee there are a few breaks in the continuity of the outcroppings, due to local faulting, but these breaks in no case exceed more than a few miles in extent. The total length of outcroppings of this remarkable iron deposit is approximately 1000 miles, thus making one of the most extensive and important continuous iron-ore deposits in the world. There also occur more or less extensive exposures in the Mississippi valley; the most northern of these deposits occurs in eastern Wisconsin. The other deposits of Ohio are found in Clinton, Highland and Adams counties. The ore has, however, only been worked in Adams county. The Clinton ores of Kentucky are limited to three counties, Bath, Montgomery and Fleming. The Bath county deposits have been worked for several years and have produced considerable ore of good quality. The Kentucky ores appear to be the southern extension of the Ohio deposits, though there is a break of several miles between the two outcrops.

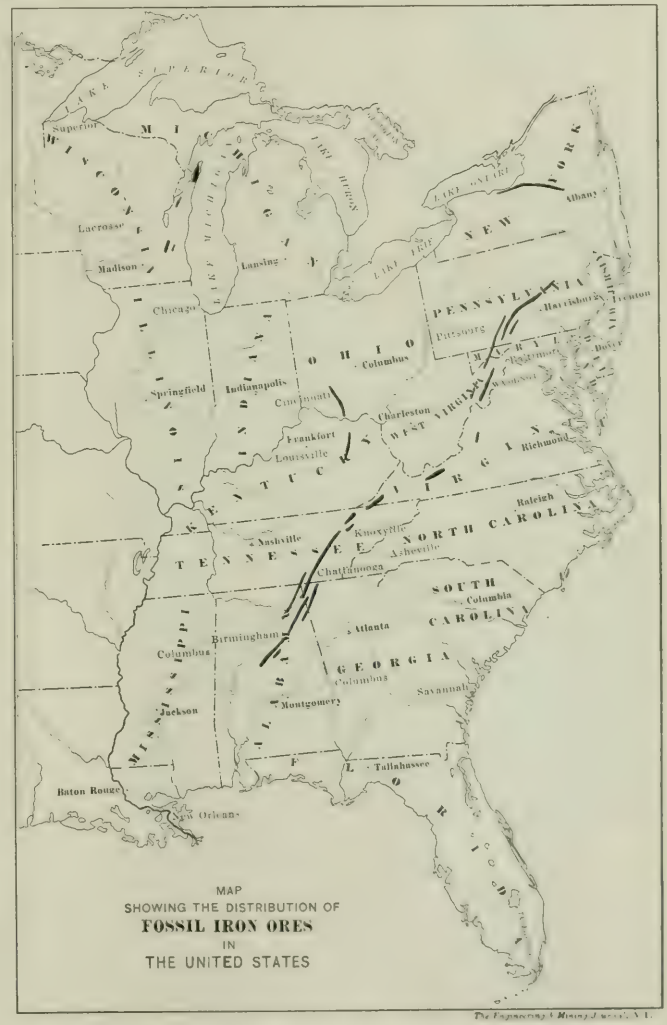
The fossil or Clinton iron ores of Georgia are confined to five counties in the extreme northwestern part of the State. These counties, Dade, Walker, Catoosa, Whitfield and Chattooga are all, with the exception of the last named, located along the Georgia-Tennessee line, only a few miles south of Chattanooga.

Dade County Deposits

In Dade county the Clinton ores are confined to Lookout valley and Johnson's creek. The ore extends from one end of Lookout valley to the other outcropping in two continuous and almost parallel lines on both sides of the valley. The western line of these outcroppings intersects the Georgia-Tennessee State line about two miles northwest of Wildwood, where the ore is well exposed in a cut on the Nashville, Chattanooga & St. Louis railroad. From this point the outcroppings extend to the southwest, parallel with and about three-quarters of a mile east of the Alabama Great Southern railroad, as far south as Trenton. After crossing the railroad this line of outcroppings continues to the northeast along the foothills of Lookout mountain to the Georgia-Tennessee State boundary, about one-half mile east of the point where the western line of outcroppings crosses the State line. Where the exposures cross the Alabama Great Southern tracks the line of outcroppings veers more to the west and continues along the foothills of Sand mountain to the head of Deerhead cove, at which point it changes its course and runs to the northeast. Along these two lines of outcroppings the exposures of the ore are continuous except where buried beneath residual or alluvial clays.

The exposures of the fossil iron ores in Johnson's crook are not so extensive as the exposures in Lookout valley, yet their characteristics are quite similar. The outcroppings along the western side of the Crook, in the immediate vicinity of the Rising Fawn iron furnace, are especially well developed, but to the southwest, along the base of Lookout mountain, they are very irregular. The absence of the ores here, as in the case of Lookout valley, appears to be entirely due to the presence of an overburden of residual clays. The main exposure of ore on the western side of the Crook, occurs along the east side of a chert ridge, near the Alabama Great Southern line, about one mile south of Rising Fawn.

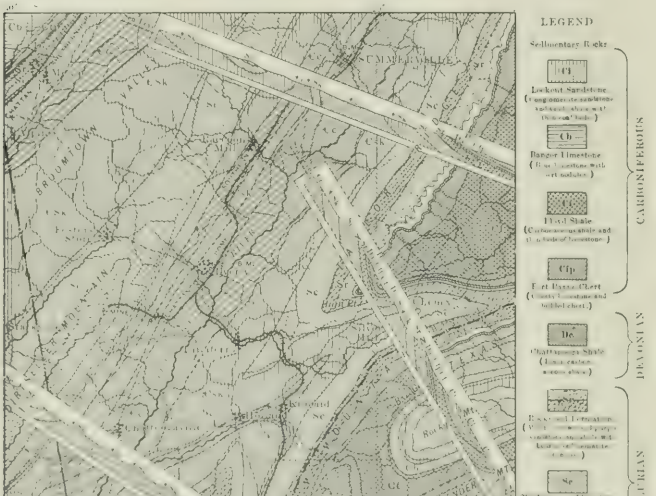
The workable fossil iron ores of Dade county are confined chiefly to one orebed



This bed which is continuous throughout Lookout valley and Johnson's crook has an average thickness of about 3 ft., but at some points, as in the vicinity of Rising Fawn furnace, attains a thickness of 7 ft. In addition to the main workable bed, one to two other beds are often locally developed, and at some points, yield ore carrying a sufficiently high percentage of iron to be of commercial value. These minor beds often attain a much greater thickness than the main workable bed, but are relatively leaner in iron.

The iron beds have been worked to a fair extent in Lookout valley, but more largely in Johnson's crook in the neighborhood of Rising Fawn. There stripping and underground work has been carried on, the former to a far more extensive degree than the latter. The total length of the strippings are revealed by the old excavations in Johnson's crook, would probably aggregate several miles. In these workings, which rarely exceed a maximum depth of more than 10 or 12 ft., the ore mined was mostly soft, running high in metallic iron and low in carbonate of lime. Exposures suitable for this stripping method in Johnson's crook are now, in a large measure, worked out and the future workings will have to be confined principally to underground mining.

The iron-ore workings of Lookout valley occur in the vicinity of New England City and also at several points along the Alabama, Great Southern Railroad, south of Trenton. The most extensive workings in the New England City locality are situated along the eastern line of outcroppings. These consist of both surface and underground workings and commence near Squirrel creek, just east of New England City and extend almost continuously beyond Morganville, a distance of 4 or 5 miles. The amount of ore taken from these various workings in Lookout valley, is not so great as that from Johnson's crook.



The Engineering & Mining Journal, N.Y.

GEOLOGICAL MAP OF PART OF CHATTOOGA AND FLOYD COUNTIES, GEORGIA
(Rome Folio U. S. G. S.)

The fossil iron ores of Dade county are for the most part favorably located for working. Many of the beds outcrop from 100 to 200 ft. above the general stream level, and as a consequence the mines in most cases can be made self-draining to considerable depth. Other conditions favorable to economic mining are the low dip of the ore-beds, usually from 10 to 20 deg., their uniformity in thickness and the absence of thick partings of shale. The less important beds are more variable in thickness and frequently thin out completely in only a short distance. It is not an uncommon thing to find the main orebed varying in thickness much more in the direction of the dip than along the strike. This variation, however, is due to weathering and not to any irregularity in the bed itself. As a general rule, the beds are all found to increase slightly in thickness near the water level, or at a point of contact of the soft and hard ores. The shale partings of the main orebed of the Dade county fossil ores rarely ever exceed 4 or 5 in. in thickness, which by no means seriously interferes with mining.

The greater part of the fossil iron ores of Dade county is owned by three companies, namely, the New England Company, the Phœnix Iron and Coal Company and the Georgia Iron and Coal Company, the latter a tributary to the Southern Steel Company. The iron-ore lands of the first two companies are situated in Lookout valley, while the lands of the last company are situated in Johnson's crook. Scattered around Dade county there are other bodies of ore partly undeveloped, owned by several different people. The ores in this county will average in iron and phosphorus, respectively, 33.76—0.51; 57.10—0.197; 53.93—0.27; 40.27—0.35; 34.72—0.57 down to, around 34.05—0.335, and 31.66—0.379 per cent.

Walker County Deposits

The Walker county ores occur along the eastern foothills of Lookout mountain, along the eastern and western foothills of Pigeon mountain and along the eastern slope of Taylor's and Dick's ridges. There is also in addition to the localities referred to a small V-shaped line of outcroppings traversing the knobby hills west of Chattanooga valley in the vicinity of the Georgia-Alabama line. In the western foothills of Lookout mountain the orebeds outcrop a short distance southwest of Flintstone and continue southwest with but a few breaks to the head of McLamore's cove; here they change their course and continue along the western foothills of Pigeon mountain to its northern terminus, when they again change their direction and continue along the eastern foothills of Pigeon mountain to the Walker-Chattooga county line. The total length of this broken line of outcroppings aggregates more than 50 miles. The outcroppings along Taylor's and Dick's ridges are to be seen in the heads of the hollows, on the Western side of the latter and eastern side of the former. This line of outcroppings is practically unbroken and extends from Walker-Chattooga county line to the Walker-Whitfield line a distance of 12 miles. The line of outcroppings west of Chattanooga valley has a length of about eight miles, thus making the total length of outcroppings of the fossil ore in Walker county more than 70 miles.

Samples of this ore taken from different properties show the following percentages of iron and phosphorus, respectively, 46.37—0.423; 54.30—0.729; 47.78—0.58; 55.64—0.283; 58.02—0.475, to 42.72—0.501; in one deposit 26.26—0.266.

The western limb of the V-shaped outcroppings referred to above is cut short by a fault about three miles south of the Georgia-Tennessee boundary; west of the Chattanooga valley, the eastern limb of the V trends nearly north and south, extending along the State line. The main part of the workings along this V-shaped line of outcroppings is located near the apex of the V about 1½ miles due east of East Cliff station. The ore from these deposits will run in per cent. of iron and phosphorus, respectively: 33.05—0.32; 49.82—0.33 and 59.66—0.40.

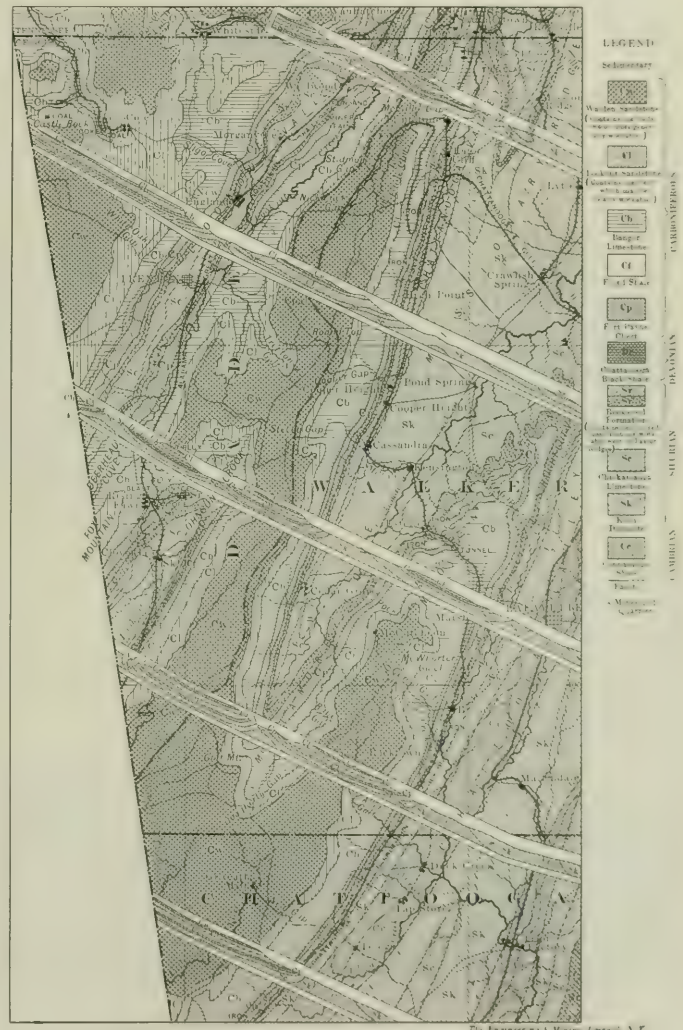
The Chattooga County Deposits

In this county the ores occur along the line of rough hills at the base of Lookout mountain, both north and south of Menlo, on Dirtseller mountain near the Georgia-Alabama State line, and on Gaylor's and Taylor's ridges farther to the south and west. The aggregate length of these four different lines of outcroppings is approximately 25 miles. The most extensive orebed and the one which has been worked the most is that along the base of Lookout mountain which is the southern extension of the Lookout mountain orebeds in Walker county. Ores from this region run in per cent. of iron and phosphorus, respectively: 44.73—1.142; 38.09—0.117; 53.64—0.301; 56.02—0.418; 54.30—0.462; 57.82—0.36.

Dirtseller mountain is a very prominent trough-like synclinal ridge intersecting the Georgia-Alabama line about midway between Lookout mountain and Gaylor's ridge. The greater part of this mountain lies in Alabama, only its northeastern extension, less than six miles in length, being confined to Georgia. The top of the mountain, or rather its elevated ridge-like brows, attaining a maximum hight of 700 ft. above the valleys on either side, is made up entirely of the Rockwood formation, consisting of shale, and heavy-bedded sandstone with one or more thin beds of fossil ore. Structural features affect, to a greater or less extent, the cost of mining. The ore in most cases outcrops only a few rods from the brow of the mountain and dips at a low angle, at many places varying but little from the slope of the surface, in which case often large quantities of ore have been mined in open cuts. The main part of the ore on Dirtseller mountain is at present owned by the Rome Furnace Company, which has been actively engaged in mining on the mountain for nearly 20 years, and has shipped to its Rome furnace more than 250,000 tons of high-grade ore.

The character of the ore and associated rocks on Dirtseller mountain differs considerably from those making up the Rockwood formation further to the north and west. The prevailing rocks here are sandstones which often become heavy-bedded and form bold bluffs along the brow of the mountain. In places immediately below the iron ore, the sandstone contains water-worn boulders often a foot or more in diameter; at some points these boulders are embedded in the ore itself. They often have the appearance of water-worn fragments of ore which have been detached by wave action and after having been rounded by the same force, have been deposited further seaward. As a rule, the ore contains much more silica in the form of sand than the ore farther to the north and west. The composition of this ore in per cent. of iron and phosphorus, respectively, is: 57.82—0.36; 54.30—0.462.

Gaylor's ridge, like Dirtseller mountain, is a very prominent synclinal ridge intersecting the Georgia-Alabama line about seven miles south of, and parallel to, Dirtseller. That part of the ridge which is confined to Georgia occupies the extreme southwestern corner of Chattooga county; its northern terminus is about 2½ miles south of Kincaid, a station on the Central Railroad of Georgia. The southern side of the ridge is deeply indented by numerous finger-like hollows, while the northern slope is steep and difficult of ascent. Its geological structure is practically the same as that of Dirtseller mountain, except that there does not seem to occur any synclinal folds. The fossil iron ore which occurs on Gaylor's ridge appears to be confined mainly to the north



GEOLOGICAL MAP OF PART OF NORTHWEST GEORGIA
(Ringgold and Stevenson Folios U. S. G. S.)

of its central trough-like valley. The ore there occurs as float ore, strewn along the western slope of the valley. From the character of the float material it seems as if the ore does not attain there a thickness of more than a few inches. It is quite possible, however, that at some favorable points where the ore lies near the surface, it may be mined with profit. The character of the ore seems to be of fair quality, but most of the samples found about the surface are badly weathered, being of brownish color and partially altered into limonite.

The ore on Taylor's ridge is the southern extension of that previously described on Taylor's ridge in Walker county. Here, as in Walker county, it is largely owned by the Georgia Iron and Coal Company. It is found in large rectilinear blocks strewn about the surface and also in the natural bedding where it has been washed bare by rains. At a point in the hollow, blocks of ore, measuring 17 in. in thickness, are strewn about the surface. The ore usually occurs in two layers.

East of these hills is Simms' ridge, which has in places limited exposures of fossil iron ore. The beds in this ridge, however, are so reduced in thickness that they seem to be of little commercial value. The only place on Simms' ridge where State Geologist McCallie examined the ore is near the gap of the ridge where the public road crosses about two miles southeast of Kincaid. The orebed at that point is not over 8 in. thick and seems to carry much silica in the form of sand.

The Whitfield County Deposits

The ores of this county are confined to Taylor's ridge and Dick's ridge in the extreme western portion of the county. These ridges are the northern extensions of the two fossil iron ore bearing ridges of the same name, previously described as traversing the eastern portions of Walker and Chattooga counties. The ore in neither of these ridges have been worked to any extent within the limit of Whitfield county. There are, however, many places where float ore is strewn along the hillsides. This is especially true of the rough hilly country south of Gordon spring and also in the vicinity of Nickajack gap, six to eight miles further to the north. To the west, float ore is seen on the hillsides along the ridges, but it has not been mined except for making chimney jams. Similar ore is found in the extreme northern part of Whitfield county. This ore, which becomes better developed in Bradley county, just across the State line occurs along a line of red hills associated with a reddish or chocolate colored marble, a similar stone to, and occupying the same geological position as, the marble which is so extensively worked in the vicinity of Knoxville, Tenn. The ore differs from the true fossiliferous ore chiefly in the absence of oolitic structure and in the high percentage of magnesia, with iron, 34.23, and phosphorus, pentoxide, 0.70 per cent.

The Catoosa County Deposits

The fossil iron ores occur on Dick's and Taylor's ridges and in the northern extension of the latter ridge, north of Chickamauga creek, known as White Oak mountain. Taylor's ridge and White Oak mountain form the western limb of a synclinal fold, which is made up of the Rockwood sandstone and shales; Dick's ridge formed of the same series of rocks, constitutes the eastern limb of the fold. The former limb traverses the entire width of the county in a northeast-southwest direction, but the latter limb is cut short by a fault just north of Panther's creek.

The eastern line of fossil-iron-ore outcroppings seems to be best developed on Dick's ridge only a short distance north of the Catoosa-Whitfield county line, where float ore of good quality in blocks, from 6 to 8 in. thick, is strewn along the hillsides. An average analysis of this ore is, iron, 50.75 per cent., and phosphorus, 0.5 per cent. The orebeds on Taylor's ridge and White Oak mountain appear to be somewhat more continuous than the ore on Dick's ridge, but the general type of the ore is similar. Along the eastern side of Taylor's ridge from the Catoosa-Whitfield line to Chickamauga creek, float ore in the form of blocks, from 4 to 6 in. thick, is strewn about the surface. This ore is soft and carries much silica in the form of sand. It averages, iron, 51.13 per cent., and phosphorus, 0.584.

There are also some deposits on the east side of Taylor's ridge, owned and worked by the Georgia Iron and Coal Company, where the ore averages 56.10 per cent. iron, and 0.392 per cent. phosphorus.

Nicaraguan Mining Notes

Special Correspondence

The goldfields of Nicaragua continue to be the center of interest. Henry Brown arrived from the States early this month and went at once to the Topaz mines, of which he is a large owner and the active head. The Topaz has not been shipping heavily during the last year owing to the entire destruction of the slime plant by a flood. A constant output has been kept up from the mill. The long crosscut has cut four of the many veins owned by the Topaz company and about 100 tons are being mined daily from the latest vein cut.

The Pittsburg owners of the La Luz group, at Cuma, are reported to have sold their holdings in conjunction with Don José Aramburo's Potosi mine for over $1,000,000. The La Luz has been a steady producer of gold and to date practically the entire tonnage milled is from open cuts and a glory hole. The ore is very soft and is ground in 3½ ft. Huntington mills. A cyanide plant is being built which will increase the extraction about 35 per cent.

Over in the Piz Piz district all the mines have suffered from the dryest season (just ended) on record. The power plant at the Siempre Viva falls kept running, however, and in addition to the power used at the company's mills, supplied Constantia and Concordia with electric power for their mills. The new plant just put up at the Bonanza mine by the General Electric Company was started in May, but the low stage of the river made steady running impossible. The new power plant at the Mars mine which went into commission in March has run very smoothly and kept two Huntington mills in operation. Harry J. Arkell, of California, is in charge at Mars. At Siempre Viva, work is progressing on the tunnel and grades for an electric haulage system. This installation will reduce the total costs for mining and milling to less than $3 per ton. These low costs have been the subject of much interest to visiting engineers but the fact remains that all the mines are operating on low grade gold ores and making a profit.

Norman McInnes, of the Lone Star, is at the mine again. His recent trip to St. Louis was for the purchase of an aërial tramway. With this he hopes to bring ore from a large quarry, high on the mountain, direct to the mill, thus avoiding some of the numerous handlings involved in the present system. The Lone Star is milling 100 tons daily and shipping about $15,000 monthly.

The new concession granted to Paul Reuer and associates covers a large territory extending from the Piz Piz district to the La Luz mine and down the Bambana river. The territory has been prospected fairly well during 10 or 12 years without any remarkable finds. It is well known that many small veins exist in the territory which would pay to open; close work may disclose some larger deposits. There is no ground suitable for dredging in the district.

Henry F. Lefevre, with a party of assistants, has just left for the States after having made a three-months' reconnaissance of the mining district. Mr Lefevre was engaged in the examination of the territory held by The United States & Nicaragua Company. On that occasion he only examined the western slope which is several hundred miles from Piz Piz. California engineers, accompanied by F. Moore, lately examined the Bonanza mine. This mine has produced nearly a million dollars and is turning out $15,000 to $20,000 monthly, yet has no underground work; its total production being from the weathered outcrop of the 25-ft vein.

Elmore Process as Applied by Zinc Corporation

Present Earnings About £6000 per Month; Large Supply of Material for Future Treatment; Description of Works and Method of Treatment

TREATMENT COST 5 7.08 d PER TON

At a recent meeting of the stockholders of the Zinc Corporation, Ltd., H. C. Hoover made the following remarks:

"When we met last we were making about £2500 to £3000 a month net, and I explained to you various directions by way of increased perfection of our process and reduced expenditure, by which we hoped to obtain improvements which would considerably increase our profits. In this case we have succeeded to a rather greater degree than I then outlined as possible, and we are now earning about £6000 per month net above the cost of material treated, taking zinc at £20 per ton, or about £8500 per month, taking zinc at present market price. The main thing of interest today is whether or not we can see our way to a further increase in profits. In this direction we have reason to believe that we shall still further increase the perfection in the separation of the lead from the zinc in our retreatment plant, and thereby increase the tonnage of lead concentrates monthly, and incidentally improve the quality of the zinc concentrates. How far we can go on these lines we are not yet certain, but every month shows some improvement, and I think you can rest assured that we shall, with experience and steady investigation and experiment, improve on this line. Theoretically we believe we should ultimately be able to secure a further 200 tons of lead per month. If we succeed our profits will have been increased by another £1200 or £1500—taking the present price of the metal. That is out of our main line of improvement, and I see no reason why it should not be accomplished.

Future Tailings Supply

"We are at present treating a portion of the Block 10 dump, which averages about 20 per cent. zinc. We have two or three years' run on this material yet. Our next treasury dump of importance is the South dump, of about 1,000,000 tons, the great bulk of which averages over 18 per cent. zinc. Now, this 2 per cent difference of zinc alone would, with our present metallurgical results, mean a diminution in our monthly profits of something like £1500. We have also the British and Block 14 dumps, altogether something like 600,000 tons, portions of which are richer than the stuff we are now treating, and portions poorer. The zinc percentage in these various dumps is not, however, the whole question. There are also the lead and silver, and, further, of equal import-

LOADING TAILINGS FOR TRANSPORT TO BINS AT MILL

STACKING FINAL RESIDUES WITH CONVEYER BELT AND BOOM STACKER

PLANT OF THE ZINC CORPORATION, BROKEN HILL, NEW SOUTH WALES

ance to us, is the faulty treatment. The zinc percentage controls the results of our treatment. Now, these subsidiary minerals are different in the different dumps. Although it is rather early in our experimental work to make a definite announcement, I may tell you that our work up to date indicates that by mixing the lower-grade dumps together we can get more perfect extraction and higher-grade products than we now obtain, and that the profit from working them will be actually greater than we obtain from the Block 10 dump. There is, therefore, little need for alarm in this direction; in fact, we have good ground for some hopeful anticipations of larger profits from the lower-grade dumps.

"The expenditure on capital has been greater during the year than we anticipated at the last meeting—among other reasons, on account of expansion of plant. We were able to sell a larger output for several years ahead, and we have increased our plant to supply this material. Since our last meeting we have increased our capacity by 4000 tons per month, or about 25 per cent. The capital outlay is now practically at an end. We have sold the whole of our product for three years ahead, and a portion of it for a further period of six years.

"We have now purchased and under contract something over 11 years' supply, and there are other sources of supply in Broken Hill, and I have no doubt we shall be able to continue our business after that date. There is one item in this connection that you will have noticed in the balance sheet, namely, that we have expended £300,000 already in the purchase of this material and in the monthly returns we set aside a sum of money representing the cost of that stuff, so that at the end of 11 or 12 years, supposing we were doing no further business, we would be able, under our present scheme of finance, to come to you with that £300,000 in our chest. As to the contracts for the sale of concentrates, they are on a sliding scale, based on the price of zinc. The major portion of the contracts are based on the year's average; about one-third of the contracts are based on the price six months forward. In other words, the price for the material sold during the first half of the year is based on the average of the subsequent half-year. That arrangement is beneficial both to us and to the smelters, as it relieves them from the gamble in the price of spelter, and they are able to make us better terms. We, on the other hand, taking year in and year out, get the same price as if it were settled on the price of the day."

The following description of the works of the Zinc Corporation has been communicated by A. Stanley Elmore:

Treatment of Tailings

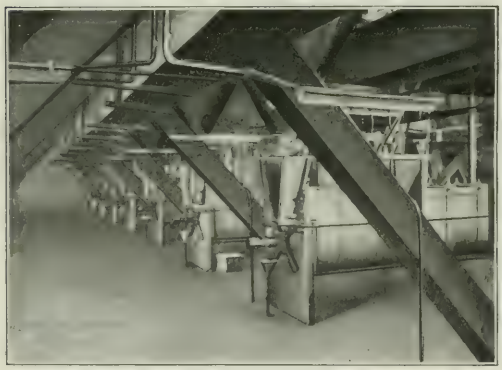
The tailings for treatment are trammed to a range of bins at the back of the plant, whence such portions as require grinding are transferred by Challenge feeds to conveyer belts to 12 grinding pans, where they are ground wet to pass 30-mesh screens. The whole product from the 12 grinding pans passes by gravity to six improved sizing screens, the undersize from these screens passing direct by belt and bucket elevators to the Elmore plant. The oversize from the six screens is taken by a belt and bucket elevator to a distributor, which divides it equally between six additional grinding pans. The whole pulp from these last six pans passes to two screens, the undersize from which joins the undersize from the first six screens, the oversize being returned to the last six grinding pans. The accompanying "flow sheet" will make the details of this grinding section quite clear.

The whole of the pulp from the 18 grinding pans referred to above passes through an automatic distributor by which it is divided into 16 equal parts, one part going to each unit of the Elmore plant. The final residues from the Elmore concentrators pass by gravity, and quite automatically, to specially designed conveyers and are thus transported directly to the dump. The concentrates from the Elmore machines consist principally of the mixed sulphides of zinc, lead and silver together with some sulphide of iron. A flow sheet showing the concentrating section is given herewith.

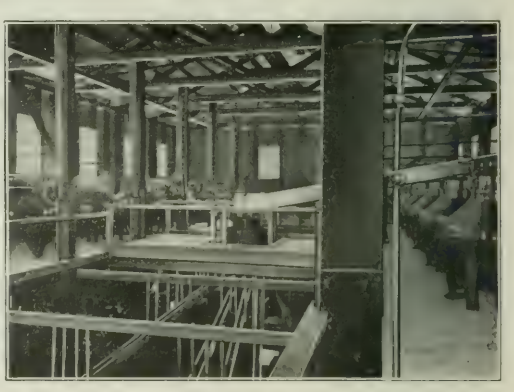
Grade of Material Treated and Concentrates Obtained

The bulk of the material thus far operated upon by the Zinc Corporation has an approximate average assay of 20 per cent. zinc, 5.75 per cent. lead, and 8 oz. silver per ton of 2240 lb. The mixed concentrates produced therefrom have an approximate average assay of about 43 per cent. zinc, 11 per cent. lead, and 17 oz. silver per ton of 2240 lb. These mixed concentrates are allowed to drain as free from water as possible and are then, by means of push conveyers, transported to furnaces, where they are raised to a sufficiently high temperature to drive off the small quantity of oil which they contain. The de-oiled concentrates after cooling are mixed with water and treated on 20 Wilfley tables in the usual manner, the results of this operation being a final zinc concentrate having an approximate average assay of 46.5 per cent. zinc, 7.25 per cent. lead and 16 oz. silver per ton of 2240 lb; and a lead concentrate having an approximate average assay of 58 per cent. lead, 15 per cent. zinc, and 30 oz. silver per ton of 2240 pounds.

The grade of the final residues depends to a great extent upon the more or less oxidized condition of the minerals in the material operated upon, but the following may be taken as fairly representative: zinc, 3.5 per cent.; lead, 2.2 per cent.; silver, 2.2 oz. per ton of 2240 lb. The actual recovery of metals secured by the Elmore plant may be taken as follows: Zinc, 90 per cent.; lead, 73 per cent.; silver, 85 per



ONE SIDE OF MIXER FLOOR SHOWING EIGHT MIXERS; THERE ARE EIGHT ON THE OPPOSITE SIDE



DISTRIBUTER WITH LAUNDER FROM CRUSHING SECTION

cent. Some further loss of metals naturally takes place in the separation of the zinc and lead on the Wilfley tables.

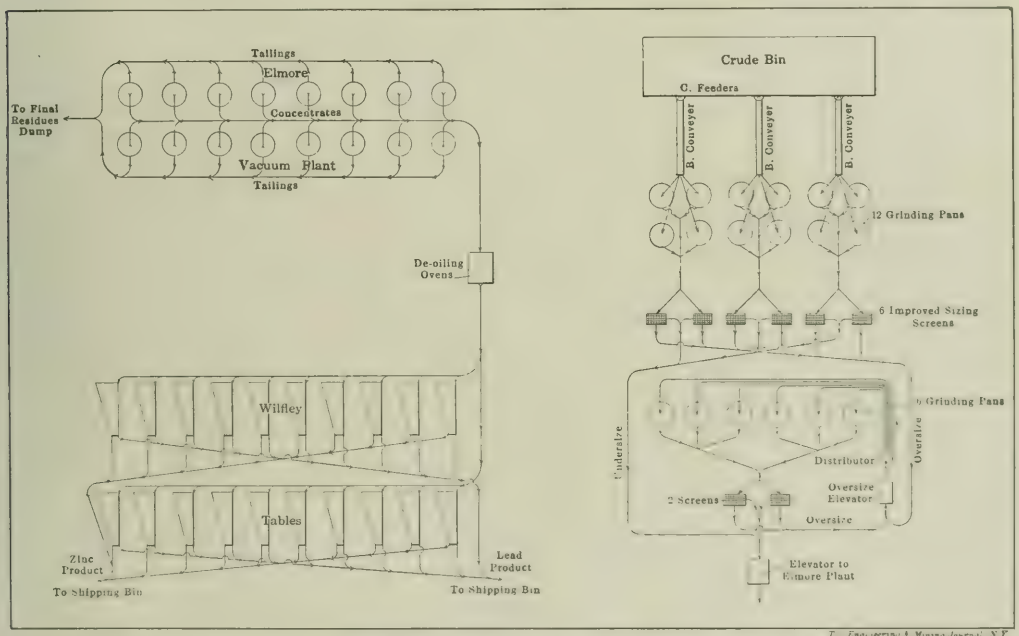
Consumption of Materials—Labor—Costs

The consumption of sulphuric acid varies to some extent with variations in the material of the different dumps treated and may be taken at 20 lb. per ton as a maximum and 10 lb. per ton as a minimum. The oil employed is Texas fuel oil, the consumption being at the rate of 6 to 8 lb. per ton of material treated. The ratio of concentration bears a relation to the grade of material treated, but may safely be assumed on the average to be about 2.5:1.

Exclusive of the labor required for the power plant and crushing section there are engaged: One man for the separator and vacuum pump floors; one man for the mixer floor; one man at the discharging floor. The men work three shifts per 24 hours.

The plant is regularly handling from 16,000 to 17,000 tons per month and producing therefrom 6000 to 7000 tons of concentrates per month. The average daily capacity of each unit of Elmore plant is 40 to 45 tons; but the unit capacity has been actually proved as high as 70 tons per 24 hours.

The cost of treatment per ton of material treated is approximately as follows: grinding, 1s. 3.96d.; flotation, 2s. 4d.; drying and de-oiling, 1s. 3.64d.; Wilfley separation, 7.48d., total, 5s. 7.08d.



The Engineering & Mining Journal, N.Y.

FLOW SHEETS OF CONCENTRATING (LEFT) AND GRINDING (RIGHT) SECTIONS, ELMORE PLANT, ZINC CORPORATION, BROKEN HILL, NEW SOUTH WALES

Reports of Some French Companies

Special Correspondence

The Compagnie des Phosphates de Dyr has decided to close its quarries at Dyr, owing to the refusal of the Algerian government to lengthen its concession for a period of 10 years after 1912. This decision is also fully justified by a reduction in the value of the rock and an increase of cost price. In consequence the Dyr quarry has produced only 48,000 tons of rock. On the other hand, the company has brought all its efforts to bear on its Tunisian mines of Kalaa es Senam and Kef-Rebiba where an improvement in the percentage of phosphate was found.

The Compagnie des Mines d'Anzin produced 3,430,109 tons of coal in 1908, an increase of about 10,000 tons over 1907. The company has started a new briquet plant; completed the pit No. 1 of the Charles Ledoux mine and pit No. 2 at the Vieux Condé; a new canal station was also completed at this place; two new pits were started on the Edouard Agache mine and crosscuts were driven to connect the pit No. 1 of Charles Ledoux mine with the Chabaud-la-Tour mine. At 3 km. from La Grange mine the company intends to sink two pits which will serve to work the anthracite seams.

The report of the Compagnie des Chemins de Fer du Congo Superieur aux Grands Lacs Africains states that the mining researches made at Bamanga are proceeding satisfactorily. New copper lodes were discovered which are said to be rich but thin and irregular. Work is difficult, owing to the great thickness of the overburden, the hardness of rocks and the closeness of the river which is subject to rises of 24 ft. Several hundred tons of 35 per cent. copper were shipped.

The Compagnie des Mines de Houille de Courrières, where the terrible disaster occurred in 1906, had in 1908 an output of 2,208,446 tons, an increase of nearly 300,000 tons over 1907. A dividend of 80 fr per share has been declared. The mineral output of Alsace-Lorraine in 1908 was 16,000,000 tons, including 2,367,742 tons of coal and 13,281,580 tons of iron ore. The total value was about 70,000,000 marks.

The Société des Pyrites de Huelva had a much better year in 1908, owing to the completion of a new pier at Huelva which afforded better facilities for the shipment of ores and caused an economy of about $40,000 in eliminating penalties to steamers for delays, etc. Work ceased at the Carpio mine, due to the dangers of its exploitation, but at the third level of the Perrunal mine an enlargement of 25 per cent. in the thickness of the deposit was found.

Developments in Quarrying Processes

By A. S. Atkinson*

In the development of processes for quarrying marble, granite and other stone, the effect of American inventions and the application of labor-saving devices is apparent. The results obtained, however, except in individual instances, may not yet be noticeable to the casual observer. Methods of quarrying stone and marble must, like ordinary mining methods, show variation according to local conditions.

Methods at Airy Quarries

As an illustration of this, the application of compressed air to cleaving granite at the Mt. Airy quarries in North Carolina is noteworthy. The granite from this quarry is used for building material, paving blocks, curbing, lintels and general stock for monumental purposes. The quarry is situated on a gently sloping hillside, and the stone splits readily in a straight line in almost any direction, and it is comparatively free of ledges or joint planes. In order to lift this stone in large sheets or laminations in the most economical manner, artificial ledges are made to which work may be carried from the surface, both powder and compressed air being used to this end.

Formerly gunpowder was used to blast out the sheets, but it was found that in spite of much care the explosions were very apt to bring the cleavage abruptly to the surface instead of following the natural lines under the surface for long distances. A number of years ago a method was adopted of drilling and then forcing water under considerable pressure into the hole. This worked better than the old gunpowder blasting, but finally compressed air was adopted instead of water, and it was found to be more economical and easy of operation. A large air compressor was then installed.

The method of quarrying thus adopted and improved by practice is to drill 2 and 3 in. holes from 6 to 8 ft. into the center of the sheet of stone to be lifted, and then to form a pocket by exploding half a stick of dynamite at the bottom of the hole. A still further enlargement is made by exploding a small charge of powder in the pocket, which starts horizontal cleavage across the greatest diameter of the sheet. The drill holes are plugged before the charges of powder are touched off to prevent blowing the block. Finally a pipe is run into the drill hole and cemented there carefully. The other end of this pipe is connected by a glass valve to a pipe line from the air compressor. Compressed air at from 50 to 80 lb. is then gradually admitted and the pressure in creased to 90 lb. or more as conditions warrant. This compressed air works its way through the natural cleavage cracks and exerts a steady and uniform upward pressure upon the stone. As a result a sheet of several acres of stone can be gently lifted without cracking or shattering any part. When this so-called bedplane has thus been separated by compressed air, the quarrymen can economically cut up the sheet in any sizes demanded.

When the compressed air is first admitted the stone sheet can be heard creacking in every direction, and in about half an hour, as the force is increased, the cleavage comes out to the surface, usually within a radius of 250 ft. of the lift hole. Formerly it took from two to three weeks to extend a cleavage 100 ft. from the lift hole, while today twice this distance is reached within half an hour after the compressed air is admitted.

The effect of this improvement in method, where natural cleavage in a straight line is present, is to reduce cost of quarrying enormously and to enable larger and better pieces of stone to be removed intact. The waste through excessive blasting and explosions is reduced to a minimum. Such methods would not, of course, apply to all cases, for where the stone breaks irregularly under any kind of a pressure or shock, the compressed air might not prove of any advantage. The success of all kinds of quarrying depends largely upon the ability of the managers in adopting devices best suited to local conditions, and the North Carolina Granite Company has achieved great results in this work at their Mt. Airy quarries.

Methods of Operation in Vermont Granite Quarries

In the granite and marble quarries of Vermont, many new applications of local methods for reducing cost of operations and reducing waste are apparent. The annual output of the granite quarries at Barre, Vt., the center of this industry, varies from 100,000 to 200,000 tons, valued at from $1,000,000 to $2,000,000.

The Barre granite quarries are situated a few miles from North Barre, and are among granite hills rising as high as 1000 ft. Some of the quarries have been opened up to a hight of 750 ft. There are five grades of granite obtained from these quarries, and their net prices f.o.b. Barre, range from $8c. to $2.25 per cu.ft. The light colored granite is the cheapest, and prices increase through the different grades of medium, dark medium, dark and extra dark. The average quotations are for blocks not more than 2 ft. thick and 6 ft. square, and for larger blocks an additional charge is made. One dollar per cu.ft. is, therefore, a low valuation to place upon the entire output.

The quarrying of this granite, owing to peculiar local conditions, differs in some respects from the method followed in other parts of the country. The granite occurs in two distinct ways: In a uniform mass which must be mined by drilling and splitting; and in layers of different thickness with more or less parallel cleavage. All of the different methods of drilling and splitting the granite blocks from their beds have been tried at various times, and in the different quarries most of these methods are found even today representing the complete history of the evolution. Originally nearly all the drilling was done by hand power, and then compressed air was introduced, working under pressures from 50 to 90 lb. per sq.in. More recently electric drills have been employed. But the systems are all more or less elastic, and nearly every form of drilling may be found in operation. Each quarry is a problem by itself and is opened and worked according to no previous example.

As much as $5000 is sometimes expended in opening a new seam or trench to a depth of 10 or 12 ft. before any saleable granite is taken out. But this method of procedure works satisfactorily in the end. A great mass of granite is thus exposed and made immediately ready for removal. The exposure of a towering wall of granite permits of easy drilling on all sides, and blocks of almost any dimension can be removed without any excess of splitting. Thus blocks of enormous size for monumental purposes have been removed by drilling a series of horizontal holes along the base and splitting with a slight charge of powder. Compressed air for splitting natural cleavage of the granite has also been employed in a limited way in the Barre quarries.

The total equipment of the Barre quarries represents about 10,000 h.p. used for driving the air compressors and for operating the big cranes, hoists and electric generators. Coal for fuel costs $6.50 per ton at the quarries, so the fuel problem is an important one. Efforts have been made in recent years to employ hydroelectric power for the operation of the electric motors, and it is believed that within a few years electric current brought from the nearest hydroelectric station will be chiefly depended upon for quarrying purposes. Several of the quarries have been experimenting with gas engines, and at least one of them has installed a gas-suction producer plant. Upon the success of these new installations will depend the question of its more general adoption.

Improved Machinery in Vermont Marble Quarries

In the marble industry of Vermont the same improvements of equipment and operation may be noticed, and there is evident the same reduction of cost and increase in efficiency. In Rutland county, the supply of various grades of valuable marble is great, and some of this marble almost equals in beauty and texture the best of imported material. In addition to

*Of Ries & Lehr, New York, N. Y.

the ordinary white marble found in these hills there is a marble of grayish white color which resembles the Grecian product. Layers of black, blue, red and greenish marble are frequently encountered, and when these are taken out carefully in large blocks they command good prices. They have in some instances a close resemblance to the famous Pentelic marbles and to the rich statuary grades from Italy.

The marble industry of Vermont is not new, but the equipments for handling the output economically are of comparatively recent date. The problems which confront the quarrymen may be gathered from the fact that some of the excavations extend down to a depth of 3000 ft., and powerful derricks and improved hoisting methods have to be adopted to get the big blocks to the surface. Frequently after exposing the faces of a bed of quarry it will be found that the under layers contain richly-colored specimens which must be removed without breaking. The problem of getting at them is, therefore, not always easy of solution.

Steam or Electrically Operated Channeler

At the Proctor and West Rutland quarries channeling machines, operated both by electricity and compressed air, are used. These machines travel back and forth on a track cutting a channel averaging 1¼ in. in width, and from 4 to 10 ft. in depth. In order to cut the channel evenly no less than five drills are assembled, each having a separate bit, but they are fastened together so that they act as a single tool. Three of the bits are adjusted directly across the channel, and two at an angle of 45 degrees. They are clamped into a head which forms a part of the piston rod, connected with the steam cylinder, so that the power acts directly on the drills through the piston. In this way the five bits really constitute a drill about ⅞x⅞ in. in size. The capacity of such a machine is very great, and as much as 100 ft. of channeling is sometimes cut in a day.

Another type of cutting machine used in these marble quarries can be operated by either steam or electricity, and while it moves back and forth on a temporary track it makes a channel on either side, cutting two grooves at a time instead of one. The drills are arranged in groups of five. An up-and-down stroke of the drills is obtained through a double system of levers connected with a crank pin on the crank shaft of the engine. A system of springs arranged between the levers and also between the lower lever and the frame, produces the necessary up-and-down stroke. There is a constant relationship between the strokes of the drills and the speed of the engine, so that the work can be accurately timed and gaged. This type of channeler is used with special effect in up-and-down or vertical quarrying. Independent drilling machines are used for small piece-work.

Little of the explosive methods are used in the marble quarries except for removing rough stone to expose a new face. The waste of material is thus greatly reduced. When the blocks are channeled out they are lifted from their beds by electric hoists and carried to the cutting yards. Here they are cut into blocks by pneumatic chisels and sand saws in the usual way. The process is somewhat lengthy, and entails a good deal of hand labor, but so far inventors have discovered no way to improve upon them. From four to five hours are frequently required to cut through a single foot of very hard marble. Over $5,000,000 are invested in the marble quarries of the Green mountains of Vermont, and upward of 3000 hands are employed in the industry. A single company extracts from the quarries under its control, marble valued at about $2,500,000 annually.

The Marble Quarries of Georgia

Marble-quarrying methods in Georgia have likewise undergone great improvements in recent years. The town of Tate, in Pickens county, 50 miles north of Atlanta, is the center of the industry. The marble deposits are of unlimited extent, and so far some of the quarries have extended down to 175 ft., exposing stone varying from white to "creole," in beautiful shades. This marble has a crushing strength of from 12,000 to 15,000 lb. per sq.in., and its low absorption of moisture makes it of particular value for many building and monumental purposes. It has a perfect crystalline, and very even, texture. Between 100,000 and 200,000 cu.ft. of this marble are quarried annually by one company.

In the quarries of the Georgia Marble Company, the stone is cut by means of channeling machines, gadders and rock drills. The channelers are of the same type as those used in the Vermont, New York and Tennessee marble quarries. But they are arranged so they can make good wall and corner cuts at any desired angle. The result of this is that valuable deposits of marble can be removed when found under heavy beds of worthless stone without the great expense of stripping. The tunneling system is adopted in the Georgia quarries so that in some cases the work has advanced several hundred feet horizontally without any attempt being made to strip the surface. This is in great contrast to the old method, which first required expensive preparations in removing the surface to get at the lower levels of good material.

Quarrying requires careful and exact methods to reduce the cost of operation without injuring the material to be excavated, and it is in the furtherance of this end that modern methods determine and lengthen the commercial life of any operation.

New Method for Determining Antimony

A method for the determination of antimony, in which the decomposition of the ore is accomplished with ammonium persulphate, is described by M. F. Coolbaugh and J. O. Betterton (*West. Chem. and Met.*, IV, pp. 229-232). The use of this reagent avoids the danger of loss of antimony by volatilization during fusion.

The portion taken for analysis is fused with 8 to 10 times its weight of ammonium persulphate for 15 min. at a low temperature. A small Erlenmeyer flask can be used for the fusion. The flask is placed on an asbestos mat on a hot plate and after the first decomposition has taken place, the heat is gradually raised until quiet fusion is attained and allowed to remain in that condition for 10 min. The fusion is extracted with 20 c.c. of hot hydrochloric acid (sp.gr. 1.10) and then diluted to 100 c.c., heated, and a rapid stream of hydrogen sulphide gas passed through it for 15 minutes.

The precipitate is filtered off and dissolved through the filter paper with 40 c.c. of concentrated hydrochloric acid. A small amount of potassium chlorate is added, the solution heated and any separated sulphur filtered off. Two drops of a ferric chloride solution are added to the solution, which should be at a temperature of 90 deg. C.; stannous chloride is then added drop by drop until the yellow color of the ferric chloride just disappears. The whole solution is then poured into a beaker containing 10 c.c. of a saturated solution of mercuric chloride, diluted to 500 to 600 c.c. and titrated with potassium permanganate to the first pink color. The stannous chloride reduces antimony in a hydrochloric acid solution before it will reduce arsenic. The mercuric chloride takes up the excess of stannous chloride.

The successful use of this method demands a close adherence to the details. The precipitation of the antimony should take place within 15 min., if the bulk of the solution is not over 75 c.c., and the acid between 1.1 and 1.15 sp.gr. The potassium chlorate oxidizes the arsenic to the higher form. The reduction by stannous chloride is best made with a strong and a weak solution, using the strong solution to accomplish most of the reduction and the weak to finish with.

The amount and strength of the ferric chloride should be known in terms of the permanganate. The reduced solution should be poured immediately into the mercuric chloride to prevent the reduction of the arsenic. Silver, lead, bismuth, arsenic and tin do not interfere. Copper should be removed. The time consumed for a single determination is not more than 1½ hours. The method has given good results in comparison with other well known methods.

Nickel, Cobalt and Chrome in New Caledonia

Nickel—The export of nickel ore in 1908 was 19,900 metric tons in excess of 1907, the value of the ore exported being £168,037, or £25,677 in advance of 1907. This mineral is engaging the attention of several leading houses in Europe, and no doubt in 1909 there will be further developments in the colony. The stock of nickel ore is about 80,000 metric tons, the production of seven or eight mines, about 30,000 metric tons of which was, however, the production of 1907. The price of nickel ore f.o.b. vessel at port of loading is £1 8s. per metric ton for mineral of 6.5 per cent. nickel content. The margin between the price of the mineral f.o.b. New Caledonian port and the refined article in the European and other markets is, approximately, as follows: Per metric ton of metal contents New Caledonia, £20 to £24 per ton. European market, £170 per ton refined metal. The cost of freighting mineral to Europe is heavy, and the reduction charges and refining treatment are also expensive. The export was 120,026 tons in 1908, against 101,707 in 1907.

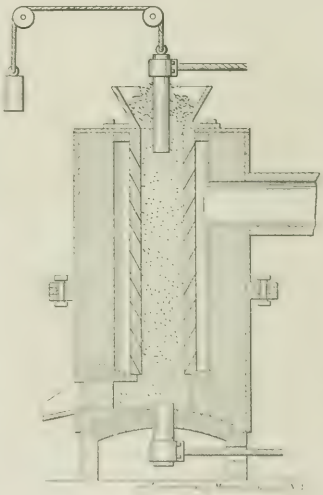
Chrome Ore—The production of this mineral in 1908 was much below the quantity exported, which shows an increase of about 14,028 metric tons as compared with 1907. This is really taken from stocks, the production of 1906-7. The price of this ore fell considerably during the year 1908, and is now quoted at £2 c.i.f. European ports. The cause of this drop in price is attributed to the vast quantities now coming on the market from India, South Africa, and other places. One mine only is producing chrome ore in the colony at present, viz., the Tiebaghi mine at Nehoue. Chrome stocks in the colony do not exceed 25,000 metric tons. In estimating the value of chrome ore exported in 1908 the authorities based their calculations at £1 16s. per metric ton f.o.b. New Caledonian port, which is somewhat high. The export was 46,386 tons in 1908 against 25,371 in 1907.

Cobalt—The export of this mineral during 1908 was 505 metric tons lower than 1907, and may now cease owing to the serious competition from Canada; prices for cobalt products fell 2s. per lb. in Europe and America in 1908, this brought about a climax in New Caledonia, and there are now no buyers for this mineral.

The ruling prices for 1908 were low, varying from £1 for one of 4 per cent. to £5 12s. for 8 per cent., and £7 12s. for 6 per cent.; these prices were maintained until about October, 1908, when buyers refused to make any contracts for forward deliveries, and more recently, in December, refused to buy further. Hopes were entertained by a few that the Canadian competition was not serious, and the depression only temporary, but the bitter truth has established itself. Stocks are, however, low, and probably 300 tons (metric) is the maximum on hand. To increase the demand, which in case Canadian mines are not able entirely to supply, would naturally leave room for a certain quantity of New Caledonian ore. The export was 3347 tons in 1908, against 3942 in 1907.

Distillation Furnace for Zinc Ore

In U. S. Pat. 920,473, May 4, 1909, Woolsey McA. Johnson describes an electric distillation furnace for the treatment of ores yielding volatile products. It is designed to provide an extensive heating or reaction zone and to afford a free and easy discharge from all portions of the zone to the condenser. The furnace may be either horizontal or vertical. The accompanying illustration shows a sectional elevation of a vertical furnace, the carbon electrodes being disposed at opposite ends. A metal casing incloses thick firebrick walls within which is a circular chamber, having a permeable tubular casing that will permit the escape of the gaseous and volatile products. The material to be treated is fed through the hopper at the top of the central reaction chamber, the residue being removed at the base.



ZINC DISTILLATION FURNACE

The furnace is designed particularly for the reduction of zinc ore. The charge of ore and carbon is heated by the electric current until the zinc is reduced. The volatile products of zinc and the carbon monoxide pass from the reduction zone through the permeable casing into the annular chamber and thence to a condenser.

Colorado Coal Development

In an article published in the JOURNAL of Jan. 25, 1908, attention was called to the important fact that the grade of the Denver, Northwestern & Pacific railway had then been advanced to the Oak Creek section of the Yampa coalfield in Routt county, where an 11-ft. seam of bituminous coal had been opened. In line with the foregoing, it is now officially announced that the Oak Hills Coal Company, which owns that seam, is prepared to furnish 2000 tons per diem. The importance of this statement is accentuated by the fact that the established maximum freight rate on this coal to Missouri river points, i.e., Omaha, Kansas City, etc., is $3.75 per ton. This means that a clean, high-grade steam and domestic coal, low in ash and moisture, and high in fixed carbon—its calorific value per pound of dry coal being 13,119 B.t.u.—will be delivered at above points at a cost including mining and freight of about $5 per ton.

Since the publication of the article above referred to $500,000 has been spent on the purchase and equipment; two miles of underground work has been done. The mine is lighted by electricity, the steam plant of 10,000 h.p. is equipped with duplicate winding engines in case of accident, and the most modern cutting, shearing and punching machines are in use, operated by electricity or compressed air. The coal company owns its own yard and tracks, and is in a position to produce coal at a minimum of cost. There are two other companies in the same district, having three workable seams of high-grade coal now being opened and equipped for a big production—the Routt County Fuel Company and the Juniper Coal Company. The general manager of the Oak Hills Coal Company is S. M. Perry; of the Routt County Fuel Company, E. S. McKinlay; and of the Juniper company, F. A. Craise.

Mineral Production of Iowa in 1908

By JAMES H. LEES*

The following statistics of mineral production in Iowa during 1908 were collected by the Iowa Geological Survey in cooperation with the U. S. Geological Survey. The output of coal was 7,149,517 short tons, valued at $11,722,228. The sales of lead ore amounted to 124,900 lb., valued at $3614; of zinc ore, 950,000 lb., valued at $23,189. There were 240,270 short tons of crude gypsum mined. Of this amount 18,000 tons was sold crude to portland cement mills; 2128 tons as land plaster, 856 tons to plaster mills, and 158,043 tons sold burned. The total tonnage marketed was 179,987, valued at $561,688.

*Assistant State geologist, Des Moines, Iowa.

The Preservation of Mine Timbers*

By John M. Nelson†

Three times as much timber is being consumed in this country as is being produced by the forest growth. Each person in the United States annually consumes about 200 cu.ft. of wood, while his European neighbor consumes but 60 cu.ft. In past years our forests have been cut without system and with considerable waste. For the past 15 years the Government Forest Service has been working to encourage a wise and more conservative use of the present forest resources, and by systematic methods of timbering, to provide crops of trees for future generations.

So far as possible, timbered areas are being extended by the planting of suitable species of trees. If the forests are to be conserved, it is important that each tree be cut at an age and size best suited for its use as lumber or railroad ties, or mine timbers. Moreover, each of these forms of lumber should be so used that it may give its maximum service.

It is sometimes more practical to preserve what you have than to provide for a future supply many years hence. The consumer may be willing to prolong the life of timber which he uses, but refuses to consider the planting of trees for future timber. Money invested in the former project yields almost immediate financial returns, while the profits of tree planting are realized only after a number of years.

The annual timber consumption in the United States amounts to over 20,000,000,000 cu.ft. About 75 per cent. of all timber subject to replacement is destroyed by decay. Timber can be preserved from decay by peeling, by seasoning or drying, and by a treatment with chemical preservatives. Throughout the United States, if all timber subjected to decay were properly preserved, timber consumers would save $22,000,000 annually.

Any Treatment to Be Successful Must Yield a Financial Return

Any method for the treatment of timber, to be a commercial success, must yield a financial return within a reasonable period. At present there are operating in the United States some 70 wood-preserving plants, which furnish an output amounting to 1¼ billion ft. of timber per year. Four years ago this output was but one-half billion: and this increase in business of 300 per cent. in four years speaks well for the practicability of this industry.

The decay of timber is due to the activities of low forms of plant life, called fungi, which abstract their food from the wood structure, destroying the wood fiber, which gives the timber strength, and leaving it decayed or punky. There are four essential conditions for the growth of a fungus. It must have the requisite amount of food, air, moisture and heat. If any of these is lacking, the fungus cannot develop and the wood will be preserved indefinitely from decay. Clearly the supply of heat and air are beyond control, but the moisture content of the wood may be reduced so low as to prevent the germination or growth of fungi, and the food supply may be poisoned. All of the efforts to promote wood preservation are based on one or both of these lines of action.

All Timber Should Be Peeled

The bark on a living tree is necessary for its life and growth; however, after the tree is cut, the bark is a positive detriment to its economic use. The bark on round mine timber increases its weight about 8 per cent., retards its seasoning or drying out, and affords a lodging and breeding place for wood-destroying fungi and insects. If timber is purchased by weight, unpeeled, the bark which is worthless must be paid for as well. The peeling of round mine timber 10 to 14 in. in diameter, costs about 1c. per lineal foot, and if it is peeled before shipment, the saving in freight charges alone will almost pay for the peeling.

SHOWING TREATED AND UNTREATED MINE TIMBERS

Seasoning timber, or reducing its water content, increases its durability, adds to its strength, reduces its weight, and hence the freight charges for transportation. If timber be peeled and seasoned previous to shipment, a saving of from 20 to 30 per cent. may be effected. Most important of all, seasoning renders the wood more porous, and in better condition for the reception of the preservative fluid. From 4 to 6 months are usually necessary for proper seasoning.

Although both peeling and seasoning prolong the life of mine timbers, a more permanent way to preserve them is to inject some chemical fluid into the wood, which will either poison the food of the wood-destroying fungi or exclude the moisture necessary for their existence. A preservative material may perform either function or both. The most common preservatives in general use are zinc chloride and creosote. The principal value of zinc chloride is found in its cheapness and its ease of transportation, for it can be hauled in the form of a solid and dissolved at the treating plant. The principal defect of zinc chloride is its liability to leach out of the timber when exposed to moisture. It readily dissolves in water, in fact, it is injected into the timber in the form of an aqueous solution, and so its subsequent leaching out is merely a question of time, and the wood is left once more subject to attack. In parts of mines not subjected to a great deal of running water, zinc chloride has efficiently preserved mine timber, and in such a situation its use is strongly recommended.

The Use of Creosote

Creosote, on the other hand, is practically insoluble in water, and so when a high grade of oil is used and injected into the timber, decay will be postponed almost indefinitely. Its principal disadvantages are its higher first cost, as compared with zinc chloride, and its limited supply. For the preservation of mine timbers, however, zinc chloride has proved efficient and will surely find a wide use, especially in mines which are relatively dry. Moreover, while a treatment with creosote has not been found to increase the inflammability of mine timbers, a treatment with zinc chloride renders the timber far more fire-resistant than untreated wood.

The methods of applying a chemical treatment in this country may be divided into two classes: those in which the preservative is injected by artificial pressure, and those in which the atmospheric pressure is made to force the preservative into the timber. The non-pressure, or open-tank process, as it is sometimes called, is much the simpler and less expensive, but not so well suited for the treatment of a variety of species and forms of timber. For the treatment of round mine timber, a non-pressure method of application may be the better. However, if large numbers of ties are to be treated for use on electric haulage ways, a plant designed for the application of a limited amount of artificial pressure is preferable. A non-pressure plant with a daily capacity of 30 sets of collar timber, or 800 lineal ft. of 12-in. timber, may be installed complete for about $6000. This plant could treat about 400 flat ties in a day of 12 hours.

There is perhaps a field for a type of plant combining the better features of

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both the pressure and non-pressure designs. In operating such a plant, a limited amount of artificial pressure (for instance 70 lb.) can be applied to assist the atmospheric pressure in forcing the preservative into the wood. Such a plant is being installed by an electric traction company in Indiana for the treatment of railroad ties. Its annual capacity is about 150,000 ties, and its cost complete installed is about $6000.

The Financial Saving

The timber situation cannot be expected to improve, and in the future, it will not be so much a problem of what is wanted as what can be obtained. At the present prices, the value of a set of collar timber in position is at least $6 or $7, including the labor cost of setting. By a non-pressure treatment with creosote, costing $1.50, and a similar treatment with zinc chloride, costing 95c., the life of the timber can be doubled. At the mines of the Philadelphia & Reading Coal and Iron Company, at least 500 sets of timber have been treated as described above, and have been compared with an equal number of untreated sets. The results obtained show that by a treatment costing less than 20 per cent. of its initial value, the life of the timber has been already increased 100 per cent.

The expensive timber used in the construction of washeries, tipples, shafts and trestle works should certainly be preserved from decay This class of material is worth perhaps $25 or $30 per 1000 ft. Moreover, the labor cost of placing it in position is high, and its replacement yet more costly. For $8 or $10 per 1000 ft. b.m., this timber can be thoroughly treated with creosote and its life can be prolonged to at least 25 years.

Painting the Timbers

A less efficient but cheaper treatment can be secured by painting the surfaces of timber with at least two coats of hot creosote, or some similar preservative. If care is taken thoroughly to fill the innumerable small cracks and other defects on the surface of the wood, a thin exterior antiseptic zone may be created, which as long as it remains intact, will successfully prevent the entrance of wood-destroying fungi. It is especially important in this latter method that the timber be thoroughly air-dry before treatment. This method of treatment can be used to good advantage where the amount of timber to be treated is too small to justify the erection of a treating plant.

In closing, I want to say that the Forest Service will be glad to assist all coal mine owners in every possible way in the solution of their timber problems, and to place at their disposal whatever information and experience it has acquired.

It is reported that cinnabar has been found in an outcrop at Krooipan, in the Mandong district of Rhodesia.

The Sociological Side of Coal Mining*

By C. Rae King†

It can be assumed that all of those who are interested in the production of coal are striving to secure the greatest possible results with the greatest safety to those in charge. To secure these desired results we are calling to our aid the best forms

SHOWING FAILURE OF UNTREATED TIMBER AFTER ONE YEAR'S SERVICE. NOTE CONDITION OF TREATED TIMBER

THE UNTREATED TIMBER HAS FAILED WHILE THE TREATED TIMBER STILL LOOKS SOUND

of construction, material, and the most efficient electrical and mechanical devices; the day has passed when any old thing is good enough for a coal mining plant. We are constantly searching about for superintendents and foremen of the best ability who can handle and direct these forces, and most important of all, to guide and manipulate the movements of the greatest and most complicated piece of mechanism of all our equipment—the foreign laborer.

Until our immigrant laws are changed, we can expect to receive the poorest and most ignorant laborers from various corrupt and unprogressive European countries. From the time of birth the foreigner is kept in ignorance and poverty, and is generally taught to be dependent on some leader. In their native country these men are taxed to the limit, and are permitted to booze to their heart's content.

During the year 1907 a stream of humanity passed through our gates amounting to 1,285,349 souls, many of whom, despite our contract-labor laws, were billed through to our mines, where their new life began, and too often suddenly ended. As a general rule, these laborers are received in bunches at our mining towns, where but a feeble attempt is made to separate the good from the bad. They are packed in closely built, unsanitary houses, where, in many instances, pure water supply is at a premium, while beer and cheap whisky are to be found in abundance. Here we let them go as they please; drink, riot, and even murder, so long as they appear to work in sufficient numbers to produce a desired quantity of coal.

The Liquor Problem

No one can deny that the liquor question gives more trouble in the management of our coal plants, and is responsible for more interruptions of work and for more accidents than all other causes combined. It is admitted that a limited amount of liquor under present conditions at least, is advisable, and would give very little trouble, inasmuch as it is the overload or last 60 per cent. consumed that causes the disorder. The evil effects of liquor on the efficiency of workmen and accidents cannot be measured.

It has been shown that at three mines, where an investigation was made, the output of these three properties on the first three days following payday does not equal the production of any one of them under ordinary circumstances. We cannot remedy this condition by our present inactivity. It has been suggested that laws be passed limiting the profits of liquor sales to 6 per cent. as a means of reducing the amount consumed. This scheme would possibly have the desired effect, but we must remember that the liquor interests control the politics of many States. It has also been suggested that the coal companies operate saloons and thereby control the consumption, but this seems to be impractical, and would probably call down public criticism.

The excessive quantities of liquor consumed is due mainly to the liberal rights granted breweries and distilleries, to the competition of many agents, who are permitted to take orders for liquor at any and all times. Many of the foreigners are led to believe that whisky is necessary in-

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*Abstract of paper read before Coal Mining Institute of America, June 29, 1909.

†Superintendent, Donohoe Coke Company, Crabtree, Penn.

order to furnish them strength for their work.

Overcoming the Liquor Evil

At the plant of the Donohoe Coke Company, in the Greensburg district, a scheme for controlling the liquor traffic has been devised and is giving excellent results. The plan here in operation is to have a welfare committee which, while in compliance with all legal requirements, seems to have the liquor traffic well under control.

The general plan of operation and regulation governing the welfare committee may be briefly outlined as follows:

1. The object of the welfare committee is to control and minimize the distribution of intoxicating liquors among the workmen at the Donohoe mine.

2. Only one agent of the various breweries and distilleries that cater to the locality shall be permitted to solicit orders for beer or whisky.

3. The said beer and whisky agent shall pay over to the treasurer of the welfare committee, for the use of the committee, all moneys and compensation received by him for his services in the soliciting and sale of beer or whisky in excess of the stipulated sum per week; all such sums so paid in shall be devoted to charity work, in accordance with the object of this committee.

4. Each week a statement will be posted showing in detail the placements of beer and whisky for that week, and the amount of money turned into the treasury by the agents.

5. The value of an agent will be determined by the extent to which he is able to reduce the consumption of liquors and beer without causing dissatisfaction among the workmen.

6. Unless otherwise directed by the secretary of the committee, the agent is to solicit for orders only on Tuesday morning of each week and to deliver on Saturday of each week.

7. The agent shall gather up empties on Monday of each week, and he shall be responsible for each and every keg or case lost.

8. Brewers, distillers and other persons interested may send a representative around at any time with the agent while he is taking orders, in order to ascertain if any influence is being exerted by said agent to cause the workmen to buy beer or liquor from any particular company.

9. No more than five kegs of beer shall be delivered to any house in one week, unless the occupant of said house obtains an order from the superintendent's office for more; the agent shall report anyone loaning or giving kegs of beer to another.

10. The dealer can sell only at one place, namely, at the place named in his application for license, and orders received by him for the goods must be filled at that place and title must pass from the dealer to the purchaser then and there.

What the Results Show

This scheme for controlling the liquor traffic at the Donohoe mine, has been in operation since December, 1908. The results produced have exceeded expectations; there has been a reduction of disorder, and at the same time an increased efficiency of workmen, most pleasing to the management. From the records kept, it has been shown that the welfare committee has reduced the consumption of intoxicating drinks by about 40 per cent., and the decrease is still in progress. These results do not show all of the decrease. The records also show that the Pole is the heaviest drinker, with the Italian in second place. It may be stated, however, that the Italians are not, as a general rule, heavy drinkers; in this special instance, the high average of the Italians was brought about by their small number and the fact that two weddings occurred.

The records also show that families with no boarders are small consumers of liquor per workman, compared with those keeping boarders. Out of the 106 families that live in the town, only 50 families purchased intoxicating drinks.

In inaugurating the system, the chief difficulties experienced were, first, to overcome the opposition of the beer and whisky agents, who were prevented from continuing their lucrative business; second, to convince the foreigner that it really was a square game with no one getting a "rake-off."

As a further inducement to reduce the liquor traffic to a minimum, the best houses and working places are given to those having the best liquor records, while the chronic drinkers are forced to take the poor places, and are thus eventually weeded out.

In order to secure wished-for conditions, it is first necessary to eliminate the liquor overload, and after this has been done, educate and improve the living conditions of the people. When four- to six-room cottages can be built for the same price per room as our standard eight-room two-decker, double houses, with their red paint, there is no excuse for the tenement-like conditions that exist in the usual mining town. Get a good class of people, then provide them with warm, single houses, encourage them to fix up and clean up, provide fruit trees, etc., and it will be found that the labor conditions of the camp will be greatly bettered.

The Ontario Department of Mines has withdrawn from prospecting and from sale or lease under the mining act the land under the waters of Sandy lake, in Harvey township, Peterborough county, where marl beds of considerable value are believed to exist. It is understood that British capitalists are negotiating with Ontario officials to obtain the privilege of developing the deposit.

An Arrangement for Holing into Old Workings

It is frequently the case in coal-mining operations after certain workings have been abandoned, that continued progress in newer workings often brings the latter within a short range of the disused portion of the underground system. As a result, there is great danger of water, which may have collected in the old workings, breaking through some weak place in the dividing wall of stone or coal and flooding the new workings, with possible loss of life and certainly suspension of work and injury to plant. For this reason, it is frequently necessary to hole into the old workings in order to draw off the water, and provisions have to be made so that the rate of flow of water from the old to the new workings can be strictly regulated. That this is necessary is evident from the fact that in some cases where the water has accumulated for some time and to a considerable depth, a pressure varying from 20 to 100 lb. per sq.in. of water may be obtained.

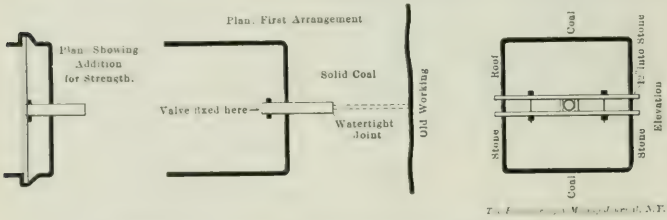
For carrying on this work, special apparatus has been constructed and sold, which, however, is somewhat costly and is moreover not always accessible in emergency. That this latter point constitutes grave danger is evident from the fact that trouble from water, in a mine, may arrive at a crucial moment and it is therefore necessary, if possible, to draw off such water with the aid of material which can be found in stock at any colliery. For this reason the following account of the way in which holing operations were carried out by means of a "home made" device may be of interest to colliery engineers. The operations were conducted at 564 ft below the surface, and the head of the new workings was driven to within about 14 ft. of the old workings. This portion of the mine contained water at 80 lb. pressure and care was therefore necessary in conducting any operations in holing for fear of causing a fracture in the dividing wall which might cause flooding.

General Arrangement of the Apparatus

The first step which was taken was to bore a hole straight forward in the solid coal for a distance of about 6 ft. The hole was 6 in. in diameter and was truly round and finished off as far as possible with a flat edge. A 6 in. diameter pipe of good thickness was inserted having on its end a rubber ring in such a way as to cause firm adhesion; this pipe was 9 ft long in order to allow it to project from the face of the hole when inserted in the hole. The pipe was tightened into the hole by means of screws working from a collar fixed to the pipe, and it was held in position by means of two ordinary wagon rails which were set into the stone above

and below the hole. These rails were about 9 in. apart and held together by bolts and the general arrangement of the structure is shown in the figure. When the pipe was carried into its position in this way the rubber ring at the further end formed a watertight joint with the coal at the end of the hole.

After placing into position in this way it was necessary to test the pipe in order to make sure that the joint at the back of the hole was perfectly watertight. The test consisted of forcing water into the pipe at a pressure of 2 or 3 times the anticipated pressure of the water which was to be drained away. In the course of this test at 200 lb. pressure per square inch, it was found that the framework of wagon rails was breaking the stone against which it was fixed, causing the pipe and joint to give and preventing it from becoming watertight. In order to remedy this, the coal at the sides of the working was notched as shown in the second plan in order to admit of two pitch pine balks 9 in. by 6 in. in section one crossing the framework of rails near the top and the other near the bottom. The balks were slipped in the notches and passed in front of the frame, thus retaining it in position.



GENERAL PLAN SHOWING SIMPLE ARRANGEMENT FOR TAPPING WATER IN OLD WORKINGS

ADDITIONAL SUPPORTS WERE NECESSARY.

Under the original arrangement, the frame gave way at a pressure of 80 lb. per square inch which indicated that under ordinary working conditions, the structure would have given way during the process of draining the workings directly the valve attached to the end of the pipe had been closed. After the pitch pine beams were put into position the pipe was tested up to a pressure of 300 lb. per square inch and was found to be quite watertight.

In the subsequent operations of draining the old workings, which were accomplished by driving a 8 in. hole forward from the point at which the watertight joint was made into the old workings, so as to make a free connection from the old to the new workings, this arrangement was found to work quite satisfactorily, and it will be seen from the simple nature of its construction, that the cost of the whole gear was trivial. The advantage of such an arrangement was not only that it may be constructed and put into operation at a few hours notice, but also that in cases where new workings approach old at various points, it does not cost much to put in a holing gear of this type at every point where an inrush of water is threatened. This could not be so easily done with expensive gear. It is hoped that this information will be of use to mining engineers meeting with similar troubles.

Coal Shipping Terminal of Virginian Railway

The coal-shipping terminal of the newly opened Virginian Railway, at Sewalls Point, near Norfolk, Va., is operated in a novel manner and contains some interesting equipment. The design of the pier and its equipment was adopted so as to enable the company to bring the coal from West Virginia mines to the seaboard in gondola cars, which can be utilized for taking other freight westward. The terminal is designed to be one of the largest of its kind in the world, the present pier having a capacity for handling 300 fifty-ton cars in 10 hours. Eventually the plans call for the building of four such piers, giving a capacity of 18,000,000 tons of coal per year.

The coal pier is 1860 ft. long from the shore line to the main harbor channel. It is of steel construction on concrete foundations. Transferring the coal from the cars that bring it to tidewater into the hoppers, from which the vessels are loaded, is accomplished in two distinct operations, the dumping of the cars and the distribution of the coal to the hoppers. The loaded cars are allowed to collect by gravity at the base of a short incline, up which they are brought by a barney car to the car dumper. The dumper picks each car up bodily, tips it at an angle of 65 deg., so that the coal is poured out into a special conveyer car of larger capacity. There are 10 of these special conveyer cars, they are built of steel with hopper bottoms, and each carries a load of 100,000 lb. of coal.

As soon as each conveyer car is loaded it is drawn up a 25 per cent. incline, 480 ft. long, by a 1000 h.p. Lidgerwood electric hoist. It requires 35 seconds for the car to reach the knuckle of the incline, whence it proceeds along the pier under its own power, each car being equipped with an electric motor taking power from an overhead trolley and controlled by a cab at one end. The barney car, which is used to raise the conveyer cars, is now returned by the hoist to the foot of the incline and is ready for another trip in 1 min. 20 sec. The conveyer car goes to the hoppers along the pier, depositing its load wherever it is wanted. The hopper bottoms of the conveyer car are operated by compressed air supplied by automatic electric compressors on the car. Having deposited its load the conveyer car returns by a kick-back system, which allows it to drift back down a gentle incline to the bottom of the slope to be refilled.

The Lidgerwood hoist, which hauls the cars up the incline is an interesting part of the equipment. Each conveyer car with its load weighs 180,000 lb. The hoist is equipped with two General Electric, M. P. C. class motors. But one of the hoist motors is used at a time, the other being provided as reserve to insure constant operation. The motors are rated at 550 h.p. each, but will actually develop much greater power.

The drum of the hoist is 84 in. in diameter, with a face 42½ in. in width, grooved for a 1¾-in. main cable, and having also a section 7 in. wide, grooved for a ¾-in. tail rope for insuring the return of the barney car, which is used behind the conveyer cars in raising the latter up the incline. The flanges on the hoist drum are 6 in. in depth. The main gear wheel is 116 in., and the intermediate gear wheel 72 in. in diameter. All gears are of cast steel with machine-cut teeth.

The drum has powerful post brakes controlled by a solenoid through the medium of compressed air; the latter is supplied at a pressure of 80 lb. per sq.in. by an electric compressor which forms part of the hoisting outfit. The general operation of the hoist is controlled by an operator near the barney car pit, 350 ft. distant from the hoist, but the hoist is provided with emergency limit switches, which make certain that it cannot overwind in either direction. The brake is set by a weight of 1400 lb. acting upon a suitable lever. When the current is turned on, the solenoid, acting through the compressed air, releases the brake, but when the current is cut off, whether by intention or accident, the solenoid releases the compressed air, permits the weight to drop, and bringing the brake into action, holds the load safely in any position.

The St. John d'l Rey Mining Company of Brazil is making experiments upon the electric smelting of iron ore in that country. Defective furnace construction has so far given much trouble, but it is hoped that success will ultimately be attained. Experimental work has shown that steel of high quality can be produced from native Brazilian pig iron mixed with common scrap.

Alabama Coal Operators Discuss Mining Problems

The Alabama Coal Operators' Association held an interesting and instructive meeting at East Lake, Ala., July 17. The convention was attended by representatives of all the important mining companies of the adjacent territory. A considerable part of the time was occupied in a discussion of first-aid methods to injured workmen. An address on this subject was delivered by Doctor Shields, of Scranton, Penn. First-aid corps are being organized and trained at six mines of the Tennessee Coal, Iron and Railroad Company. The work of organization and training is being superintended by Doctor Shields. The Tennessee company announced that if the experiment proves as successful as expected, corps will be maintained at all their mines. Other companies are watching the results closely, and will establish stations as soon as its success is shown.

Method of Training

In regard to the method of training Doctor Shields said: "The mining operations of the company are divided into districts, and a general foreman or superintendent is placed in charge of each district. A suitable central hall is secured, so as to be convenient for all the men in the district as a meeting place. The hall is large enough, of course, for practice work and stretcher drills. The most intelligent, and those whose work makes it convenient for them to attend, and especially those who in case of accident would be best prepared to undertake instant rescue work are selected for the corps. This includes for the most part men who work outside the mines.

"Then the lectures are begun. These are attended by the local surgeon, and the corps subsequently will be under his charge."

The meeting of the mine operators and superintendents at East Lake has aroused unusual interest in this feature of mine work. It has been shown that the cost to the companies is not large, and the men are more than willing to undertake what they see will add to their security and to that of their fellow workers.

Among those who spoke at the afternoon session were Edward H. Coxe, superintendent of the coal-mining department of the Tennessee company, who read a valuable and instructive paper dealing with all kinds of mine accidents and methods of prevention.

In New South Wales at the close of 1908, there were 31 dredges at work on gold-bearing gravels. Of these 21 were bucket dredges and 10 pump or suction dredges. The total recovery for the year 1908 was 37,017 oz. gold, an average of 1.223 oz. per dredge.

Colliery Notes

As regards the output per person employed in mining coal, the United States takes the first place with an output of 577 tons per employee, the United Kingdom second place with 292 tons, followed by Germany, France and Belgium with 264 tons, 188 tons and 166 tons respectively.

At the mines of one company where the shooting is done by electricty, a record has been kept showing that of the total shots fired, less than 2 per cent. are missed. At this property, the missed shots are left for the next day's shooting and are either reprimed, or a new hole drilled to perform the work intended for the original shot.

It is necessary that good judgment be exercised in the construction of powder magazines at coal mines. Such buildings should be built of stone, iron and cement, and should be absolutely fireproof. One of the most effective ways of heating a powder magazine, is by electric radiators, which maintain a constant temperature within the building. The electric stove, or radiator, as well as all wires should be located at a considerable distance from the stored powder and out of reach of anything combustible or explosive.

In hoisting, the chains used to support the cage are never subjected to a steady stress for long. They are subjected to repeated shocks which produce fatigue, making the chain more liable to fracture. This danger is guarded against by annealing the chain at least once every 6 months. Annealing is usually performed by heating the chain in a wood fire for several hours, and then allowing it to cool down as the fire cools, or taking it out and covering it with sand or ashes until it is cooled. By passing a chain through a fire in this way, the metal is restored to its normal fibrous condition.

During the year 1908, there were 131 coal-cutting machines in use in the Liverpool and North Wales district of Great Britain. The quantity of coal mined by machines during 1908 was less than in the previous year, the output for 1908 was 834,273 tons, and for 1907, 874,865 tons. There were 18 electrically-driven machines, as compared with 11 in 1907. Mr. Hall, the inspector for these districts, says that compressed air is a much safer power than electricity to use for coal cutting in seams liable to firedamp. In this connection Mr. Hall says: "I think it is a very foolhardy proceeding to use electricity for this purpose under such circumstances."

It is stated that the engineers of the Pittsburg-Buffalo Coal Company are planning to install an elaborate ventilating system, which will comprise a mine fan, 35 ft. in diameter, said to be the largest mechanical ventilator in this country. The capacity of this fan will be 1,200,000 cu.ft. of air per min. Two engines, either one heavy enough to carry the load, will be installed. This will insure plenty of reserve power. The cost of the fan and its accompanying machinery is estimated at $200,000. This same company has prepared to install a hoisting plant, which will be the largest in Pennsylvania. The engineers have designed a winding plant to take care of an output of 13,000 tons per day.

When sulphur is present in coal in the form of pyrites, it adds a little to the heating value of the fuel; however, the objectionable properties of sulphur in coal outweigh any benefits that accrue. There are numerous methods for determining the quantity of sulphur in a fuel. The Eschka method is largely used by European chemists. The general scheme there adopted is to mix one gram of coal with one-half gram anhydrous sodium carbonate and one gram of calcined magnesia; this mixture is covered with one-half gram magnesia. The combination is then heated until no black specks remain. The mixture is then cooled, and the mass extracted with boiling water. After digestion for 30 min., the solution is filtered. Ten c.c. bromine water and 5 c.c. Hcl are added, the liquid boils and the sulphuric acid is determined by precipitation as baric sulphate. Barium sulphate contains 32 parts sulphur in every 233 parts, thus giving the factor of sulphur in barium sulphate ($CaSO_4$), as 0.1373.

One of the largest coal operations in the southwestern part of the United States, has adopted, in practical form, all modern ideas that will tend to eliminate accidents underground. At the mines of this company the shooting is done by electricity after all the men are checked out of the mine. As the miners enter the workings, they are required to deposit a metal check at the shot-firing house outside, near the entrance. These checks are placed on a checkboard and returned to the men as they come out. A record of the working place of each check number is kept in the shot-firing house, and in case any check is uncalled for, the shot-firer makes a search for the man until he is found. No shots are fired until it is known positively that all persons are out of the mine. To insure safety against accidental discharge of the shot by electricity, there are two or more locked switch boxes in each mine with throw-off switches; one at the mouth and one or more at stations underground. After inspecting the underground connection with the shot to be fired, the shot-firer on his way out of the mine makes connection at each of the switches. After he reaches the surface, the shot-firer goes to the firing cabin to turn on the electric current; before doing this, however, he turns on an electric red signal light to warn all persons away from the mouth of the mine, so that should an explosion occur underground, no one on the surface could be injured by flying débris.

The Proposed New Mining Law of Mexico

Provisions of the New Law Which Is to Govern Mining Titles and Mines in Mexico. The Present Status of the New Mining Law

BY RICHARD E. CHISM*

The proposed new law which will govern the acquisition of mining claims and the titles to mining property throughout the Republic is the most important question now before the mining community.

Present State of the Project

The project for a mining law was drawn up by the Ministry of Fomento, which has charge of the mining bureau, and was submitted for discussion in the form of a bill, to the House of Deputies of the Mexican Congress at its last session, which commenced in April, 1909. The House discussed the bill at some length and many modifications of the official project were proposed. The discussion being finished, the project was approved in its modified form and was transmitted to the Senate for further discussion. However, the bill was only delivered to the Senate in the very last hours of the session, which terminated according to law on May 30; owing to that fact the bill was laid over until the next session of Congress, which will be convened on Sept. 15 next. There are many learned lawyers in the Senate and the discussion in that body can scarcely fail to result in material alterations to the present project. All of these alterations will have to be submitted again to the House of Deputies. In the event of a divergence of opinions upon some particular point or points conference committees will be appointed to arrange any differences that may arise.

In view of these circumstances, the date when the law will be put into operation has been changed from July 1, 1909, and has been tentatively fixed for Jan. 1, 1910. Any discussion of the project as it at present stands is to a certain extent premature because of the senatorial amendments which will probably be made. Also there will be a body of regulations to be promulgated for the proper execution of the law and a set of police regulations is also contemplated. In order to form a really useful and practical digest of the new law it is obvious that those latter enactments contained in outside codes and ordinances which are referred to in the new mining law should be included. This being the case, I shall simply attempt to summarize the new law in a general manner with the understanding that it is as yet only an incomplete proposition, subject to modifications.

The project, as sent to the Senate, has 153 main articles and 9 transitory articles while the law now in force and which the new law is intended to supersede, has only 33 main articles, 6 transitory articles and 1 final ordinance. As compared with the old law the new project does not make any radical changes. Mining property is still to be acquired by discovery and denouncement as in the time honored way handed down from Spanish times. Annual taxes are to be paid in lieu of working and these are the same as have been in force since March 25, 1905. The exploration-zone denouncements are greatly restricted and other minor details have been changed, in the light of experience, to facilitate the obtaining of mining titles and to cut off disputes and litigation.

The projected mining law is divided into nine chapters as follows:

I. Mining Property and Its Character.

II. The Acquisition and Forfeiture of Mining Property.

III. Reduction of Titled Claims; Corrections of the Localization of Claims; Corrections of Title Deeds; Division of Mining Glebes.

IV. Legal Servitudes.

V. Mining Contracts; Registration

VI. Expropriation.

VII. Penal Enactments.

VIII. Litigation.

IX. Miscellaneous Enactments.

In the following pages extracts from the law itself are given in quotation marks; the paragraphs not quoted are my comments on the law and on proposed changes:

Chapter I. Mining Property and Its Characteristics

"*Articles 1 and 2*—The Nation has direct dominion over the following goods and they are therefore subject to the provisions of the present law:

"1. Aggregations of all inorganic substances which, as veins, blankets or masses or any shape, constitute deposits whose composition is distinct from that of the country rocks, such as those of gold, platinum, silver, copper, iron, cobalt, nickel, manganese lead, mercury, tin, chromium, antimony, zinc and bismuth; also those of rock salt and precious stones.

"2. Placers of gold and platinum.

"The owner of the ground has the exclusive property of:

"1. Deposits of combustible minerals, of all forms and varieties.

"2. Deposits of bituminous materials.

"3. Deposits of saline matters which effloresce upon the surface.

"4. Subterranean or surface springs of water, in subjection to the common law or special enactments; without prejudice to the prescriptions of Article 9 of the present law.

"5. Rocks in place and surface soil; as slates, porphyries, basalts, limestone and earths, sands and clays.

"6. Bog iron ore, alluvial iron ore, placer tin and others."

The above definition of property subject to the eminent domain of the Nation and made denounceable under the mining law is identically the same as that of the present law, except that chromium has been added to the list of metals and tellurium to that of metalloids and minor metals. The basis of classification of mineral deposits by the new law is aggregation and segregation, in whatever way these may have been effected, whether chemically or mechanically. The nondenounceable substances belonging, as such, to the owner of the land, are also the same as in the present law except that superficially efflorescing saline deposits have been included in the list.

"*Article 3*—Whenever the new law does not otherwise provide, the enactments of the civil code of the Federal district relative to common property and its modifications shall apply to mining property."

According to the present law mining property and its modifications are subject to the legislation of each State or to the Federal district and territories except when these are modified by express provisions of the law itself.

"*Articles 4 and 5*—The unit for mining property is called pertenencia and is a solid of indefinite depth, limited upon the ground by four vertical planes corresponding to the projection of a horizontal square with sides 100 m. long. The mining pertenencia (or claim as I shall call it henceforth) is indivisible in all acts and contracts which effect ownership of the property.

"*Article 7*—A mining glebe (*fundo minero*) is a claim, or a conjunction of contiguous claims, covered by one primordial title or by a subsequent transfer title founded upon the primitive title. The owner of a mining glebe may remove and profit by any substance of those comprehended in article 1 (denounceable sub-

Note.—Read at the first general meeting of the Mexican Institute of Mining and Metallurgy, held July 12, in the City of Mexico.

*Mining engineer and Scientist in Mexican [illegible] City of Mexico.

stances) which may be found upon the surface or in the subsoil of his glebe, but his mining work must not extend beyond the boundaries of the glebe, as laid down in his title, even if the adjoining property is free ground. The owner of a mining glebe has the use and profit of all waters found in his workings, with all the substances which they may hold in solution. He cannot claim any subsidy if his waters are exhausted or diminished by the drainage of other mining glebes. Proprietors of springs dried up or diminished by mining operations may recover the water belonging to them, but may not deprive the glebe owner of the water necessary for the exploitation of his mines nor can they demand damages from him. The transfer of mining glebes implies the transfer of all right with respect to the water encountered in the workings.

"*Article* 10—The mining industry is of public utility; wherefore mining-glebe owners have the right to expropriate in the cases and under the conditions of the present law."

Chapter II. Acquisition and Forfeiture of Mining Property

"*Articles* 11, 12 *and* 13—Mining property is to be acquired originally from the Nation by means of a title deed granted by the Executive through the ministry of fomento after denouncement and the fulfilment of the other requisites established by the new law. No denouncements can be made unless upon claims in free grounds, that is in ground where no claims have been yet denounced or where former denouncements have lapsed or been declared forfeited."

Articles 15-36 define the manner of making a denouncement (filing a claim upon vacant mining property) and relate to the procedure for obtaining title under the same, all of which present no radical departure from present practice except that according to article 27 no title can be issued until the denouncer has proven to the department of fomento that his glebe has been properly monumented. If this is not done within a limited time, the denouncement is to be declared null and void.

"*Articles* 37-40—Denouncements can only be opposed: (1) for invasion by the filing of claims already held under an existing title; (2) for having been filed upon claims previously denounced. Oppositions will be decided administratively or judicially as the parties may agree. If no agreement is had the case will be sent to the courts for settlement. These disputes will hereafter be decided by the Federal courts and Federal law and not by the State courts, as under the present law.

"*Article* 51—Mining property shall be forfeited for failure to pay the tax as it may be established by the law relating thereto."

Denouncements may be made upon public or private lands. Previous notice to the owner of the ground will apparently not be a prerequisite to the admission of a denouncement, nor will the lack of consent by the landowner be a ground for opposition.

Chapter III. Reduction of Titled Claims; Corrections of the Localization of Claims; Corrections of Titled Deeds; Division of Mining Glebes

Articles 52-60, included in this chapter, relate to matters of detail which are not important for our present purpose.

Chapter IV. Legal Servitudes

"*Articles* 61-70—Common property is subject, in favor of mining properties, to legal servitudes of right of way, drainage, aqueduction (the passage of water), ventilation and transmission of electric power. Mining properties are not subject to any legal servitudes except those of drainage and ventilation in favor of other mining properties.

"The establishment and use of the above servitudes upon common property are subject to the enactments of the civil code of the Federal district and to special rules laid down in the new mining law.

"*Articles* 71-77—The servitudes referred to are to be constituted upon the servient property by consent of the owner thereof; by administrative resolution of the ministry of fomento or by judicial decision. The administrative resolution of the ministry of fomento constituting a servitude shall be regulated by the enactments of the civil code of the Federal district and the courts may be appealed to in case the applicant for the servitude or the owner of the servient property is not satisfied with the administrative resolution. But the appeal to the courts must be taken within 30 days."

The courts to be appealed to are the Federal courts as per Article 107 of the proposed law.

Chapter V. Mining Contracts; Registration

"*Articles* 79-81—Mining enterprise contracts which have for their object the transfer and exploitation of mines and contracts which relate to mining products are to be considered mercantile acts, subject to the enactments of the Code of Commerce unless otherwise especially provided for in the projected law.

"When a mining company is organized the value which the founders thereof may attribute to any mining property or mining rights is to be considered as proved for all legal purposes.

"No mining contract can be rescinded on account of the 'lesion'; that is, neither the buyer nor the seller can nullify the contract on the ground of an excess of price paid or of inadequate consideration received.

"*Articles* 82-86—The commercial registry offices of the States, Federal district and territories are to keep a special book in which to register:

"1. The titles to mining property.

"2. All public instruments and administrative or judicial rulings which transfer or effect the proprietorship of mining glebes, or by which positive rights are constituted upon mining properties or such rights are affected.

"3. All public instruments conceding options upon mining glebes or mining claims.

"4. All public instruments and judicial decisions which relate to the exploitation of mining glebes.

"These registrations are to be made in the registry office of the municipality where the mining glebe is situated.

"Registration of options will be effective against third parties for two years only, even if a longer term is stated for the option. When the registration of any document is effected with in 30 days of its date the registration shall take effect from the legal date of the documents. If the document is presented for registration after 30 days it will only produce legal effects from the date of registration. The registration of public instruments proceeding from foreign countries will produce legal effects from the date on which the official copy of the notarial record may be presented at the registration office."

Chapter VI. Expropriation

"*Articles* 87-96—The owner of a mining glebe has a right to occupy within the limits of his claims, such part of the surface ground as may be strictly necessary for the mining and exploitation of superficial deposits, for the buildings, dependencies and necessary uses of the mining work and the plants that may be necessary for the treatment of the minerals produced by that glebe and by the other glebes annexed thereto, belonging to the same owner. Also the mineowner has a right to occupy, within or without the perimeter of his claim and subject to the provisions of the mining regulations, any ground necessary for the establishment of railways of a permanent character destined for the use of his business.

"The mineowner should first try to arrange with the owner of the surface ground for the use thereof; but if no agreement is reached he may apply for expropriation of the necessary ground to the ministry of fomento, which will, after hearing both parties, decide how much land is to expropriated and the price to be paid by the mineowner. The decisions of the ministry of fomento are subject to review in the courts if an appeal is taken within 30 days. If no appeal is taken the fomento decisions must stand and will be enforced by the courts.

"Unknown landowners are to be summoned to appear by publication of a notice

during 30 days. If no one appears the mineowner may deposit the value of the surface land and a competent court will make deed to the land in favor of the mineowner. When surface land has been expropriated for a particular object the landowner may recover the same, within one year, if the proposed object has not been fulfilled."

Chapter VII. Penal Enactments

"*Articles* 97-106—All crimes which may be committed against the proposed law and the actions for damages to which said crimes may give rise shall be subject to the penal code of the Federal district, with the modifications as follows:

"Five months to one year and fine for a mining agent or expert who may commit a fraud in the exercise of his official functions. If these frauds were committed in collusion with the denouncer or the opposer or through bribery, the accomplice shall also be punished by arrest and fine.

"A surveyor who may fraudulently omit to present plans or reports relative to a mining denouncement within the legal time shall be punished by imprisonment and by disability to exercise the profession for from one to five years. The ministry of fomento may impose up to one month arrest and up to 500 pesos fine upon mining agents and upon surveyors who may be guilty of negligence, carelessness or infraction of the proposed law or of any order of the ministry or of the mining regulations or police ordinances. Fines of from 1000 to 2000 pesos and imprisonment of from one to two years may be imposed for exploiting mines belonging to other owners or denounced by other parties or in free ground.

"A denouncer who exploits his mining glebe before obtaining title thereto may be punished by imprisonment and fine and with additional penalties if he should sell the ore.

"The robbery of ores by operatives or employees may be punished under article 384 of the penal code, section V; with two years' imprisonment.

"The destruction of surface or underground monuments or land marks is punishable, under article 497 of the penal code, with from 8 days' to 6 months' arrest and fine of from 10 to 200 pesos. If the object of the destruction is to usurp neighboring land or to obliterate the boundaries fixed by litigation or to steal the materials of the monument, the penalty is from 3 to 12 months' arrest and a fine of from 16 to 1000 pesos.

"Disobedience of legal orders and resistance to surveying operations by private parties are punishable by fines and imprisonment, the fine running up to 1000 pesos."

Chapter VIII. Litigation

"*Articles* 107-123—The Federal courts are to have charge of litigation over opposition to denouncements, or to the concession of mining titles; nullity of mining titles; legal servitudes for mining purposes; crimes in infraction of the new law and crimes that may imperil the stability of mining works of the life of underground operations.

"The ministry of fomento may commence suit to declare the nullity of any mining title if obtained by fraud or deception, within three years from the date of the title deed. Any third interested party may also sue for a declaration of nullity of a title.

"Litigation relative to mining contracts which are merely mercantile in their nature, as by article 79 of the proposed law, is to be carried on before a competent judge of the common law, according to the procedure of the code of commerce.

"Litigation relating to mining glebes not upon matters mentioned in article 107 is tried before competent common-law courts, according to the code of commerce, or to the civil code of the Federal district, as the case may be."

Chapter IX. Miscellaneous Enactments

"*Articles* 124-135—Mining explorations are to be subject to the regulations of the mining law and to special regulations of mining police, and are to be carried on within a zone not over 500 m. radius, with the consent of the proprietor, if in private property. If the landowner should refuse the consent it may be supplied after a hearing by the mining agent and under bond of the prospector to pay damages if any are caused to the landowner.

"Exploration permits shall only be valid for 60 days, during which period only the prospector may file denouncements upon mining claims within the zone.

"The secretary of fomento may send inspectors to visit mines to report upon violations of mining police regulations and to obtain scientific statistical data; also to determine if the workings may have entered free ground outside of the boundaries of the glebe. The ministry of fomento may order the suspension of work in any mine for infractions of the regulations or of mining police rules, or upon petition of the governors of States or Territories for the same reasons.

"The department of fomento may make special contracts for mining work in the beds of navigable rivers.

"*Articles* 136-144—Restrictions upon foreigners. No mining title can be issued to foreigners who may denounce mining properties within a zone of 80 km. along the National boundary lines, unless a special permit from the Executive shall previously be obtained. The same permit must be obtained by foreigners who may acquire mining properties or positive rights upon the same within the same limits. Foreign companies cannot denounce nor acquire in any way mining properties or positive rights upon the same within the 80-km. zone.

"If any foreigner shall acquire mining property within this zone, as by inheritance or through legal sale for payment of a debt, he shall have one year within which to sell said properties, unless he should obtain a special permit to hold them before the expiration of that time. Foreign companies which may acquire mining properties by inheritance or in payment by judicial decision must sell the same within one year.

"If the above enactments are not complied with the Executive of the Union may attach said properties and proceed to sell the same by public sale, according to the code of civil proceedings of the Federation, and the proceeds of the sale, less costs and taxes, shall be delivered to the interested parties.

"*Article* 145—Any person may pay the property tax upon a mining glebe, but only a legitimately interested party may compel the owner of the glebe to repay him the said amount. The payment of the mining tax by an interested party shall have the preference over any other credits that are to be paid from the value of the glebe, including mortgage credits.

"*Article* 153—The ministry of fomento will promulgate the general regulations under the proposed law; the special regulations of mining positions of the proposed law; the special regulations of mining police and any other regulation enactments which may be necessary to carry into effect the provisions of the law."

Monuments

"Mineowners who have not yet placed monuments upon their boundaries are allowed one year to do so. Noncompliance shall be subject to the payment of damages to third parties who may have suffered thereby and to a fine of from 100 to 500 pesos to be imposed by the department of fomento. Further noncompliance will entail more serious penalties, including the construction of the monuments by the department at the expense of the mineowner."

Final Provisions

"From the date of passage of the proposed law all preferential rights as to mining denouncements, or acquisitions, even those established by special laws, shall be abrogated. From the same date all previous laws and regulations about mining shall be abrogated except those of a fiscal nature, which shall continue in force wherever they are not changed by the proposed law.

"The proposed law shall take effect on Jan. 1, 1910. Title deeds, acts and contracts registered under the law of June 4, 1892, and before Jan. 1, 1910, shall have legal effect without new registry."

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The Coal Trade and Railroad Rates

Two years ago comparatively little was heard about competitive conditions in the coalfields. There was work enough for all, and while competition always exists and there is always some complaint about railroad rates, there was more trouble about car supply than about any rate question. During the past year, however, the situation has been altogether different. The demand has been less than the supply, and cars have been abundant, so that there has been no difficulty about shipping all the coal required—or more. The more is just where the difficulty about competition comes in.

We have already referred at some length to the controversy on differential rates on coal for shipment up the Lakes, which is not yet settled. Other controversies have arisen over rates to Western centers, such as Chicago and Cleveland, on coal from Ohio, Indiana and West Virginia points, and from the Pittsburg district. There is also more or less complaint about coal rates to tidewater points; shippers from central and western Pennsylvania complaining that the low rates made on coal from the West Virginia mines are depriving them of a market in which they should naturally have the lead. Now a further complaint comes from Alabama operators, who claim that the rates made by the Southern railway on their coal are shutting them out of the cities along the Southern seaboard, while West Virginia coal is finding a ready sale there, and the operators of that State are planning further railroad connections to secure this trade.

In all these cases West Virginia is the aggressor whose competition is feared by the other districts, not only because it deprives them of trade, but because it keeps down the prices. To say nothing about the quality of the coal—which might cause undue controversy—the West Virginia operators are favored by their comparative freedom from labor exactions and the lower rates which they have to pay for mining. This gives them an advantage over other districts which the latter might find difficult to meet in any case; and when rates are lowered or so adjusted as to do away in whole or in part with the handicap of distance, it is easy for operators to work up grievances which will justify appeals to the Interstate Commerce Commission.

It is hard to see where a remedy can be found for these complaints. Railroads cannot be expected to adjust rates in such a way as to deprive themselves of a business in which they find even a small amount of profit; nor can they be expected or allowed to adjust rates in such a way as to prevent the competition of producing districts. This has been done in the past for various reasons, but it was just such abuses that the present interstate commerce law was intended to prevent. The competition will probably continue as long as the capacity for producing coal exceeds consumptive demand, as is the case at the present time.

The Change in the Metal Exchange

Many years ago the New York Metal Exchange was what its name implies, *i.e.*, a mart in which transactions in the metals were made. In the course of time it was found to be a useless medium for the distribution of those commodities—the sellers having no difficulty in dealing directly with the manufacturing consumers—especially as the buying and selling became concentrated into comparatively few hands. Incidentally the old brokerage firms found their business disappearing, there being no object in paying them a commisson on business that could easily be effected by the principals alone. Particularly was this true of the business that is done in large blocks as must be the chief business in the sale of copper, whereof, at present, an output of more than 4,000,000 lb. must be sold daily on the average. The surviving brokerage houses were, therefore, limited to a retail business, comparatively speaking; buying perhaps for a few old customers that stuck to them, and perhaps carrying on some small speculation on their own account. Transactions on the Metal Exchange, save in tin, ceased long ago. The real market for the metals had been transferred to the offices of the refiners, with the exception of tin, which is not produced in this country.

For a long time, however, some brokers met at the Exchange and went through the form of making bids and offers, thereby establishing quotations that (except for tin) were utterly erroneous, being in no

way representative of the real markets for copper, lead and spelter, which were elsewhere. This involved the Exhange in adverse criticism many years ago, which most persons have now forgotten. As a corrective, it was decided to cause the Exchange to become recognized merely as a statistical bureau, to furnish necessary information to its members at much less expense than would be incurred by them individually; and the quotations to be published five days a week were to be given out by the secretary after consultation with committees, which included representatives of the refiners, whose offices, as we have remarked above, constituted the real market.

During the last year or two the copper quotations of the Metal Exchange have been the subject of a good deal of adverse criticism, which culminated in unfavorable recommendations by the Hughes' committee, appointed to investigate the methods of doing business in all of the exchanges in New York. As a matter of fact, the recent quotations of the Metal Exchange have been substantially representative of the actual market. They have not always been quite correct, but the errors have been explainable, perhaps, by the difficulty in reconciling the divergent reports of committees of five members. In a matter of this kind it does not necessarily follow that the figure upon which the majority agree is the correct one. The remarks of the Hughes' committee about the Metal Exchange were rather superficial, although decidedly effective in view of the criticisms that had previously been directed against the organization.

These criticisms were inspired by several [illegible] The brokerage firms have been hopeful to effect some change that will tend to rejuvenate their business. Those who are engaged in a retail business have wanted the representation of the retail market. Some producers, even, may not have liked to have the disclosure of market [illegible] from day to day. And there have been other motives. However, the [illegible] effect, backed up by the Hughes [illegible] has been to cause the Metal Exchange to abandon its practice of [illegible] Without doubt the [illegible] much as the [illegible] to convey an impression [illegible] on the floor of the Exchange [illegible] although this was quite understood by the well-informed, and gave an official character to the quotations when there should not have been.

It is now intended to introduce upon the floor of the Exchange dealings in "standard" copper after the fashion of the London Metal Exchange. Whether a speculative business in any way approaching in magnitude that of London can be developed here remains to be seen. One thing only can be forecasted with certainty, namely that the refiners will continue to deal directly with the manufacturing consumers and that the real market for copper and the other metals, will continue to be in the New York offices of the refiners, where nearly 70 per cent, of the world's production of copper is primarily negotiated.

Natural Gas in Oklahoma

According to a press dispatch the article in the constitution of Oklahoma that forbids the piping of natural gas outside of the State has been declared unconstitutional by a Federal court on the ground that it is in contravention of interstate commerce. This is in line with many other decisions affecting traffic between States and probably will be upheld by the higher courts if the case be taken to them. The decision is of considerable interest to the zinc smelting industry.

There are smelters near the Oklahoma line, of which at least one has a pipe line extending into Oklahoma but has been deprived of the right to take gas from its own property in that State by the officials thereof under the terms of the Oklahoma constitution. On the other hand there is a group of three smelters at Bartlesville which have been protected against encroachment upon their gas supply by the very same provision.

This provision may be unconstitutional, but it was undoubtedly framed for the general welfare of the State, its purpose and effect being to bring manufacturing industries into the State and prevent the rapid exhaustion of this great fuel resource by short-sighted wastrels. The Kansas Natural Gas Company, which is rapidly sucking the life out of the gas pools of Montgomery county, Kansas, has long had hungry eyes upon Oklahoma and doubtless will quickly begin to draw from that State and pipe the gas to Kansas City and elsewhere. This is, of course, a legitimate use for the gas and no criticism could fairly be directed against it if the company to pay interest on its enormous bond issue and over-capitalization did not have to supply more gas than it ought to do with a view to the preservation of its wells.

Steel Corporation Statement

The statement of the United States Steel Corporation for the quarter ended June 30 shows the effect of the increased business which started with the adoption of the open market early in the year. Notwithstanding the lower range of prices prevailing, the net earnings, as compared with 1908, showed gains of $9,054,735 for the quarter and of $13,766,998 for the half-year; while the unfilled orders on the books on June 30 were 744,063 tons greater than a year ago. In 1908 the surplus for the quarter after paying dividends was only $195,595; this year, $5,894,244 remained, though the common stock dividend was raised from ½ to ¾ per cent. It is to be observed that no appropriations for new construction were made in either year. The result, however, is sufficiently encouraging, showing real progress in business, even if it still stands below the boom level of two years ago.

Iron-ore movement from the Lake Superior region is developing at a rate unexpected earlier in the season. The requirements of the large steel companies are greater than seemed at all probable, and now the merchant furnaces are coming into the market to buy ore. It is quite unusual for ore to sell at all so late in the season, contracts being usually made by May 1 at the latest. This year is an exception, however, and more sales have been made since June 1 than in any year on record. The Lake ore ports will be busy places for the rest of the season.

The German Potash Syndicate has finally agreed to continue its troubled existence for another year. The mines of which Americans have secured control remain nominally outside the syndicate, but agree to work measurably in harmony with its members. This arrangement will be given a fair trial for at least a year, though many of the Germans seem to be doubtful as to its working.

The Pacific Northwest Society of Engineers

SPECIAL CORRESPONDENCE

The seventh annual convention of the Pacific Northwest Society of Engineers was held at the Alaska-Yukon-Pacific Exposition, Seattle, Wash., July 8-10. The president, Prof. Milnor Roberts, dean of the School of Mines of the University of Washington, presided and several valuable papers were read and briefly discussed.

July 8 the engineers made an excursion by steamer from Seattle to points on Puget sound, in the course of which the works of the Pacific Creosoting Company, at Eagle Harbor, and the navy yard, Bremerton, were visited. The plant of the former is the largest of its kind in the world, using 2,400,000 gal. of creosote yearly in treating timbers.

At Bremerton the engineers were shown the excavation for the new dry dock, which is to be the largest naval dry dock in the United States.

On July 9 the president's annual address was delivered. This was a comprehensive review of "The Mineral Industry in the Northwest." Professor Roberts had prepared an exhaustive paper on this subject, together with 11 chronological charts giving references to much information published recently in mining journals, relative to mining in Oregon, Idaho, Washington and British Columbia, and illustrated by many maps and photographs. This was necessarily summarized in his address, only the leading features of the subject being brought out. He said, in part:

"The name 'Pacific Northwest' is usually applied to the States of Oregon, Washington and Idaho. Their mineral resources and industries, though, are so closely linked to those of British Columbia, the Yukon territory and Alaska, that for the present purpose it is convenient to consider the region as a whole. The area thus defined is in extent approximately 1,500,000 sq.m., or two-fifths as large as the United States proper. This enormous region has geological, geographical and topographical boundaries which set it off with some distinctness from adjacent lands. Salt waters bound its northern, and roughly speaking, its western rim, the latter alone being rich enough in mineral to satisfy most countries. The landward boundaries are varied in their nature. In southern Oregon the Klamath mountains mark the border of California; the range is mineralized and no sharp line can be drawn between the California and Oregon mines, except that they are tributary to the towns in their respective States. The range forms a noticeable geographical boundary. The only known mineral deposits of much importance in southern Idaho are in the Owyhee district, which has no direct relations with Utah and Wyoming, except that the coal of the latter finds its way into much of the territory of the Northwest. Between Montana and Idaho the line is less distinct. On the map the mines of western Montana seem to be closely connected with those of Idaho, but actually they are not. The northeastern border of Idaho has poor means of transportation to many of its mining districts, but they are more closely related to Idaho's life and trade than to Montana's. The wonderfully rich Cœur d'Alene lead-silver district of northern Idaho has its outlet through Spokane, Wash., rather than to the east.

"On the Canadian side of the international boundary line, the enormous province of British Columbia—half as large again as our three northwestern States taken together—includes practically all the mineral-bearing ground of western Canada outside of the Yukon territory, except the great coalfields east of the Rocky mountains in Alberta and Saskatchewan. East of the Yukon territory is a vast wilderness known to contain coal, oil and gold; but there is scarcely any industrial development within it.

"General statements regarding the present status of the mineral industry in the Pacific Northwest would prove unsatisfactory, because many exceptions would have to be noted, therefore it seems simpler to consider the minerals separately."

Professor Roberts dwelt at more or less length upon the following minerals:

Coal and Coke—These were covered somewhat fully, reference having been made to the leading features in connection with coal mining in the Northwest—new equipments, developments of importance, markets, etc.

Copper—Apart from gold, copper mining is the most widespread of the metal-mining industries, employing more men than the others. In Washington alone 226 companies have been organized to mine this metal. There are copper-smelting plants in Washington, Idaho, Oregon, British Columbia and southeast Alaska.

Gold—Gold, and silver associated with it, to a total value of about $180,000,000, has been received at the assay office in Seattle to date of meeting. Of this about $80,000,000 came from Alaska, $87,000,000 from the Yukon territory, and $11,000,000 from British Columbia. Besides this there was much gold shipped direct to the United States mint or to other assay offices. A description of the Yukon Gold Company's big ditch to Bonanza creek, Yukon—ditch, flume, pipe line, mechanical elevators and power plant—was given, illustrated by lantern slides.

Other Minerals—The status and prospects of the Irondale (Puget sound) iron-mining and smelting enterprise was given; also data relative to markets for pig iron. Lead in Idaho and British Columbia; tin near Spokane, Wash., and at York, Alaska; pyrite on Puget Sound; cobalt in Oregon; monazite in Idaho; tungsten in Washington, and marble in southeast Alaska, each had attention.

Particular importance was attached to developments in connection with the manufacture of cement, an interesting summary of progress in which was given.

Other papers were read, one on "Flow of Water through Wood Stave Pipes," by Theron A. Noble, North Yakima, Wash., which gave many valuable data relative to construction and use of wood-stave pipes.

Each afternoon there was made in the neighboring machinery building a series of timber tests, in connection with the United States Timber Testing Station working in conjunction with the University of Washington. These included the testing to breaking point of timbers up to 8x16 in. and 16 ft. long.

At the close of the business session on Saturday a dinner was held in the New York building nearby. At this there were about 80 members and guests.

Gold Receipts at the Seattle Assay Office

SPECIAL CORRESPONDENCE

During the fiscal year ended June 30, 1909, there were received at the U. S. assay office, Seattle, Wash., 2061 deposits of gold; total weight, 1,075,323 troy oz. (38.8 tons avoirdupois), and value $19,314,053. The origin of this gold was as under:

From United States:	Value.
Nome, Alaska	$5,327,223
Tanana, Alaska	10,382,160
Other parts Alaska	639,102
Total	**$16,348,485**
Washington, Oregon and other States	65,468
Total from U. S.	**$16,413,953**
From Canada:	
Yukon territory	$1,615,726
British Columbia	1,284,374
Total Canada	$2,900,100
Grand total	**$19,314,053**

The proportion of silver contained in the gold bullion received from Alaska and Canada, respectively, is shown in the following table:

Source.	Gold, Oz.	Silver, Oz.
Alaska	871,203	120,359
Yukon Territory	85,573	20,351
British Columbia	68,425	9,751
Total	1,025,203	150,161

The total weight of precious metals was 1,175,604 oz., of which gold formed 87.2 per cent., and silver 12.8 per cent. by weight.

TOTAL RECEIPTS FOR ALL YEARS

During 11 years that have elapsed since the United States Assay Office was opened in Seattle—from July 15, 1898, to June 30, 1909, inclusive—the quantity and value of

the gold bullion received was as follows: Number of deposits, 44,170; weight, 10,441,255 (356.8 avoirdupois tons). The origin of this gold was as follows:

United States:	
Nome, Alaska	$38,211,970
Tanana, Alaska	32,341,427
Other Alaska	7,712,758
Total Alaska	$78,266,155
Washington, Oregon, etc.	1,987,464
Total U. S.	$80,253,619
Canada:	
Yukon Territory	$86,464,794
British Columbia	11,205,285
Total Canada	$97,670,079
Grand total	$177,923,698

This is, of course, not the total output of the districts named, gold having also been shipped from them to other places than Seattle.

It should be noted that large receipts from the Nome district commenced in 1899, but from Tanana not until five or six years later. The total gold output of the Canadian Yukon for the 11 years the assay office has been open in Seattle has been, approximately, $124,000,000; more than three-quarters of the gold sent from the Yukon having gone to the Seattle office.

American Chemical Society

The meeting of the American Chemical Society at Detroit, June 29 to July 2, was more largely attended than any summer meeting in its history. Meetings were held by the Division of Industrial Chemists and Chemical Engineers, the Division of Physical and Inorganic Chemistry, the Division of Organic Chemistry, the Division of Fertilizer Chemistry and the Division of Agricultural and Food Chemistry and by the sections of Biological Chemistry and Pharmaceutical Chemistry and the section of Chemical Education. In all 186 papers were presented. Besides the reading of the various papers the points of special interest were the largely attended meetings of the Division of Industrial Chemists and Chemical Engineers, where representatives were present from all parts of the country. Perhaps the "experience meeting" before this division on July 1 was the feature of the program, for many ideas of value were brought out and the discussion was general. It is quite noteworthy that secrecy which has developed so many of the chemical industries and industrial chemistry in the past appears to be falling away and both the enterprises and the chemists find that they gain more than they lose thereby. In the convention it might be added that a considerable number of chemical corporations are joining the Society as well and are heartily entering into the spirit of progress with which the society is so thoroughly imbued. The social features of the meeting included a complimentary smoker given by the Society of Detroit Chemists to the visiting chemists, June 29, and a banquet, July 1. On June 30 afternoon the chemists were the guests of Parke, Davis & Co., visited the works, were entertained there at dinner and were given an evening boatride on the Detroit river and Lake St. Clair before returning. July 2 was spent in Ann Arbor as the guests of the regents of the University of Michigan and three papers of general interest were there presented in general session. The rest of the day was turned over to the section of Chemical Education. During the day the members visited the new laboratories of the University of Michigan and were entertained through the courtesy of the regents. Many manufacturing works and chemical establishments were opened to the visitors in Detroit, among which may be mentioned the Acme White Lead and Color Works, the Detroit Salt Company, Hiram Walker & Sons and the Hoskins Manufacturing Company. It is interesting to note that more and more chemical corporations are appreciating the value of these meetings to their chemists and are insisting upon their attendance.

New Rules for the Metal Exchange

At a meeting of the board of managers of the New York Metal Exchange, July 22, new rules to govern trading in tin, lead, spelter and copper, were adopted as follows, to become effective Aug. 2:

Copper

1. The kind of copper to be dealt in shall be standard copper.

2. The minimum quantity dealt in shall be 25 tons of 2240 lb. each.

3. All bids for and offers to sell shall be for about 25 tons of 2240 lb. each, or the multiples thereof, and when quantity is not named, it shall be understood as about 25 tons of 2240 lb. each. No offer to buy or sell shall be entertained at a less difference than 0.025c. per pound.

4. Form of contract. In consideration of one (1) dollar in hand paid, the receipt of which is hereby acknowledged . . . . . ha . . . . this day sold to (or bought from) . . . . . about . . . . tons, of 2240 lb. each, of standard copper, at . . . . . cents per pound, deliverable at seller's option during . . . . . 190 . .

Sellers have the option to deliver each 25 tons, either in:

Class A. Refined copper assaying not less than 99 per cent., and below 99.30 per cent. at contract price.

Class B. Refined copper assaying not less than 99.30 per cent., and below 99.80 per cent. at ¼c. per lb. over contract price.

Class C. Refined copper assaying not less than 99.80 per cent., at ¼c. per lb. over contract price.

Class D. Rough copper subject to a rebate of ⅜c. per lb. from contract price.

This contract is made in view of and in all respects subject to the by-laws and rules established by the New York Metal Exchange, in force at this date.

(Signed) . . . . . .

5. Refined copper may be delivered in ingots, ingot bars, tiles, cakes, cathodes or wire bars. Cakes and wire bars shall not weigh less than 100 lb. and not more than 250 lb. each. All copper must be delivered in bulk.

6. All negotiable warehouse receipts for refined copper shall be accompanied by an assay certificate showing that the copper content is not less than 99 per cent. electrolytic assay.

7. For rough copper the standard of produce shall be 97 per cent., but no excess shall be paid for. A pro rata allowance on the settlement price shall be made for deficient produces below 97 per cent. down to and including 96 per cent., and a double pro rata allowance on the same basis for deficient produces below 96 per cent. down to and including 94 per cent. Produces below 94 per cent. shall not be a good delivery. All certificates of rough copper shall state that the quality has been passed by the assays as good merchantable.

8. In delivering copper the seller shall deliver: 1. Invoice. 2. Weighers' return. 3. Assay certificate. 4. Warehouse certificate (negotiable).

9. Copper stored in warehouses at the port of New York shall be a good delivery. The negotiable receipts of the following refineries shall be also a good delivery; but such receipts shall contain a clause, lighterage free to New York: Raritan Copper Works, Perth Amboy Works of the Am. S. & R. Company., Nichols Copper Company, Balbach S. & R. Company, U. S. Metals Refining Company.

10. Should any standard copper subsequently to tendering prove to be of such quality as not to constitute a valid tender under the rules, buyers shall be entitled to call upon sellers (by giving notice to them in writing, as soon as practicable) to substitute a similar quantity of standard copper of the quality stipulated by the rules, and such substitution shall be made not later than 2:30 p.m., on the first business day following the notice of rejection of the original parcel or parcels. Should the contract be for a special brand, or brands, sellers shall, if possible, substitute the same brand, or brands, and of the proper quality as fixed by the rules, but if unable to thus substitute, and in cases where it becomes a question of special damages the dispute shall be settled by arbitration, according to the rules.

11. On all transactions on the floor of the Exchange commission shall be charged and paid whenever a member of this Exchange transacts business for another party, whether said party is a member of

this Exchange or not, both upon the purchase and sale of contracts for future delivery, and where a "turn" involves two transactions, viz., a purchase and a sale, a commission must be charged on both. This rule applies also to extension or transfer of contracts from one month to another.

The following shall be the minimum rates: One dollar per ton for each and every ton of standard copper bought or sold, when the transaction is made for any party not a member of this Exchange. Fifty cents per ton for each and every ton of standard copper, bought or sold, when the transaction is made for any member of this Exchange, but carried in the name of the member making the transaction. Twenty-five cents per ton for each and every ton of standard copper, bought or sold, when the transaction is made for a member of this Exchange, and his name given up and accepted on the day the transaction is made. Twelve and one-half cents per ton for each and every ton of standard copper, for receiving and delivering the same.

All commissions shall be due and payable as soon as the services shall have been rendered.

The above-mentioned rates shall be in each and every case the minimum that may be charged by any member of this Exchange, and shall be absolutely net and free of all and any rebate or discount in any way, shape or manner, under penalty of expulsion from the Exchange.

12. These rules, being special rules for trading in standard copper, form a part of the general rules for trading in metals; and in conjunction with such general rules shall govern all contracts for standard copper.

Other Metals

Lead—In pig lead dealings shall be in lead known as "Good Merchantable Brands," and dealings on the Exchange shall be for "Delivery New York" and "Delivery East St. Louis."

Spelter—In spelter dealings shall be in spelter known as "Prime Virgin Spelter," and dealings on the Exchange shall be for "Delivery New York," and "Delivery East St. Louis."

Tin—In pig tin the minimum shall be for five tons.

In a paper read before the American Society for Testing Materials, W. H. Walker said there were three methods of coating iron and steel with zinc, namely, the hot galvanizing process in which the material is passed through the molten zinc; the cold or electro-plating and the Sherardizing processes. In conclusion he stated that tests should be developed to ascertain: (1) The uniformity and thickness of the zinc coating. (2) The continuity of the coating. (3) The toughness and ductility of the coating.

Pig Iron Production in 1909

The production of pig iron in the United States for the half-year ended June 30, 1909, as reported by the American Iron and Steel Association, was 11,022,346 long tons. This is an increase of 4,104,342 tons, or 59.3 per cent., over the first half of 1908, and of 2,004,332 tons, or 22.2 per cent. over the second half of last year. In 1908 the increase in the second half of the year over the first was 2,100,010 tons, or 30.3 per cent., so that the rate of gain was greater than in the half year just closed.

The make of pig iron by half-years has been, for eight years past, in long tons:

	First Half.	Second Half.	Year.
1902	8,808,574	9,012,733	17,821,307
1903	9,707,367	8,301,885	18,009,252
1904	8,173,438	8,323,595	16,497,033
1905	11,163,175	11,829,205	22,992,380
1906	12,582,250	12,724,941	25,307,191
1907	13,478,044	12,303,317	25,781,361
1908	6,918,004	9,018,214	15,936,218
1909	11,022,346	.....	.....

The highest production in any half-year during this period was in the first half of 1907; the lowest was in the first half of 1908, when it was only 51.3 per cent. of that of the first half of 1907. The make in the first half of 1909 was 81.8 per cent. of that maximum.

The production by grades in the first half of 1909 was as follows, in long tons, comparison being made with the first half of 1908:

	1908		1909	
	Tons.	Per Ct.	Tons.	Per Ct.
Foundry & forge	1,833,188	26.5	3,000,169	27.2
Bessemer pig	3,388,491	49.0	4,483,490	40.7
Basic pig	1,481,642	21.4	3,288,573	29.8
Charcoal iron	129,220	1.9	171,389	1.6
Spiegel and ferro	85,493	1.2	80,785	0.7
Total	6,918,004	100.0	11,022,346	100.0

Bessemer pig includes some special low-phosphorus iron, not made for conversion into steel. The quantity of such iron made this year was 109,866 tons, being 48,041 tons more than in the first half of 1908, and 41,075 tons more than in the second half. A notable feature is the large make of basic pig. The production in the first half of 1909 was larger than in any previous half year and was larger than any whole year prior to 1905, when 4,105,179 tons were made. Basic pig iron made with charcoal is not included in any of the above figures. The production of charcoal pig iron includes a few tons made with charcoal and electricity. The production of spiegeleisen alone in the first half of 1909 was 40,107 tons, and of ferromanganese alone 40,678 tons.

The production, according to fuel used, was as follows, as compared with the first half of 1908:

	1908.	1909.	Changes.
Coke	6,578,370	10,582,455	I. 4,004,085
Anthracite	210,414	268,502	I. 58,088
Charcoal	129,220	171,389	I. 42,169
Total	6,918,004	11,022,346	I. 4,104,342

Coke includes the very few stacks which use bituminous coal. Nearly all the anthracite furnaces use some proportion of coke mixed with the coal; the production this year with anthracite alone, unmixed with coke, was only 8257 tons.

The production by States for three half-years has been as follows:

	1908 First Half.	1908 Second Half.	1909 First Half
Mass., Conn.	5,220	8,574	9,685
New York	376,208	643,287	688,828
New Jersey	125,143	100,229	118,219
Pennsylvania	3,032,297	3,954,894	4,755,079
Maryland	82,885	100,717	115,260
Virginia	137,356	183,102	183,019
Georgia, Texas	5,260	19,085	10,101
Alabama	605,617	791,397	800,708
West Virginia	27,901	37,650	63,290
Kentucky	21,357	23,739	19,580
Tennessee	115,249	175,557	152,628
Ohio	1,209,399	1,651,926	2,242,987
Illinois	782,865	909,079	1,055,874
Indiana, Mich	167,063	181,033	420,191
Wisconsin, Minn.	69,303	79,635	171,277
Mo., Colo., Oregon, Wash., California	154,981	158,090	183,710
Total	6,918,004	9,018,014	11,022,346

The production in California this year consisted of a small quantity made in the electric furnace; this is included under charcoal iron in the general table above.

Condition of Blast Furnaces

The condition of the blast furnaces for several years past has been as follows:

	In Blast.	Idle.	Total.	Per Cent. In Blast.
Dec. 31, 1903	182	243	425	42.8
Dec. 31, 1904	261	168	429	60.8
Dec. 31, 1905	313	111	424	73.8
Dec. 31, 1906	340	89	429	79.3
Dec. 31, 1907	167	276	443	37.7
June 30, 1908	168	283	451	37.3
Dec. 31, 1908	236	223	459	51.4
June 30, 1909	258	205	463	55.7

The total number of furnaces was increased during the period of depression; and most of the additions made were stacks of large size and capacity for making iron.

During the first six months of 1909 the number of furnaces actually in blast during a part or the whole of the period was 315, as compared with 279 in the last half of 1908 and 250 in the first half of that year.

On June 30, 1909, there were 15 furnaces in course of construction, of which 14 will use mineral fuel and one will use charcoal, as follows: New York, 1; Pennsylvania, 5; Ohio, 2; Indiana, 4; Illinois, 1, and Michigan, 2. In addition one furnace in Pennsylvania and one in Virginia were partly erected, but work on their construction had been indefinitely suspended.

On June 30, 1909, there were 14 furnaces being rebuilt, 13 mineral fuel and one charcoal, as follows: New Jersey, 1; Pennsylvania, 7; Alabama, 2; Ohio, 2, and Illinois, 2 stacks.

The Cleveland-Cliffs Iron Company is building an air line 18,000 ft. long from its Cliff Shaft mine on the Marquette range in Michigan to the North Lake mine near Ishpeming. The pipe used is iron, and will be laid underground, in a trench 2 ft. deep.

Handling Iron Ore at Mount Hope, N. J.

At the Leonard mine of the Empire Iron and Steel Company, at Mount Hope, N. J., the ore when mined is brought to the surface by means of a skip hoist and dumped into a feeding bin, forming a part of the head house, from which it is discharged over a steel chute into an automatic railway car, as shown in Fig. 1. The car has a capacity of approximately three tons of iron ore, and is operated entirely by the "Hunt" gravity system.

By means of this system the car, when loaded from the chute of the feeding bin, runs over the track to the crushing mill, a distance of approximately 100 ft., automatically dumps its load and automatically returns to the head house. This is accomplished by placing the track on a slight grade so that the loaded car will run over the track system by gravity, and when approaching the end of the incline, automatically pick up a cross-bar, shown in Fig. 1, to which is spliced a wire cable connected to a counterbalance weight. As the car carries this cross-bar it raises the weight to a hight sufficient to give the car when emptied the necessary impetus to return it to the head house.

FIG. 1. CAR ON INCLINE SHOWING CROSS-BAR

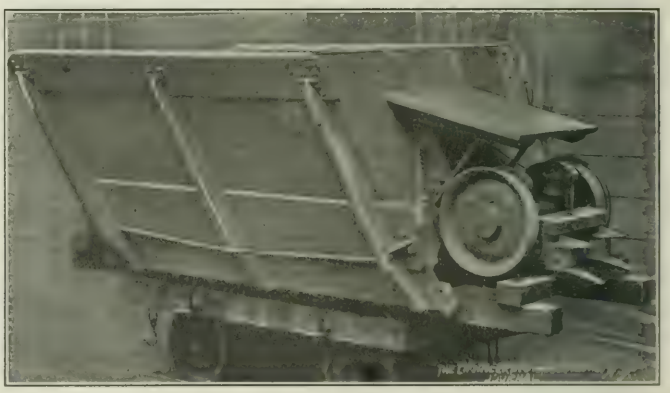

FIG. 2. CAR USED AT MOUNT HOPE, N. J.

The ore is discharged automatically from the car by means of a tripping device, which may be best understood by the illustration of the car, Fig. 2. The body of the car is of an inverted V-shape, with the apex in the center of the car and the apex of the V forming the inclined bottom of the car, thus enabling the ore to be discharged simultaneously on both sides of the car. The car doors are hinged at the top and are connected by a system of levers to the tripping wheel of the car, which running over V blocks nailed to the timbers supporting the track, automatically opens the doors and discharges the ore. The time taken, at this particular installation, for the loaded car to run from the head house to the crushing mill, discharge its ore contents, and return to the head house, a distance of approximately 200 ft., is between 15 and 20 sec., thus giving an ore-handling capacity limited practically only by the rapidity with which the car can be loaded from the chute.

The entire operation of this system is automatic, the energy or work units required to operate the car over the track system being developed entirely by the car itself. At foreign ports this system has earned the characteristic name of "Yankee Devil."

The Wanderer Mine, Rhodesia

SPECIAL CORRESPONDENCE

In the earlier days of Rhodesian mining the Wanderer was one of the more noted mines. It is a large deposit of low-grade gold ore, from which much was expected. That hopes have not been realized is shown by the report of the Wanderer (Selukwe) Gold Mines, Ltd., for the year ended April 30, 1909, which brings disappointment to the shareholders. The ore milled during the year has been 186,708 tons, from which gold to the value of £89,292 was won, but at an expenditure exceeding the revenue by some £8,290. From a technical point of view the report contains interesting information. The statistics are admirable. The mine is of exceedingly low grade, and is to a great extent worked as a quarry. The average assay of the ore treated was 2.501 dwt. and the extraction 2.035 dwt., equal to 78.5 per cent. The working costs, exclusive of development, depreciation and London expense, amounted to $1.66 per ton, or, including the items omitted, to $2.28. The ore developed was not, however, equal to the ore milled, and the ore reserves fell during the year from 415,729 to 372,683 tons. This failure to keep the ore reserves up to the mark is attributed to a scarcity of native labor.

The reduction works consists of a dry crushing plant, the ore being crushed by breakers and rolls and screened through four-mesh screens. The crushing, therefore, is very coarse. Careful records have been kept of the wear and tear of the crushing plant. That on jaw plates amounted to 0.54c. per ton of ore crushed, or, expressed by weight, 0.037 lb. The wear and tear on the shells of rolls was 0.13 lb. of metal per ton crushed, equal to a cost of 1.72c. The life of a 36x15 shell is about 5 months, and of a 26x15 shell about 2½ months. The average tonnage put through the mill with two crushers and four rolls was 625.72 tons, dry weight. The average moisture in the ore was 3.368 per cent. The residues are discharged with a value of 0.521 dwt. The gold, of course, is recovered by the cyanide process.

The company is about to acquire another mine, the Camperdown, upon which some development work was done during the year. It is estimated that this mine has 325,000 tons of ore in sight, of a value of about [illegible] dwt. A wire-rope tramway is to be built to connect the mine with the Wanderer mill.

Attention is called to the high royalty which can be claimed by the British South Africa Company, amounting to from 11 to 19 per cent. of the profits, according to the scale of production and the estimated recovery. In order to effect a purchase of the Camperdown mine it is proposed to reconstruct the Wanderer Company, which has at present an issued capital of £400,100 in £1 shares. The new company will have a nominal capital of £150,000 divided into 600,000 shares of 5s. each. The present shareholders are to get 431,386 new shares, the Matebele Proprietary Mines 134,007 shares for the Camperdown mine, while £5000 cash and

34,607 shares will be held in reserve. These reserve shares have been offered to the British South Africa Company in commutation of the royalties to which that company would be entitled under the present arrangement.

Mineral Production of Alabama in 1908

By Eugene A. Smith*

As a producer of iron ore, the Birmingham district, Alabama, ranks second in importance in the United States, its output during 1907 having been in excess of 4,000,000 long tons, from which more than 1,500,000 tons of pig iron were made. In 1908 there was a decrease of about 7 per cent. in the production of iron ore, the amount being 3,734,438 long tons. The depression in business and actual production did not prevent preparations for a future increase. Extensive improvements were begun at the mines of the Tennessee Coal, Iron and Railroad Company, and the Sloss-Sheffield Steel and Iron Company, while some other companies made arrangements to open mines and test new deposits.

Coal and Coke—Late returns to the office of the State mine inspector show that the total output of coal during 1908 was 11,523,299 tons, as compared with 14,424,863 tons in 1907 a decrease of 2,901,564 tons. The total output of coke in 1908 was 2,335,602 tons, as compared with 3,096,722 tons in 1907, a decrease of 761,120 tons. Full returns will increase these figures of 1908 production somewhat.

Cement—During 1908 only two plants making portland cement and one making slag cement were in operation in Alabama, namely, the Standard Portland Cement Company, Leeds, Jefferson county, using Trenton limestone and carboniferous shale; and the Alabama-Portland Cement Company, Demopolis, Marengo county, using the Selma chalk and a residual clay. Both of these plants suffered from the general business depression. The projected portland cement plants at Village Springs, Blount county, Ragland, St. Clair county, and at St. Stephens, Washington county, have not yet begun operations. The slag cement industry, like the others, suffered from the effect of the panic.

Pyrite—As heretofore, most of the pyrite produced in Alabama in 1908 came from the "copper lead" in Clay county, within three or four miles of Pyriton station. At these points the deposit shows a thickness of from 7 to 9 ft., and in some parts carries a small percentage of copper. The actual production was confined to three companies. This industry in 1908, like so many others, suffered from the financial depression.

Bauxite, Mica and Graphite — The amount of bauxite shipped during 1908 registered a large falling off from the production in 1907 of 11,000 tons. The principal mining was done in the vicinity of Rock Run in Cherokee county, the two companies which shipped practically all the bauxite produced in Alabama being the Republic Mining and Manufacturing Company and the General Bauxite Company. The production of mica during the year was about 55 tons. Only three companies were active during 1908 in the graphite industry, the production being less than 500 short tons of refined graphite. The Alabama graphite is crystalline, or flake graphite.

*State geologist, University, Ala.

FIG. 3. GENERAL VIEW OF THE INSTALLATION

The Anti-Dredge Convention in California

Special Correspondence

Mayor White, of Sacramento, Cal., called an Anti-Dredge Mining Convention at Sacramento for July 22, but was not himself present when it met. It is too early to give the result of the proceedings, but it is hardly probable that anything more definite will be done than to appoint a committee to investigate the subject of dredging for gold in the Sacramento valley. The fact is, that it is not possible for these people to interfere with this class of mining unless they can prove some damage directly traced to dredge operations. There is more gold dredging being done at Oroville than at any other place, but the city of Oroville was not invited to send any delegates to the convention. The Chamber of Commerce of Oroville, on the day before the convention, adopted resolutions to the effect that, not having been invited to the convention, they would forward to it the opinion of Oroville on the subject. The Chamber then expressed itself as firm in the opinion and belief that the agitation against dredge mining is the result of lack of knowledge on the subject, and that a full investigation should convince the people of the Sacramento valley that there is nothing to fear from the industry. It is further their belief that the dredging industry has been of inestimable value to the valley by giving added value to the lands, attracting foreign capital, providing a remunerative market for both skilled and unskilled labor, and, in general, stimulating industry. The Chamber, therefore, deplores the attack made on the dredging people and their industry. These sentiments, expressed by the people of Oroville through their Chamber of Commerce, were rather a damper on the anti-dredge convention.

The German Potash Salts Syndicate

The troubles of the Kali-Syndikat in Germany do not seem to be over, by any means. According to Berlin despatches, a meeting was held on July 23 at which a motion to continue the agreement for two months was voted down. The despatch says, that "the difference of opinion was so sharp between the representatives of the Virginia-Carolina Chemical Company and the Northern Fertilizer Trust that the Government's leading mining expert, Herr Paxmann, who presided, said that a continuance of the negotiations was useless."

On July 24, however, another meeting was held, of which the Berlin report says: "Tonight it was decided to continue the syndicate for one year, but without the Schmidtmann mines, with which the American packing and fertilizing interests are connected. The result is considered a drawn battle.

"While the Americans would have preferred to see the syndicate dissolved, both they and the Germans say they are satisfied. The Americans are confident that they are now assured of an era of better treatment in the matter of prices and purchasing conditions."

Metallics

The cost of melting cathodes of copper and casting in the form of ingots, cakes, or wire-bars at the refineries in the neighborhood of New York is $2@2.50 per 2000 pounds.

To better illuminate the plumb line for the instrument man in underground surveying, a piece of ordinary vellum tracing cloth held behind the line and in front of the candle serves very well.

In attempting to shovel rock from the top of the pile, as is necessary in sinking or to clear a space for the column of a machine drill, it will be found helpful in a majority of cases to bend back the point of the shovel slightly.

A stout piece of wire bent in the shape of an S and used to hang the bucket of drill water from the bar or arm on which the machine is set will always insure the water being convenient and handy to reach and will prevent slopping and spilling.

Selenium is recovered by the electrolytic refiners of copper from the fume that comes off from the silver-refining furnaces wherein the slime is treated. The selenium is recovered as a metal and is used in the arts for coloring glass and pottery, and also in the electrical industry.

An easily remembered formula for the horsepower of a stream of water is the following: Multiply the head in feet by the cubic feet of flow per second and divide the product by 11. This gives the actual horsepower delivered by a Pelton wheel and presupposes an efficiency of 80 per cent. for the wheel. It is sufficiently accurate for all field purposes.

The temperature results obtained in a recent bore hole, put down to a depth of nearly 5000 ft., are interesting. The records show that the average gradient from the surface down to the lowest point in the bore hole was 1 deg. F. in 87½ ft. This result compares with 1 deg. F. in 64 ft., as noted in the report of the British Association for the Advancement of Science.

The Lake Superior Smelting Company, which treats the copper concentrates of the Lake, Osceola and Ahmeek mines, produces from 55,000,000 to 60,000,000 lb. of copper per annum. About half of this is derived from the product of the above Michigan mines above mentioned, the remainder is derived from Boston & Montana cathodes, which are mixed with the Michigan copper, the product being sold as Lake copper. The Montana cathodes are treated at a charge of $4 per ton.

In the development of prospects, too much emphasis cannot be laid on the importance of "following the ore." Costly mistakes are often made by a decision to run a long crosscut adit to the ore, or to sink a shaft and crosscut to the ore, before it has been proved that the ore is really present. In prospect shafts levels should be run at least every 50 ft. When it has been proved that ore is present, it is time to figure on a crosscut adit, or a shaft in the country rock with crosscuts to the ore, for the economical extraction of the ore.

In the selection of miners, the superintendent should make sure that the men he employs are experienced in the mining of the character of ore and deposit to be worked. The miner who has had wide experience and is graded as an efficient man in wide stopes, where everything is shot down and loaded into the cars, is seldom qualified to work in a narrow stope carrying rich ore. Here the so-called "candle box" miner is worth two or three times the wage of a wide stope miner. This point is often overlooked, the result being a lack of efficiency and a corresponding increase in cost of mining.

One of the prime requisites for a compressed-air installation is ample tank capacity, both for insuring steady pressure and removing as much water from the air as possible. If troubled by freezing at the drills, drain pipes should be inserted in the pipe line at suitable intervals, preferably at low points. A tee is put in the line with the side opening pointing downward. A short pipe of any convenient length with a valve at the lower end is put into the tee. The water may be drawn off at any time. A piston drill may often be prevented from freezing by attaching a piece of rubber hose a foot or more in length to the exhaust elbow.

In sinking prospect shafts the dirt or rock is usually removed by hand for the first 10 ft. When this point is reached a windlass should be installed; this device may be profitably employed to depths ranging from 50 to 100 ft., depending on whether the prospect warrants the installation of a whim or boiler and hoist before the latter depth is reached. In any case, working below 100 ft. with a windlass is bad practice; a horse whim should be installed at this, or even less, depth. The horse whim may be found effective to a depth of 300 ft., but before this point is reached, if the mine is of value, it is usually time to install a boiler and hoist.

In mining and metallurgical operations, as well as in other industrial enterprises, the heads of the different departments should be held responsible for the work in their departments, and there should be no question as to the scope of their authority and responsibility. Lack of system in this respect is one of the chief causes of dissatisfaction and sore headedness which so often arise in the operation of large plants; the consequence is inevitably mirrored in the net results of the operation. The best results can only be obtained when everyone puts his shoulder to the wheel and pushes in the same direction.

Permanent underground survey points are best marked by small screw-eyes in wooden plugs which are driven in drill holes in the roof of the workings. The plugs should be at least 6 in. long and tapered from about a 2-in. diam. at the large end. Screw-eyes are preferable to horseshoe nails as it is easy to slip the plumb-bob string through them and the plummet always hangs from the same point. Plugs may be marked by tacking on them small pieces of tin or copper sheet into which station numbers have been stamped. For station locations a well sheltered place should be selected for the plug, and one where the hanging-wall is firm.

Too little or improper timbering is often the cause of serious annoyance and often expense to the prospector and mine operator. In order to make funds go as far as possible in searching for ore, or in developing an orebody, even the old-time miner will take chances, with regard to timbering, that often result disastrously. In the long run, it will be found that much money can be saved by using ordinary care in securely timbering ground that is at all suspicious. Many falls of ground, the results of which have necessitated much labor, or have even resulted in the loss of the entire mine, might have easily been prevented had the time been taken to place two or three sets of timbers when the ground was first broken.

In mine sampling a simple and efficient device for catching the rock as it is chipped or broken is made as follows: Take a piece of stiff wire about 5 ft. long and bend it into the form of a square, with sides 10 or 11 in. in length; the surplus wire remaining on each end of the piece is bent outward from the middle of the open side to form the handle of the device. Now take a piece of canvas or heavy duck 4 ft. in length and about 20 in. deep and shear off the ends diagonally so that the length of the strip at the top shall be 4 ft. and that at the bottom about 2 ft. Lap the upper end over about ½ in. and stitch it, providing ample room for the wire to pass through. Sew the sheared ends together, thus forming a funnel shaped bag. Now pass the wire through the lap or hem, and the bag is complete. While catching the sample, a stout piece of twine is tied in a slip knot around the bottom of the bag. When it is desired to transfer the sample to the sample sack, the twine is removed and the contents of the bag poured into the sack. By the use of this bag, samples may be taken from points which seem inaccessible when using a candle box or some other method of catching the rock.

Patents Relating To Mining and Metallurgy

A Selected and Classified List of New Inventions Described during the Past Month in the Publications of the Patent Offices

UNITED STATES AND BRITISH PATENTS

A copy of the specifications of any of these patents issued by the United States Patent Office will be mailed by THE ENGINEERING AND MINING JOURNAL upon the receipt of 25 cents. British patents are supplied at 40 cents. In ordering specifications, correspondents are requested to give the number, name of inventor and date of issue.

ALUMINUM

SOLDER—An Improved Aluminum Solder. William H. Finfrock, Chicago, Ill. (Brit. No. 12,494 of 1908.)

ARSENIC

TREATMENT OF ORES AND SPEISS—Process of Treating Arsenical Ores and Speiss. Anson G. Betts, Troy, N. Y. (U. S. No. 927,021; July 6, 1909.)

COAL AND COKE

COAL-CUTTING MACHINES — Improvements Relating to Coal Cutting Machines. Robert Hay and Henry G. Nadin, Burton-on-Trent, England. (Brit. No. 15,340 of 1908.)

COAL-PICKING TABLE. John E. Jones, Hazleton, Penn. (U. S. No. 927,412; July 6, 1909.)

COKE—Improvements in Gas and Coke Oven Plant. Heinrich Koppers, Essen-Ruhr, Germany. (Brit. No. 982 of 1909.)

COKE-OVEN. Heinrich Koppers, Essen-Ruhr, Germany. (U. S. No. 925,815; June 22, 1909.)

COKE-OVENS—Apparatus for Watering Coke-Ovens. Daniel D. Stauft, Penn. (U. S. No. 925,241; June 15, 1909.)

COKE-OVENS — Improvements in Coke Ovens. Louis Bansart, Yolimont, Belgium. (Brit. No. 9377 of 1908.)

COKE-OVENS — Improvements in Coke Ovens, Furnaces and the Like. Francois C. Ghislain, Douai, France. (Brit. No. 8774 of 1908.)

CONVEYER—An Improved Conveyer for Use in Coal Mines. Peter Milligan, Midlothian, Scotland. (Brit. No. 16,637 of 1908.)

TIPPLE for Coal-Cars. William L. Hansen and Alfred Hayes, Coalville, Utah. (U. S. No. 926,116; June 29, 1909.)

WASHING—Improvements in Apparatus for Washing and Separating Coal. Louis Ferrette, Ekaterinoslaw, Russia. (Brit. No. 12,393 of 1908.)

COPPER

EXTRACTION PROCESS — Improvements in Extracting Copper from Its Ores, Matte or the Like. Henry K. Hess, Philadelphia, Penn. (Brit. No. 11,864 of 1908.)

GOLD AND SILVER

FILTER-LEAF. Hiram W. Blaisdell and Harry A. Brooks, Los Angeles, Cal. (U. S. No. 925,554; June 22, 1909.)

IRON AND STEEL

BLAST-FURNACE-CHARGING APPARATUS. Gibbon C. Shackleford, Youngstown, Ohio, assignor of one-half to Thomas J. Bray, Pittsburg, Penn. (U. S. No. 926,143; June 29, 1909.)

DRYING AIR—Method of and Apparatus for Drying Air. David Baker, Philadelphia, Penn. (U. S. No. 926,972; July 6, 1909.)

MANUFACTURE—Method of Making Iron and Steel. Communicated from John T. Jones, Iron Mountain, Mich. (Brit. No. 12,324 of 1908.)

MANUFACTURE—Process of Producing High-Grade Steel from Low-Grade Material. William R. Palmer, Bridgeport, Conn., assignor of one-half to Frank A. Wilmot, Bridgeport, Conn. (U. S. No. 924,818; June 15, 1909.)

MANUFACTURE Process of Producing High-Grade Steel from Low-Grade Material. William R. Palmer, Bridgeport, Conn., assignor of one-half to Frank A. Wilmot, Bridgeport, Conn. (U. S. No. 924,818; June 15, 1909.)

OPEN-HEARTH STEEL—Manufacture of Open-Hearth Steel. Thomas S. Blair, Jr., Elmhurst, Ill., assignor to Blair Engineering Company, Chicago, Ill., a Corporation of New York. (U. S. No. 927,097; July 6, 1909.)

ORE TREATMENT—A Method of Reducing Iron Ores. Communicated from John T. Jones, Iron Mountain, Michigan. (Brit. No. 12,323 of 1908.)

LEAD

SUBLIMED WHITE LEAD — Improvement in Method of Manufacturing Sublimed White Lead. Louis S. Hughes, Joplin, Mo. (Brit. No. 16,520 of 1908.)

NICKEL AND COBALT

MANUFACTURE OF NEW COMPOUNDS of Cobalt and the Application Thereof. The Mond Nickel Company, Ltd., Heinrich Hirtz and Matthewman D. Cowap, London. (Brit. No. 13,207 of 1908.)

NITRATE OF SODA

EXTRACTION FROM CALICHE—Improvements in Lixiviation Apparatus More Particularly Adapted for Use in the Extraction of Sodium Nitrate from Caliche. Communicated from Robert T. Love, Iquique, Chile, South America. (Brit. No. 1381 of 1909.)

TIN

DETINNING—Process for Recovering Tin from Tinned Scrap. Emerson C. Higgins, Bayonne, N. J. (Brit. No. 23,069 of 1908.)

ZINC

ELECTRIC FURNACE for the Continuance Extraction of Zinc from Its Ores. Eugene F. Cote, and Paul R. Pierron, Lyons, France. (Brit. No. 18,653 of 1908.)

ZINC DUST—Manufacture of Zinc-Dust. Sherard O. Cowper-Coles, London, England. (U. S. No. 623,411; June 1, 1909.)

MANUFACTURE — Improved Process of Manufacture of Zinc. Oscar Loiseau, Liege, Belgium. (Brit. No. 15,176 of 1908.)

SMELTING PROCESS—Improved Apparatus for Use in Smelting Zinc Ore, Galvanizers' Dross and the Like. Evan H. Hopkins, Addlestone, Surrey, England. (Brit. No. 12,403 of 1908.)

SMELTER FUMES—Improved Means for Treating the Fumes of Spelter Furnaces. Henry H. Howard and George Hadley, Halesowen, near Birmingham, England. (Brit. No. 19,380 of 1908.)

REFINING—Improvements in Appliances to be Used in the Refining of Zinc during Extraction by Distillation. The New Delaville Spelter Co., Birmingham, and Edw. H. Shortman, Bloxwich, England. (Brit. No. 16,056 of 1908.)

ORE DRESSING—GENERAL

CONCENTRATING—Improvements in Apparatus for Washing, Separating or Concentrating Minerals or Substances of Different Specific Gravities. Geo. H. Tarver and M. Coulson and Co., Ltd., Spennymoore, England. (Brit. No. 11,996 of 1908.)

CONCENTRATOR. William M. Stover, Oakland, Cal., assignor to Stover-Glaze Manufacturing Company, San Francisco, Cal., a Corporation of California. (U. S. No. 926,631; June 22, 1909.)

DRY ORE SEPARATOR. James J. Lapping, Woodward, Ala. (U. S. No. 926,428; June 29, 1909.)

ELECTROMAGNETIC SEPARATION—Apparatus for Electromagnetic Separation. Ferdinand Steinert and Heinrich Stein, Cologne, Germany. (Brit. No. 6257 of 1909.)

ORE CLASSIFIER. Oscar M. Kuchs, Anaconda, Mont., assignor of one-half to Frederick Laist, Anaconda, Mont. (U. S. No. 927,059; July 6, 1909.)

ORE-FEEDER. Norman V. Fitts, Denver, Colo., assignor of one-half to Colorado Iron Works Company, Denver, Colo. (U. S. No. 926,085; June 22, 1909.)

SCREENING APPARATUS—Improvements in the Construction of Rotary Screening Apparatus. Thomas A. Pool, Hayle, Eng. (Brit. No. 20,486 of 1908.)

SEPARATOR—Improvements in or Relating to Centrifugal Machines for Separating Solids from Liquids. Communicated from William H. Bradley, Chicago, Ill. (Brit. No. 25,300 of 1908.)

MINING—GENERAL

EXPLOSION GASES—Composition for Oxidizing and Purifying Explosion Gases. Herbert Walker, Knights, Transvaal. (U. S. No. 925,670; June 22, 1909.)

VENTILATION—System of Mine Ventilation. Domenico Belloni, Edri, Penn. (U. S. No. 925,274; June 15, 1909.)

METALLURGY—GENERAL

BRIQUETTING Improvements in or Relating to the Manufacture of Briquets of Coal or Ores. Communicated from Wulff & Cie., Düsseldorf, Germany. (Brit. No. 10,625 of 1908.)

DESULPHURIZING—Process for Desulphurizing and Agglomerating Ores. Cyrus Robinson, Mount Vernon, N. Y. (U. S. No. 926,289; June 29, 1909.)

ELECTROLYTIC RECOVERY—Apparatus for Recovering Metals from Ores and Other Substances. Léon Dion, New York, N. Y., assignor to the Americus Electro-Hermatic Company, New York, N. Y., a Corporation of Arizona. (U. S. No. 925,626; June 22, 1909.)

FURNACE-GAS — Process of Obtaining Sulphur, etc., from Furnace-Gases. Franklin R. Carpenter, Denver, Colo., assignor by direct and mesne assignments, to the American Iron and Steel Alloys Company, a Corporation of Colorado. (U. S. No. 925,751; June 22, 1909.)

REFRACTORY ORES—Method of Treating Ores. Hascal A. Hogel, New York, N. Y. (U. S. No. 927,046; July 6, 1909.)

MINING MACHINERY AND APPARATUS

CONVEYERS—Improvements in Conveyers for Use in Mines. Roman Rieger, Witkowitz, Austria. (Brit. No. 18,516 of 1908.)

HOISTING DEVICE—A New or Improved Safety Device for Mine Cages, Lifts and the Like. Fred'k H. Watkeys, Burry Post, Wales. (Brit. No. 15,082 of 1908.)

HOISTING DEVICE—Safety Device for Mine-Elevators. John K. Williams, Nanticoke, Penn., assignor of one-half to John Washcofski, Nanticoke, Penn. (U. S. No. 927,440; July 6, 1909.)

HOISTING DEVICES—Improvements in Devices for Preventing Excessive Speed in Winding Engines and the Like at Collieries, Mines and Other Places. John Wood, Wigan, Eng. (Brit. No. 9873 of 1908.)

HOISTING DEVICES—Improvements in Devices for the Prevention of Overwinding at Collieries, Mines and Other Places. John Wood, Wigan, Eng. (Brit. No. 9685 of 1908.)

HOISTING ENGINES—Improvements in Means or Apparatus for Controlling Winding Engines Used in Connection with Mines, Hoists, Lifts and the Like. William Wilde and William Petrie, Yorkshire, England. (Brit. No. 12,006 of 1908.)

METALLURGICAL MACHINERY AND APPARATUS

DISCHARGING APPARATUS—Improvements Relating to Means for Discharging Materials from Receptacles Such as Lime Kilns, Cupolas, Calcining Furnaces, Hoppers and the Like. Edmund J. Noble, Worksop, Eng. (Brit. No. 8882 of 1908.)

EVAPORATING APPARATUS — Improvements in and Connected with Apparatus for Use in Evaporating Liquid from Brine for the Production of Salt or for Evaporating Liquid from Other Solutions. James Hodgkinson, Pendleton, Manchester, England. (Brit. No. 5011 of 1908.)

FURNACE DOORS, ETC.—Means for Operating the Doors of Retort Furnaces, Coke-Ovens, and the Like from a Distance. Paul Riecke, Dessau, Germany. (U. S. No. 925,651; June 22, 1909.)

ROASTING-FURNACE for the Treatment of Refractory Ores. Hascal A. Hogel, New York, N. Y. (U. S. No. 926,942; July 6, 1909.)

Personal

Mining and metallurgical engineers are invited to keep THE ENGINEERING AND MINING JOURNAL informed of their movements and appointments.

Thomas H. Cole has been visiting some of the mines of the Lake Superior district.

J. L. Parker recently left Victoria, B. C., to examine a mining claim in southeast Alaska.

Ben Howe recently returned to London from Tunis, where he had been engaged on professional business.

A. H. Brooks, after visiting the Alaska-Yukon-Pacific Exposition, at Seattle, Wash., started for Alaska.

John D. Ryan, president of the Amalgamated Copper Company, was recently in the Lake district of Michigan.

S. J. Speak, of the firm of Hooper & Speak, has returned to London from a visit of inspection in West Africa.

Charles M. Hall, president of the Aluminum Company of America, is on his way from Liverpool to New York.

Lester W. Strauss recently left Lima, Peru, for a short visit to some coal prospects on the Oroya-Huancayo railroad.

D. W. Brunton has just returned to Denver, Colo., from an examination of the Pioneer mines in Nye county, Nevada.

I. Lund has left London to take charge of a mine in the Caucasus for the Russian Estates and Mines, Ltd., of London.

D. R. Thomas has accepted a position as manager for the Predilecta Mining Company, at Guanacevi, Durango, Mexico.

H. E. West, of the staff of El Oro Mining and Railway Company, El Oro, Mexico, left New York, July 24, for England.

Dr. Ernst Angermann has removed from Fuerte, Sinaloa, to San Luis Potosi, Mexico, where he will open an office as consulting geologist.

James Barr has resigned his position as an instructor at the Michigan College of Mines and will go to Montana as manager of the Assets Gold Mining Company.

Milnor Roberts, of Seattle, Wash., dean of the School of Mines of the University of Washington, was at the Nicola Valley goldfield in British Columbia recently.

Prof. F. D. Peters, of Harvard University will spend the next two months in the mining regions of the West, gathering material for the re-writing of his book on "Modern Copper Smelting."

Sidney B. Tyler, a graduate of the Colorado School of Mines, and recently manager of properties in Nevada, has taken the management of the Topeka mine near Central City, Colorado.

Frederick B. Irvine, of New York, is manager of the Buena Fe Mining Company, at Guerdo, Chihuahua, Mexico. Samuel Pearce, of Cripple Creek, Colo., is in charge of mill construction at the mines.

M. O. Leighton, chief hydrographer of the U. S. Geological Survey, has gone to Honolulu, Hawaii, to establish there a hydrographic service for the Territorial government. He will be absent about three months.

Arthur Neel, superintendent of the Fayette City mines of the Monongahela River Consolidated Coal and Coke Company, has been appointed district superintendent, with office at California, Penn. M. Gibson is his successor at Fayette City.

William Braden, general manager of the Braden Copper Company, is expected to arrive in New York from Chile early in August. During his absence, Frank Langford will be acting general manager in charge of the company's operations in the province of O'Higgins, Chile.

H. S. Geismer, of Sayreton, Ala., has resigned his position as general superintendent of the coal and coke operations in Alabama for the Republic Iron and Steel Company, to date from Sept. 1. He has accepted a similar position in Tennessee with the Southern Steel and Iron Company.

Frank M. Kurie has resigned his position as general manager of the Portland Gold Mining Company, Cripple Creek, Colo., but will continue with the company as consulting engineer. Frank L. Smale, superintendent, will have entire charge of the mine. Mr. Smale has been at the Portland 13 years, starting in as a mucker and rising gradually to his present position.

William D. Calverly has been appointed a member of the board of control of the Michigan College of Mines, succeeding Walter Fitch, who resigned on account of removal to Utah. Mr. Calverly was one of the earliest students of the college, entering in 1886 to take a course in metallurgy and ore dressing in order to fit himself for the management of the Chapin iron mine.

George E. Farish, of Denver, Colo., after a two months' examination trip in the States of Guerrero and Jalisco, Mexico, passed through El Paso, Tex., July 4, on his way to Sonora, where he will make a general reconnoissance of the Yaqui river valley along the line of the new railroad now building. He will be out of mail and telegraph communication until he returns to his Denver office, early in August.

Obituary

Frederick J. Allen died at San Blas, Tepic, Mexico, July 7, aged 28 years. He was born in Wilkes-Barre, Penn., and educated as a mining engineer. He was employed for a number of years at various collieries in the anthracite region, and held a good position in his profession. In 1903 he went to Mexico for persons interested in coal mining there, and had since remained in that country.

John A. Reid died in Stockton, Cal., July 4. He was a graduate of the University of California, and for some time taught in the University of Nevada. He had also done much geological work in California and Mexico.

Thomas Southern, of New Philadelphia, O., superintendent of the Highland coal mine at Warnock, in Belmont county, was killed July 12, by an explosion of gas in the mine. He had entered the mine with a party of miners, and was 200 ft. from the entrance when the explosion occurred. Several of the miners were injured.

Captain Wager Bradford, manager of the Robinson gold mines on the Witwatersrand, died at Johannesburg, Transvaal, July 18, aged 48 years. He was born in Stockton, Cal., was educated at Hamilton College and studied mining engineering in the University of California. He was superintendent of various gold mines in California until 12 years ago, when he went to South Africa. He leaves a widow and two children.

Societies and Technical Schools

British Association for the Advancement of Science—In connection with the annual meeting of the British Association for Advancement of Science at Winnipeg, Manitoba, in August, arrangements have been made by Professor Willet G. Miller, Ontario provincial geologist, for the mining and geological sections of the association to visit the Cobalt and Sudbury districts before the meeting. The trip will be made from Aug. 17 to 20. The headquarters of the visitors at Cobalt will be the office of A. A. Cole, mining engineer of the Temiskaming & Northern Ontario railway.

Case School of Applied Science—The junior mining class, with Professors Smith, Van Horn and Abbott in charge, went to South Dakota this year for their practice-term trip. They spent the month of June in visiting the mines and mills in the vicinity of Deadwood. Professor Van Horn and a few of the students extended the trip to include an excursion to the Yellowstone National park where a brief study of the geology will be taken up. The sophomore mining class under the direction of Professor Cadwell and Mr. Pallister made their headquarters at Greensburg, Penn., during the practice term. The Keystone Coal and Coke Company kindly permitted the class to survey No. 2 mine and a five-mile circuit was run. With this as a base many shorter lines were run and the notes were all plotted on one large map. Many trips were taken to the mines in that region. An excursion was made to Pittsburg and the Government Testing and Rescue Station was visited.

Special Correspondence from Mining Centers

News of the Industry Reported by Special Representatives at Butte, Denver, Salt Lake City, Goldfield, Cobalt and London

REVIEWS OF IMPORTANT EVENTS

San Francisco

July 22—A Shasta county man has put in operation in the Blue Ravine district, a short distance above Folsom, Sacramento county, several prospecting drills to test the underlying gravels, with a view to dredging them if found to be profitable. This district has for some years been turning out considerable gold obtained in various mines by the drifting method. The Blue Ravine, Gray-Wing and half a dozen other properties paid largely by this system, though work has ceased at some of the mines. The section was mined on the surface 50 or more years ago by the early-day miners, but not until about 10 years ago were extensive operations commenced. The underlying gravel is known to exist for several miles, but only certain portions will pay to drift. The whole area could be dredged if they could dredge satisfactorily to an 80-ft. depth and reach bed rock. The deposits are not all as deep as that, but the most profitable are. The gravel is not cemented and is easily washed in sluices when taken to the surface. The district should be quite profitable provided it is found feasible to work the gravel by dredges.

Yolo county has now joined the Anti-Débris Association, but as its supervisors only contribute $25 per month to the support of the association, it is not thought that much of importance will be done. The association still has its spies out after hydraulic miners, but also seems to be trying to get after the dredge miners as much as possible. It is not succeeding as well in this as it did in the fight against hydraulic mining.

In a district called Table Mountain, about seven miles northeast of Bodie, Mono county, some prospectors have made a good strike in an old abandoned tunnel. Rich float has been found in that vicinity at different times, but not enough active work had been done to ascertain the source. In the old tunnel referred to three veins have been crosscut, the ore running from $40 to $100 per ton. Quite a number of men have gone in and a new district may be the result.

The range known as the White mountains extends through Mono county south into Inyo county, a region hitherto very little prospected, though since the discoveries in southern Nevada more or less work has been done. Last fall some men started on a prospecting trip in the Inyo part of the range and found good indications, but the snows drove them back into the valleys. This summer they have been busy again and have formed the camp, called Gold Storage, because their prospects are turning out so rich. The richest claim so far found is the Golden Siren, owned by D. C. Adamson and John Beauregard, of Bishop, Inyo county. W. G. Adamson, of Winnemucca, Nev., has interested a number of men who are putting money into development work in the new section where the present showings are very encouraging.

What is known as the "Harrison Gulch Townsite Case" in the mining district of that name at Knob, Shasta county, has been stubbornly contested for some years, but the Victor Mining Company has won out in the end. The Bonanza mineowners were the original locators, but they sold out to the Victor company. They got a mineral patent to the land in the first place, but others came on and built a town and defied the mineral owners, paying no rents, etc. Now under the last decision the mineral patent holds and the subsequent locators must recognize it.

Butte

July 22—The State Railway Commission has directed that the rates on coal shipments over the Northern Pacific and the Yellowstone Park railways from points in the eastern part of the State and particularly from the Bear Creek coalfields in Carbon county and the mines near Chestnut in Gallatin county be reduced, approximately, 10c. The new tariff is to go into effect on Aug. 1. The decision of the commission states that the rates made by the Northern Pacific were excessive. The new carload rate on coal from Red Lodge, Wilsey and Bridger to Butte is $1.65; from Chestnut to Butte, $1, and from Electric to Butte, $1.25 per ton.

At a special meeting of the stockholders of the Raven Mining Company held on July 22, it was voted to sell the property to the Raven Copper Company, which involves an assessment of 25c. per share at the time of the exchange of stock, the last date for which is Aug. 31. The new company is to assume the mortgage of $65,000, to discharge the floating debt amounting to about $20,000, and to assume maintenance expense since June 1. It is expected that work will be resumed within 30 days, and that John Berkin will remain as manager.

Robert H. Gross, president of the East Butte Copper Company, is in Butte inspecting the East Butte and its subsidiary company, the Pittsmont. Mr. Gross says the Pittsmont is pushing development work more than has ever been done before and several new orebodies have been opened up. The mine shows much improvement since he was here, last March, and is said to be in better condition than it ever has been in its history. The new furnace at the smeltery was blown in last week and the old furnace has been completely overhauled and is expected to be blown in immediately. They are shipping about 350 to 400 tons of ore a day of which about one-half is first-class ore.

General Manager F. H. Cooney, of the East Butte Extension Company, has just made a report to the stockholders, reviewing the new work which is being done on that property. A new two-compartment shaft, which is about 300 ft. from the Belmont shaft of the Anaconda company, has been sunk to a depth of 250 ft. and crosscuts of over 500 ft. have been driven. The property is paid for in full, with the exception of three town lots on which there is a balance due of $2400. The total indebtedness of the company will not exceed $4000. The work at the mine is being done entirely by leasers and the only expense is that of the company office.

Denver

July 23—In the Cripple Creek district no small stir has been caused by a strike of gold ore on a dairy farm just outside the town, in Dead Ox gulch. The ore shows what in that camp is called "rusty gold," i.e., oxidized calaverite. The assays so far made range from $2 to $200 per ton, and all adjacent ground has been taken up. A new shaft house and ore house on the Gold Sovereign, to replace the building recently burned down, are in course of erection. The mine will be operated by the Clements Leasing Company. The Cresson Consolidated company, Richard Roelofs, manager, has cut the main vein at the 1000-ft. level, and the ore is said to average over an ounce per ton. The width of the vein is reported at 12 ft. This is a well-managed, prosperous mine, and is producing from 2500 to 3000 tons per month. The Cresson company has also secured leases on some of the adjoining ground.

The Elkton mine, one of the oldest producers of the Cripple Creek district, has issued its annual report, showing an output for the year, ended June 1, of 27,120 tons of gold ore, of a gross value of $630,132, giving a net profit to the company of $176,875. The dividends paid for-

ing the year amounted to $237,500, and the total dividends paid to date amount to $2,354,460, with a reserve fund of $254,961. Large bodies of low grade ore which will pay to mill have recently been developed in the southern extension, outside the breccia area and in the granite. The main shaft of the Doctor-Jack Pot has been equipped with an electric hoist and powerful compressor and the lessees are working with machine drills, and shipping steadily.

At Georgetown it is reported that the Kelly tunnel, which is now about 2800 ft. into Democrat mountain, is to resume work, and should eventually intersect some of the richest early-day producers of this section. On Saxon mountain, the Doric tunnel, driven by British capital, is in 3000 ft., and is going to be the outlet for a big tonnage of the ores of the series of veins whose surface workings have for many years demonstrated their richness.

The Griffith, a former Clear Creek county producer, will be worked through this tunnel, and it is stated that the owners of the mine are to erect a 50-ton mill at the portal. The Drummond group, on Columbia mountain, is credited with a shipment of 125 tons of silver-lead ore of smelting grade. The property has a good surface equipment for development work. The Mineral Chief, also on Democrat mountain, netted during June $3050 from concentrates. The smelting ore, of which a fine body has just been opened, shows a high silver and lead content.

In the White Raven mine at Ward, a tunnel is being driven to exploit a rich shoot of ore which produced heavily at one time from a shaft. It is stated that ore has been opened for a distance of 70 ft., giving 225 ft. of stoping ground. Some of the ore is very rich, showing much native silver. Two hundred sacks of this ore have already been shipped to the smelters.

In the Silverton district, the Iowa-Tiger, an extension of the Silver Lake, is being worked by a leasing company, with a capital stock of $15,000. A third monthly dividend of 20 per cent has just been declared, making 60 per cent already paid. A big strike is reported at Animas Forks, in the Bagley tunnel, of which Charles Gegner is manager. No details are yet available.

Goldfield

[illegible] The new mill of the Goldfield Consolidated handled during last week an average of 520 tons per day, and the old mill [illegible] tons. The average value of the ore was between $30 and $35 per ton. Dress [illegible] were made on July 15 for "high grading." One man admitted his guilt and was fined $100 and sentenced to five months in the county jail. The present management of the company has succeeded in eliminating to a great extent the practice of stealing high grade ore, and the courts are now more severe with these offenders than in years past.

The Round Mountain Mining Company reports that during the second quarter of this year the mill at Round Mountain in Nye county has treated approximately 8000 tons of ore, and that development has been kept well ahead of ore extraction. The mine and mill, since the advent of the Nevada-California Power Company, have changed their equipment, and on July 20 were to start using electric power. With the new installation it is expected to maintain production at 100 tons per day. A new and important discovery has been made in the west breast of the 700-ft. level, at which point a large orebody has been discovered.

At Manhattan, on the McCallum & Nurse lease, a dredge designed by E. D. Morse, of Sacramento, for a capacity of 300 to 400 cu.yd. of gravel per day, is expected to begin operations during the present week. It is expected to mine the gravel for about 25c. per yd., whereas the present method of drift mining costs at Manhattan about $2.50 to $3 per yard. The danger of storing explosive material in underground workings has again been called to the attention of the public by an unfortunate accident at the Tyke lease in Manhattan gulch, where three men lost their lives as a result of an explosion of gasolene on the 45-ft., or bedrock level.

Salt Lake City

July 23—An important mining deal was consummated last week, resulting in the merging of the Bingham Central-Standard and the Bingham Metal companies. The new organization will be known as the Utah Metals Mining Company, and will have a capital of $7,500,000, representing 1,500,000 shares of a par value of $5 each. The deal has been under consideration since early in the spring, and means the active development of an estate comprising more than 2300 acres in extent and covering four or five of the most promising lodes in the Bingham district. The campaign of operations on these mines will be started by connecting the lower workings in order to drain the upper claims.

The trading on the Salt Lake Mining and Stock Exchange during the last week has been especially light. Many members have left on their summer vacations and prices have ruled generally low and unsettled. From the mine standpoint, however, there is no reason why stocks should not be moving up as more ore is being marketed than at any time during the year. The Boston Consolidated company will deliver more than 2,000,000 lb. of copper in the concentrates sent to the Garfield plant of the American Smelting and Refining Company this month. The mill went into full commission about 10 days ago and since then it has been working smoothly, and the monthly earnings will probably establish a new record for the company.

It is announced that the fires at the Tintic Smelting Company's plant in Silver City are to be drawn during the coming week, and the plant overhauled to effect more economical handling of the ores. Jesse Knight, the principal owner, is quoted as saying that the company will take an inventory during this shutdown and ascertain what profits have been made, and claims that the furnaces will be blown in again within a few weeks. It has been stated from time to time that the smelter has not been making money, and in many quarters it is thought that the plant may not be recommissioned. The plant was started about a year ago, and has four lead furnaces and one copper furnace. For some time negotiations have been pending, first with the Cole-Ryan and then with other interests for the sale of the smelter, together with the Colorado and Iron Blossom mines; but none of these deals have been consummated. It has been hinted the inventory is now being taken in connection with the negotiations for the sale of the property. Meanwhile the ores from the Knight mines in Tintic will be sent to the United States Smelting Company at Bingham Junction.

Cobalt

July 24—The directors of the Nova Scotia mine, at a recent meeting, decided to start immediately with the erection of a concentrator, designed by Mr. Kirby, of Reno, Nev., who has also been retained to look after the construction. The erection of this mill will be followed with much interest, as it is a wide departure from local practice in some of its features. The process will consist of pan amalgamation and cyaniding. The capacity will be 75 tons per day and twenty 1650-lb. stamps will be installed. The estimated cost is $100,000. The main building will be 84x222 ft. No jigs or concentrating tables will be installed but provision will be made for them in case they should become necessary.

At the Buffalo mine, a highly important discovery has been made that may affect a number of leading mines in the neighborhood. Hitherto practically all the ore of the Buffalo has been obtained from veins in the conglomerate, which ceased to be productive on reaching the Keewatin formation. Some time since it was decided to test the vein on the west side of the property in the Keewatin by continuing the drift of No 3 vein at the 200-ft. level. After drifting about 50 ft. Huronian slate was encountered and the vein again became enriched. As several mines in the neighborhood have had the same experience of the veins losing their high silver on reaching the contact between Keewatin and conglomerate, it is thought that development beyond the contact may disclose valuable deposits.

The plant of the Beaver mine is again running. The vein apparently follows a series of step faults, and the valuable minerals periodically pinch out along the heave of the fault. The Station Grounds Mining Company has again resumed operations and there are now two diamond drills working, and it is expected that eight of their veins will be prospected at depth by this method. Negotiations are under way with the Nipissing company to acquire the shaft southeast of the Catholic church grounds. If these are successful the headframe, which was destroyed by the recent fire, will be rebuilt, and the shaft put in shape. Another shaft will probably be started a little to the south of the Temiskaming & Northern Ontario station.

A new strike of importance has been made on the Gillies limit, on the property known as the Cobalt Reserve, purchased by Waldman and Pierce. The vein varies in width from 5 to 8 in. and shows native silver. This property is situated one lot to the west of the Silver Bar mine. Another find that may exceed this in importance was made a few days since at the Provincial mine. This mine is owned by the government and so far had failed to make good. Recently diamond drilling was resorted to and at a depth of about 170 ft. a vein of high-grade ore about 5 inches in width was cut. The finding of ore on these properties will give a great impetus to the development work now being carried on.

The action of the directors of the Coniagas, in passing the regular dividend, which would have been payable August 1, was totally unexpected. The directors issued a statement, giving as the reason that they needed the money for the enlarging of the mill at Cobalt, and the smelter at Thorold; also, for the installation of electrical machinery and to buy custom ores. This statement is not generally credited in Cobalt, as it is considered that the company is in good shape financially and that its ore reserves are second to none in the camp. Many seem to think that the dividend was passed with a view to getting the taxes lowered. There has always been bad blood between the town and the mining company, and last year the taxes were doubled.

Mexico

July 21—A vigorous and picturesque campaign in behalf of Gen. Bernardo Reyes for vice-president in place of Ramon Corral is being waged in Mexico with the result of unsettling business to some extent. The importance of the vice-presidential post lies in the fact that in the next six year term the vice-president is likely to become the president of the Republic. The election is not held until 1910. It is expected, of course, that President Diaz will be reëlected and that his general policy will be carried out in any event. General Reyes is a military man of ability and in his administration of the affairs of the state of Nuevo Leon, of which he has been governor, has won the respect of all and the full confidence of the foreign element.

Mexico now has an excellent port at Salina Cruz, the terminus of the Tehuantepec railroad, and another at Manzanillo, the terminus of the Guadalajara extension of the Mexican Central. Other ports on the Pacific coast are at Mazatlan, Altata and Guaymas, all of which are on the line of the Mexico Southern Pacific railroad. At Topolobampo, the Orient road has its harbor which with the completion of this road will become important. These Pacific ports have now very cheap rates to Europe around the Horn by steam and sail, and they also have the facility afforded by the Pacific steamer connections at Tehuantepec using the new and thoroughly equipped Isthmus railroad for transport to Puerto Mexico where excellent connections are made for transport to United States and to Europe. The West coast will also feel the impulse of the completion of the Panama canal and it looks as though this neglected and isolated region is now in the track of commerce and will be favored with the competition between the Orient, the Occident and the United States.

London

July 16—The British Broken Hill Proprietary Company has issued a circular to its shareholders informing them that it has been decided to reconstruct its lead mill and to install the Elmore process for the treatment of zinc tailings. It has made arrangements with the Zinc Corporation, Ltd., which has been working the Elmore process with success, for the payment of sums sufficient to meet the cost of the proposed reconstruction of the concentrating plant.

The report of the Victoria Falls and Transvaal Power Company, formerly the Victoria Falls Power Company, Ltd., states that the capital at Dec. 31, 1908, was £1,801,050 divided into 1,000,000 ordinary shares of £1, and 801,050 preference shares of £1 each. The debenture capital amounted to £800,000. During the present year there has been a further issue of £900,000 preference shares. Arrangements have also been made for an increase in the debenture capital of £900,000.

The new issue of capital is made in connection with the formation of the Rand Mines Power Supply Company, Ltd., which has a capital of £500,000, the whole of which is owned by the Victoria Falls company. The Rand Mines Power company's business is that of supplying electric power to the Witwatersrand mines. The company is working three stations, one at Dreihoek, purchased from the General Electric Power Company, Ltd.; another at Brakpan, and a third at the Simmer Pan. The latter station is to be of 16,000 h.p., and half the plant has already been put to commercial use.

The subsidiary company floated this year is for the purpose of supplying power for the next 20 years to 15 mines, controlled by the Rand Mines, Ltd., and H. Eckstein & Co. It is estimated that these mines will require 270,000,000 units per annum.

No profit and loss statement is given, but shareholders are informed that there was a surplus of £48,177 for the year on revenue and expenditure account. No reference is made in the report to the original scheme of bringing power from the Victoria falls of the Zambesi.

Johannesburg

June 15—A reconstruction scheme has now been brought forward for another far eastern property, namely, the Cassel Colliery Company. Like the Rand Collieries, Ltd., this company has in its underlying main reef far greater possibilities than in its coal. In 1904 the Cassel, Daggafontein and Clydesdale companies, which adjoin one another, combined to finance the sinking of a borehole on the first-mentioned company's ground; the drill intersected the main reef at a depth of 5540 ft., but as the bore hole was deflected, it is believed that the reef lies at considerably less depth than this.

One of those unpleasant incidents, which always accompany any slight boom here, has again taken place. Crushing was started on the Midas, a property situated on the Black reef, the ore reserves of which were worked out years ago. Optimistic predictions as to the monthly output were made by the "consulting engineer" and "manager." The shares were boosted up to 32s., but were rapidly pushed down to 9s. by heavy selling, which was soon followed by the exceedingly poor result of the actual crushing. A great deal of money has been lost in this stock by the public and much ill feeling was engendered. As it was at first supposed that the alleged richness of the ore crushed had gone into the tailings a local metallurgist, Mr. Heymann, was engaged to report on it. His report amounts to a wholesale condemnation of the management. Incompetence and slipshod methods seemed to have prevailed in every department and the mistakes made in the estimates of ore treated, in the assays of screen, pulp and residues, led Mr. Heymann to conclude that no reliance could be placed on any of the assays returned by the mine. This fact, he also says, accounts for the apparent shortage of gold in the mill recovery. No examination has been made by a mining man, but there seems to be no doubt that there are no ore reserves and that all that the mine restarted on was a very small patch of high-grade reef.

Mining News from All Parts of the World

New Enterprises, Installations of New Machinery, Development of Mines and Transfers of Property Reported by Special Correspondents

THE CURRENT HISTORY OF MINING

General Mining News

Alabama

Southern Iron and Steel Company—The reorganization is now complete, and arrangements are being made to put all the mines and works in operation. The company has decided to move the rolling mill from Ensley to Gadsden, where the steel works are. President W. H. Hassinger has made the following appointments: Frank B. Keiser, vice-president in charge of operations. John Y. Brooks, general superintendent of rod mill. Joseph A. Durfee, general superintendent of steel plant and furnace. George P. Thornton, general superintendent of ore mines. James E. Strong, general superintendent of coal mines in Alabama. H. F. Geismer, Chattanooga district manager, comprising Rising Fawn furnace, Cole City, Dunlap and Chattanooga furnace. Charles A. Moffett, chief engineer. B. F. Tyler, purchasing agent. H. H. Knight, traffic manager.

Tennessee Coal, Iron and Railroad Company—This company has started up its Sumter and Adger coal mines, which have been idle for some time, and all the mines in the Pratt City division, which have been running short, on full time. It has also started up over 500 coke ovens, which have been idle, at Johns mine, Robertson, Bessemer and DeBardaleben.

Arizona

Cochise County

Lone Star Consolidated—Since the flooding of the pumps on the 1000-ft. level, the company has encountered excellent ore between the 700 and 800 levels, and has decided to maintain the water level at about 812 ft., which requires the pumping of only 1,300,000 gal. per day, which the present pumping capacity on the 800-ft. level and above will readily handle. Two new Prescott pumps have been ordered, and will be installed on the 800 level, when the mine will be again pumped out to below the 1000-ft. level.

Copper Queen—Experiments are being made with concrete for mine timber at Bisbee. Production at Douglas, last month, was 6,002,000 lb. of copper, eight of the ten furnaces being in operation.

Graham County

New York Arizona Gold and Copper—The Lillian tunnel has now been driven about 1400 ft., and the company is considering the installation of a mill to treat the gold ores encountered.

Pinal County

Inspiration Copper—With the acquisition of the Black Copper group, the area controlled by this company now amounts to about 550 acres, situated about eight miles west of Globe. Six drill holes were put down on the new group during the life of the option, all encountering ore at depths varying from 190 to 380 ft. Hole No. 5, which was 1400 ft. from the Joe Bush shaft, encountered commercial ore at a depth of 190 ft., and was continued to 415 ft., being still in sulphide ore averaging about 2 per cent. copper. The Joe Bush or main shaft, which is close to the Miami territory, is a double-compartment shaft, and has been sunk to a depth of 320 ft. Overburden to a depth of 90 ft. was encountered, and the balance of the distance, approximately 230 ft., has been in ore averaging about 2½ per cent. copper.

Prospecting of the copper orebodies will be continued with churn drills, and one drill hole will be sunk near the Joe Bush shaft to demonstrate the ultimate thickness of the orebody at this point. Near the other end of the property the Bulldog shaft is down 300 ft., and two drifts are being driven, one toward the Woodson tunnel and another in a southwesterly direction. The former drift is expected to converge with one from the Mercer tunnel at a depth of about 75 ft. below the Woodson tunnel. There are four other development tunnels on the property, including the Columbian, in which two crosscuts have been run, and the Taylor, Clipper and Bulldog. In the latter three no work is being done at the present time. George E. Gunn, Salt Lake City, is general manager, and the local work is in charge of Superintendent Mike Shovlin.

California

Amador County

Oneida—At this old mine near Jackson, given up by the company some time since, a leaser named Howard has found ore running as high as $30 to $70 per ton, and is shipping to the Selby smelter.

Butte County

Butte Creek Dredging Company—At the dredge on Butte Creek, some nuggets weighing upward of two ounces are being taken out, showing that the big gold had not been all mined in that district.

Magalia Consolidated—This company, with A. E. Smith, of Los Angeles as principal stockholder, has been incorporated to work claims adjoining those of the Steifer company at Magalia. It is composed of stockholders who are dissatisfied with the operations of that company.

Calaveras County

Sheep Ranch—This famous old mine, located about 1867 and for many years a large producer, has been sold under foreclosure. It was purchased by the Charles Martin Company for $45,160. Little will be done for about a year, or until time for possible redemption passes.

Inyo County

Modoc Consolidated—At this old property, now under supervision of John Kelly, at Darwin, a number of men are at work and high-grade ore is exposed in the lower tunnel. They are mining silver-lead ore.

Mariposa County

Big Bonanza—W. C. McCray, of Groveland, Tuolumne county, and associates, Los Angeles men, are equipping this mine in Bull Creek district with hoist and mill.

Ruth Pierce—This company, an involuntary bankrupt, has debts of $20,000 but the president says the assets will amount to $100,000, if everything is kept together and sold as a whole.

Number Five Mining and Milling Company—This new company has started work in the Number Five mine at Hornitos. J. J. La Tourneau, of Duluth, Minn., is president and E. S. O'Brien, of Merced, is secretary. A new shaft is being sunk and a hoist is being installed.

Nevada County

Lexington—This Nevada City mine has been closed down for the present pending settlement of estate matters in the courts.

Golden Gate—A large compressor has been purchased for the mine at Nevada City. The mill is running on good ore.

Yellow Metal—At the property near Graniteville a stamp mill will shortly be erected and run by electric power. Keller & McMillan, principal owners.

Sierra County

Rosasco—This mine near Downieville has been bonded to J. E. Lutz, of Oakland, and J. L. McMahan, of Wabuska, Nev. Work has been started.

Pacific—The gravel mine at Howland flat has been placed under bond to Geo. Wingfield, of Goldfield, Nev.

Rainbow—Another strike in this mine at Alleghany shows richer ore than has been taken out for some time.

Hidden Treasure—The mine has been bonded to Dr. A. H. Tickell, who has placed W. P. Jones in charge at Alleghany. A tunnel to intersect the vein is to be started.

SISKIYOU COUNTY

Elk Creek—The mine, three miles from Yreka, is being opened by R. L. Douglas and others. There is a small mill on the property.

Quartz Hill—This old mine opposite Scott Bar, supposed to have been worked out, has yielded nearly $50,000 this season.

YUBA COUNTY

Suction Dredge—Charles Swezy, of Sacramento, representing Eastern men, has leased 25 acres of land from the Stevensons, along the Yuba river, and it is the intention to work the ground with a suction dredge. The sand from the river bed is to be deposited on the land in order to reclaim it.

Colorado

CLEAR CREEK COUNTY

Western Metals—This company intends to erect a 50-ton plant near the Doric tunnel and will handle ores from the Griffith mine. The office is at Georgetown.

Golden Glory—The Drummond mine of this company, at Georgetown, will install a compressor plant, also an electric plant.

Eclipse Reduction—The company operating on Silver mountain, at Empire, will erect a plant of about 200 tons capacity for the treatment of the low-grade ores.

Columbia—A good strike is reported at this property on Silver mountain, and an air compressor and drills are to be installed. E. J. Butts, Georgetown, Colo., is manager.

Nathan Group—Work on this property in the Banner district has been started, under management of Thomas Barnard, Idaho Springs, and it is reported that English capitalists are negotiating for the group.

Josephine—Denver people have taken hold of this group on Spanish bar, and have also a lease on the Lincoln mill to handle the product of the group. H. M. Corwin, Idaho Springs, is manager.

GILPIN COUNTY

London—This group in the Twelve Mile district has been leased and bonded to W. McLeod and R. S. McConnell, of Victor, Colo., and machinery is to be installed. W. McLeod, Apex, Colo., will be in charge of developments.

Hawley-Gardner—Eastern people have become interested in this property in the Nevada district. F. J. Buck, Bald Mountain, Colo., is manager.

King Bee—A shipment of several tons of high-grade ores has been made from the strike in the lateral from the Newhouse tunnel. Shipments have also commenced from the Iron Duke mine in Russell district. A. H. Heller, Russell Gulch, Colo., is superintendent.

German Gold and Uranium—An air compressor or electric drills will be purchased for this property. R. A. Miller, Bald Mountain, is superintendent.

LAKE COUNTY—LEADVILLE

Highland Mary—The shaft on Breece hill has now reached a depth of 40 ft. with ore still in the bottom, and is to be sunk until the hanging-wall is reached. The ore at the bottom of the shaft has about the same content (gold and bismuth). In the neighborhood several shafts have been started to catch the extension north and south.

Tribune—Through the Yak tunnel, shipments of gold ore have been started and the vein has been opened for 160 ft. New machine drills and an electric-driven air compressor are now being installed.

Iron Silver—The new aërial tramway for the Tucson mine is about completed, after which the output will be doubled. Regular shipments are now going out from the large body of ore recently opened, and prospecting of the high-grade orebody in the Cambrian quartzite is being pushed. The mine is at present shipping 2500 tons per month. The Moyer mine, belonging to this company, is shipping about the same amount of ore.

LARIMER COUNTY

Northern Colorado Coal Company—The company owns 4000 acres of coal land near Hebron, and is now stripping the overburden, which had an approximate thickness of 65 ft. The company is planning for an output of 1200 tons daily when the railroad reaches the property. E. R. Miller, Laramie, Wyo., is manager.

LAS ANIMAS COUNTY

Colorado Fuel and Iron—During the recent shutdown, a large electrically-operated fan has been installed at the Frederick mine, near Segundo. The coal will be sent to Segundo for treatment.

Idaho

SHOSHONE COUNTY

Orofino—A site for a 100-ton mill is being surveyed at this property in the Murray section. Patrick Burke is manager.

Interstate Mining Company—Work is in progress on the new power house on this property, west of the Hercules. A saw mill, air compressor, and other equipment will be installed to expedite the driving of the long lower tunnel. Oscar B. Wallace, Wallace, Ida., is in charge.

Illinois

VERMILION COUNTY

Davis—This coal mine at Muncie has been sold to Hartshorn Brothers, who also operate the Electric mine at Danville. Some improvements are to be made at the Davis mine.

Indiana

GREENE COUNTY

A peculiar dispute has arisen at a mine of the Vandalia Company. The mine extends for a mile from the opening. The shot-firers wished to fire their shots four minutes earlier than the designated time in the afternoon that they might ride to the mouth of the mine shaft on the last trip of the mine cars. The operators oppose this change on the ground of increasing hazard to those who have not left the mine.

VIGO COUNTY

Four hundred more Indiana miners have gone out o a strike, about equally divided between the Collins company at Billtown and at the Grant company's mine at Burnett. The United Mine Workers had given the operators until July 14 to concede the demands made. At Billtown, it is an old dispute arising from the fact that the mine is on the dividing line between the block and bituminous fields, the basis of pay varying according to whether the coal is run-of-mine or screened. The two fields have different prices for each kind. At Burnett the men were fined for not going into a particular part of the mine. Already 225 men were out at the Summit mine in a dispute about the pay for removing slate. The Indiana Operators' Association has called a meeting to consider the situation.

Michigan

COPPER

Quincy—The company has begun the dismantling of the shafts on the old Franklin workings. The ground tributary to these shafts will be worked through Nos. 6 and 8 shafts of this company, and as they are equipped with electrical haulage the rock can be handled more economically than by maintaining the old shafts.

Keweenaw—The company has begun trenching operations on the outcropping of the Kearsarge lode, and in all probability a shaft will be started before fall to open this formation. Considerable diamond drilling has been done on this lode and some promising cores have been taken out.

Superior—This company is making a mill run of about 1000 tons of rock at the Calumet & Hecla mill and it is thought

that the improved methods of milling may give a better recovery of copper. The company has been shipping its rock to the Atlantic mill and has had an average yield of about 22 lb. of copper per ton.

Calumet & Hecla—At the large regrinding plant of this company, six additional Chilean mills have gone into commission, making a total of 30 mills now running. The ultimate equipment of the plant will include 48 of these mills and about 275 concentrating tables. Experiments are being carried on at this plant with a tube mill, the first to be tried in the district. The annual report just issued shows an increase in surplus of over $2,000,000. The company has outstanding, this year, notes and bills payable amounting to $848,112, this sum being largely represented by purchases of stock in the Osceola, Laurium, Seneca, Isle Royale, Tamarack and Ahmeek companies.

Franklin—Fire was discovered on July 23 in the shafts of the old workings, which are now being dismantled by the Quincy company. It is believed to be near the 11th level. The shafts have not closed, but considerable gas and smoke is coming into the Quincy workings and it may be necessary to abandon work in one or two of the Quincy shafts until such time as necessary to quench the fire. The management is considering turning water into the shaft.

IRON—MENOMINEE RANGE

Hollister—This mine, near Iron Mountain, is employing 80 men and shipping 150 tons of iron ore daily. The shaft is to be sunk 100 ft. deeper.

Portland—A contract has been let to Hoose & Perkins, of Iron Mountain, to take out 130,000 tons of ore this season by steam shovel. It is the first mine on the range to be operated in this way. The ore is a brown hematite, and to reach the orebody required the removal of 40,000 cu.yd. of overburden. The mine is near Michigamme, and is operated by the Buffalo & Susquehanna Iron Company.

Minnesota

IRON—MESABI RANGE

Sliver—The first shipment of ore has been made from this property, near Virginia. The mine covers 36 acres of land, and is the twelfth of the State mining properties to be worked under lease.

Missouri

JOPLIN—ZINC-LEAD DISTRICT

Coleman Heath—The new 200-ton mill near Aurora is completed. The mine will employ about 50 men.

New York Zinc and Lead—This company has been organized with Dr. Franklin Wilcox, of New York, president, and J. F. Ripley, of Joplin, general manager, to work the old Acorn mines at Prosperity. A 200-ton mill will be erected at once, and later a second mill.

Wilcox & Co.—This Joplin company has developed rich ore at 275 ft. depth, north of Galena, Kan. The ore is similar to that found in the Herald mine.

Royalty Land and Leasing—The company has bought a 20-acre lease south of Webb City and will erect a 300-ton mill at once. George Babson, of Chicago, is interested.

Sunrise—This company at Spring City has completed the mill and is producing again.

Turtle—This old tract south of Joplin was the scene of a strike of high-grade silicate ore.

Montana

BUTTE DISTRICT

North Butte—Negotiations are in progress for the purchase of the Granite Mountain claim from the Lewisohns. The claim has a shaft 500 ft. deep and the North Butte company is raising on this shaft from the 1200, 1400 and 1600 levels, with all possible haste. This will give the company the much needed additional shaft, and it is in a very advantageous location being between the Edith May and Jesse. A crosscut is being driven on the 2200-ft. level of the Jesse vein.

Butte Coalition—The company has just made an important strike on the Minnie Healy vein on the 1700 level from the Tramway shaft. The vein is 20 ft. wide and is mainly first-class ore.

Davis-Daly—Development work is being done both east and west from the Colorado shaft. The company is shipping to the Washoe smelter about 200 tons per day, which will average from 3½ to 4½ per cent. copper, but at present they are paying more attention to development than to increase in production. All mining is being done by contract.

Amalgamated Copper—The Anaconda Copper Mining Company proposes building a tailings dam near the Washoe reduction works at Anaconda. Tenders are asked for this work by J. A. Dunlap, purchasing agent, Daly Bank and Trust Company Building, Butte, Montana.

CARBON COUNTY

Bituminous Coal Company—This company has acquired and is now operating the mine formerly owned by the Gebo Coal Company at Coalville, formerly called Gebo. Willis Todd, Coalville, is general manager.

LEWIS AND CLARK COUNTY

Belmont—This old mine in the Marysville district has been purchased by Col. Thomas Cruse who also controls the adjoining Bald Mountain property on which a mill is being erected.

MADISON COUNTY

McKee—This group, near McAllister, has been purchased by Chicago capitalists. A cyanide plant is to be erected and a 2000-ft. aërial tramway constructed. R. B. McGinnis, superintendent.

Nevada

ESMERALDA COUNTY—GOLDFIELD

Pittsburg-Nevada—The shaft has now reached a depth of about 300 ft. and will be continued to the 500-ft. level before crosscutting is started.

Belmont Lease—The first lot, consisting of 100 tons, has been shipped to the Nevada Reduction Works for sampling.

Goldfield Annex—This company, owning a lease upon the Poleverde claim of the Jumbo Extension, is sinking a three-compartment shaft, which has now reached a depth of 340 ft. and is to be continued to the 1000-ft. level before crosscutting. W. D. Hickman is manager.

ESMERALDA COUNTY—LUCKY BOY

Broken Hills Lease—The shaft has been sunk to a depth of 215 ft. Eight carloads of smelting ore have been shipped to date.

NYE COUNTY—PIONEER

Mayflower Consolidated—The new electric equipment consisting of four motors, with a total of 126 h.p., has arrived at the property and will be installed at the mine and mill immediately. The June report gives the value of bullion produced as $6450, the mill treating 365 tons of ore and making a 93 per cent. saving.

NYE COUNTY—RHYOLITE

Montgomery-Shoshone—Manager John G. Kirchen has installed an additional 6-ft. Chile mill, and it is the intention to treat a total of 7000 tons per month. The average value of the mill product has been between $55,000 and $60,000 per month.

Nevada Ore Treating Company—Arrangements for the establishment of a plant at Springdale have been completed. Active work for the construction of a mill to treat Pioneer ores will soon be started.

NYE COUNTY—TONOPAH

Tonopah Extension Mining Company—The directors have authorized an issue of $187,500 in 6 per cent. bonds for the erection of a mill. The mortgage securing these bonds contains a provision requiring the company to set aside $1.50 for each ton of ore treated for their retirement. The company has about $50,000 in the treasury and the engineers have estimated about $300,000 in ore on the dumps and $250,000 in "ore developed."

Tonopah Mining—An important discovery has been made in the underlying dacite. At a depth of about 650 ft. a winze has encountered 9 ft. of high-grade ore. Another high-grade shoot has since been cut at about the same depth, east of the Mizpah shaft.

WHITE PINE COUNTY—ELY

Giroux Consolidated—An orebody, approximately 100 ft. thick and carrying about 7 per cent. copper has recently been disclosed by drilling operations near the Giroux shaft. The company is opening an office in Salt Lake City and a large portion of the clerical force at Ely will be removed to the former city, this action confirming the impression that the Giroux ores will eventually be smelted by the International Smelting company's Tooele plant.

Nevada Consolidated—Churn drills on the northern portion of the Ruth property have demonstrated the existence of the sulphide orebody for a considerable distance in that direction. Estimates of the copper content of this ore have not been made public, but it is understood to be of good grade.

New Mexico

SOCORRO COUNTY

Tri-Bullion—Since May 1 about 600 ft. of development has been done at the Kelly mine. Preparations are being made to hoist a greater amount of ore from the Traylor shaft, which is nearest the mills, and the directors have authorized the finishing of the magnetic-separating plant. About 2500 tons of ore are being mined monthly. R. W. Bull, Kelly, N. M., is superintendent.

Oklahoma

Petroleum production in June is reported by the *Oil Investors' Journal* at 3,633,487 bbl., an increase of 100,891 bbl. over May. Shipments were 3,152,482 bbl., and 481,055 bbl. were added to the stocks, which amounted to 56,116,036 bbl. at the close of June. There were 273 wells completed during the month, of which 245 were oil producers, 4 gas producers and 24 dry. On July 1 there were 213 new wells being drilled.

OTTAWA COUNTY

Emma Gordon—A tailing mill has been erected at this zinc-lead mine at Miami.

Hawkeye—This company at Miami has completed the erection of a large mill.

Oregon

LANE COUNTY

Martin Creek Mining Company—The tunnel is now in about 200 ft., and has encountered two veins of good ore. S. H. Burghardt, superintendent.

Combination Mines Company — Clark Brothers expect to have the new mill on this property ready for operation in about one month.

Vesuvius Mining Company—Manager Hard states that the mill on this property, near Bohemia, will be started shortly. The concentrates will be sent to Tacoma for treatment.

Pennsylvania

ANTHRACITE COAL

Humbert Coal Company—The breaker at the Sunnyside colliery at Jessup was recently destroyed by fire. The breaker was not new, but was in good order, and the loss is estimated at $75,000. The breaker is to be rebuilt, and meantime the colliery is idle.

New York, Ontario & Western—The Capous branch is being extended through Keyser valley to the Sibley colliery at Taylor, 4½ miles; later it will be extended to the Jermyn colliery at Old Forge. It is understood that both the Sibley and the Jermyn are under option to the Ontario & Western company.

BITUMINOUS COAL

The coal land owned by the Kinder estate at West Brownsville has been sold to W. H. Warner & Co., of Cleveland. The price per acre has not been made public but is said to be the highest ever yet paid for coal along the Monongahela river.

Isabella-Connellsville Coke Company—Contracts have been let for two concrete-lined shafts at No. 1 plant at Arensburg, Fayette county. Both shafts are to be used for hoisting coal, the main opening for coal used in charging the ovens, of which 500 will be located at this point, and the air shaft for shipping coal. In addition to a large air compartment the second shaft will have two hoisting compartments, making it the largest concrete shaft in the coke country. It is the purpose of the company to construct three plants, all of which will be equipped with modern machinery.

Texas

Petroleum production in the Gulf Coast district in June was 758,700 bbl., a decrease of 63,525 bbl. from May. Shipments were 366,897 bbl. by sea and 395,711 by rail, a total of 762,608 bbl. There were 36 new wells completed in June, 24 being oil producers, one a gas producer and 11 dry. There were 11 wells in progress at the end of the month.

Utah

BEAVER COUNTY

Peacock Copper—Manager L. F. Block states that the development is now progressing in a full breast of ore on the 150-ft. level. The property adjoins the Cupric and the King David in the Frisco district.

Cedar-Talisman—The company is ready to ship the ore that was opened up on the 400 level and is preparing to open the same orebody on the 500-ft. level.

SALT LAKE COUNTY

Ohio Copper—General Manager Colin McIntosh states that the delay in arrival of material for the trestle work which is to complete the link between the Mascot tunnel and the big mill at Lark is responsible for not putting the plant in commission.

Utah Apex—Shipments of first-class lead ore have recently been sent to the valley smelting plants. The orebody on which the winze is being sunk continues to show improvement in both grade and thickness, and about 200 ft. west a new orebody is being opened.

SUMMIT COUNTY

A merger has been proposed of a number of important mines in this district reaching from the Daly-West and Daly-Judge possessions in Park City over into Snake creek on the south.

Uintah-Treasure Hill—In the 265-ft. level of this Park City property a vein of high-grade ore has just been opened, which is thought to be a continuation of the orebody cut a few weeks since. R. L. Andrew, superintendent.

Silver King—A strike of high-grade silver-lead ore was made at a depth of 1500 ft. in the Andes claim, jointly owned at Park City by the Silver King Consolidated and the Silver King Coalition companies.

Daly-West—The regular quarterly report shows that the receipts of the sale of 3830 tons of crude ore amounted to $74,336 and 2221 tons of concentrates brought $69,002. On July 15, a dividend of 30c. per share, amounting to $54,000, was declared.

TOOELE COUNTY

Geyser-Marion—The Geyser-Marion mill was totally destroyed by fire and only the assay office and blacksmith shop, which were detached from the mill, have been saved. The mill had not been used for a number of years, but contained some valuable machinery.

Virginia

WARREN COUNTY

Gooney Manor Copper Company—This company has been incorporated to mine on a tract of 83 acres, 4½ miles south of Front Royal. Development work has been carried on for some time and is said to show a lens-shaped body of copper ore. At a depth of 350 ft. sulphide ore is found, a smelter test of several carloads indicating a content of 5 per cent. copper. Operations at the mine are in charge of A. G. Sager.

West Virginia

MARION COUNTY

Jamison Coal and Coke Company—A contract has been let to H. F. Stark & Co., of Greensburg, Penn., for the first development on the coal land recently bought by this company near Fairmont. The contract includes the sinking and timbering of two shafts and the construction

of a railroad spur connecting with the Baltimore & Ohio at Fairmont. Both shafts will be 250 ft. deep, one for hoisting and the other for air. Because of the hilly country at that point, the grading will be heavy.

MINGO COUNTY

Twisted White Ash Coal Company—This is a reorganization of the Winifred Consolidated Coal Company, owning 1000 acres of coal land near Goodman, on which there is a mine with a daily capacity of 700 tons of coal. The officers of the new company are E. L. Sternberger, Cincinnati, O., president; O. B. Gould, Goodman, W. Va., general manager in charge.

RALEIGH COUNTY

Winding Gulf Colliery Company—Preparations are being made to begin work on a tract of 3300 acres of coal land on Winding Gulf creek, which has been made accessible by the completion of the Virginian railway. It is the purpose of the company to erect a large power plant, tipples, offices, stores and houses and develop its mines to a capacity of 500,000 tons of coal annually. The present address of the company is Abney, W. Va., with main offices at Union Trust building, Cincinnati. Its officers are Justus Collins, Cincinnati, president; J. A. Renahan, New York, vice-president; J. S. Berry, Cincinnati, secretary and treasurer; A. M. Herndon, superintendent.

Wisconsin

ZINC-LEAD DISTRICT

Jarrett Lead and Zinc—Power machinery for the new concentrating mill of this company is being unloaded near Cuba City. George Jarrett, of Platteville, is manager.

Klar-Piquette—This company paid on July 1, a 10 per cent. dividend, the third within sixty days, and making a total of 45 per cent. on a $20,000 capitalization.

Tower Hill Mining Syndicate—The Gold Express mill has been purchased and will be removed and rebuilt at the Ellsworth mine at Livingston.

Jackson—The company is reported to have purchased the 100-ton mill of the Midway company of Cuba City.

Pecatonica—The 100-ton Hodge mill was bid in at the bankruptcy sale by Fred Howe, of Lancaster, Wis., for use by this company.

Canada

BRITISH COLUMBIA—PHOENIX

Granby Consolidated—The production of this company for the first six months of 1909 was approximately 12,000,000 lb. of copper, 125,000 tons of ore having been treated with a recovery of 24 lb. of copper per ton. During this period there have been interruptions which included winter difficulties, labor troubles and interruptions by reason of enlarging the furnaces. Six of the eight furnaces have been enlarged, and when the other two are increased in size it is expected that the company will produce on a basis of 35,000,000 lb. of copper per annum.

BRITISH COLUMBIA—VANCOUVER ISLAND

Pacific Coast Coal Company—A contract has been let to the United Wireless Telegraph Company to erect a wireless station at the new mine this company is opening on the north end of Malcolm island.

NOVA SCOTIA

Dominion Iron and Steel Company—A new record for all departments was made in June with the following output: Pig iron 24,260 tons; steel 28,142 tons; rails, 18,419 tons; wire-rods 7404 tons. The strike of the miners employed by the Dominion Coal Company, is not likely to affect the Steel company's operations, as there are supplies of fuel on hand sufficient for two months.

ONTARIO—COBALT

Lumsden—Arrangements have been made to obtain compressed air from the Badger company. Drills have been ordered and the shaft will be sunk to the 200-ft. level.

Right of Way—J. Reynolds, of Goldfield, Nev., has acquired a lease on the dump, which will be hand sorted.

Jumbo—At this property at Latchford, a 60-h.p. boiler and a three-drill compressor plant are being installed.

Temiskaming—Work has been started on the new mill, which will be about 300 ft. from the crusher house and connected therewith by an aërial tram.

Trethewey—The balance of the treasury stock, 45,000 shares, is to be offered at par for the purpose of building a concentrator. Grading is now being done.

Ore Shipments—Shipments of ore from Cobalt, for the week ended July 17, were as follows: Crown Reserve, 188,320 lb.; Cobalt Central, 38,700; Chambers Ferland, 60,000; La Rose, 151,000; McKinley-Darragh, 64,420; Nipissing, 259,110; O'Brien, 63,870; Temiskaming, 61,000; total, 886,420 pounds.

Alexandria—At a point about 300 ft. southwest of the shaft, the diamond drill went through a broken-up orebody about 4 ft. wide, and in this there was a 5-in. vein of calcite believed to carry good silver content.

ONTARIO—GOWGANDA

Clarkson Mines Company—This company, organized by Pennsylvania capitalists, has purchased six claims in the Gowganda Elk Lake district, one of them being situated near the Boyd Gordon.

ONTARIO—MANITOU LAKE

Laurentian Gold Mine—The main shaft is down 170 ft., with drifts every 70 ft. Arrangements are in progress to increase the milling capacity, the present 20-stamp mill, which has been utilized during development, being inadequate for handling the ore stoped out.

Mexico

CHIHUAHUA

La Republica—Mining operations were practically suspended at this company's mines during the early part of July on account of water accumulating in the workings as a result of the fuel shortage. Sufficient ore and tailings, however, are available for insuring two months' operation of the milling plant, by which time the mine will probably be operative again. Pending the selection of a successor to Superintendent C. D. Ridgway, lately resigned, operations are being prosecuted under the personal supervision of the consulting engineer, J. Gordon Hardy.

Rio Tinto Copper Company—The Terrazas smeltery is producing bullion of a value of about 75,000 pesos per month. An elevated railroad track is being built to facilitate delivery of coke and ore to the works. A new compressor and drill plant has been ordered for the mine.

Naica—It is reported that the company is planning the erection of a lead smeltery near the town of Concho on the Mexican Central, south of Chihuahua. The plant is to treat ore from the company's mines at Naica, the daily production of which is now about 400 tons, but it is likely that custom ores sufficient to make a daily tonnage of at least twice that amount can be secured.

JALISCO

Cinco Minas—This property in the Hostotipaquillo district, recently examined by John B. Farish, is reported sold to the Marcus Daly estate, 11 Broadway, New York, for 530,000 pesos. The valuable content of the ore is mainly in silver, and a mill will probably be erected after the treatment problem has been solved.

Virginia & Mexico Mine and Smelter Corporation—The company's new 150-ton stamp mill and cyanide plant on the Santiago river in the Hostotipaquillo district will shortly go into commission. Jesse Scobey, general manager; P. R. Whitman, superintendent.

MEXICO

Mexico Mines of El Oro, Ltd.—The June report from London states that the mill ran 26 days, crushing 10,050 tons of ore and yielding bullion valued at $107,020. Working expenses were $42,800, including $6900 expended on development.

SONORA

Llano Consolidated—The new 4-mile aërial tramway is now delivering ore to the 50-stamp mill which was placed in operation on July 3. The concentrating and cyanide adjuncts to the plant will shortly be ready for operation. W. P. McComas, superintendent.

Metal, Mineral, Coal and Stock Markets

Current Prices, Market Conditions and Commercial Statistics of the Metals, Minerals and Mining Stocks

QUOTATIONS FROM IMPORTANT CENTERS

Coal Trade Review

Coal trade in the West is still improving. More sales of steam coal are being made and more mines are being put on full time. The list of the latter is rather too long, according to dealers at the principal centers, who are warning shippers against over-production and consequent forced sales.

In the East the bituminous market improves rather slowly and is still pretty quiet. The wage question in the central Pennsylvania districts is still unsettled.

The anthracite market is quiet and unchanged. The United Mine Workers in their district convention for the anthracite region held last week, voted and talked rather in favor of a policy of conciliation.

The Connellsville Coal Merger—Announcement has been made of a plan under which it is proposed to consolidate a number of independent coke operations into the Consolidated Connellsville Coke Company. According to the plan, 25 per cent. of the valuation of the coke plants will be paid the operators in cash and the balance in bonds. The purchasers and operators, shortly after Oct. 1, will incorporate under the laws of Pennsylvania, the corporation taking over all titles to property. At the same time a holding company will be formed for the corporation and all subsidiary companies' stocks. The holding company will issue preferred and common stock sufficient, with cash and bonds available, to complete payments for property. The company taking title to the properties will issue 5 per cent. gold bonds, of which $15,000,000 shall remain in the treasury, as against an equal amount of bonds of sundry coke companies outstanding to be exchanged as opportunity presents. All the remaining bonds will be sold and the proceeds turned over to the vendors in part payment, less expenses of sale, except $5,000,000 cash, which will be placed in the treasury of the company for a working capital.

The Utah Coal Land Suits—Washington despatches state that Attorney-General Wickersham has discontinued equity suits recently instituted against the Utah Fuel Company to annul title to 800 acres of coal lands in Utah, valued at $40,000. The discontinuance is made in view of the settlement between the Government and the company, under which the company agrees to pay the Government $73,000, reconveys the 800 acres to the United States, besides forfeiting $14,400 paid to the Government when the patents were issued on the land. The formal statement says: "Only the lands described in the suits discontinued were embraced in the settlement. Further investigation is being prosecuted, and in case other coal lands shall appear to have been illegally acquired suits will at once be instituted to assert the Government's interest therein."

Coal Traffic Notes

Tonnage originating on Pennsylvania railroad lines east of Pittsburg and Erie, year to July 17, short tons:

	1908.	1909.	Changes.
Anthracite	2,859,672	2,720,673	D. 138,999
Bituminous	17,535,290	19,123,863	I. 1,588,573
Coke	3,670,466	5,437,655	I. 1,767,189
Total	24,065,428	27,282,191	I. 3,216,763

The total increase this year to date was 13.4 per cent.

The shipments of the Consolidation Company, including the Fairmont and Somerset mines as well as the Cumberland, for the five months ended May 31, were 2,548,100 tons in 1908, and 2,696,187 tons in 1909; an increase of 112,087 tons, or 4.3 per cent. There was a large decrease for the first quarter of the year, but heavy gains in April and May.

Coal receipts at San Francisco by water, five months ended May 31 were 119,502 tons in 1908, and 207,506 in 1909; increase, 88,004 tons.

Coal shipments from Seattle and Tacoma, Wash., by water, five months ended May 31, were 277,064 tons in 1908, and 110,350 in 1909; decrease, 166,714 tons.

Coastwise shipments of coal from chief Atlantic ports, five months ended May 31, long tons:

	Anthracite.	Bitum.	Total.	Perct.
New York	6,837,229	4,175,179	11,012,408	64.0
Philadelphia	949,436	1,748,660	2,698,096	15.7
Baltimore	114,450	1,389,023	1,503,473	8.7
Newp't News	.....	1,287,550	1,287,550	7.5
Norfolk	.....	715,312	715,312	4.1
Total	7,901,115	9,315,724	17,216,839	100.0
Total, 1908.	7,903,508	8,939,688	16,843,196	.....

Total increase, 373,643 tons, or 4.7 per cent. New York includes all the New York harbor shipping points.

Coal shipments passing Davis Island dam on the Ohio river, five months ended May 31, were 1,573,235 tons in 1908, and 1,942,820 in 1909; increase, 369,585 tons.

Coal passing through the locks on the Monongahela river above Pittsburg, six months to June 30, was 4,176,900 tons in 1908, and 4,890,680 in 1909; increase, 713,780 tons.

Coal receipts at St. Louis, five months ended May 31, were 2,674,383 short tons in 1908, and 2,679,242 in 1909; increase, 4859 tons.

New York

Anthracite

July 28—The anthracite market is extremely dull with only the usual business doing and no special point of interest.

Schedule prices for prepared sizes continue this week at $4.55 for lump and $4.80 for egg, stove and chestnut, f.o.b. New York harbor points. On Monday, however, 10c. additional will come off the summer discounts. For steam sizes quotations are: Pea, $3.15@3.25; buckwheat, $2.25@2.50; No. 2 buckwheat or rice, $1.75@2; barley, $1.35@1.50; all f.o.b. New York harbor. Some individual pea continues to be offered at 10c. under the market.

Bituminous

Dealers admit an improvement in the market, although they say it is slow. More mills and factories are buying and they are taking larger quantities. This is especially the case with the New England mills. The improvement is most marked in the far East; Long Island sound is very slow and New York harbor is almost dead except as a dumping-ground for cheap coal. All-rail trade keeps up well. Quite a number of New England points which have heretofore been served from Sound ports are getting their coal all-rail, finding that it arrives in better condition in this way.

Prices are extremely low. Good Miller vein steam coal can be had at a delivered price which nets $1.30@1.35 at mines, while lower grades bring 90@95c. per ton at mines, and gas coal can be had at 60@65c. per ton at mine for run-of-mine.

Transportation is rather slow, coal taking two or three days over the schedule to come through. Cars are plentiful.

In the Coastwise trade vessels are in good supply and freights are low. Standard rates are 60c. from Philadelphia to Boston for large vessels and 60c. for small vessels from New York to points around Cape Cod. In both cases, however, prices will be shaded 5c. on full cargoes in order to get the business.

Birmingham

July 26—Coal-mining operations have

taken on considerable improvement in Alabama. The Tennessee Coal, Iron and Railroad Company made official announcement the past week that practically all of their mines which have been running on half or less time, or were idle altogether, will be put on full time and effort made to get out as much coal as possible. Other companies are increasing their output. Railroad interests are buying coal now and delivery will be started at once on this business.

The Tennessee Company has announced that there will be a corresponding increase in the coke production, a number of ovens to be started up.

Chicago

July 29—The coal market continues quiet, with the demand for fine coals somewhat lessening and that for lump stronger, though the change is not great. Steam supplies are, in general, large, causing prices to remain low and competition to be keen among both retailers and wholesalers. This is, of course, in accordance with the expectation of dealers for the summer market. That retailers are beginning to buy autumn stocks of domestic coals is evident, and they may be expected to buy with slowly increasing requirements throughout August. This naturally tends to strengthen lump and to weaken screenings, the latter being the chief supply of this market for the summer months. The market, however, can hardly be expected to be lively until cold weather actually makes its appearance.

Illinois and Indiana lump brings $1.75@2.15; run-of-mine, $1.00@1.75, and screenings sell for $1.40@1.60. Eastern coals are, in general, still so abundant that demurrage sales are frequent at 10 or 20c. below list prices on smokeless and Hocking. Smokeless lump brings $2.95@3.30, and run-of-mine, $2.75@2.95; Hocking sells for $2.90@3.15. Pittsburg No. 8 holds at $2.55@2.65, and Youghiogheny at $3.15 for ¾ in. gas. The demand for anthracite is still light, in both city and country.

Cleveland

July 29—There is nothing new about the Lake trade, except that shipments are increasing.

Local trade is improving and the demand for coal is good. The best demand just now is for slack, which is firm in price, some lots selling for 5 or 10c above quoted figures. Prices are unchanged. Middle district coal bringing $1.85@2 for lump, $1.60@1.75 for run-of-mine, and $1.35 for slack. No. 8 district coal is 5 or 10c above these prices. Pittsburg coal, f.o.b. Cleveland, is $2.10@2.25 for lump, $2.00@2.05 for run-of-mine, and $1.35@1.40 for slack. Pocahontas brings $2.80 for lump and $2.65 for run-of-mine.

Pittsburg

July 27—There has been no change in the coal situation in the week. Shipments to the Lakes are heavier than they were in June, but are still relatively light, and the season's trade is bound to fall considerably short of 1907. Nominal prices remain at $1.20 to retail dealers and $1.10 to large consumers for mine-run, and 65c. for slack, but these prices continue to be shaded, mine-run selling down to $1 in some cases, while a number of sales of slack have been made at 50c., when the competition was keen.

Connellsville Coke—The whole coke market is stronger, and prices for standard Connellsville coke can be quoted at about 10c. a ton higher than for several weeks past, as follows: Prompt furnace, $1.65@1.70; contract furnace, $1.75@1.80; foundry, prompt, $1.85@1.90; contract, $2@2.25 per ton.

The *Courier* reports the production in the Connellsville and lower Connellsville region at 384,425 tons, a gain of 94,000 tons from the previous week, which had been an off week on account of the holiday; the net gain in two weeks was 60,000 tons. Shipments are reported at 12,401 cars, a gain of 1300 cars in a week, but a net loss of 400 cars in two weeks. Shipments were divided as follows: Pittsburg district, 4342 cars; points west, 7247; points east, 812 cars.

Foreign Coal Trade

Transvaal Coal—For the five months ended May 31 the total coal mined in the Transvaal was 1,963,469 short tons, of which 530,134 tons, or 27 per cent., were sorted or screened out as waste. The total sales were 1,431,336 tons, the average price being $1.21 at mine. There were 27 collieries at work.

German Coal Production—Coal production of the German Empire, five months ended May 31, metric tons:

	1908.	1909.	Changes.
Coal	61,516,204	59,931,082	D. 1,585,122
Brown coal	27,003,501	27,026,370	I. 22,869
Total mined	88,519,705	86,957,452	D. 1,562,253
Coke made	8,938,212	8,683,507	D. 254,705
Briquets made	7,355,237	7,369,541	I. 14,304

Of the briquets reported this year, 5,842,624 tons were made from brown coal or lignite.

German Steel Syndicate—The syndicate reports sales for the five months ended May 31 as follows: Blooms, billets and other half-finished material, 501,447 tons; bars, shapes, girders, etc., 707,450; railroad material, 771,128; total, 2,070,025 metric tons.

Welsh Coal Prices—Messrs. Hull, Blyth & Co., London and Cardiff, report current prices of coal as follows, on July 17: Best Welsh steam, 4.02@4.08; seconds, $3.84; thirds, $3.72; dry coals, $3.84; best Monmouthshire, $3.60; seconds, $3.48; best small steam, $2.58; seconds, $2.34. All per long ton, f.o.b. shipping port. This is a slight advance over the drop of the previous week.

Iron Trade Review

New York, July 28—The iron and steel markets continue active considering the season, and a good amount of business is being done. The traditional dullness of the July market appears to some extent, but not nearly the same as usual.

In pig iron, business has been done both in foundry and basic iron. The demand in Eastern territory is chiefly for foundry, and is pretty well distributed. Prices are firm with a tendency to advance, so that furnaces are reluctant to take contracts running beyond the fourth quarter. Southern makers refuse to take anything for 1910 delivery at present prices.

In steel there is a better demand for billets in the East, especially for open-hearth material, for which some premium is asked. Structural tonnage continued to come in, chiefly in small orders, but to a good total. Other material is in good demand, especially bars. A number of independent mills have announced that they will ask an advance of $1 on deliveries of material running beyond the current quarter. This includes bars, shapes and plates. The American Steel and Wire Company announces an advance of $2 per ton on wire and wire products.

Rail purchases of standard sections continue light. There is, however, a pretty good demand for light rails and for trolley rails.

United States Steel Corporation—The statement for the quarter ended June 30 is as follows, the earnings given being the net result after paying all working expenses, repairs, etc.:

	1908.	1909.
April	$ 6,761,680	$ 8,163,244
May	6,021,279	9,661,228
June	7,482,797	11,516,019
Total for quarter	$20,265,756	$29,340,491
Sinking fund, subsidiary cos.		$ 506,096
Depreciation and reserve		5,511,000
Interest and sinking fund, Corp. bonds		7,311,963
Total charges		$13,329,059
Surplus for quarter		$16,011,432

From this surplus appropriations were made of $6,304,419 for the usual dividend of 1¾ per cent on preferred stock; and of $3,812,269 for a dividend of ¾ per cent. on the common, an increase of ¼ per cent. The total dividends are $10,117,188, leaving an undivided balance of $5,894,244. No appropriations were made for new construction. For the half year ended June 30 the net earnings were $38,494,761 in 1908, and $52,261,750 in 1909; an increase of $13,766,908, or 35.7 per cent. The total orders on hand June 30 were 4,057,939 tons, an increase of 515,344 tons over March 31, and of 744,063 tons over June 30 of last year.

Birmingham

July 26—Southern furnace companies are not making much effort to sell iron for delivery during the third or fourth quarters of this year beyond what they have already sold, their order books being well filled and the expectation being that there will be a better price. No. 2 foundry iron is quoted at $12.75 per ton and is strengthening to $13. Two or three companies are out of the market altogether as to the third quarter, the probable make for that period having been covered. Three furnaces have blown in so far this month and one had to be blown out for repairs. One furnace will be started up this week and two next week. There is a heavy outward movement of pig iron and stocks on hand are dwindling. Very little business for 1910 is being done here as the quotations are expected to be $14 and better when buying starts in for the first quarter.

Additional open-hearth furnaces at the steel plant of the Tennessee company at Ensley have been lighted and the entire plant, according to indications, will be in full operation soon.

Chicago

July 26—The iron market continues quiet, with light sales, well distributed, of both Northern and Southern pig iron. Prices hold up well and none but exceptional contracts get a shading of the common quotations of $12.50 Birmingham ($16.85 Chicago) on Southern, and $17 on Northern, with some sales probably made at a little more. Inquiries are plentiful for last-quarter and first-quarter delivery iron, but selling agents profess not to be anxious to sell far ahead except at larger prices than the average buyer is willing to pay. For 1909 delivery sales there is somewhat lively competition. That business shows no signs of a jump is in most quarters of the iron trade considered a good sign, the slow and steady increase being preferred to a sudden rush of melters to get in on a rising market. The increase in the consumption of pig iron and manufactured products, in this district, is constant, and there are no indications of its ceasing or changing notably in rate. There is still considerable iron to be bought for the last quarter, and while most of it will be taken in lots of not more than 500 tons, a number of good-sized contracts will be closed soon, it is said.

Cleveland

July 27—Iron ore sales continue at a rate unusual so late in the season. Prices continue at $4.50 for Old Range and $4.25 for Mesabi bessemer; $3.70 for Old Range and $3.50 for Mesabi non-bessemer; guarantees being 55 per cent. iron for bessemer and 51.5 for non-bessemer ores.

Pig Iron—Transactions have mainly been in small lots, the total reaching a considerable quantity. Prices are firmer and tending upward; quotations being $16.50@16.75 for bessemer, $15.75@16 for No. 2 foundry, and $15.25@15.50 for gray forge.

Finished Material—A number of small orders for structural steel are noted. Bars are in demand; also plates, rivets and sheets.

Philadelphia

July 28—Additional orders for pig iron are reported, basic having the call this week, though foundry goes well. Buyers are providing for their fourth-quarter needs. More furnaces are going into blast. Prices are firm and tending upward. No. 2X foundry brings $16.50@17; No. 2 plain, $16@16.50; forge, $15.50 or a little over; while $16 is had for basic.

Steel Billets—Some good sales have been made at $25.50@26 seaboard delivery, and $27.50 for forging billets. More is asked for fourth-quarter deliveries than for spot orders.

Scrap—No change in prices is noted, but the tone is stronger and scrap dealers are not pressing sales just now. The best demand is for heavy steel and No. 1 wrought. Yardmen are looking cheerfully for higher prices.

Pittsburg

July 27—Intimations have appeared this week that the strikes at the steel-car plants may be settled shortly, but nothing definite has yet developed. There are conflicting reports as to the status of the sheet and tinplate trouble. The company claims to be operating 24 tin mills, in four plants, of those from which the workmen walked out June 30, in addition to all the non-union tinplate plants, while the workers do not admit the operation of more than about 10 of the 24, and claim that an eight-mill non-union plant is closed. There is no question as to sheets, since there were plenty of non-union mills to start with.

The steel-car and tinplate labor troubles are tying up the movement of about 3000 tons of plates, shapes, axles and tinplate bars daily and have a tendency to reduce total production by about this amount, while in other directions the steel mills are working under even better conditions than in June, having an ample supply of specifications ahead. The Republic Iron and Steel Company and the Jones & Laughlin Steel Company, for instance, are not affected by these labor troubles at all, and are probably turning out a larger daily tonnage than ever before in their history, having somewhat increased capacity since 1907. These two companies are particularly aggressive at this time.

Effective July 26, the American Steel and Wire Company, followed by the independents, announced an advance of $2 per ton on wire products, making plain wire 1.60c. base, wire nails $1.80, base, painted barb wire 1.80c. and galvanized barb wire 2.10c. This follows an advance of $2 per ton on May 15. Following the open-market declaration of Feb. 18 no formal reduction in wire products was made until May 1, when reductions were announced of $8 per ton on plain wire, $7 on nails and $10 on barb wire. The preceding changes had been an advance of $1 per ton Sept. 3, 1907, and a reduction of $2 per ton June 9, 1908. Thus, since the drop May 1 last, wire products have advanced about one-third the way to the prices ruling in the first eight months of 1907.

The National Tube Company will probably announce an advance of one point, or $2 per ton, in merchant steel pipe, effective Aug. 2. The Carnegie Steel Company is expected this week to withdraw its prices of 1.25c. on steel bars and 1.35c. on plates and shapes, which would put the bar market at 1.30c. and the plate and shape market at 1.40c., prices which practically all the independents have been asking for the past 10 days. If the Carnegie advance is made the Republic company will probably advance its price on steel bars to 1.35 cents.

Pig Iron—Negotiations have been practically dropped on the matter of the Steel Corporation buying a round tonnage, perhaps 100,000 tons, of standard bessemer in the open market. It developed that the tonnage could hardly be secured at less than $16, Valley, whereas the last large transaction was the 25,000 tons to the Youngstown Sheet and Tube Company, at $15.50. Fannie furnace of the United Iron and Steel Company and Ella furnace of Pickands, Mather & Co., both at West Middlesex, Penn., are expected to be blown in within a week, which will put all the merchant furnaces in the Shenango valley in operation. There are only two idle merchant furnaces in the Mahoning valley, and these are undergoing improvements. The market is firm, although quiet. It is impossible to obtain malleable or No. 2 foundry at less than $15.25, Valley, an advance of 25c. from last week. Basic remains at $15, Valley, and is firm at that price, while bessemer may be quoted nominally at $15.50@16, Valley, prices delivered Pittsburg being 90c. higher.

Steel—Billets have become quite scarce, and can hardly be had at less than $24, Pittsburg, an advance of $1 per ton as regards bessemer since the beginning of last week. Sheet bars are firm at $25@26, Pittsburg.

Sheets—The market is firm, with demand well maintained, something unusual at this time of the year. Prices remain at 2.20c. for black and 3.25c. for galvanized, 28 gage.

Ferromanganese—The market continues firm. For early delivery 80 per cent. ferromanganese is quotable at $41.50@42, Baltimore, and for contracts running into next year at $42@43, the freight to Pittsburg being $1.05 per ton.

Metal Markets

New York, July 28—The metal markets show some activity, but at irregular prices. Speculative action still affects the market in some lines.

Gold, Silver and Platinum

UNITED STATES GOLD AND SILVER MOVEMENT

Metal.	Exports.	Imports.	Excess.
Gold			
June 1909..	$ 8,446,446	$ 2,417,735	Exp. $ 5,928,711
" 1908..	8,026,718	3,449,673	Exp. 5,177,045
Year 1909..	63,834,337	20,185,592	Exp. 43,648,745
" 1908..	53,517,975	21,141,348	Exp. 32,376,627
Silver			
June 1909..	5,504,437	4,339,275	Exp. 1,165,162
" 1908..	4,437,360	3,453,198	" 984,162
Year 1909..	29,359,066	22,872,028	" 6,487,038
" 1908..	25,514,545	21,141,348	" 4,373,197

Exports from the port of New York, week ended July 24: Gold, $6,752,500, principally to Argentina; silver, $761,060, chiefly to London. Imports: Gold, $111,018, from the West Indies; silver, $106,654, from Mexico.

Gold—The price of gold on the open market in London continued at 77s. 9d. per oz. for bars and 76s. 4d. per oz. for American coin. Gold arriving was taken about equally by the Bank of England and by Paris and Berlin. In New York, $1,250,000 was taken for shipment to Argentina.

The demand for gold for Argentina is due in part to heavy grain exports, and in part to the recent placing of a large loan in London. The shipments to Argentina from New York have been made on orders from London.

Platinum—Business is very quiet and sales few. Refined platinum can be had at $21@22.50 per ounce. Hard metal is selling at $26. Dealers are paying $17 to $18 per oz. for good scrap.

Silver—The silver market has ruled quiet and steady around 23 7/16d. in London. There is no pronounced tendency, and the outlook at the present level is uncertain.

SILVER AND STERLING EXCHANGE

July.	22	23	24	26	27	28
New York....	50⅞	50⅞	50⅞	51	50⅞	50⅞
London.....	23¼	23⅛	23⅛	23⅛	23⅛	23⅛
Sterling Ex..	4.8740	4.8745	4.8750	4.8740	4.8735	4.8720

New York quotations, cents per ounce troy, fine silver; London, pence per ounce sterling silver, 0.925 fine.

Exports of silver from London to the East, Jan. 1 to July 15, as reported by Messrs. Pixley & Abell

	1908.	1909	Changes
India..	£ 4,414,908	£2,413,800	D. £1,001,108
China	516,400	1,185,100	I. 668,700
Straits	96,510	82,800	D. 13,710
Total.....	£ 4,994,818	£4,681,700	D. £ 309,118

Receipts for the week, £4500 from Mexico, £4000 from the West Indies, and £116,500 from New York; total £125,000. Exports: £4000 to Port Said and £111,000 to India; £10,000 to U.S.

Copper, Tin, Lead and Zinc

July.	Copper. Lake, Cts. per lb.	Copper. Electrolytic, Cts. per lb.	Copper. London, £ per ton.	Tin. Cts. per lb.	Lead. New York, Cts. per lb.	Lead. St. Louis, Cts. per lb.	Zinc. St. Louis, Cts. per lb.
22	13¼ @13½	12⅞ @13⅛	59¼	29⅛	4.30 @4.32½	4.15 @4.17½	5.22½ @5.25
23	13¼ @13⅛	13 @13⅛	59⅞	29⅛	4.30 @4.32½	4.15 @4.17½	5.25 @5.27½
24	13¼ @13½	12⅞ @13⅛	....	29⅜	4.30 @4.32½	4.15 @4.17½	5.25 @5.27½
26	13¼ @13⅛	12⅞ @13⅛	59½	29¼	4.30 @4.32½	4.15 @4.17½	5.25 @5.30
27	13¼ @13⅛	12⅞ @13	58⅝	29⅛	4.30 @4.32½	4.15 @4.17½	5.27½ @5.30
28	13⅛ @13⅛	12¾ @13	58⅝	29⅛	4.30 @4.32½	4.15 @4.17½	5.27½ @5.30

London quotations are per long ton (2240 lb.) standard copper. The New York quotations for electrolytic copper are for cakes, ingots and wirebars, and represent the bulk of the transactions made with consumers, basis, New York, cash. The price of cathodes is usually 0.125c. below that of electrolytic. The quotations for lead represent wholesale transactions in the open market. The quotations on spelter are for ordinary Western brands; special brands command a premium.

Copper—The large business reported last week continued up to July 23, some important sales for export being made on the 22nd and 23rd, and the effect was to continue the advance in price, the highest being 13¼c., delivered, 30 days, equivalent to 13⅛c., cash, New York, for electrolytic. The best grades of Lake copper were sold at 13½c. On July 23, the United Metals Selling Company entered the market with an asked price of 13⅜c. for Lake and 13¼c. for electrolytic, delivered, 30 days. The demand from consumers having already dropped off with the advance in price, the market immediately began to exhibit a weaker tone in the face of the additional offering and prices were promptly cut by competitors. Some variety was injected into the market by one of the short-lived speculative flurries, which started in London on July 22, but by the 26th this had spent its force. On July 28, electrolytic was freely offered here at 12⅞. The decline has brought about a general disappointment and uncertainty, and the market closes again in a rather dull state and weak at 13⅛@13⅜c. for Lake, and 12¾@13c. for electrolytic in cakes, ingots and wirebars. The average for casting has been 12¾@12⅞ cents.

Copper sheets are 17@18c., base for large lots. Full extras are charged, and higher prices for small quantities. Copper wire is 15c. base, carload lots at mill.

Orders which were reported as coming from this side brought about an advance in the London standard market, which reached £59 17s. 6d. for spot and £60 12s. 6d. for three months on Friday, July 23. Since then, there has been a quick recession, which put prices down to the point from which they started, the quotations at the close being £58 12s. 6d. for spot and £59 8s. 6d. for three months.

Refined and manufactured sorts we quote: English tough, £62; best selected, £61@62; strong sheets, £73@75.

Exports of copper from New York and Philadelphia for the week were 7650 long tons. Our special correspondent reports no exports from Baltimore for the week.

It is reported that the Lake Superior Smelting Company, of Dollar Bay, no longer mixes Montana cathodes with the copper from the Tamarack, Osceola and Ahmeek mines, the discontinuance of the former practice having been inaugurated under the Calumet & Hecla regime.

Tin—The market displays a strong undertone. After a sharp rally in London the early part of the week, in sympathy with copper, the subsequent reaction did not wipe out the full extent of the advance, and the close is cabled steady at £132 17s. 6d. for spot and £134 5s. for three months.

Consumers here appear to be displaying a waiting attitude. Business at the close has taken place at about 29⅛ cents.

The Netherlands Trading Company has announced that the quantity of Banka tin to be sold in 1910 is at present estimated at 200,000 pikuls.

Lead—The market is unchanged and steady at 4.15@4.17½c. St. Louis, and 4.30@4.32½c. New York.

The London market continues weak, and declined further to £12 7s. 6d. for Spanish, £12 10s. for English.

Spelter—The great activity in the iron and steel industry and advices from Washington that there will be no change in the schedule as passed by the Senate, have made sellers very reticent, and upon the appearance of only a moderate demand, prices have improved from day to day. The close is firm at 5.42½@5.45c. New York, and 5.27½@5.30c. St. Louis.

Quotations for spelter in New York, July 22, were 5.37½@5.40c.; July 23 and 24, 5.40@5.42½c.; July 26, 5.40@5.45c; July 27 and 28, 5.42½@5.45 cents.

The London market is unchanged at £22 for good ordinaries, and £22 5s. for specials.

Base price of sheet zinc is 7c. per lb., f.o.b. La Salle-Peru, Ill., less 8 per cent. discount.

The Illinois Zinc Company, under date of July 22, has addressed the following letter: ". . . . The Tariff Conference Committee has fixed the rate on zinc blocks and sheets at 1.25c. per lb.; and fixed the Senate duty on zinc ore—which is the first duty on zinc ore in 50 years—at 1c. per lb. on zinc contents of ore. We have worked night and day against such a duty on zinc ore. With this high protection, Missouri zinc ore miners are liable to force upward the prices for zinc ore, our raw material. If they reach the figures they are now encouraged to believe possible, it will, by necessity, mean a very

much higher market price for our products."

Other Metals

Antimony—Only a retail business is being done. Quotations continue nominal at 8⅜c. per lb. for Cookson's; 7⅝c. for Hallett's; 7⅞c. for U. S., and 7⅜c. for outside brands.

Aluminum—No. 1 ingots can be had at 20@23c. per lb. for large lots. The higher price is that asked by the American maker.

Quicksilver—Business is quiet and steady, with New York prices unchanged at $43.50@44 per flask of 75 lb. San Francisco, $43@43.50 for domestic business, and $2 less for export orders. The London price is £8 5s. per flask, with £8 2s. 6d. quoted from second hands.

Nickel—Large lots, contract business, 40@45c. per lb. Retail, spot, from 50c. for 2000-lb. lots, up to 55c. for 500-lb. lots. The price for electrolytic is 5c. higher.

Magnesium—Quotations for this metal are $1.25 per lb., New York, in 100-lb. lots; for 5-lb lots, $1.40 per pound.

Cadmium—Current quotations are 75c. per lb. in 100-lb. lots at Cleveland, Ohio. In Germany 450@475 marks per 100 kg., at factory in Silesia.

Zinc and Lead Ore Markets

Platteville, Wis., July 24—The base price paid this week for 60 per cent. zinc ore was $42.50 per ton; no premium price was paid. For 80 per cent. lead ore $52 per ton was paid.

SHIPMENTS, WEEK ENDED JULY 24.

Camps.	Zinc ore, lb.	Lead ore, lb.	Sulphur ore, lb.
Highland	872,200	50,000	.....
Platteville	925,575	.....	288,850
Cuba City	485,790	85,000	80,965
Harker	369,340	.....	.....
Hazel Green	305,200	50,000	.....
Benton	264,000	147,700	.....
Days Siding	176,000	.....	.....
Livingston	80,000	.....	.....
Scales Mound	65,000	.....	.....
Linden	61,380	.....	.....
Rewey	54,900	.....	.....
Total	3,259,385	332,700	372,815
Year to July 24	71,594,054	3,758,725	6,039,940

In addition to the above there were shipped to the American Zinc Ore Separating Company, 734,070 lb. and to the Joplin Separator Works, 201,900 lb. zinc ore.

Joplin, Mo., July 24—The highest price paid for sulphide zinc ore was $47, the base price ranging from $42@44 per ton of 60 per cent. zinc. Silicate zinc ore sold as high as $28, the base ranging from $20 @22 per ton of 40 per cent. zinc. The average price, all grades, was $40.92. The highest price paid for lead ore was $56, with $57 bid on next week's delivery. The average price, all grades, was $54.72 per ton.

With four large mines still shut down from the water inflow of three weeks ago the output is rapidly regaining its former size, by the resumption of many mines closed for one, two or three weeks, and the starting of a number of new mines. The output this week is estimated at 5200 to 5300 tons, a gain of 400 to 500 tons over last week. A further gain is expected next week. The zinc smelters have but a narrow margin on present prices of ore and metal, but the lead smelters have a great deal wider margin to work upon. Under existing methods of treating this ore a 95 per cent. recovery is low.

SHIPMENTS, WEEK ENDED JULY 24.

	Zinc, lb.	Lead, lb.	Value.
Webb City-Carterville	3,721,690	648,680	$ 97,853
Joplin	1,789,320	207,480	45,071
Miami	837,020	231,650	21,436
Duenweg	684,440	143,230	16,839
Galena	337,350	72,150	12,902
Prosperity	496,100	56,920	12,231
Alba-Neck	435,260	.....	9,575
Aurora	535,810	.....	9,377
Granby	559,750	5,670	7,798
Spurgeon	159,970	176,880	7,550
Carthage	317,990	.....	6,995
Zincite	274,110	8,650	6,533
Quapaw-Baxter	236,160	7,950	4,942
Badger	223,930	3,600	4,914
Sarcoxie	132,040	.....	2,838
Totals	10,950,940	1,562,860	$266,854
30 weeks	335,677,530	51,208,450	$7,656,543

Zinc value, the week, $224,081; 30 weeks, $6,279,199
Lead value, the week, 42,773; 30 weeks, 1,377,344

MONTHLY AVERAGE PRICES

Month.	Zinc Ore. Base Price.		Zinc Ore. All Ores.		Lead Ore. All Ores.	
	1908.	1909.	1908.	1909.	1908.	1909.
January	$37.60	$41.25	$35.56	$38.46	$45.58	$52.17
February	36.63	36.94	34.92	34.37	49.72	50.50
March	36.19	37.40	34.19	34.71	49.90	50.82
April	35.40	38.63	34.08	37.01	52.47	55.63
May	34.19	40.06	33.39	37.42	56.05	56.59
June	33.06	44.15	32.07	40.35	60.48	57.52
July	34.55	.....	31.67	.....	59.90	.....
August	36.53	.....	33.42	.....	60.34	.....
September	37.63	.....	34.44	.....	54.59	.....
October	35.95	.....	33.28	.....	52.63	.....
November	39.13	.....	35.02	.....	54.53	.....
December	42.75	.....	39.63	.....	49.68	.....
Year	$36.63	.....	$34.31	.....	$53.93	.....

NOTE—Under zinc ore the first two columns give base prices for 60 per cent. zinc ore; the second two the average for all ores sold. Lead ore prices are the average for all ores sold.

Petroleum

San Francisco, July 24—Compared with about 40,000,000 bbl. of oil in 1907 the year 1908 showed nearly 48,000,000 bbl. production in California. The oil companies listed on the Stock Exchanges paid in dividends in June $558,610. A number of unlisted companies paying dividends are not included in this amount. The Associated Oil Company is about beginning the drilling of 100 wells in the Kern River fields and is drilling elsewhere also. Oil is now the most productive mineral substance exploited in California.

Chemicals

New York, July 28—The market is generally quiet as is usual at this season. Contract deliveries continue good, but new business is slow.

Copper Sulphate—The market is quiet and prices are unchanged at $4.22½ per 100 lb. for carload lots or over; $4.32½ @4.47½ per 100 lb. for smaller orders.

Arsenic—The market has straightened out a little, and some trading has been done at about 3c. per lb. for white arsenic. Most holders are unwilling to sell at this level, expecting higher prices.

Nitrate of Soda—A fair business is being done in this article at current prices, which remain 2.15c. per lb. for spot nitrate and 2.12½c. for futures.

Potash Salts—According to the Berlin despatches published elsewhere, the German Kali-syndikat has been continued for a year; the mines in which American fertilizer companies have secured an interest taking an independent position outside the syndicate. This will only benefit the two fertilizer companies concerned, however; outside buyers having to deal with the syndicate, as heretofore.

Mining Stocks

New York, July 28—The general stock market has subsided into rather a dull condition. Even Steel Corporation issues were in suspense, awaiting the action of the directors on the dividend question, which is always kept a close secret up to the last minute. The announcement yesterday of an increase in the dividend on the common stock, putting it on a 3 per cent. yearly basis, instead of 2 per cent., was not made until after business hours.

One sale of Homestake of South Dakota was reported during the week at $91 per share for a small lot.

On the Curb the market was about as dull as on the Exchange.

The stage settings were about completed for a little activity in the copper stocks, but the relapse in the metal has been a damper. Ray Consolidated is shortly to issue 200,000 shares of new stock for which the underwriting is now being arranged. Miami rose about a point on comparatively small buying, but little of this stock being apparently on the market.

Boston, July 27—There is a much improved tone to the market and sentiment is notably optimistic. Copper share prices almost reached the boiling point on July 23, and an active and buoyant list of prices was the result. Subsequently, however, a moderate setback occurred, although a strong undertone is now prevalent and a better market is expected later in the season.

North Butte's position, marketwise, is much improved and the price reached $58 during the week. It is the best belief that this company's troubles, both mining and marketwise, are nearing the end. Superior & Boston has been an active and strong spot, advancing $2 to $48, with some setback. Lake Copper moved up over $3 to $25 in sympathy; and a demand from New York caused a $1.25 advance in Boston Consolidated to $16.25.

U. S. Smelting securities and American Zinc have also given a good account of themselves. The common stock of the former has advanced $2.50 to $51.50, while the preferred issue crossed $50. Earnings of this company are reported as being record ones. Zinc touched $30.50 for high and becomes active at times. Good buying orders in Superior & Pittsburg caused a $1.37½ advance to $18.12½. Amalgamated, after sagging to $81.75 ex-dividend during the week, spurted to $84.50. Utah Consolidated rose $1.75 to $44.25 at the light of the rise. Osceola was up $4 to $138; Copper Range $2.25 to $84; Arizona Commercial $2.25 to $43; Calumet & Hecla $18 to $653 per share.

Rhode Island Coal has been the Curb feature, selling up almost $3.50 to $7.50 on heavy trading. Henry M. Whitney is president of this company, which has land in Portsmouth, R. I. It is a very old property, but the claim is made that by chemical treatment the product can be made of commercial value. Curb prices show a gradual hardening tendency.

STOCK QUOTATIONS

NEW YORK July 28 Name of Comp.	Clg.
Alaska Mine	.11
Amalgamated	83¼
Anaconda	48¾
Balaklala	‡2½
British Col. Cop.	7¼
Buffalo Mines	3½
Butte Coalition	26
Colonial Silver	⅛
Cum. Ely Mining	7¾
Davis-Daly	6⅛
Dominion Cop.	7
Douglas Copper	1¼
El Rayo	2½
Florence	3
Foster Cobalt	.32
Furnace Creek	06
Giroux	9⅞
Gold Hill	½
Goldfield Con.	6
Granby	102
Greene Gold	½
Greene G. & S.	[illegible]
Guanajuato	1¼
Guggen. Exp.	196
Hanapah	‡15
Kerr Lake	7⅞
McKinley Dar.	87
Miami Copper	16
Micmac	¾
Mines Co. of Am.	[illegible]
Montezuma of C. R.	28
Mont. Sho. C.	1⅛
Nev. Utah M. & S.	1½
Newhouse M. & S.	2¼
Nipissing Mines	10⅞
Old Hundred	⅝
Silver Queen	‡.35
Stewart	1⅛
Tennessee Copper	‡37
Tri-Bullion	½
United Copper	9¼
Utah Apex	4⅝
Utah Copper	51
Yukon Gold	5½

‡Last quotation.

BOSTON July 28 Name of Comp.	Clg.
Adventure	6¾
Allouez	43
Am. Zinc	30¼
Arcadian	4¼
Arizona Com.	42
Atlantic	9⅛
Boston Con.	16
Calumet & Ariz.	105
Calumet & Hecla	‡635
Centennial	‡32
Copper Range	82½
Daly-West	‡8
East Butte	12½
Franklin	17⅛
Greene Can.	9⅞
Hancock	10⅜
Isle Royal	25
Keweenaw	3⅞
La Salle	14
Mass	8⅝
Michigan	11½
Mohawk	63
Nevada	24
North Butte	56¼
Ojibway	11½
Old Colony	50
Old Dominion	55
Osceola	136
Parrot	32
Quincy	90
Rhode Island	3¼
Shannon	16
Superior	46½
Superior & Bost.	15
Superior & Pitts.	17¼
Tamarack	‡64
Trinity	12¼
U. S. Smg. & Ref.	51
U. S. Sm. & Re., pd.	50
Utah Con.	44
Victoria	4½
Winona	6
Wolverine	150
Wyandotte	2⅛

‡Last quotation.

N. Y. INDUSTRIAL	
Am. Agri. Chem.	‡46⅛
Am. Smelt. & Ref.	95⅞
Am. Sm. & Ref., pf.	112½
Colo. Fuel & Iron.	44
Federal M. & S., pf.	‡88¾
National Lead	86⅛
National Lead, pf.	‡107
Pittsburg Coal	14
Republic I. & S.	35⅜
Republic I. & S., pf.	109¾
Sloss-Sheffield	84
Standard Oil	‡685
U. S. Steel	71¼
U. S. Steel, pf.	127⅝
Va. Car. Chem.	52¼

BOSTON CURB	Low.
Ahmeek	190
Chemung	14⅛
Chino	6¾
Corbin	7⅜
Globe Con.	4
Gila	6½
Ray Central	2½
Ray Con.	16¾
San Antonio	10

Furnished by Hornblower & Weeks, N. Y.

ST. LOUIS July 24 N. of Com.	High.	Low.
Adams	.40	.30
Am. Nettie.	.08	.07
Center Cr'k	1.75	1.50
Cent. C. & C.	82.00	81.00
C. C. & C. pf.	81.00	80.00
Cent. Oil	110.00	105.00
Columbia	8.00	7.00
Con. Coal	19.00	18.00
Doe Run	110.00	100.00
Gra. Bimet.	.28	.22
St. Joe.	12.00	11.00

LONDON July 28 Name of Com.	Clg.
Dolores	£1 5s 0d
Stratton's Ind.	0 3 3
Camp Bird	1 7 6
Esperanza	2 17 6
Tomboy	1 1 0
El Oro	1 5 0
Oroville	0 11 9

Cabled through Wm. P. Bonbright & Co., N. Y.

NEVADA STOCKS. July 28.
Furnished by Weir Bros. & Co., New York.

Name of Comp.	Clg.
COMSTOCK STOCKS	
Belcher	53
Best & Belcher	.38
Caledonia	.16
Chollar	.16
Comstock	27
Con. Cal. & Va.	70
Crown Point	.39
Exchequer	22
Gould & Curry	15
Hale & Norcross	22
Mexican	91
Ophir	1 17
Overman	22
Potosi	31
Savage	21
Sierra Nevada	34
Union	42
Utah	05
Yellow Jacket	70
TONOPAH STOCKS	
Belmont	.82
Extension	.43
Golden Anchor	..
Jim Butler	.08
MacNamara	.21
Midway	.19
Montana	.64
North Star	02
Tono'h Mine of N.	7 00
West End Con.	22
GOLDFI'D STOCKS	
Adams	01
Atlanta	10
Blue Bell	03
Booth	09
C.O.D. Con.	.12
Columbia Mt.	08
Comb. Frac.	.61
Con. Red Top	.
Cracker Jack	01
Dia'dfield B. B. C.	.02
Goldfield Belmont	.04
Goldfield Daisy	23
Great Bend	06
Jumbo Extension	14
Kendall	03
Lone Star	.02
May Queen	.04
Oro	.04
Red Hill	05
Sandstorm	07

Name of Comp.	Clg.
Silver Pick	10
St. Ives	09
Triangle	01
BULLFROG STOCKS	
Gibraltar	02
Homestake King	...
Mont. Shoshone C.	1 43¾
Tramp Cons.	04
MISCELLANEOUS	
Cumberland Ely	7.63
Giroux	9.87½
Greenwa'r Copper	04½
Nevada Con.	23.32½
Nevada Hills	.75
Nevada Smelting	.93¾
Nevada Wonder	.40
Nevada-Utah	1 87½
Penn-Wyoming	...
Pittsburgh S. Pk.	.45
Ray Central	2.56¼
Ray Con.	15.75
Round Mt. Sphinx	10

COLO. SPRINGS July 23 Name of Comp.	Clg.
Acacia	‡.07
C. C. Con.	‡ 03⅛
Dante	‡.05⅝
Doctor	.11⅛
Elkton	69
El Paso	.55
Findlay	‡ 13⅛
Gold Dollar	.13⅛
Gold Sovereign	.03½
Isabella	.20¾
Jack Pot	.10
Jennie Sample	.08
Jerry Johnson	06¼
Lexington	‡.02
Mary McKinney	.40
Pharmacist	‡.03
Portland	78
U. G. M.	05¾
Vindicator	63
Work	.06

Assessments

Company.	Delinq.	Sale	Amt.
Alpha, Nev.	July 16	Aug. 6	$0 05
Belcher, Nev.	July 20	Aug. 10	0.10
Best & Belcher, Nev.	July 20	Aug. 10	0.10
Caledonia, Nev.	July 23	Aug. 13	0.05
Douglas, Idaho	July 8	Aug. 2	0.002
Ely Con. Copper, Nev.	July 16	Aug. 28	0.03
Gold Mt. Champion, Utah	July 26	Aug. 10	0.00½
Massasoit, Utah	Aug. 21	Sept. 14	0.00½
Mountain Dell, Utah	July 19	Aug. 5	0.01½
Pittsburg Con., Utah	Aug. 20	Sept. 17	0.01
Potosi, Nev.	July 9	Aug. 2	0.10
Savage, Nev.	July 28	Aug. 18	0.10
Scottish Chief, Utah	July 7	Aug. 4	0.01
Seven Troughs Mon., Nev.	Aug. 18	Sept. 8	0.00½
Sierra Nevada, Nev.	July 15	Aug. 10	0.10
Silver Bell, Utah	June 30	Aug. 20	0.01½
Tarbox, Idaho	July 29	Aug. 24	0.003
Tombey Grand C., Utah	July 13	Aug. 19	0.00½
Wasatch Utah, Utah	July 19	Aug. 16	0.01
W. Con. Va., Nev.	July 16	Aug. 10	0.10
Yellow Jacket, Nev.	July 13	Aug. 5	0.25

Monthly Average Prices of Metals

SILVER

Month.	New York. 1908.	New York. 1909.	London. 1908.	London. 1909.
January	55.678	51.750	25.738	23.834
February	56.000	51.472	25.855	23.706
March	55.365	50.468	25.570	23.227
April	55.505	51.428	25.133	23.708
May	52.795	52.905	24.377	24.348
June	53.663	52.538	24.760	24.166
July	53.115	......	24.514	......
August	51.683	......	23.858	......
September	51.720	......	23.877	.....
October	51.431	......	23.725	...
November	49.647	......	22.933	......
December	48.766	......	22.493	....
Total	52.864	......	24.402	

New York, cents per fine ounce; London, pence per standard ounce.

COPPER

	NEW YORK. Electrolytic 1908.	Electrolytic 1909.	Lake. 1908.	Lake. 1909.	LONDON. 1908.	LONDON. 1909.
January	13.726	13.893	13.901	14.280	62.386	57.688
February	12.905	12.949	13.098	13.295	58.786	61.198
March	12.704	12.387	12.875	12.826	58.761	56.231
April	12.743	12.56¼	12.928	12.93¾	58.331	57.363
May	12.598	12.893	12.788	13.238	57.387	59.338
June	12.675	13.214	12.877	13.548	57.842	59.627
July	12.702	......	12.933	......	57.989	......
August	13.462	......	13.639	......	60.500	......
September	13.388	......	13.600	......	60.338	.....
October	13.354	......	13.646	......	60.139	......
November	14.130	......	14.386	......	63.417	......
December	14.111	......	14.411	......	62.943	.....
Year	13.208	......	13.424	......	59.902	....

New York, cents per pound. Electrolytic is for cakes, ingots or wirebars. London, pounds sterling, per long ton, standard copper.

TIN AT NEW YORK

Month.	1908.	1909.	Month.	1908.	1909.
January	27.380	28.060	July	29.207	......
February	28.978	28.290	August	29.942	......
March	30.577	28.727	September	28.815	......
April	31.702	29.445	October	29.444	......
May	30.015	29.225	November	30.348	......
June	28.024	29 322	December	29.154	......
			Av. Year	29.465	......

Prices are in cents per pound.

LEAD

Month.	New York. 1908.	New York. 1909.	St. Louis 1909.	London. 1908.	London. 1909.
January	3.691	4.175	4.025	14.469	13.113
February	3.725	4.018	3.868	14.250	13.313
March	3.838	3.986	3.835	13.975	13.438
April	3.993	4.168	4.051	13.469	13.297
May	4.253	4.287	4.214	12.938	13.225
June	4.466	4.350	4.291	12.600	13.031
July	4.744	......	......	13.000	.....
August	4.580	......	......	13.375	......
September	4.515	......	......	13.125	......
October	4.351	......	......	13.375	.....
November	4.330	......	......	13.538	.....
December	4.213	......	......	13.156	...
Year	4.200	......	......	13.439	...

New York and St. Louis, cents per pound. London, pounds sterling per long ton.

SPELTER

Month.	New York 1908.	New York 1909.	St. Louis. 1908.	St. Louis. 1909.	London. 1908.	London. 1909.
January	4.513	5.141	4.363	4.991	20.563	21.425
February	4.788	4.889	4.638	4.739	20.875	21.563
March	4.665	4.757	4.527	4.607	21.075	21.438
April	4.645	4.965	4.495	4.815	21.344	21.531
May	4.608	5.124	4.458	4.974	19.906	21.975
June	4.543	5.402	4.393	5.252	19.000	22.000
July	4.485	......	4.338	......	19.031	......
August	4.702	......	4.556	......	19.350	.....
September	4.769	......	4.619	......	19.563	......
October	4.801	......	4.651	......	19.750	......
November	5.059	......	4.909	......	20.875	......
December	5.137	.....	4.987	......	20.625	.....
Year	4.726	......	4.578	......	20.163	....

New York and St. Louis, cents per pound. London, pounds sterling per long ton.

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Copper Blast Furnace Smelting at Anaconda

Only Three Furnaces Now Used; Two Are 51 Ft. Long and the Third 87 Ft., with a Further Extension of 50 Ft. Planned for the Latter

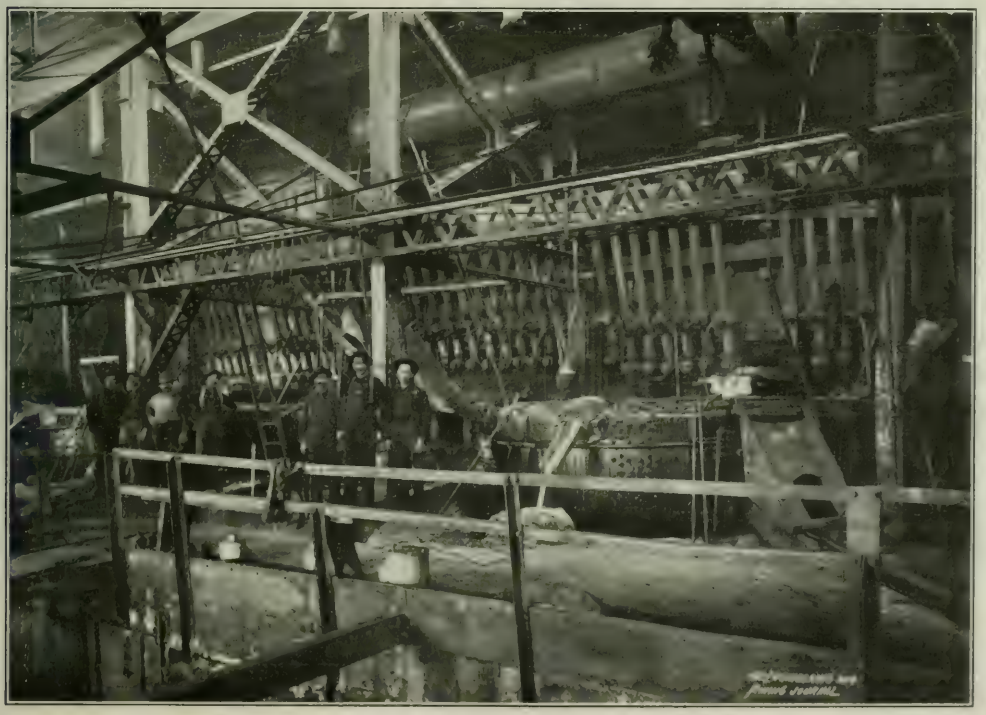
BY C. OFFERHAUS*

Two types of matting furnaces are used in smelting copper ore, the reverberatory furnace and the blast furnace. In the reverberatory furnace the fuel (bituminous coal or oil) is separated from the charge and the charge is so prepared that it is only necessary to melt it down on the hearth in a neutral atmosphere in order to produce a matte of desired concentration and a slag of desired composition and properties. To prepare the charge in this way, the ore generally needs to be concentrated and roasted. The reverberatory furnace is especially adapted for fine materials such as fine roasted concentrates and flue dust. The size of materials charged is limited.

In the blast furnace the charge and fuel (coke) are introduced in the same shaft. A powerful current of air is forced through it, which excludes charging of fine materials. Fine materials, however, may be charged, if previously made into briquets. In blast furnace smelting a distinction is made between "ordinary blast-furnace smelting" and "pyrite smelting."

In ordinary blast-furnace smelting the principal fuel is coke. All the sulphur in the charge goes into the matte except about one half of the pyrite sulphur, which goes off as such, and that proportion of sulphur which will burn off not withstanding the large amount of coke present. The same internal sulphide-oxide reactions which occur in the reverberatory furnace probably also cause a further reduction in the sulphur. To obtain an effective concentration part of the sulphur must be roasted off or mixtures of sulphide and oxide ore must be charged. The gangue must be fluxed, and since our sulphide ores generally contain a silicious gangue a basic flux (lime) will be needed in addition to the iron oxides formed in roasting. Heavy pyrite or pirrhotite ores may, however, need an acid flux.

In the pyrite smelting the principal fuel is FeS, about one half of the pyrite sulphur goes off as such before the com-



VIEW OF TAPPING FLOOR SHOWING ONE OF THE LARGE FURNACES AT ANACONDA, MONT.

*Metallurgical and chemical engineer, 165 Broadway, New York.

[illegible] is reached. In present practice, probably owing to the construction of our furnaces, an addition of some coke varying from 1 to 2 per cent. of the charge seems to be a necessity for most profitable working. True pyrite smelting requires heavy sulphide ore. Iron oxides are formed in excess and a silicious flux (quartz) is required to flux them.

"Semi-pyritic smelting" is intermediate between ordinary blast-furnace smelting and true pyrite smelting; coke and FeS both serve as the fuel. It is applied to relatively poor ores and generally needs in addition to the iron oxides formed an excess of basic flux to slag the silicious gangue. Pyrite and semi-pyritic smelting are, therefore, as far as final results are concerned, a combination of roasting and ordinary smelting, and cause saving of fuel and time.

Anaconda Blast Furnaces

It might occur to a superficial observer that since our modern steel water-jacketed blast furnaces have replaced the old brick shaft furnaces, the construction of the blast furnace has become of much less interest to the present metallurgist, than for instance, the construction of the reverberatory furnace, which is entirely built at the plant. It is true that there are firms which make a specialty of constructing copper blast furnaces and which produce satisfactory equipment. Any essential progress in the construction, however, has been and will be suggested by the metallurgist.

The Anaconda blast-furnace plant consisted originally of seven ordinary 15-ft. furnaces, 56 in. wide at the tuyeres, placed 21 ft. apart. E. P. Mathewson connected two of these furnaces so as to form one furnace, 51 ft. in length. This proved successful and at the present time there are three large furnaces: two 51 ft. long and one 87 ft. long, this latter furnace being a connection or joining of three of the old furnaces. The plan exists to increase its length another 50 ft. Construction work was started, but has been discontinued for the present.

The 51-ft. furnaces are provided with two crucibles and two settlers and the 87-ft. furnace with three crucibles and three settlers, these seven settlers belonging to the original seven 15-ft. furnaces. The advantages of the use of these large blast furnaces over small ones are numerous. They do away, respectively, with two and four sets of end jackets, which means less cooling water and consequently less heat to heat, less corner [illegible] and smaller construction cost. They [illegible] per square foot of [illegible] than the 15-ft. furnaces with less [illegible] coke. Irregularities of all kinds have less influence and the furnaces run, in consequence, more smoothly and require less labor. If freezing takes place it occurs only locally, as a rule, and this can be overcome without closing down the furnace. Changing of water jackets without shutting down entirely, as first practiced at Anaconda, can take place more safely and easily than with the 15-ft. furnaces.

Large furnaces, not only for metallurgical, but for all operations, will work more economically and smoothly as they have less radiating surface and are less susceptible to irregularities of all kinds. There is a tendency at the present time to build large furnaces. The length of a blast furnace is limited only by the supply of ore; the width is limited among other factors, by the power of the blast. A cross-section and a longitudinal section of one of the large Anaconda blast furnaces are shown in the accompanying illustrations. They are self-explanatory and make a detailed description superfluous.

The settlers are 16 ft. in diameter and 5 ft. high. The shell is of [illegible] in. steel plate, lined with 15 in. of silica brick, a space of 3 in. between the steel shell and the silica brick lining being filled with Dillon quartz. The bottom is covered with 12×8×3 in. silica brick laid on end, over these is spread a layer of Dillon quartz. An iron water pipe with holes in it is suspended in and the top on the outside of the settler and furnishes a spray of water for cooling purposes.

The settlers have two matte tap holes, each covered with a cast iron tap block, 4 in. thick. Lined, sheet-steel runners conduct the matte and discharge it over the ladle track. A cast iron slag spout, bolted to the settler shell opposite the furnace,

ANACONDA BLAST FURNACES—DAILY OFFICE REPORT.

Furnace No.	No. of Charges.	Coke. Tons.	Total Smelted. Tons.	Coarse Concentrate. Tons.	Ore. Tons.	Slag. Tons.	Lime Rock. Tons.	Briquets. Tons.	B. F. Cleanings. Tons.	Yard Matte. Tons.	Scrap Iron. Tons.
1-2	265	142	1254.4	31.0	309.7	94.0	487.8	322.5	9.4	....	....
3-4	268	145	1255.4	48.2	289.8	112.3	479.6	295.0	9.5	19.5	1.5
5-6-7	475	255	2247.9	68.5	555.9	178.1	879.7	563.7	.		2.0
Total .	1008	542	4757.7	147.7	1155.4	384.4	1847.1	1181.2	18.9	....	3.5
Loaders . . .				148.2	1161.4	386.1	1856.3	. .	. . .	. .	...

Extra coke used: First shift, 11.5 tons, second shift, 15.0 tons, third shift, 11.0 tons.

Unit days, 11 (i.e., 11 furnace units running).

Coke percentage: 11.39. Total cupreous material smelted, 2907.1 tons.

Blast pressure, 11.12 oz.; draft, 0.7 in. of water (taken in the flue about 100 yards from the dust chamber).

Cupreous material smelted per unit, 273.4 tons.

Delays: First shift, [illegible], second shift, [illegible], third shift, [illegible].

DISTRIBUTION OF CHARGES.*

	1	1-2C	2	Total.	3	3-4C	4	Total	5	5-6C	6	6-7C	7	Total.	Grand Total
First shift	27	33	28	88	27	33	26	86	29	32	29	36	31	157	331
Second shift	27	34	29	90	30	34	25	89	30	31	33	34	32	160	339
Third shift	26	33	28	87	29	36	29	94	27	31	36	33	31	158	339

* The distribution of charges under 1, 1-2C, 2, etc., refers to the number of charges fed to each unit or section of the furnaces; for example, the [illegible] 1-2C, 1 and 2 to the section representing the old No. 1 furnace, 1-2C is the section or unit constructed in joining the old No. 1 and No. 2 [illegible] 2 represents the old No. 2 furnace, 3, 3-4C, 4 are the three units of the joined No. 3 and No. 4 furnaces, 5, 5-6C, 6, 6-7C, 7 are the units of the 87-ft. furnace. The original furnaces and the 51-footers are considered as 11 furnace units.

guides the slag to the granulating launders. The dust chamber is situated at one side of the furnace building on the charging floor level. It is built of red brick, concrete having proved unsatisfactory.

Materials Smelted

The materials charged in the blast furnaces are: First-class ore; briquets; concentrates; matte; slag, containing matte; limestone; cement copper and coke. The ore comes from the mines in Butte as first-class and second-class ore. Every car of first-class ore and every fifth car of second-class ore are run through the sample mill.

The first-class ore is then taken directly to the storage bins of the blast furnaces and the second-class ore goes to the concentrating mill. The first class ore generally contains 4 per cent less SiO_2 than the second-class ore. It may contain more or less Cu than the second-class ore. It is, therefore, perhaps, more correct to classify it as ore suitable for direct smelting and ore suitable for concentration. A certain copper silicate ore, with about 5 per cent. Cu and 65 per cent. SiO_2, and a sulphide ore with 1 per cent. Cu, but 40 oz. Ag. per ton, containing 28 per cent. SiO_2 and often up to 20 per cent. Zn (as sulphide) both custom ores, are, for instance, exclusively used as first-class or direct smelting ore.

The composition of the briquets varies greatly. They contain fine concentrates (about 40 per cent.), fine first-class ore (10 to 20 per cent.), tank or pond slum (40 to 50 per cent.) and coke. Sixty tons of wet coke or 40 tons of dry coke, recovered from the ashes of the reverberatory furnaces, are used daily in the briquets. The following is an analysis of tank slum: SiO_2, 48 per cent.; Cu, 6.95; FeO, 12; S, 14.7; Al_2O_3, 9.8; CaO, 0.5; Ag., 5.6 oz. per ton; and 0.015 oz. Au. per ton. The pond slum has practically the same composition but contains about 2.5 per cent. Cu. There are four briquet machines each with a capacity of about 600 tons per day. The briquets are analyzed daily and the percentage of "insoluble" is determined for every shift. The following analysis may serve to give an idea of the composition of the briquets, which may vary, of course, considerably: H_2O, 14.58 per cent.; Cu, 4.90; SiO_2, 39; FeO, 21.2; S, 20.8; CaO, 0.2; insoluble, first shift, 54.60; second shift, 48.00; third shift, 44 per cent.

The concentrates, mentioned among the charged materials for the blast furnaces, are coarse concentrates from the jigs at the concentrating mill. Their composition may be noted in the accompanying assay office report. The matte that goes into the blast furnaces is clean-up matte from all over the works, e.g., ladle bottoms, runner cleanings, matte tapped from reverberatory furnaces on the floor outside the building, and matte tapped from blast furnace settlers in case of necessity when no ladles were available.

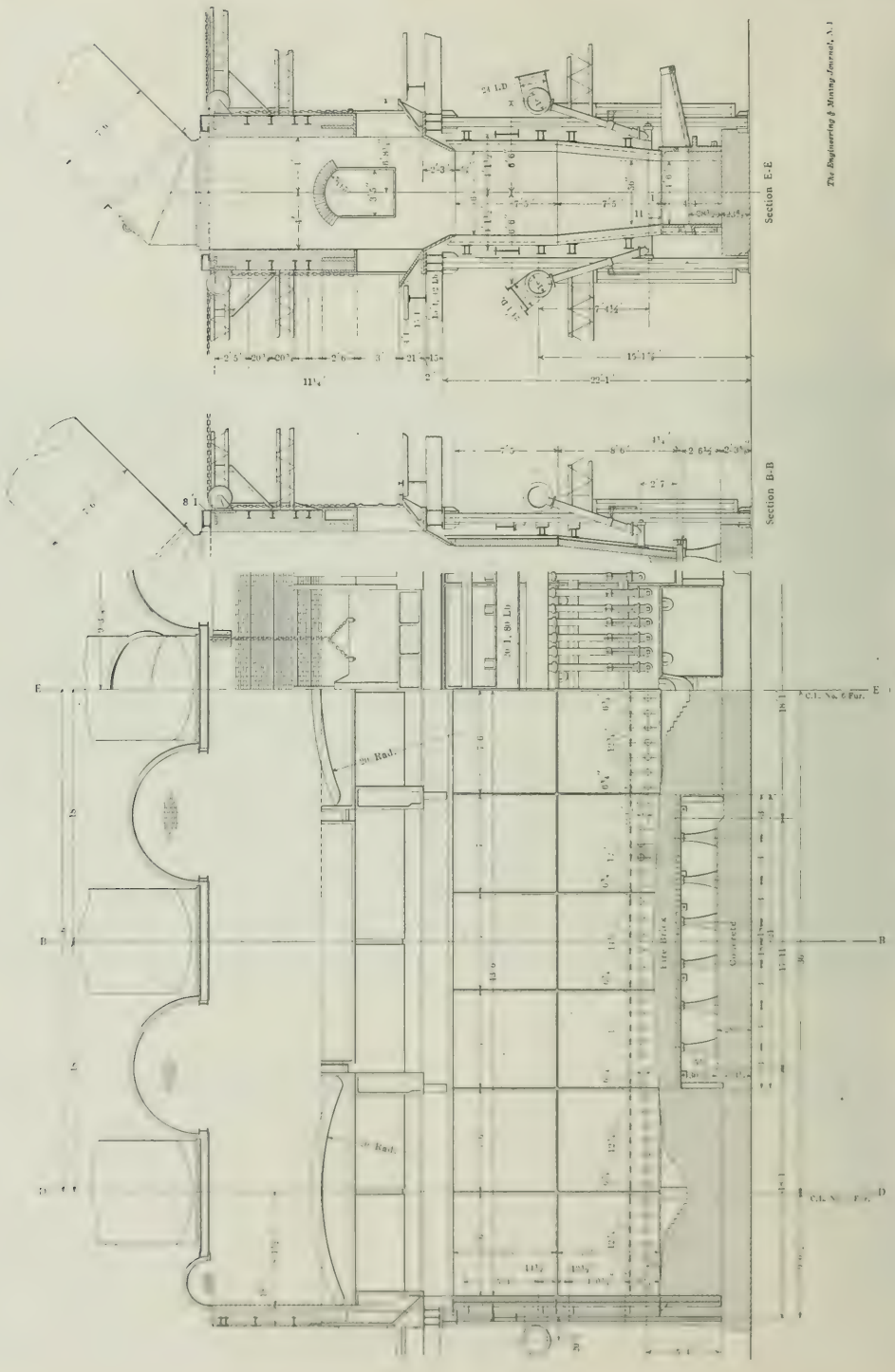
The slag used is mainly converter slag, containing a little matte and averaging about 2½ per cent. copper. This is a basic material which serves as a desirable flux for the acid gangue of the Butte ores. Some additional clean-up slag comes from the reverberatory furnaces.[1] The cement copper charged in the blast furnaces is obtained from the Butte and Anaconda precipitation plants and contains about 60 per cent. copper. The limestone used for flux contains about 1¼ per cent. moisture, and 0.5 per cent. insoluble. The coke for the plant is purchased where it may be obtained most cheaply and is consequently of varied origin and quality. Its average ash content during one month was 12.35 per cent.

VIEW OF FEED FLOOR AT ANACONDA—DOORS ARE RAISED AND CARS TILTED BY COMPRESSED AIR

Conditions Affecting Furnace Operations

The composition of the charge must be calculated in order to produce a matte of the desired concentration and a slag of a desired composition. The matte should contain 45 per cent copper, as this concen-

[1] C. Offerhaus, "Reverberatory Smelting of Copper Ore," Engineering and Mining Journal, June 13, 1908, 2nd June 20, 1908.



DIMENSIONAL AND TRANSVERSE SECTIONAL ELEVATION OF A PORTION OF THE 8½ FOOT COPPER BLAST FURNACE OF THE ANACONDA COPPER MINING COMPANY

tration is preferred at the converter plant, and as the blast furnaces run most economically and uniformly on this concentration. When no foreign slag or high-iron ores are available, the following is about the desired composition of the slag at Anaconda: SiO_2, 41 per cent.; CaO, 30; FeO, 17. The calculation of the charge in pyrite and semi-pyritic smelting is more or less empirical. If the amount of sulphur, copper and coke in the charge is fixed, the concentration of the matte and the composition of the slag in consequence will depend mainly upon the pressure of the blast, or better, upon the amount of air which is forced through in a unit of time.

If, on the other hand, the amount of coke in the charge and the pressure of the blast are fixed (the furnace itself is also a constant factor), the concentration will depend mainly upon the percentage of sulphur (and copper) in the charge. About 11 per cent. coke is normally charged. (The furnaces sometimes run on less than 9 per cent. coke, making matte of 48 to 50 per cent. copper, this depending upon the amount of active sulphur in the charge.) The pressure of the blast is kept practically constant at 42 oz. per sq.in. The amount of air the furnace will take is, of course, variable. It is found, however, that if the above amount of coke and blast pressure is used with a charge of a certain sulphur and copper content, about 75 per cent. of the sulphur will go off as S and SO_2, and a matte of about 45 per cent. copper and a slag of the desired composition will be formed.

Upon this the calculation of the charge is based. We assume that about 75 per cent. of the total sulphur goes off, forming a matte of about 45 per cent. copper and calculate the amount of the different components of the charge so as to form a slag of the composition given above. The amount of slag produced, by weight, is from eight to nine times that of the matte, and the percentage of sulphur and iron on the total charge is relatively small; wide limits in the concentration of the matte produced or in the percentage of sulphur and iron on the charge have, therefore, only a slight influence upon the composition of the slag. For instance, a certain charge, assuming the formation of matte of 40 per cent. copper, would give by calculation a slag with 41.1 per cent. SiO_2, 17.7 FeO and 30.2 CaO. If the same charge produces in fact mattes of 45 and 50 per cent. copper, the composition of the slag will be 40.6 per cent. SiO_2, 18.6 FeO, 29.8 CaO, and 40.1 SiO_2, 19.5 FeO, 29.4 CaO, respectively.

CHARGE CALCULATION.

Material.	Pounds.	Silica. Per Cent.	Silica. Pounds.	FeO. Per Cent.	FeO. Pounds.	CaO. Per Cent.	CaO. Pounds.	Copper. Per Cent.	Copper. Pounds.
Concentrates	1000	28	280	32	320	..	....	7	70
Ore	3200	52	1660	14	450	..	....	7	224
Slag	1300	30	390	48	624	..		7	91
Lime	4200	7	294	..	....	47	1975	...	...
Ash of 1000 lb. coke.		..	60	..	20	..	..	...	....
Slag:									
41.0% SiO_2	....	..	2684	..	1414	..	2000	...	385
17.5% FeO	....	..	1147	(for matte)	267	..	....	(5% loss)	20
30.5% CaO	....	..	2000	.	....	..	....	...	....
89.0%	...	..	5831	..	1147	..	..	...	365
Total weight of slag	....	..	6550	..	....	..	....	matte (45%)	810 lb.
Concentrates	300	28	84	32	96	..	....	7	21
Ore	1800	52	935	14	252	.	...	7	126
Slag	1300	30	390	48	624	.	..	7	91
Lime	3800	7.	266	..	....	47	1800	...	. .
Briquets (2000 dry)	2500	38	760	20	400	.	...	4 5	90
Ash of 1000 lb. coke.			60	.	20	.	...	...	. .
Slag:									
40.6% SiO_2	...	..	2495		1392		1800	...	328
19.0% FeO			1163	(for matte)	229		.	(5% loss)	16
29.4% CaO			1800						
89.0%			5458	..	1163	.	.	.	312
Total weight of slag	. .		6140	.	.		....	matte (45%)	693 lb.

Four or five different copper-carrying materials are charged at Anaconda, the composition of each of which (except briquets) varies only slightly, as the company smelts Butte ore almost exclusively, a large part of the tonnage being from its own or affiliated mines. Different proportions of these materials can be selected so as to produce matte and slag of the desired composition. The supply of the different materials changes, however, and the difficulty in running the blast furnaces lies not so much in the calculation of the charge as in running the furnaces most economically with the materials at hand.

The weight of the briquets charged is a fixed quantity as the hoppers from which the briquets are dumped into the charging cars contain 2500 lb. The amount of coarse concentrates and slag charged can vary but slightly as they are available in limited quantities only. Their weight is, therefore, also fixed, whereupon the amount of ore and lime is calculated by the trial method.

Calculation of the Charge

The assay office reports regularly the analysis of all smelting products to the blast-furnace department. For the calculation of the charge the average monthly analysis is used, except for the briquets, the composition of which is too changeable. The amount of materials estimated to be in the storage bins is reported daily. In an accompanying table two charge calculations are shown. With a 9000-lb. charge loaded in two cars, 1000 lb. of coke are charged, the ash of which contains approximately 60 lb. SiO_2 and 20 lb. FeO. It is usual to subtract 5 per cent. of the total copper as loss in the slag. This corresponds approximately with 0.3 per cent. copper in the slag. In the first calculation 395 lb. of copper corresponds with the 810 lb. of 45-per cent. matte, and as 100 parts of matte of 45 per cent. copper contain 25.6 parts Fe, corresponding to 33 parts FeO, we must subtract from the total FeO, 267 pounds, equivalent to 208 lb. Fe, which goes into the matte as sulphid-

RECORD OF BLAST FURNACE CHARGES FOR ONE WEEK FROM ANACONDA CHARGE BOOK.

Date.	Conc.	Ore.	Slag.	Lime.	Briq.	Conc.	Ore.	Slag.	Lime.	Conc.	Green Ore.	Slag.	Lime.	Briq.
Aug. 10, 7:00 a.m.	1200	1100	600	3800	2500	1200	3100	900	1200	600	1500	1000	4000	2500
Aug. 10, 3:00 p.m.	300	2200	600	3900	2500	1100	3100	700	1200	600	1500	1000	4000	2500
Aug. 10, 11:00 p.m.	1200	1100	600	3800	2500	1200	3100	900	1200	600	1500	1000	4000	2500
Aug. 11, 7:00 a.m.	300	1300	600	3900	2500	1200	3200	800	1200	600	1500	1000	4000	2500
Aug. 11, 3:00 p.m.	1200	1100	600	3800	2500	1200	3100	900	1200	600	1500	1000	4000	2500
Aug. 11, 11:00 p.m.	300	2400	600	3800	2500	1200	3200	800	1200	600	1500	1000	4000	2500
Aug. 13, 9:00 a.m.	300	2400	700	3700	2500	1200	3200	800	1200	600	1500	1000	4000	2500
Aug. 14, 9:00 a.m.	200	2400	700	3700	2500	1200	3200	800	1200	600	1500	1000	4000	2500
Aug. 16, 3:00 p.m.	200	2400	800	3700	2500	1200	3200	1000	1200	600	1500	1000	4000	2500
Aug. 17, 3:00 p.m.	200	2400	1000	3600	2500	1200	3200	1100	1200	600	1500	1000	4000	2500

Light charge: Matte, 1500; concentrates, 1500; ore, 500, slag, 2000; limerock, 2500.
Three charges always kept on the board.

The slag will, therefore, contain 2684 lb. SiO_2, 1147 lb. FeO and 2000 lb. CaO, and these three constituents form 89 per cent. of the slag. The total slag is, therefore, 6550 lb., and should contain 41 per cent. SiO_2, 17.5 FeO and 30.5 CaO.

The charge is changed as the stock of charging materials in the storage bins requires, or as the composition of the slag itself may demand. If the SiO_2 content of the slag runs up to 45 per cent. there is danger of freezing the furnace. An accompanying table taken from the charging book shows the changes made over the period of a week and will help to give an idea of the running of these large furnaces. A so-called light charge is always on the charging book in case of need. It is calculated to produce a 40-per cent. matte; the ordinary charge with extra coke has much the same effect.

Charging Operations

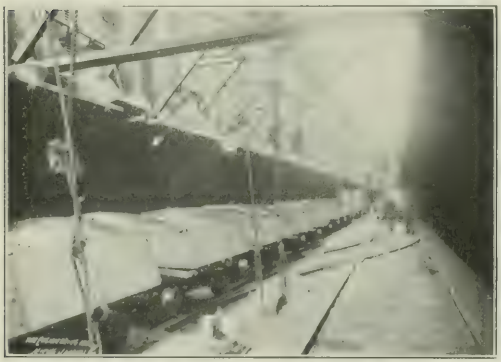
The row of furnaces are alternately charged from each side by charging trains which run along the sides of the furnaces. The trains are pulled by a compressed-air locomotive operating at 1000 lb. air pressure and recharged every 20 min. An unloaded train coming from the blast furnaces runs along the storage bins and the charge is dropped from chutes into two cars at the same time. The two cars of quartzite weigh 4700 lb. each and stand on Fairbanks track scales, every constituent of the charge being weighed as the charge. The different materials are then stowed in railroad cars before being dumped in the storage bins and then placed in storage. The order in which the materials are loaded into the cars is as follows: Limestone, slag, slag, slag, briquets.

From the storage bins the train passes under the briquet hoppers, which contain, as previously mentioned, about 1000 lb. of briquets. With the train in a heavy all the briquets discharge their contents through the hoppers down on the cars. The train is then ready to go to the furnaces. The coke comes to the charging floor level of the blast furnaces in railroad cars and is discharged into wheelbarrows, which have a capacity of 1000 lb. It is the practice to moisten the coke, in order to prevent dust.

If, in the opinion of the feeder, the previous charge is down sufficiently, the heavy iron doors of the furnace are opened mechanically by means of compressed air at 90-lb. pressure and half of a barrow of coke is charged per door. All of the doors do not always receive a charge and sometimes more coke is charged in one door than in another, this depending upon the condition of the furnace. Immediately following this operation the train moves up and one car is charged per door. The side-dumping cars are tipped mechanically, using compressed air at 90-lb. pressure, and discharge their contents directly into the furnace. The small furnaces have 6 doors on each side and the larger ones 10 doors. A train of 18 cars is discharged about every 10 or 15 min. Normally one barrow of coke (1000 lb.) is used for every two cars of charge (9000 lb.), but extra coke may be charged if necessary.

Crusts are broken up if possible by long iron bars. Bad places in the furnace, where the charge does not go down, are remedied by a light charge, by extra coke, or scrap iron. Cement copper, on the other hand, is only charged at normal places, and precaution is taken not to charge more than the furnace can handle. It raises the grade of the matte and tends to build up hearth. A large amount of low concentrates in the briquets sometimes tends to make the furnaces run very hot in the top. A light charge or extra coke makes the furnace run more easily, and for this reason there are often more of these charges than is necessary. It is the duty of the blast-furnace superintendent to see that this is not done, as it causes, besides a high coke consumption, production of lower matte and consequently throws more work on the converters.

A sample of the daily report of the blast furnaces, covering the whole 24-hour period, is shown in an accompanying table. It shows that, on the day in question, 2907.1 tons of cupreous material were smelted, requiring 1847.1 tons of limestone as flux, this being over 60 per cent. of the amount of cupreous material smelted. It shows, furthermore, that the center portions of the furnaces which are 21 ft. in length take a greater number of charges than the end sections which are 15 ft. long. As a rule, however, the tonnage per square foot of hearth area is less in the center than in the end sections. The centers run as fast as the normal running of a 15-ft. furnace and the ends faster. A pronounced difference in matte concentration between the center and the end sections of a furnace and in consequence between the 51-ft. furnaces and the 87-ft. furnace is not noticed. The 87-ft. furnace gives, sometimes, lower matte and sometimes higher matte than the 51-ft. furnaces, principally due to irregularities in the composition of the charge.



CHARGE TRAIN UNDER STORAGE BINS

LOADING BRIQUETS ON THE FURNACE CHARGE

Tapping Floor Operations

For every settler there is a tapper and two helpers. The tuyeres are regularly punched twice per shift of eight hours, using a punch rod of ¾ in. diameter. Those which cannot be opened are taken out and drilled by an air drill, which is kept on the tapping floor, cleaned and replaced. The tuyeres in the end jackets are left out and the last tuyeres at each end of the sides of the furnaces is not used. Using these tuyeres would give too much heat at the ends which might cause bad chilling.

Matte and slag leave the furnaces continuously through trap spouts and enter the settlers through an opening in the roof. The spouts are of boiler plate and

have a cast-iron nose; the noses last from two to three months; the spouts a year or more. It is the practice to cover the furnace spouts with wooden blocks or lumps of coke around which a clay hood is built. The opening in the roof of the settler is liable to get narrow and must be kept of a sufficient size. The furnace discharge spouts also require barring occasionally. To enlarge and keep them open, coke is thrown into the clay-covered spout, part of which stays at each side of the slag and matte stream. This works fairly well. Another means is to insert a fresh block of wood or lump of coke. Inside crusts sometimes stop up these spout openings. To get rid of them the water of the jackets around the connection is shut off slightly. The overflow water of the jackets, however, should never get hotter than one can bear on the hand.

ASSAY OFFICE REPORT—BLAST FURNACES.

	1st Shift.	2d. Shift.	3d. Shift.
Cu. in matte	49 8	47 0	42 5
SiO₂ in slag	41 2	41 5	41 4
FeO in slag	18 4	18 0	19 5
CaO in slag	29 0	29 8	28 1

SETTLERS.

	1.	2.	3	4.	5.	6.	7
Cu. in slag	0 25	0 20	0 25	0 25	0 20	0 20	0.25
Cu. in matte[b]	47.2	47.3	46.3	47 7	46 2	44 6	45.2

	Cu. Per Cent.	Insol. Per Cent	FeO Per Cent.	CaO Per Cent.	H_2O Per Cent.
Coarse concentrates	8.9	26 0	34.0		
Coarse limestone		9 3		48 6	1 25

[a] Sampled in blast-furnace department.
[b] Sampled in converter department.

Working on high-grade matte causes the bottom of the furnaces to rise and if it rises too high the tuyeres become filled with slag. A light charge will bring the bottom down again. Sometimes a single tuyere becomes red hot. In this case slag has been forced into it between the crust and the jacket. The tuyere is then chilled with water from a hose and cleaned out later. Break-outs between jackets or jacket and bottom plate occur but seldom and are closed by chilling with water from a hose. Burning a water jacket seldom occurs; the interior of the jackets must be cleaned by washing them out and by scraping out the silt at certain intervals, this depending upon the nature of the water.

Tapping the Matte

A new settler holds 3 to 4 ladles of matte, the capacity of the ladles being from 7 to 10 tons. An old settler, which contains chilled slag may hold only two ladles. To find the level of the matte the tapper lowers an iron rod into the settler, leaves it there for a few minutes, and pulls it out rapidly. Matte does not accumulate on the rod as readily as slag and it cools more quickly so that the dividing line between the thin layer of dark red matte and the heavy layer of the red hot slag can easily be seen. To tap the settler, the iron bar in the taphole is knocked out, using a ring and wedge, and the matte flows through a dry, clayed runner into a lined sheet-steel ladle of 7- to 10-tons capacity, mounted on a car. The runners are lined with a mixture of converter lining ore and pond slum and are dried with hot slag; newly lined ladles are first used at the reverberatory furnaces, the matte of these furnaces being cooler.

When the settlers are tapped dense white fumes, which are principally ZnO, rise from the matte. As soon as the tap hole is open a sheet-iron cover or hood, shown in the view of the tapping floor, is lowered over the tap hole. A compressed-air pipe extends into the hood and the air is turned on to expel the white fumes, so that the tap hole will be visible. The dense white fumes deposited on and collected from this sheet-iron cover were analyzed several times for arsenic, but this could not be detected. If two ladles are to be tapped from the same settler the full ladle is replaced by the following empty one without stopping the flow. A compressed-air locomotive takes a train of full ladles at once to the converter plant.

One or two ladles of matte having been withdrawn, the tapper closes the tap hole with a clay plug stuck on a dolly, one of the helpers assisting him by hammering on the end of the dolly bar. The sheet-iron cover is then raised and a warm, pointed iron bar is driven through the fresh clay until it reaches the matte. This iron rod is dissolved by the matte and must be driven in from time to time to secure contact with the matte. If it does not feed free it is forced in, or if this can not be done it is replaced by a chisel pointed bar, and the tap hole is opened by continuous hammering. As soon as soft material is reached the chisel-pointed rod is replaced by the original rod, which is then driven in without spilling the matte. The cooling water of the settler is shut off during this operation.

The necessity of drilling the tap hole open as must often be done at the reverberatory furnaces seldom occurs here, since the matte is so much hotter. The average temperature of the blast-furnace matte leaving the settler is 1230 deg. C., and that of the slag 1280 deg. C. The temperature of matte and slag measured at the spout of the furnace is 1325 deg. C. Notwithstanding the high temperature of the matte the settlers are scarcely affected and can be used for two or three years before repairing.

If the level of the matte gets too high unexpectedly, which is indicated by running of the slag hole of the settler, the matte must be tapped at once, and in case no ladles are at hand it is tapped on the floor. It always takes some time to open the tap hole, and if necessary, the flow of the furnace may be stopped for this purpose for a short time by cutting off the blast. There are two tap holes, and in case one of them is "lost" unexpectedly, the other can be used.

Slag Disposal

The slag overflows through the slag hole at the top of the settler at the opposite side from the furnace. It is guided by a cast-iron slag runner, which is knocked from time to time to clean it from slag, and painted afresh with lime water to prevent the slag from adhering to it. The slag stream goes through a hole in the tapping floor and a few inches below is granulated by a powerful stream of water from a 6-in. pipe, somewhat flattened at the end. The granulated slag from all the blast furnaces discharges in one large wooden flume lined up with iron plates. This flume conveys the granulated slag to the dump. There are two of these flumes, one being for reserve.

Every ladle of matte is sampled, the sample being taken from the runner, and every two hours a slag sample is taken. The daily assay report for the blast furnaces is shown in an accompanying table. A copper determination on an average matte sample and an analysis of

COMPARISON OF SLAGS

	Cu. Per Cent	SiO_2 Per Cent.	FeO Per Cent.	CaO Per Cent.	Cu. in Matte	Coke Per Cent	1st Class Ore Used Per Cent
Slag No. 1 (high lime)	0 23	42 2	17 9	29 5	45 0	11 7	21 6
Slag No. 2	0 33	40 2	22 5	26 9	45.0	10 7	16 2

an average slag sample is made for each [illegible]. In addition a copper determination [illegible] an average slag sample is made for each settler. Every ladle of matte is [illegible] more sampled on the converter [illegible] during blow. The slag contains only 0.2 to 0.25 per cent. copper. This copper is present almost exclusively as suspended matte, and this low percentage of copper is due to the low specific gravity and the high temperature of the slag and perhaps to the size of the settler. The advantage of large settlers over small ones lies much more in their durability (less variation in the temperature) than [illegible] more perfect separation. An accompanying table shows that a slag high in iron, which has a lower melting point but is heavier than the usual slag, is produced with less coke but takes more copper away.

Claying a Settler

It is found that the settlers need reclaying about every three months on the front side only and especially at the tap holes. Dillon quartz is thrown in through the hole in the roof, this hole being enlarged for this purpose. When the settler is almost filled with matte the spout of the furnace is stopped up, the tuyeres are shut off and the settler is tapped dry. All men available are employed to throw in the Dillon quartz and to tamp it in with special tools. The operation of claying takes only 20 min. in this way. If necessary the spout is relined with fireclay and provided with a new hood; the cast-iron slag runner is changed and the slag hole provided with a hood of coke and clay to keep the slag from crusting too much at this point.

To change a tapping block it is not necessary to tap the settler dry. The plate is taken away without removing the iron rod which closes the tap hole and a new plate is slipped over the iron rod and put in place. A safer way to change the tapping plate is, however, to first tap the settler about dry, and this is usually done. The tap hole in the brick lining of a newly lined settler is not much larger than the diameter of the rod. The tapping block is 3 x 4 in. cast-iron plate. The dissolving power of copper matte containing 45 per cent. copper for iron, is almost the minimum, and a tapping plate lasts about one month.

According to the "Central Oregonian" [illegible] temporarily reported [illegible] yellow soap. Gasolene will not [illegible] soap and if the latter [illegible] the opening [illegible] stopped up. In the [illegible] soap is an excellent [illegible] gasolene pipe [illegible].

[illegible] Office Report on an Anaconda Copper Company [illegible] Engineering and Mining Journal, Oct. 17, 1908.

Base Metals in the Transvaal

Special Correspondence

The near approach of the producing stage of some of the northern Transvaal tin ventures is again drawing attention to the possibilities of South Africa as a tin producer. The most important of these are the Rooiberg, which has just completed a satisfactory trial crushing with 20 stamps Weynek and Doornhoek (South Africa Tins, Ltd.) properties. A good description of the main features of these and the other known occurrences of tin ores will be found in Johnson's "Ore Deposits of South Africa," Part 1, "Base Metals."

The Tin Deposits

Until about 2½ years ago the South Africa output of tinstone was entirely derived from the detrital accumulations in the Embabaan valley which have been regularly worked since 1892. Since then this source has been overshadowed by the Potgietersrust tinfield, also in the northern Transvaal. There ore is being mined from end to end of a belt of country four miles in length.

The Rooiberg occurrence bids fair to develop into a tin deposit of importance. It was registered as a company in May last under the title of the "Rooiberg Minerals Development Company, Ltd.," with a nominal capital of £150,000. Of this amount £75,000 was apportioned to working capital and £25,000 was held in reserve. The Oceana Consolidated Company, Ltd., Farrar Brothers, and the Anglo-French Exploration Company, are the chief parties interested.

Much activity is also being displayed in the neighborhood of the Embabaan occurrence. As already stated, this has been regularly worked since 1892, but it is only since the formation of the present company (the Swazi Tins, Ltd.) in 1905, that records of the output have been kept. For the year ending June 30, 1906, 229 tons of concentrates were shipped, followed in 1907 by 270, and in 1908 by 512 tons.

The tinstone has hitherto been obtained from the gravel by sluicing at a cost of 30s per cu.yd., the value of the deposit being about 48s per cu.yd. The concentrates are then hand-sorted into three grades of a respective value of £125 ton, £120 and £75 per ton. The tinstone in this last product is very fine and cannot be completely separated from the matrix with the methods at present employed. Last year hydraulicking was started and it is hoped by this method to be able to work many of the poorer gravels which cannot be worked at a profit by the older and more expensive method.

Iron Ores

There has lately been much discussion in the local papers as to the possibilities of an iron industry in the Transvaal. But why the discussion should center on the demerits of titaniferous ores is difficult to understand. That deposits of titaniferous iron ore occur all along the margin of the great Bushveld laccolith on the southern edge of which Pretoria is situated is well known, but it stands to reason that even if the difficulties attending the treatment of such ores can be overcome, they will yet be a disadvantage compared with non-titaniferous ores, in which these difficulties do not have to be overcome, and of which there are plenty of good deposits in the country.

The general manager of the Central South African Railways in his annual report for 1908, says: "For some time past attention has been devoted to the possibility of utilizing the ironstone of good quality which has been found to exist in the neighborhood of Pretoria, and particularly so on railway land adjacent to the workshops. Among the difficulties to be overcome is the provision of coke of suitable quality and price, or, alternatively, the supply of electricity in bulk at a sufficiently low cost to enable an iron industry to be established on a commercially profitable basis. This problem has not yet been solved, but it is hoped that it will be shortly.

"The government mining engineer is actively interesting himself in the matter and we are affording him all the assistance open to us. It is proposed to commence with a plant capable of converting our scrap steel, combined with a proportion of the iron ore, into material suited to our requirements, with an output of about five tons a day. If experience proves as successful as anticipated, it is expected that private enterprise will thereafter undertake operations on an adequate scale, and so do away with the present practice of disposing of large quantities of scrapped steel and iron for export over sea at what is virtually a nominal price. Taking the supply of the (Witwatersrand) mines into consideration it is estimated that there will be at least 10,000 tons per annum of good quality scrap steel available for conversion."

At the recent Het Volk congress the minister of mines stated that the government had decided to offer a bonus to Transvaal iron factories, commencing at 15s per ton for the first year and tapering away in 10 years. The small electric furnace to be ordered for railroad shops at Pretoria is intended to demonstrate the possibilities of Transvaal iron ores.

The great disadvantage is the apparent absence of good coking coal in South Africa. Attempts have been made to produce coke, but so far without success. Whether this is wholly due to the unsuitability of the coal, or whether it may not be in part due to the ignorance of proper methods is uncertain.

Efficiency of the Air Lift as a Solution Pump

Theory Worked Out and Applications Given. Minimum Efficiency of 70 Per Cent. Should Be Attained; Substitute for Small Centrifugal Pumps

BY LEONARD M. GREEN*

Although, on account of its convenience, the air lift is frequently employed in cyanide plants, it is seldom credited with efficiency and but little attention is paid to the relative proportions of its component parts. There appears to be no reason why an air lift should not work with a fairly high efficiency, and it seems probable that the reason for the general belief that the efficiency is low, is that it is generally used for low lifts with air at a considerable pressure.

It is also generally assumed that the pressure of air necessary to work the lift depends solely on the depth of the well. This is an erroneous supposition, for although the air pressure necessary to start the lift working depends only on the depth of the well, that necessary to keep it working is dependent both on the depth of the well and on the velocity of the water entering the rising main, and is always less than that due to depth alone.

With the idea of approximately determining the efficiency that may be expected from an air lift used as a solution pump under any given conditions, I have worked out the formulas given below and I trust that they may be of use to others.

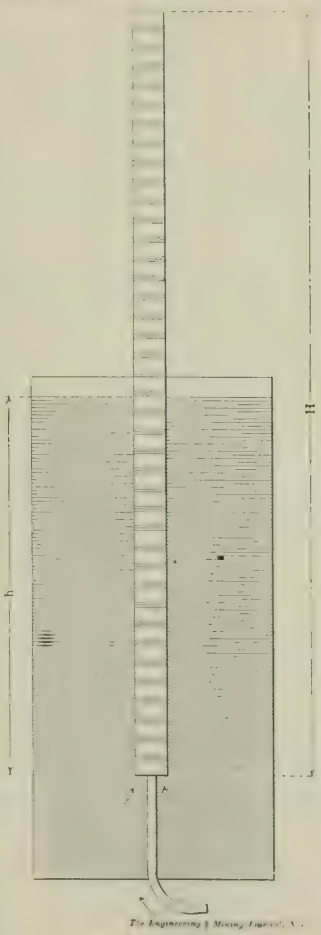
Theory of the Air Lift

When an air lift is working, the rising main may be considered as containing a number of layers of air and water, each water layer containing the same amount of free air though not having the same cubic contents. Owing to the rapidity of expansion of air, the separate layers of air each assume their proper volume due to the weight of the water layers above them. If the air nozzle of the lift is connected directly to the compressor and receives uncooled compressed air, the air on entering the lift probably loses its heat to the lower layers of water, slightly raising their temperature. On rising through the main, however, the expanding air reabsorbs this heat so that air and water at the normal temperature are discharged, and as the weight of water in the rising main is so much greater than that of the air, the rise in temperature of the lower layers is so slight that, for practical purposes, both the air and water may be considered as being at the normal temperature throughout the lift.

Supposing equal quantities of free air in each layer, if the volume of the lowest be unity that of the upper layer will be

$$\frac{33.94 + \textit{equivalent hight of water in the main}}{33.94},$$

33.94 ft. of water being taken as the equivalent of atmospheric pressure. In the following calculations, the diameter of the well is in all cases considered sufficient to eliminate friction of water passing downward to reach the bottom of the rising main. With a very narrow well the capacity of the lift is largely reduced



The Engineering & Mining Journal, N. Y.

FIG. 1. THE AIR LIFT

Amount of Air Required

The following is a determination of the cubic feet per second of free air required to raise a certain amount of water per minute to a given hight, with a well of fixed depth and a lift of given diameter:

Let

h = Depth of the well in feet,
H = Hight of the rising main in feet,
a = Area of the rising main in square feet.

At any time during the working let the rising main contain air which occupies x cu.ft. Then

$$\frac{x}{a} = \text{Equivalent hight of air in the main.}$$

and

$$H - \frac{x}{a} = \text{Equivalent hight of water in the main.}$$

Since the weight of the air may be neglected, the head produced at the bottom of the main, tending to cause water to enter it, is equal to $h - \left(H - \frac{x}{a}\right)$ ft. of water.

Suppose that there are n layers each of air and water in the main, and let the equivalent hight of the lowest layer of air be b ft. This layer, after it has left the air nozzle, is under a pressure of $\left(H - \frac{x}{a}\right)$ ft. of water. The top layer will be at approximately atmospheric pressure, so that its hight will be:

$$b \times \frac{33.94 + \left(H - \frac{x}{a}\right)}{33.94}$$

ft. The average hight of each layer will be slightly less than the mean of the hights of the top and bottom layers. It will be the sum of the hights of the top and bottom layers multiplied by a factor which is always slightly less than 0.50. The value of this factor depends on the equivalent hight of the water in the rising main, and its value for variations of the factor $\left(H - \frac{x}{a}\right)$ is shown in Fig. 2. Calling this factor f, the average value of the hight of an air layer will be:

$$f \times \left(b + b \cdot \frac{33.94 + \left(H - \frac{x}{a}\right)}{33.94}\right) = bf\left(\frac{67.88 + \left(H - \frac{x}{a}\right)}{33.94}\right)$$

and since there are n layers, the total equivalent hight of the air in the main will be

*British Club, City of Mexico.

$$n^2 f \cdot \left(\frac{67.88 + \left(H - \frac{x}{a}\right)}{33.94} \right) = \frac{x}{a}.$$

Therefore,

$$n = \frac{\frac{x}{a}}{\sqrt{f \cdot \left(\frac{67.88 + \left(H - \frac{x}{a}\right)}{33.94} \right)}}.$$

Also since there are n layers of water, each layer of water has a hight of:

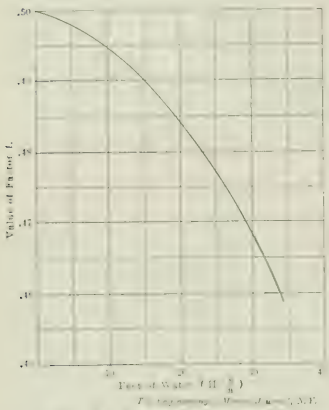


FIG. 2. VALUES OF FACTOR f

$$\frac{H - \frac{x}{a}}{n} \text{ ft.} = \frac{H - \frac{x}{a}}{\frac{x}{a}} \times \sqrt{f \cdot \left(\frac{67.88 + \left(H - \frac{x}{a}\right)}{33.94} \right)}$$

ft. Therefore, the ratio of the hight of the lowest layer of air to the hight of the lowest layer of water is as

$$h : hf \left(\frac{67.88 + \left(H - \frac{x}{a}\right)}{33.94} \right) \quad \frac{H - \frac{x}{a}}{\frac{x}{a}}$$

or as

$$\frac{x}{a} : \left(H - \frac{x}{a}\right) \cdot f \cdot \left(\frac{67.88 + \left(H - \frac{x}{a}\right)}{33.94} \right)$$

Now the velocity with which the water entering the bottom of the rising main moves is due to a head $h = \left(H - \frac{x}{a}\right)$ ft. Suppose this velocity is v ft. per second. Then the volume of air and water raised per second at the bottom of the rising main is $\frac{Va}{8.32}$, the volume of air being

$$\frac{\frac{x}{a}}{\frac{x}{a} + \left(H - \frac{x}{a}\right) \cdot f \cdot \left(\frac{67.88 + \left(H - \frac{x}{a}\right)}{33.94} \right)}$$

that is the ratio

$$\frac{\left(H - \frac{x}{a}\right) \cdot f \cdot \left(\frac{67.88 + \left(H - \frac{x}{a}\right)}{33.94} \right)}{\frac{x}{a} + \left(H - \frac{x}{a}\right) \cdot f \cdot \left(\frac{67.88 + \left(H - \frac{x}{a}\right)}{33.94} \right)}.$$

Let V = velocity in ft. per sec. of water flowing through a cast-iron pipe of area a sq.ft. and length H ft. under a pressure of 30 lb. per sq.in. (or a head of 69.28 ft. of water). Then as the amounts flowing through such a pipe are practically proportional to the square roots of the pressures or heads under which they flow, the velocity due to a head of $h = \left(H - \frac{x}{a}\right)$ ft. will be:

$$v = V \times \sqrt{\frac{h - \left(H - \frac{x}{a}\right)}{69.28}} = \frac{V}{8.32} \times \sqrt{h - \left(H - \frac{x}{a}\right)}$$

Substituting this value in the above equations:

$$\frac{\left(H - \frac{x}{a}\right) \cdot f \cdot \left(\frac{67.88 + \left(H - \frac{x}{a}\right)}{33.94} \right)}{\frac{x}{a} + \left(H - \frac{x}{a}\right) \cdot f \cdot \left(\frac{67.88 + \left(H - \frac{x}{a}\right)}{33.94} \right)}$$

Both these results are in cubic feet per second, and the air has been measured under a head of $\left(H - \frac{x}{a}\right)$ ft. of water, the equations may, therefore, more conveniently be written:

(*A*) Cu.ft. of free air rising per sec. =

$$\frac{\frac{33.94 + \left(H - \frac{x}{a}\right)}{33.94}}{\frac{x}{a} + \left(H - \frac{x}{a}\right) \cdot f \cdot \left(\frac{67.88 + \left(H - \frac{x}{a}\right)}{33.94} \right)} \times \frac{Va}{8.32} \times \sqrt{h - \left(H - \frac{x}{a}\right)} \times$$

(*B*) Lb. of water raised per min. =

$$374^{\text{l}} \times \frac{Va}{8.32} \times \sqrt{h - \left(H - \frac{x}{a}\right)} \times$$

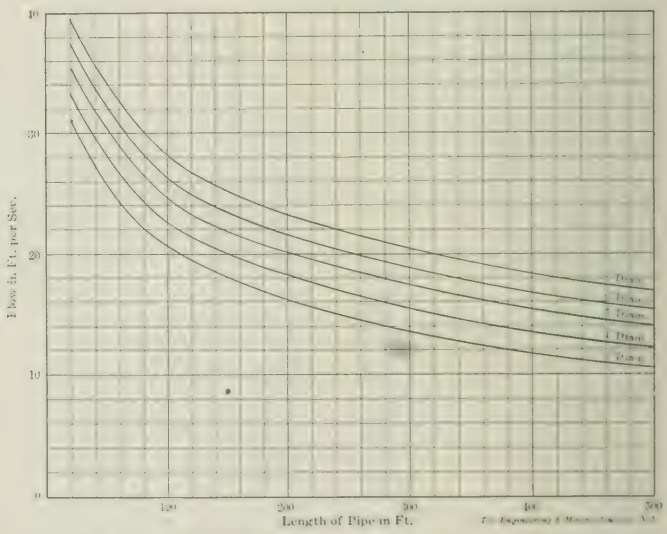


FIG. 3. VELOCITY OF FLOW OF WATER IN CLEAN CAST IRON PIPES. WATER UNDER 30 LB. PER SQ. IN. PRESSURE AT ONE END, WITH NO BACK PRESSURE

Air raised per second

$$= \frac{Va}{8.32} \times \sqrt{h - \left(H - \frac{x}{a}\right)} \times \frac{\frac{x}{a}}{\frac{x}{a} + \left(H - \frac{x}{a}\right) \cdot f \cdot \left(\frac{67.88 + \left(H - \frac{x}{a}\right)}{33.94} \right)}$$

and water raised per sec.

$$= \frac{Va}{8.32} \times \sqrt{h - \left(H - \frac{x}{a}\right)} \times \frac{\left(H - \frac{x}{a}\right) \cdot f \cdot \left(\frac{67.88 + \left(H - \frac{x}{a}\right)}{33.94} \right)}{\frac{x}{a} + \left(H - \frac{x}{a}\right) \cdot f \cdot \left(\frac{67.88 + \left(H - \frac{x}{a}\right)}{33.94} \right)}$$

There is a good deal of variation in the values of V given by different experimenters as the results of actual trials, but I have collected and averaged a number of results from which the values shown in Fig. 3 have been obtained.

If now, in any particular case, the depth

of well), H (hight of rising main) and a (area of rising main) be known, any suitable value may be substituted for $\frac{x}{a}$, f may be determined from the factor curve and V from the velocity curves, and then substituting these values in equations (A) and (B), the cubic feet of free air rising per second and the pounds of water raised per minute for this value of $\frac{x}{a}$ are determined. The results for different values of $\frac{x}{a}$ may then be plotted in a curve.

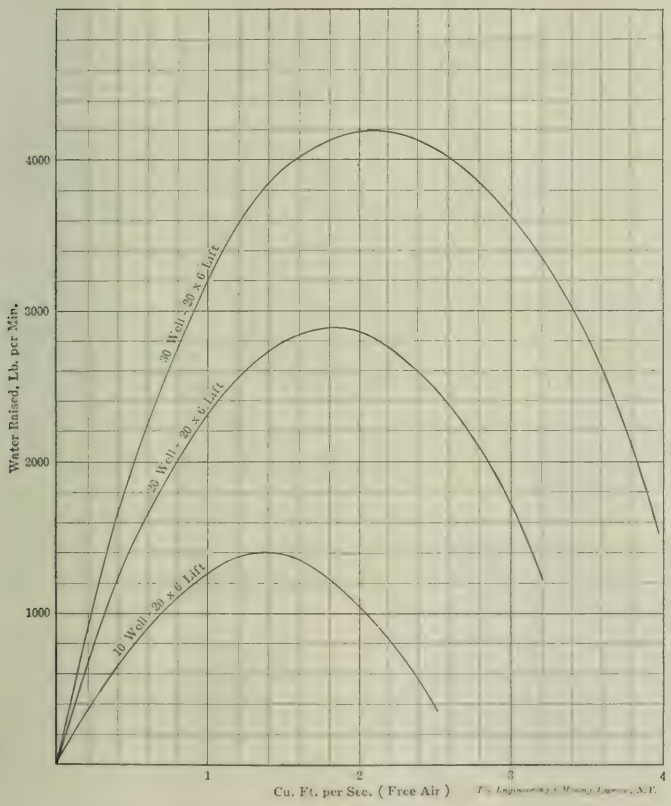


FIG. 4. CAPACITIES OF AIR LIFTS

Take, for example, an air lift with a well 20 ft. deep, a rising main 40 ft. long and 6 in. in diameter (an actual lift of 20 ft.)

Then $h = 20$, $H = 40$, $a = 0.194$, $V = 33.8$.

Assuming $\frac{x}{a} = 21$, then $H - \frac{x}{a} = 19$, $f = 0.4975$. Substituting these values in (A) and (B):

Air (free) rising $= 1.56 \times 1 \times 1 \times 0.471 = 0.588$ cu ft per sec

Water raised $= 0.80 \times 1 \times 0.53 \times 3741 = 1586$ lb. per min.

Assuming $\frac{x}{a} = 24$, then $H - \frac{x}{a} = 16$, $f = 0.489$:

Free air rising $= 1.47 \times 0.80 \times 2 \times 0.554 = 1.31$ cu ft per sec

Water raised $= 0.80 \times 2 \times 0.446 \times 3741 = 2670$ lb. per minute.

Assuming $\frac{x}{a} = 29$, then $H - \frac{x}{a} = 11$, $f = 0.494$:

Free air rising $= 1.324 \times 0.80 \times 3 \times 698 = 2.22$ cu.ft. per sec.

Water raised $= 0.80 \times 3 \times 0.302 \times 3741 = 2712$ lb. per minute.

Assuming $\frac{x}{a} = 36$, then $H - \frac{x}{a} = 4$, $f = 0.4986$:

Free air rising $= 1.12 \times 0.80 \times 4 \times 0.895 = 3.21$ cu. ft. per sec.

Water raised $= 0.80 \times 4 \times 0.105 \times 3741 = 1257$ lb. per minute.

The curves plotted in Fig. 4, show the cubic feet of free air per second required to lift various amounts of water per

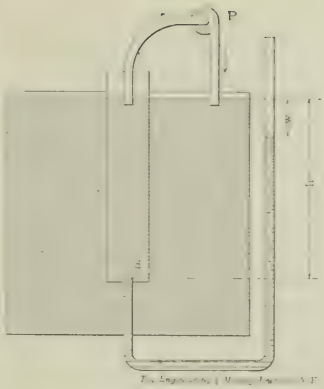


FIG. 5. PUMP AND AIR LIFT

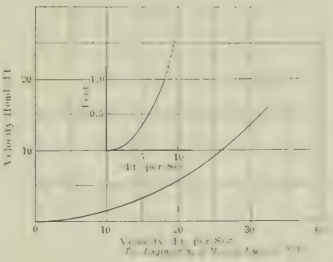


FIG. 6. VELOCITY HEAD

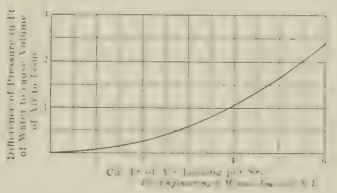


FIG. 7. ENTRANCE HEAD FOR AIR ISSUING FROM 2-INCH CYLINDRICAL NOZZLE

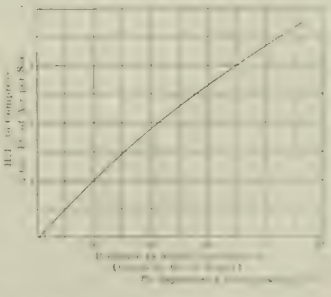


FIG. 8 THEORETICAL HEADS [illegible]

minutes. Results are plotted for 10-, 20- and 30-ft. wells, 6 in. in diameter, for 20 ft. lifts. It will be noticed that the maximum capacities of the lifts are proportional to the depths of the wells.

Minimum Air Pressure.

The foregoing formulas do not indicate the pressure at which air must leave the nozzle. The minimum pressure which may be used in each case depends on the following causes: (a) The depth of the well; (b) The upward velocity of the water entering the rising main. (c) The excess

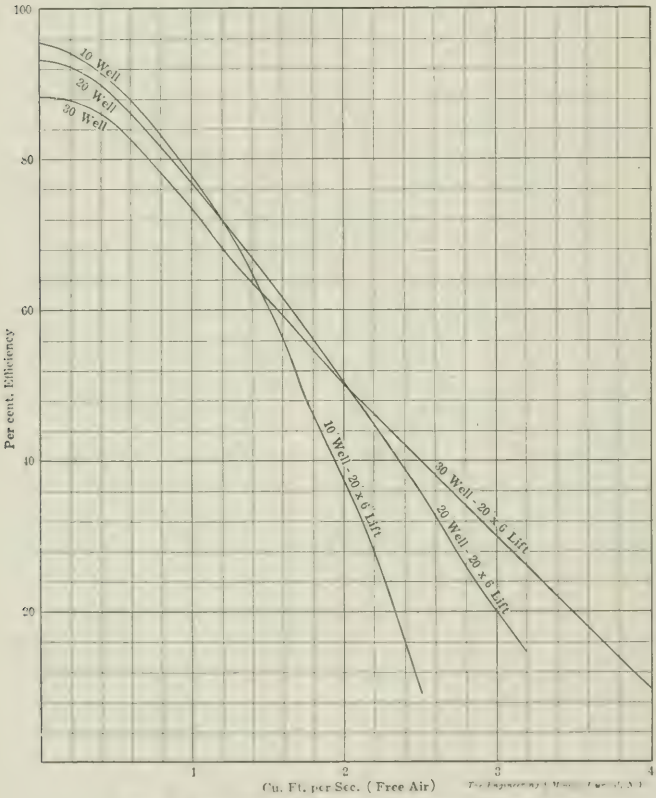


FIG. 9. EFFICIENCIES FOR VARIOUS AIR CONSUMPTIONS

of pressure at the air nozzle required to make the necessary volume of air per second issue from the nozzle.

Considering first the causes (a) and (b), Fig. 5 represents part of an air lift, the air nozzle of which opening at the point "d" is connected outside the apparatus with a rising pipe. When, at rest, the water in the outside pipe will be at the same level as that in the well, and the downward pressure at "d" due to the depth of the well will be balanced by the column of water h in the outside pipe. Now suppose that a pump "P" be arranged to draw water from the rising main and deliver it again to the well. The levels of the water in the well and the rising main will remain the same, but there will be an upward velocity in the latter, and it will also be noticed that the level of the water in the outside will have fallen by some amount w, showing that the downward pressure at the point "d" is less than before.

The downward pressure at "d" is now due to the depth of the well h less the velocity head due to the rising water. This velocity head is measured by the distance w, and if the velocity be v ft. per sec. it is equal to $\frac{v^2}{2g}$ where g is the acceleration due to gravity. Variations of the velocity head for different values of v are shown by the curve in Fig. 6. Now the velocity

$$v = \frac{1}{8.32} \times \sqrt{h - \left(H - \frac{1}{a}\right)}$$

so that for any particular value of $\frac{1}{a}$ the velocity and the velocity head can readily be found, and thus the downward pressure at the opening of the air nozzle determined.

Considering (c) the third factor effecting the minimum pressure permissible—there is some difficulty in obtaining reliable data as to the volume of air under pressure issuing from a nozzle into a space under a less pressure.

For a cylindrical nozzle the formula

$$Q = a \times 178 \sqrt{h}$$

is probably as correct as any where:

Q = The quantity of air issuing in cu.ft. per sec.

a = The area of the nozzle in sq.ft.

h = The difference of pressure between the issuing air and the space into which it issues, calculated in feet of water.

The factor 178 is given for a plain cylindrical nozzle. If the nozzle is conical the area at the issuing point being a, the factor may be as high as 200.

The entrance head for air issuing from a 2-in. diameter cylindrical nozzle is shown in Fig. 7. With different diameter nozzles the quantity of air issuing for any given head is proportional to the square of the diameter. If e represent the entrance head in feet of water, then the pressure of the air supplied at the mouth of the air nozzle (measured in feet of water) must be

$$h - \textit{velocity head} - e.$$

The air pressure necessary at the air nozzle can now be ascertained in any particular case. For example take the case of a 20-ft. well with a 40-ft. main already

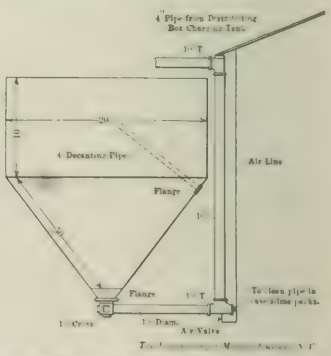


FIG. 10. TANK WITH AIR LIFT CONNECTIONS

considered. When $\frac{1}{a} = 24$, the free air rising per sec. is 1.31 cu.ft. The actual volume of this issuing air is

$$1.31 \times \frac{33.94}{33.94 + h - \textit{velocity head} + e}$$

but since e is very small compared with (h — velocity head), the volume may be considered to be

$$1.31 \times \frac{33.94}{33.94 + h - \textit{velocity head}}$$

The entering velocity is

$$v = \frac{V}{8.32} \times \sqrt{h - \left(H - \frac{x}{a}\right)} = \frac{33.8}{8.32} \times 2$$

$$= 8.12 \text{ ft. per sec.}$$

Therefore from the curve the velocity head = 1.05 ft. The actual volume of the issuing air is therefore

$$1.31 \times \frac{33.94}{33.94 + 20 - 1.05}$$

$$= 0.84 \text{ cu.ft. per sec.}$$

Therefore if a 2-in. diameter nozzle is used, $e = 0.05$ ft. The total minimum pressure required for the air at the nozzle is then: $20 - 1.05 + 0.05 = 19$ ft. of water. The air pressures may be similarly determined for other values of $\frac{x}{a}$.

When $\frac{x}{a} = 21$	Air pressure = 19.8 ft. of water
29	17.9
36	16.2

Efficiency of Lift Under Given Conditions

Since the number of cubic feet per second of free air required to raise a given amount of water per minute in any lift is known, and also the pressure at which this air must be supplied at the mouth of the air nozzle, it is obvious that the efficiency of the lift may be calculated. By the efficiency of the lift is here meant the percentage of the power contained in the air delivered at the nozzle which is actually developed in foot pounds of water raised. This efficiency is therefore independent of the efficiency of the compressor and conveying air pipes. The air is considered as being compressed and delivered direct to the nozzle of the air lift without cooling. The theoretical power necessary to compress 1 cu.ft. of free air to any pressure without cooling is shown by the curve in Fig. 8. For convenience the pressures are given in feet of water.

With the case already considered, where the well is 20 ft. deep and the rising main 40 ft. long and 6 in. in diameter, when $\frac{x}{a} = 21$, the free rising is 0.588 cu.ft. per sec. and the water raised is 1586 lb. per min. The air pressure as already determined is equal to 19.8 ft. of water. From the curve 1.9 h.p. is necessary to compress 1 cu.ft. of air to this pressure. Therefore 1.117 h.p. is required for 0.588 cu.ft. The actual power developed in water raised is

$$\frac{15.86 \times 20}{30{,}000} = 0.961 \text{ h.p.}$$

This gives an efficiency of 86 per cent.

Theoretically the maximum efficiency of the lift would be obtained when the quantities of air and water rising were infinitely small, and in order to complete the efficiency curve, this efficiency is determined for the case when $\frac{x}{a} = 20 + \text{an}$ indefinitely small amount. Actually, of course, the efficiencies on the curve close to this maximum efficiency could never be realized, for the upward velocity in the rising main would be so small that the air would merely bubble through the water without any useful effect. Fig. 9 shows efficiency curves for the three cases already considered, and one could, of course, be drawn for any other set of conditions. It will be noticed that at the maximum capacity of each particular lift, the lift which has the shallowest well gives the highest efficiency, and that this is also the case for any proportional part of the maximum capacity. At the same time it is not the case that for a given amount of water raised the lift with the shallowest well has the highest efficiency. It would appear that for a given amount of water raised per minute the highest efficiency can be obtained with a lift that does this when working at about one-third of its maximum capacity.

Generalizations Deduced

The following generalizations may be deduced as to the efficiency and capacity of an air lift: (1) The air nozzle should be connected directly to the compressor in order to use air compressed to the minimum pressure required; (2) the lift should not be used at more than one-half of its maximum capacity; (3) the size of the air nozzle should be sufficient to keep the air entry head small; (4) the well must be of sufficient diameter to avoid friction of water in reaching the rising main. For the same reason there must be sufficient space between the bottom of the well and the lower end of the rising main; (5) to obtain the best results the lower end of the rising main should be cone or trumpet shaped, opening outward, and the air nozzle should be conical. A maximum value for v for any given head is then obtained, and the value for the air-entry head is reduced to its minimum.

Under these conditions the total combined efficiency of the compressor and lift should not be less than 70 per cent. and in cases where a comparatively small amount of water or solution is being continuously raised, as in cases of continuous cyanide treatment, the efficiency of a compressor and air lift should certainly compare very favorably with that of small centrifugal pumps, the efficiencies of which are sometimes as low as 30 per cent.

The Smelter Suits in California

Special Correspondence

In the Solano county courts in California the case against the officials of the Selby Smelting and Lead Company has been deferred to Aug. 20. The suit is for violating an injunction which prohibits the company from operating its works during certain months of the year, when the prevailing winds are supposed to carry fumes across Carquinez straits from the smelter into Contra Costa county. This suit is instituted by about 20 farmers and the residents of the small town of Benicia against the smelting company for alleged damages from fumes. The Selby company has some millions of dollars invested and employs directly about 500 men, while indirectly about 3000 persons are interested in its operation. In 1908 the company handled $25,200,000 worth of gold, or more than a quarter of the entire gold production of the United States, as well as over $8,000,000 worth of silver and $1,500,000 worth of lead, making about $35,000,000 in all. In addition, the company manufactured large quantities of bar lead, sheet lead, shot, white lead, cartridges, etc., so it is an important factor in the industrial progress of California and adjoining States. Its activities are also on the increase. For instance, in June of this year it handled about $4,000,000 in gold alone, or nearly half of the total gold yield of the country on the basis of last year's total production. Yet a small town and a few farmers threaten to curtail the operations of a company which is of such vast benefit to the mining industry of the Pacific coast as well as to the city of San Francisco. It is expected, however, that in the final adjudication, it will be found that the noxious fumes complained of, have their origin in works which are making asphaltum from California crude petroleum, rather than from the smelting works; but this is yet to be proven.

Copper Mining in Chile

Conditions in the copper industry of this country are said to be unsatisfactory, comparatively few mines being able to pay expenses at a lower price than £60, London. The high cost of transportation from most of the mines is against the industry, and with exchange over 11d. wages are high. However, mines producing very rich ore, like Collahuasi, are able to stand the high freight charges. On the other hand the two smelters at Caldera are said to have lost a good deal of money during the last six months. The Collahuasi mines are said to be showing well in depth. The Dulcinea at Pupuios continues to be the chief producer in the Copiapo district. It has been paying dividends since 1875. At present it is producing about 1000 tons of ore per month, averaging 7 to 8 per cent. copper.

The United States Smelting, Refining and Mining Company is to introduce at its dressing works at Bingham Junction, Utah, the Huff electrostatic separator for the purpose of separating the blende and pyrites of the zinky concentrate that is there produced. The blende will be shipped to smelters in Kansas, except a portion which will be kept for the production of zinc oxide for use in the neutralizing process for the sulphur fumes of the smeltery at Bingham Junction.

Volumetric Determination of Cobalt

C. D. Test (*West. Chem. and Met.*, Vol. IV, pp. 167-173) describes a volumetric method for the determination of cobalt. The method consists in the separation of the cobalt from nickel as the double potassium cobaltic nitrite, the decomposition of the nitrite with sulphuric acid and the titration of the liberated nitrous acid with potassium permanganate. It was desired to develop not only an accurate method but also a rapid one, and with this in view the conditions suitable for the rapid precipitation of the nitrite were carefully studied. The best results were obtained by using an excess of acetic acid, sodium acetate, and potassium nitrite. The solution should be concentrated and at a temperature of 50 deg. C., and should be agitated frequently. If the solution is too concentrated, the precipitate comes down in a finely divided state and runs through the filter. The precipitation is practically complete in an hour under proper conditions.

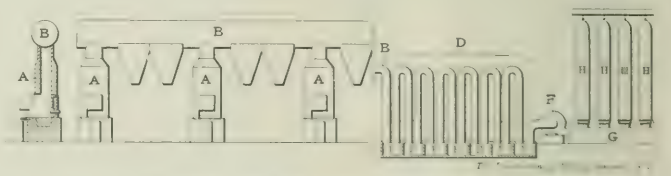
The determination is carried out in the following manner: After the ore or furnace product is in acid solution, the copper, arsenic, antimony, etc., are removed with hydrogen sulphide. The precipitated sulphides are filtered off, the solution oxidized, evaporated to dryness with hydrochloric acid and potassium chloride and any iron separated by the basic acetate method. If the solution is made up to a definite volume and filtered rapidly, an aliquot portion of the filtrate may be used for the determination, thus avoiding tedious washing of the precipitate. The nickel and cobalt is next separated from calcium, barium or strontium, if present, by precipitation with ammonium sulphide. The sulphides are filtered off, dissolved with aqua regia, evaporated almost to dryness and diluted to a voulme of 10 c.c. The excess of acid is neutralized with sodium hydrate and three grams of sodium acetate, 1 c.c. of 80 per cent. acetic acid, and 10 c.c. of a 50 per cent. solution of potassium nitrite added. The solution is maintained at a temperature of 50 deg. C. for half an hour or more, shaking frequently, and then filtered and washed rapidly with a 10 per cent. solution of potassium nitrite. Usually 50 to 100 c.c. of the washing solution is sufficient to completely remove all the potassium nitrite but it should be tested by acidifying the last washings with sulphuric acid and adding a drop of permanganate solution.

The precipitate and filter paper are then returned to the precipitating flask, 200 c.c. of cold water added, the precipitate broken up by shaking and a known excess of standard potassium permanganate solution added. Sulphuric acid is now added, the solution heated to boiling and the excess permanganate titrated with standard ferrous sulphate solution. Manganese dioxide may separate out on heating, but a slight excess of the oxalic acid dissolves it and the solution can then be titrated back with permanganate. The color due to the cobalt present should not be mistaken for the permanganate coloration.

The permanganate solution should contain about 10 grams of the salt to the liter and the oxalic acid solution about 10 grams of the crystallized acid to the liter. The cobalt factor of permanganate equals the iron factor × 0.0877. The results obtained by the method are consistent but seem to be a trifle lower than the theoretical. On the whole, fair accuracy and rapidity are attainable.

New Method of Treating Argentiferous Lead Ores

Oliver H. Picher, Joplin, Mo., describes (U. S. Pat. 920,388, May 4, 1909) a process for treating argentiferous lead ores containing sulphur, applying particularly to the production of pig lead and sublimed white lead, and to desulphurizing argentiferous products for further treatment for the production of silver and lead. The accompanying diagram shows a plant for carrying out the process. *A A A* are open-hearth furnaces of the Scotch type; *B* is a horizontal flue leading from the furnaces and provided with dust-collecting chambers *D*; *F* is a fan to draw the gases and fumes through the flues *D* and to force them through the flue *G* into the fabric screens or bags *H*.



PICHER FURNACE FOR ARGENTIFEROUS LEAD ORES

The sulphide ore of lead and silver mixed with carbon is subjected to a reducing and oxidizing action at a comparatively low temperature without previous desulphurization. The gaseous products of the furnaces, together with the dust and fume are drawn through the settling and cooling flues, thus separating the argentiferous dust by subsidence and cooling the gases, and the practically non-argentiferous "blue fume" is finally separated from the gases by the screen system. The recovered "blue fume" is treated for its nonargentiferous lead in any convenient way as sintering and subjecting the product to a reducing and oxidizing treatment at a high temperature. This produces pig lead practically free from silver, and sublimed white lead which is separated from the furnace gases by screens.

Ancient Mining Customs in the Peak District of Derbyshire

By H. L. Terry*

The spring Great Barmote Court for the Soke and Wapentake of Wirksworth, commonly known as the Low Peak, was held on April 22, at the Moot Hall, Wirksworth. The only business, besides the rendering of the barmaster's accounts, was the swearing in of the grand jury of lead miners for the ensuing six months. Although the acts of Parliament relating to the holding of these courts, and also those held at Monyash for the High Peak division of the King's Field, date only from the middle of the last century, they are founded on customs and procedure that go back to the Middle Ages. The first of these courts was held in 1287, and they have an unbroken record to the present time. The duties of the jurymen, it may be mentioned, consist in advising the barmaster as to the title of any mining sett which is claimed in the King's Field, and, generally, in the words of the steward's charge, to look after the interests of the King, who receives the duties of Lot and Cope in right of his Duchy of Lancaster. In the King's Field anyone has the right of mining for lead ore, the land owners or tenants having no power to prevent it except in orchards. Briefly described, the procedure before the mine can be started is as follows: The discoverer of the ore must open up the ground to obtain at least a dish of it dressed for sale, and then inform the barmaster of the fact. If he desires to work it, the official summons a couple of jurymen well acquainted with the district, and if there is general agreement that no one is already in possession, a meer of ground of 32 yd. is staked out on each side of the point of discovery of the ore, and the claim is entered in the books. Work may then commence, but it is not until a later date, when the barmaster has attended and measured the ore produced in order to take the portion due to the Duchy, that the miner is completely in possession of the claim. There is no time limit for proving the claim, but afterward, when in possession of it, if the miner ceases work for three weeks, the mine may be "nicked," as it is called.

*Abstract of an article in *Min. Journ.*, May 15, 1909.

i.e., given to anyone else who expresses a desire to obtain and work it.

A great deal of this nicking went on a few years ago, when the fluorspar boom began, most of the properties not having been worked for a great number of years. The royalties, it may be mentioned, vary considerably in Derbyshire. In the King's Field they go from one-thirteenth at Bradwell to one-twenty-fifth at Wirksworth. In the case of the Golconda mine the royalty is one-ninth. These royalties are fixed for the different districts, and cannot be set aside by any bargaining. Before any ore may be removed from a mine the barmaster must attend, on three days' notice being given, and measure out the ore in his dish, putting aside every one-thirteenth, or whatever the proportion may be for the royalty. In to-day's practice the Duchy's portion is never taken away, but goes to the smelter with the bulk, a due account for it being subsequently rendered to the barmaster. The dish, it should be said, varies according to the district. In some cases it is a circular one, made of wood; but the more usual one is a rectangular oak box, strictly to the pattern of the bronze dish dating from the time of Henry VIII., which is kept chained up in a chest at the Moot Hall, Wirksworth. A common system of measure is: 16 pints = 1 dish; 9 dishes = 1 load; 4 or 5 loads going to the ton.

In the *Mineral Statistics* there is usually a reference to lead ore obtained from quarries in Derbyshire. This ore, which varies between 20 and 100 tons from year to year is not, I may say, the product of special quarrying operations. It is obtained from stringers which occur in the limestone quarries, more especially in the Wirksworth district. The quantity of ore from this source is limited in amount, as it is not followed up specially, only such ore as is uncovered by the blasting operations being collected. The quarry owners do not dress the lead themselves, this work being usually carried out on terms at the surface of the abandoned Bage mine, to the northeast of Wirksworth. While on this subject of lead from quarries, I may note the interesting find of a new vein in the limestone quarry recently opened by Messrs. Hadfield at Hope, near Castleton. The limestone hereabouts contains a good deal of bitumen, and it is, therefore, particularly suitable for asphalt making. Under the Acts of Parliament referred to above, the quarry owners have to work the lead themselves or submit to the incursion of any miner who may notify the barmaster of his intention to have the claim "nicked" in his favor. It is not very often that a new vein is discovered in Derbyshire, and considerable local interest has been aroused. At the inquiry held on the spot on April 17, it was decided by the barmaster and jury that the vein was a new one, and that there was no previous holder of it to be formally dispossessed for not working it.

The Catenary Flue

By N. S. Stewart*

The catenary flue, also called the Fogh flue, as it was first designed by C. S. Fogh, is built entirely of brick, no steel buckstays or skewbacks being used in its construction. It is not suitable for all kinds of flue work, but for many purposes it is useful, as it is cheap and has no metal parts to be attacked by corrosive gases. Ordinarily the smaller sizes are built with one thickness of brick. Large flues require thicker walls. There have been some failures of flues of this type and these accidents have given it a bad name. However, if the flue is properly designed and constructed, it can be depended on.

The accompanying tables were made to facilitate laying out working drawings. They give coördinates of the curves which have a ratio of hight to width of base equal to 0.75, approximately. This requires a different value of the constant c for each curve. The equation of the catenary is

$$Y = \frac{C}{2}\left(e^{\frac{x}{c}} + e^{-\frac{x}{c}}\right)$$

where

$e = 2.7182$ (*the naperian base*)

or

$$\frac{1}{c} = 0.3679,$$

$$\log. \frac{1}{c} = 1.565719.$$

The curves for flues are quite often defined on working drawings by arcs of circles. However, the method of coördinates as given in the table seems to be simpler and easier, both for office and field work.

TABLE OF VALUES OF $Y - C$ IN FT. FOR CATENARY FLUES.

B	$\times \frac{1}{2}$	$\times 1$	$\times 1\frac{1}{2}$	$\times 2$	$\times 2\frac{1}{2}$	$\times 3$	$\times 3\frac{1}{2}$	$\times 4$	$\times 4\frac{1}{2}$	$\times 5$	C
8	0.064	0.267	0.620	1.148	1.893	2.903	4.244	6.00	.....	.....	1.90
10	0.057	0.215	0.491	0.901	1.462	2.195	3.129	4.314	5.80	7.659	2.35
12	0.039	0.174	0.396	0.729	1.170	1.728	2.443	3.314	4.373	5.653	2.84
16	0.032	0.129	0.292	0.534	0.851	1.242	1.727	2.297	2.994	3.786	3.80
20	0.026	0.100	0.242	0.429	0.657	0.967	1.334	1.761	2.258	2.839	4.80

B	$\times 5\frac{1}{2}$	$\times 6$	$\times 6\frac{1}{2}$	$\times 7$	$\times 7\frac{1}{2}$	8	$\times 8\frac{1}{2}$	$\times 9$	$9\frac{1}{2}$	10	C
12	7.205	9.061	.....	.....	.....	.....	.....	.....	.....	.....	2.84
16	4.721	5.806	7.049	8.489	10.125	12.011	.....	.....	.....	.....	3.80
20	3.499	4.262	5.107	6.076	7.149	8.373	9.72	11.215	12.907	14.76	4.80

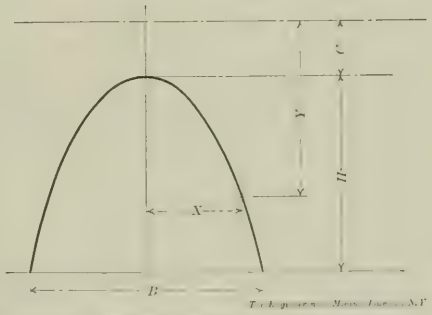
$\frac{H}{B}$ 0.75, approximately. $\times \frac{1}{2} = 0.5$ ft. $\times 1 = 1$ ft., etc.

$Y = \frac{C}{2}\left(e^{\frac{x}{c}} + e^{-\frac{x}{c}}\right)$

$e = 2.7182$

$\frac{1}{c} = 0.3679$

$\log \frac{1}{c} = 1.565719$



THE CATENARY, SHOWING VARIABLES

The United States production of copper in 1908 was larger than that in either 1906 or 1907, according to statistics collected for The Mineral Industry. The total production of the refineries for 1908 was 948,196,490 lb. The 1908 output, however, was only valued at $127,058,329, against $181,660,141 for the 1907 production.

According to figures collected for The Mineral Industry, the average price of pig iron in the United States fell off from $22.80 per long ton in 1907 to $16.05 in 1908. The production decreased from 25,442,013 long tons, value $580,077,800, to 15,784,000 long tons, value $207,540,378.

The Duluth, Missabe & Northern railroad in Minnesota in the week ended July 10 handled 554,898 tons of iron ore, the largest quantity ever shipped over the road in one week. This required the loading, hauling and unloading at the ore docks of about 12,500 cars.

*Engineer, Salt Lake City, Utah.

Prospecting Anthracite Mines by Drill Holes

Economy, Efficiency and Safety in Mining Anthracite Coal Seams Is Largely Secured by a Definite and Detailed Plan of Diamond Boring

BY FRANK LYNDE

There is, perhaps, no coalfield in the world so thoroughly prospected, or having its coal-bearing area so systematically determined as is the anthracite field of Pennsylvania.

The methods employed in prospecting a virgin field of anthracite are tunnels, shafts, drifts and bore holes. When there are indications in a tract, a careful examination of the surface is the first step. This consists of observing local conditions, such as rock exposures, ravines, pitch of the strata, etc. Then small excavations are made with pick and shovel on the sides of hills or mountains where the outcrop of the seam is well defined by terraces. Such a terrace always depends on the thickness of the seam, the dip of the strata and the amount of dirt upon the rock, and the surface slope.

When a coal measure dips into the mountain, the width of the terrace is usually greater than when the seam pitches with the hill. But when the bed lies on a gentle pitch the terrace is usually broader. Fig. 1 shows the characteristics of the surface outcrops, which can be easily reached by tunneling, shafting and drifting. When dealing with a flat surface, which, of course, lacks terrace, shafting, drifting, etc., becomes too slow and expensive, and boring is resorted to.

As late as 1885, the drilling was principally done by percussion-power drills, and the borings were brought up for examination by means of sand pumps. The fine borings thus obtained were carefully examined and the character of the strata that produced them was thus determined

Diamond Drills Now Used

Diamond core drills are now generally used in prospecting and developing anthracite seams, usually with good results. When making a diamond drill hole for prospecting coal measures, the site of the hole should be governed by the extent, location and topographical condition of the tract to be developed. The location should, if possible, be within the radius of a good water supply. When only a limited amount of water is available, the holes at the surface should be so arranged as to have all the water which flows out, by forming a weir, to a tank so that it may be used over and over again. It is also advisable to have the location at least [illegible] feet from the crop for a flat seam, and deeper if the seam pitches.

Where the strata along the outcrop are found to be in a state of decomposition, the cores cannot be obtained, but are pulverized and lost. The size of a hole greatly influences the condition of the cores extracted. A 1½-in. bit cuts a core about ⅞ in. in diameter, and a 2-in. bit cuts about 1⅜ in. When prospecting along an outcrop, the best results are obtained by using a large bit as the strata are always more or less soft and the cores extracted should be at least 1⅜ in. diameter. In some instances a 2½-in. hole is put down for this purpose as the difference in cost of drilling 1½-in. and 2½-in. holes is very small, compared with the value of

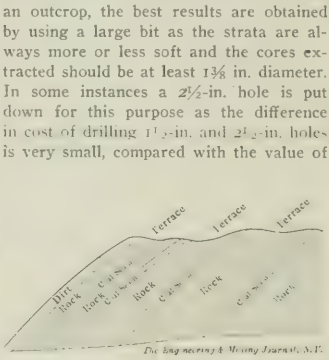


FIG. 1. CHARACTER OF OUTCROPS

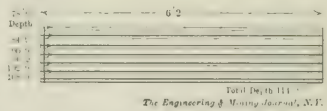


FIG. 2. CORE BOX MADE OF 1-INCH BOARD

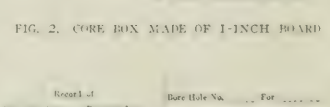


FIG. 3. FRONT COVER OF REPORT BLANK USED BY CONTRACTORS

the complete data obtained by a larger hole.

The advantage of diamond drilling over any other kind of drilling is obvious, in that a diamond drill hole may be put down at any angle. When the strata are steep, it is common practice among the operators to put down the hole at right angles to the plane of stratification. This method, while it is simple, not only reduces the expenses of the hole, but saves time. Progress made in a diamond hole depends largely upon the hardness and kind of strata to be drilled. In the Mahanoy region, when prospecting the lower seams of coal, the drills encounter the harder rocks. In many instances, holes are drilled through the Pottsville conglomerate, which has been found to be not only the hardest stratum to be drilled, but also the wear and tear on the diamonds is so great that the bit has to be reseated after drilling 5 to 30 ft., while the same kind of a bit used in the upper series of the coal measures can cut 500 to 1000 ft. without resetting. The amount of conglomerate cut by a diamond bit per nine-hour shift varies from 3 to 10 ft., while 20 to 65 ft. can be cut through the upper formations. This fact must be considered in making a statement of cost per foot and average progress per shift.

In drilling a shallow hole down to 100 ft., the cost per foot is usually greater. This is accounted for by the loss of two or three shifts in removing the outfit from one place to another, setting it up in position, building a shed, etc. When the hole is completed, the machinery, shed, etc., have to be taken apart and moved to the next hole. This item of time not actually engaged in drilling is usually charged to each hole, whether it is 50 or 1000 ft. deep. For the reasons above stated, a short hole less than 100 ft. costs more than one 500 ft. deep. But when a hole is greater than 500 ft., the cost per foot gradually increases. In the Mahanoy region, 23 holes were put down, six of which averaged 115 ft. deep; the cost per foot was $1.74, and the average progress per shift was 22.6 ft.; 10 holes averaged 375.5 ft. deep, with an average cost per foot of $1.30. The cost of the remaining seven holes was $1.72 per foot, and the average progress was 27.9 ft. per shift. The cost per foot of the drill holes is made up of labor, water hauling, fuel, wear and tear on carbons, resetting the bit, and an allowance of 15 per cent. interest and depreciation on the outlay. The machine used is a Sullivan hydraulic feed, having a capacity of 1250 feet.

The Core Box

All the cores extracted are placed in the core boxes, 1.4x3 in. x6 ft., made of 1-in. boards. The inside of the box is spaced with grooves 1/16 to ⅛ in. larger than the diameter of the cores. One end of the box is marked "upper" or "lower" end of the hole. An arrow head is attached to each groove to indicate the direction in which the cores are placed, while at the other end of the box where the cores end in the grooves, continuous

measurements of the depth of the hole are marked, as shown in Fig. 2. The advantage of this system of preserving cores is obvious; it not only makes the future identification of the strata easier, but also adds so much more valuable data for future references. The driller makes his report on a blank form, submitted at the end of each week to the superintendent or engineer in charge. The classification of items to be entered in the report is as follows:

CLASSIFICATION OF ITEMS.

Surface	Dirt and clay. Sand and quicksand. Foam and gravels. Hard pan, etc.
Rock	Appearance, color. Hardness. Approximate constituents. Pitch and fault.
Vein	Quality of coal. Hardness. Amount of refuse. Pitch.

The driller keeps a minute record of the amount and rate of progress. In his record book he notes steam and water pressures, cause of delays. One bad feature of the method of reporting drill holes as practiced in the anthracite field is that each driler has his own name for each stratum drilled. This leads to complications as to the identification of rock formations, which is the most important data when prospecting for coal in a virgin field. This point is well illustrated by tests recently made. A specimen of limestone from Easton, Penn., somewhat hard, $H = 5\frac{1}{2}$, and rather dark, due to carbonaceous matter, was presented to seven drillers for classification. The result was as follows:

1st man said "black sand rock."
2nd man said "hard sandstone."
3rd man said "sand slate."
4th man said "hard sand slate."
5th man said "fire clay."
6th man said "slaty sandstone."
7th man said "dark rock."

These seven gentlemen rank as first-class drillers, yet not one of them gave the proper name of the sample; incidentally, no two men expressed the same opinion. As far as the strata classification is concerned, entire dependence cannot be placed on the driller's report. Hence the engineer in charge examines the cores and makes a special report to supplement the driller's report.

Importance of a Proper Identification

In many instances the seams of coal are recognized by their characteristics, such as the thickness of the veins, the amount and position of refuse they contain, and relative intervals of the seams. But these elements vary in different localities; even in the same colliery, one portion of the mine will be entirely different from other parts. In a mine we may find a seam 10 ft. thick. The same bed in the adjoining colliery may appear in two or three splits. For these reasons, a proper identification of the intervening strata is the most valuable data for the engineer in charge of the prospecting work.

The hardness of strata should be included in the weekly report. This observation is not a difficult matter for the average driller who is unfamiliar with geology or mineralogy. After a few trials the driller can easily determine the hardness. In general, the hardness of a

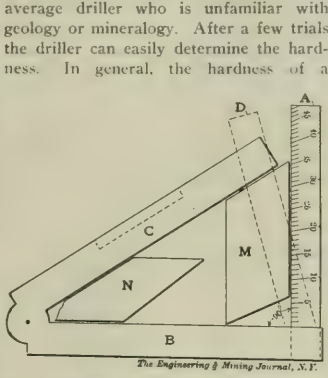


FIG. 4. SHOWS THE METHOD BY WHICH THE PITCH OF A CORE IS READILY MEASURED

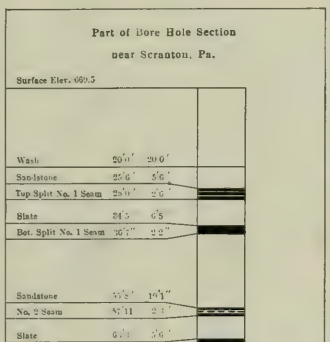


FIG. 5. SHOWING USUAL METHOD OF PLOTTING A BORE HOLE

stratum is measured by the resistance which the surface offers to abrasion. The degree of hardness is, therefore, calculated by observing the relative ease or difficulty with which the core is scratched by the standards. To get the value of hardness of cores the following minerals may be used as standards:

STANDARDS OF HARDNESS

Talc,	hardness	=	1
Gypsum,	hardness	=	2
Calcite,	hardness	=	3
Fluorite	hardness	=	4
Apatite,	hardness	=	5
Orthoclase,	hardness	=	6
Quartz,	hardness	=	7
Corundum,	hardness	=	8

When the core under observation is scratched by fluorite as easily as this latter scratches calcite, the hardness of the core is said to be 3.

To test a core to determine whether it is a limestone or not, is easily and rapidly done by applying hydrochloric acid to the core, and in case of limestone, effervescence due to the evolution of carbon dioxide, or "black damp," as the miners call it, will take place. One ounce of the acid kept in a glass-stoppered bottle will last for a year.

Calculating the Pitch of the Core

In measuring the pitch of cores a clinometer is generally used. When folded it is 6 in. long, and resembles a heavy foot ruler. Fig. 4 shows the method by which the pitch of cores is measured. The arm *A* is made of iron, and is graduated to degrees. When it is unfolded in the position as shown on the sketch, it always takes a position at right angles to the base *B*. When the pitch of a core is less than 45 deg., the core is placed parallel to the arm *A*, as indicated by *M*. If the core is long, the the *M* may be moved up or down parallel to *A* until the plane of stratification of *M* takes the direction of the arm *C*. Then *M* is removed and *A* is brought to *D*, as shown by dotted lines, and the observation is taken on the arm *A*. This gives the pitch of the core

If the pitch is greater than 45 deg., the core is placed between the arms *B* and *C*, as indicated by *N*. The core is then moved back and forth parallel to the base *B* until the bedding plane of the core takes the direction of the arm *C*; *A* is then brought to the position of *D* and an observation is taken on *A* as before. In this case the actual pitch is the difference between 90 deg. and the number of degrees read on the arm *A*. Some drillers still use slope levels of all sizes and shapes, but the one above described is perhaps the most convenient one.

In some instances, we find parting planes in cores, especially in faulty ground, which is different from the true pitch of the measures. Such planes are more pronounced in the coal seams than in the rock which underlies or overlies the coal. A true plane of stratification can easily be identified by means of the bands of slate and bone in the seam. These bands usually occur in the bed parallel to the plane of stratification. The thickness of the bands varies from the thickness of paper up to many inches. It is along these bands that the coal core usually breaks

A section of a bore hole is usually plotted on a scale of 1 in. to 20 ft. How-

ever, in many instances, it is not uncommon to find it plotted to a 10-, 30-, 40-, or 50-ft. scale. If a section is plotted on a 10-ft. scale, for a 1000-ft. hole, the map becomes 100 in. long. This makes it entirely too long and bulky. When it is plotted on a 50-ft. scale, some of the characteristics of the seams cannot be shown. The scale drawing depends on the purpose for which it is intended.

A 20-ft. Scale Is Used

For general working purposes, it is the prevailing practice throughout the anthracite field to plot on a 20-ft. scale. Fig. 5 shows the usual form of a plotted bore hole, drawn on either paper or tracing cloth, ruled 10 spaces to the inch, so that each space represents 2 ft. of the strata drawn on a 20-ft. scale. Some engineers use plain tracing cloth for this purpose; in either case, the first column is the classification of strata drilled, the second column is the thickness of each item, the third the continuous measurements from the surface, and the fourth column, the strata drawn to the scale. In the Southern and Middle coalfields, where the pitch is heavy, a section of the strata is plotted to represent the true pitch of the measures, as shown on Fig. 6. In many cases these bore holes are sunk down through the Pottsville conglomerate and part of the Mauch Chunk red shales series in which it is known that coal does exist. Fig. 7 shows the geological section through the Tamaqua basin between the Sharp and Locust mountains.

In the Wyoming and Lackawanna valleys, many of the rich seams are found within a few hundred feet from the surface. The depth of wash along the old river beds varies from 50 to 175 ft. In working these shallow seams, it is a matter of great importance to know the exact depth of the wash over the seams. In some places we find pocket holes along the old river bed. It is, therefore, necessary to determine the depth of the surface deposit when developing a surface bed.

In such a case, it is the prevailing practice among the operators to put down a series of test holes to the bed rock by driving pipes from the surface. By this means the elevation of the rock surface is obtained. Having the elevation of the workings in the mine, we can readily determine the thickness of the rock overlying the seam. When a workable seam has less than 100 ft. rock cover, the usual method employed in this field is a checker board system. A test hole is put down at the intersection of each corner. The size of squares varies from 100 to 500 ft.; which, however, depends on the thickness and the character of the rock. Generally the squares vary directly as the thickness of the overlying rock.

The lines of the squares are laid out either parallel to, or at right angles to the line of the strike. In most cases these holes are sunk a few hundred feet ahead of the inside development to insure the safety of men and property; under no circumstances is a surface seam developed without test holes. The speed with which such test holes can be sunk depends on the nature of the ground. It is not uncommon to find 50 to 75 ft. of progress made in one shift. When the stand pipe encounters a boulder, it is usually chopped by bits, but when it is too large for such an operation, it is removed by dynamite. In such a case the pipe must be raised

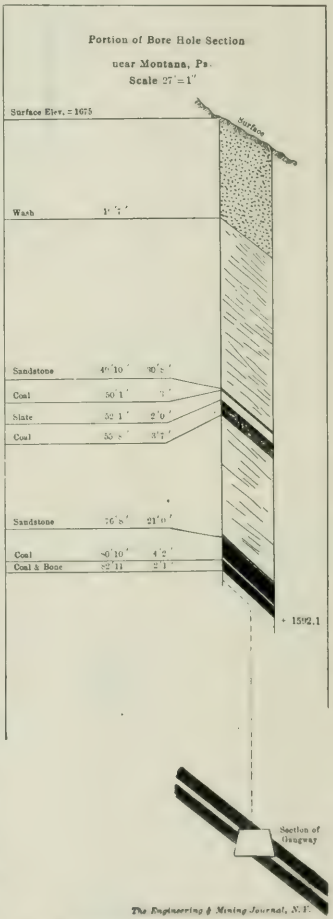


FIG. 6. SECTION SHOWING PITCH OF THE MEASURES

about 5 ft. before the blast is fired in order to protect the shoe and the pipe.

The cost of sinking test holes varies all the way from 60c. to $1.50 per foot. But 90c. is about the average. As the work of sinking the test holes progresses, sections are constructed of the geological formation of the district, with the help of the inside workings. These sections will show the depth of the wash and the thickness of the rock overlying the seam, as shown in Fig. 8. The section will give a constant guide as to the limit beyond which the inside workings are unsafe to proceed. For the depth of 50 to 100 ft. of water-bearing surface, 50 to 75 ft. of rock cover is necessary to develop the seam with safety. But in some extreme cases, a seam is well developed under a rock cover less than 50 ft. In this latter method the width of the workings are narrow, the pillars wide, so as to avoid a possible cave.

In prospecting for coal, there are no data so important and so valuable as complete records of diamond-drill holes and geological sections; without these there is no other means of gaining a knowledge of the geological formations or the quality and quantity of coal in the ground. When prospecting is finished, an estimate is made to determine the amount of coal in a given tract. When a whole area is underlaid with coal of a moderate pitch, the area of the tract may be taken for the seam area. This is generally the case in the Northern field. But in the Southern and Middle fields, where the pitch of seams is steep, the seam area is greater than the area of the tract, other things remaining the same. In such case the total seam area is obtained by measuring the bed lines on the geological sections. For a rectangular tract, the length is the same for the seam and the tract, but the width varies according to the degree of the pitch.

Mining Anthracite is More of a Manufacturing Proposition

At the present stage of anthracite mining there is no uncertainty as to the existence of the coal measures, as the field is well prospected and developed. Mining is, therefore, based strictly on a manufacturing basis, and the constant aim of the operators is expressed in the watchwords: "Economy, efficiency and safety." To accomplish this, economy and efficiency are often sacrificed for safety. In working a surface seam, a mine is not safe until the thickness of overlying rock is systematically determined. A failure to employ such a system means the consequent wreck and destruction of property, as well as the probable loss of many lives.

In early days, when the surface testings were little known, many a mine was destroyed for lack of insufficient data in regard to the overlying rock strata. For an example, the Hunt mines at Wyoming, Penn., were working in the Skidmore seam, which had about 100 ft. rock cover with 80 ft. of wash above. From this seam a connection was made to an upper seam 60 ft. above by means of a rock plane. When the upper seam was reached by the rockwork a cave occurred at the face on Oct. 27, 1889. The cave reached water-bearing strata above, which caused an inrush of water and the consequent destruction of the mines.

The Carbonization of Coal in By-Product Coke Ovens*

By E. Lloyd†

The progressive changes which the coal undergoes in the modern by-product coke oven during the coking period, and the character of the carbonization products, are set forth in the following notes. When the coal is charged into the coke oven, carbonization of the surface quickly results in a dense layer about 1½ in. composed of coal in the process of decomposition forming. The tar and water vapor resulting from this decomposition condense on the cool side of this layer farthest away from the wall, and are in turn redistilled as the heating proceeds inward and again condensed on the cool adjacent coal, this process going on until the carbonization penetrates to the center of the charge. Until the layer undergoing carbonization has advanced to the middle, the coal in the interior of the charge is unchanged.

This condensation of the moisture and tarry matters on the inner layers of a charge plays an important part in the coking process, the latter acting as a binding material of the coal particles, particularly in the case of poorly coking coals. The addition of water as an aid to the coking of certain coals and an improvement in the quality of the coke from others can also be understood on these grounds.

With regard to the rate of penetration of the heat into the charge, according to Herr Hilgenstock the temperature at the center rises to 100 deg. C. toward the end of the first hour, remaining stationary at this temperature until the end of the 18th hour, the rise in temperature from 100 deg. C. becoming gradually slower as the inner zones are reached; whereas the temperature immediately above the coal ranges between 800 and 900 deg. C. Similar results have been obtained by other observers in England, the time at which the temperature at the center of the charge rises above 100 deg. C. varying with the nature of the coal, width of oven, moisture and temperature of carbonization.

The rate of evolution of the gases is fairly uniform during the period when the bulk of the gas is evolved. This period corresponds to about two-thirds of the total coking period. The rate, however, would appear to be modified when compression of the charge of coal is practised, the period of the evolution of the gas being extended over a larger proportion of the whole coking time. This also has an effect on the yield of tar, the quantity being appreciably reduced when the charge is compressed and being evidently due to a cracking up of tar into the permanent gases.

Nature of the Gases Evolved

The constitution of the gases evolved in the coking process is essentially that of coal gas obtained in retorts in ordinary gas making, being richer, however, in hydrogen and nitrogen. At the beginning of carbonization, the gas is rich in illuminants and relatively poor in hydrogen. As the coking proceeds and the temperature increases, the illuminants and methane steadily decrease, and the hydrogen steadily increases in proportion.

In regard to the passage of the gases, there appears to be a difference of opinion, it being maintained, on the one hand, that they pass to the center and upward through the charge, and on the other, that they pass outward and upward between the outside of the charge and the walls of the oven. The difficulty which the gas would have in forcing its way through the finely ground and closely packed coal would alone appear sufficient to preclude the former view, while the formation of "scurf" on the walls through the breakdown of the hydrocarbons in the gas in contact with the highly heated surface, the increased density of the outer coke, with, in many cases, the actual appearance of carbonaceous feathers of carbon deposition on it give support to the latter view. It would not be unreasonable also to expect results as regards the constitution of the tar and the yield of ammonia analogous to those obtained in the vertical retorts for gas making if the former view be correct. This, however, is not the case. It is probable, however, that when the coking of the charge has advanced to the inner core, the gases begin to pass upward through the center through the clearage which forms in the center of the charge.

The investigation of Mr. Merivale, of Middleton colliery, Leeds, England, on the rate of evolution of the ammonia in a coke oven of the Simon-Carves vertical flued type, showed that after the first two hours when the quantity of ammonia formed is high, the rate becomes more uniform until about the 16th hour, which corresponds roughly to the period when the inner core begins to carbonize and the gases are probably passing through the center of the charge. At this point the rate of formation again becomes more rapid, pointing to some protective influence preventing the decomposition of the ammonia.

It has been the aim of coke-oven builders to design an oven which shall insure the uniform heating of the walls, facility of the control of the heating arrangements, economical utilization of the fuel gases and strength of the structure, for in these are embodied the most favorable conditions for the production of the best quality of coke with a maximum yield of by-products, whether of the vertical or the horizontal flued type, or regenerative or non-regenerative.

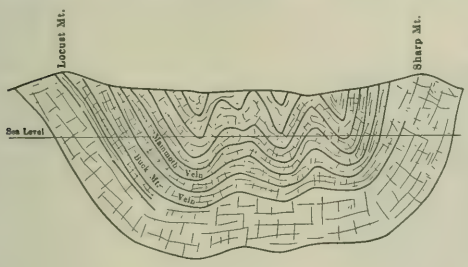


FIG. 7. GEOLOGICAL SECTION THROUGH TAMAQUA BASIN

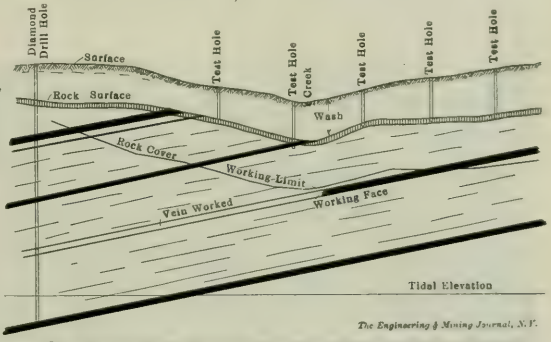


FIG. 8. SHOWING HOW SURFACE SEAMS ARE DEVELOPED BY TEST HOLES

*Abstract of paper read before the International Congress of Applied Chemistry, London, England, June 1, 1909.

†Manchester, England.

What is claimed to be the deepest diamond-drill hole in the United States was recently completed on the Marquette iron range in Michigan. It is 3265 ft. deep, and was drilled on lands which George J. Maas and associates are exploring for iron ore in the vicinity of M. A. Hanna & Co.'s American mine to the east of Republic. It required six months' steady work to penetrate to this depth.

The Roan Type of Gathering Locomotive

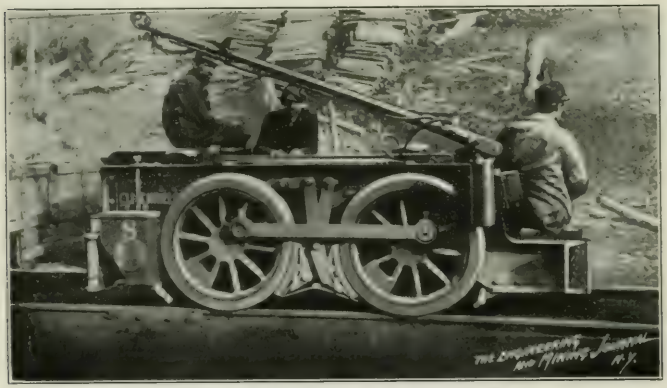
An improved electric mining locomotive of the "gathering" type, in which a single powerful motor performs the functions of both propulsion, and operation of the gathering reel, has been brought out by the Westinghouse Electric and Manufacturing Company and the Baldwin Locomotive Works, under the patents of an invention of J. M. Roan, general manager of the Clinchfield Coal Corporation.

In the Roan gathering locomotive the single motor used to drive the wheels is arranged to be detached and connected to the wire-rope gathering reel. The wheels or the reel may thus be operated either independently or simultaneously.

The arrangement described secures advantages of flexibility, compactness, and reduced amount and cost of electrical apparatus. The provision of one powerful motor to perform the duties of both gathering and driving motors, cuts in half motor and controller expense, at the same time making the total power of the traction motor available for the gathering reel.

When loaded cars are to be hauled from the working face to the butt heading, on which the locomotive stands, the rope is paid out and attached to the cars. The main driving motor is then unclutched from the axle and connected to the reel which winds up the rope, drawing the car toward the locomotive which stands, with its brakes set, on the heading track. The provision for propelling the locomotive at the same time the reel is in operation, enables the cars to be swung upon the heading without sawing the rope on the rib at the room-neck. In service, many applications have suggested themselves for the combined tractive and hoisting action secured from the motor. Detached cars may be easily replaced on the track, and cars may be extracted from under a rib of coal, and placed on a car, and in fact the reel can be used for any kind of general hoisting work.

The motor transmits its power, through a single spur gear, directly to one axle. The two axles are connected together by side-rods spaced 90 deg. apart, securing increased tractive effort beyond that of any single-motor or two-motor locomotive. As shown, the wheel-base is short, although the wheels are of full size, and the maximum amount of service is secured by the spring suspension of the frame and motor. The locomotive frame is made up of steel angles and plates, giving maximum strength for a given weight.



THE ROAN TYPE OF GATHERING LOCOMOTIVE

Colliery Notes

In the use of electricity underground, additional protection over and above heavy braiding is required by trailing cables, and the most successful form of protection seems to be plaited leather and a hard, light rope covering, the latter wound round the cable spirally. This latter protection has some advantage in low first cost and in the ease with which it can be repaired. With a trailing cable of this description, it is essential to have a carefully designed plug connection for both ends, and the leads, from the starting or controlling switch on the machine frame to the motor, should be completely protected from end to end, and not left exposed as is often the case.

When unarmored cable is used to carry electric current underground, it should be remembered that ordinary rubber insulations ignite easily and burn freely. It is necessary, therefore, to have the wires carried on porcelain insulators, giving at least 1 in. separation from the surface over which the wire is strung; it is also best to have the wires supported at short intervals, and separated from each other and from contact with side walls, roofs, floor and roof supports, by a few inches of air space.

Many experienced coal men discredit all arguments upholding the theory that destructive outbursts of gas may occur suddenly in a coal mine. In dealing with this subject, one writer says that such outbursts may prove a source of great danger, often totally fouling whole districts, and sometimes injuring miners by dislodging material. This same writer mentions a case in point in which he refers to an outburst of gas at a colliery, causing the death of 121 persons. The gas was ignited at the engine-house near the shaft-head, shot upward for 120 ft. and continued to burn for three hours. It was afterward assumed that 80,000 cu.ft. of gas per minute must have been given off. Experiments conducted to determine at what pressure such gas exists, have revealed the fact that it is not unusual for gas so contained to exist under a pressure of from 400 to 500 lb. per square inch.

Conditions of mining in Scotland, England and Wales are practically similar; however, rectangular shafts have applied almost exclusively to Scotland, circular shafts to England, and elliptical or oval shafts have been largely used in Wales. The rectangular shaft adapts itself best to the cage with the least waste of area; the circular shaft is the strongest and it is also considered the cheapest to sink; the elliptical shaft is the result of an effort to combine the advantages of the other two styles. It would, therefore, be interesting to know why certain districts, having similar conditions, adhere so strongly to one special style of shaft.

Permitted explosives are used in many European coal districts, to the almost total exclusion of gunpowder. In the United States, the investigations now being conducted will probably lead to the greater use of high explosives in our coal mines. In this connection, there is absolutely no question but that the use of high explosives is attended with greater safety. The action of the high explosive is much quicker than gunpowder, and the force of the explosion is scattered over the whole body in which the charge is placed, rather than on any particular point, thus preventing many blown-out shots. In European mines, it is still a debated question as to whether the use of permitted explosives should be compulsory in all mines, or only in gaseous workings. The action of the high explosive is so sudden that a higher percentage of slack is produced. For this reason, slow-acting gunpowder is superior to any other kind of explosives. The greater the percentage of round coal produced, the more money the operator will receive for his output. It seems certain, therefore, that the question as to where and when permitted explosives shall be used, is a delicate matter to decide. If we specify that permitted or high explosives shall be used in all gaseous mines, then what rule will we use to determine what shall constitute a gassy mine?

Notes on the Nicaraguan Goldfields

By M. R. Walker*

The Piz Piz district of Nicaragua lies about 60 miles south and 100 miles west of Cape Gracias á Dios, and about 30 miles north and 100 miles west of Prinzapulca, these towns being both Nicaraguan ports on the Caribbean sea. Overland routes to Nicaragua are impracticable, the usual and best route being by steamer from New Orleans. The trip up the rivers from the coast to Piz Piz is mainly by bateau and takes about seven days. The down trip takes at least three days. The rivers are devious, their crookedness adding probably 50 per cent. to the distance by air line. For the first 100 miles of the trip, the tropical forests are dense and the surrounding country flat. The second half of the trip is broken by various rapids and waterfalls.

My notebook gives the following details of the various mines whose relative locations are roughly shown on the accompanying sketch map:

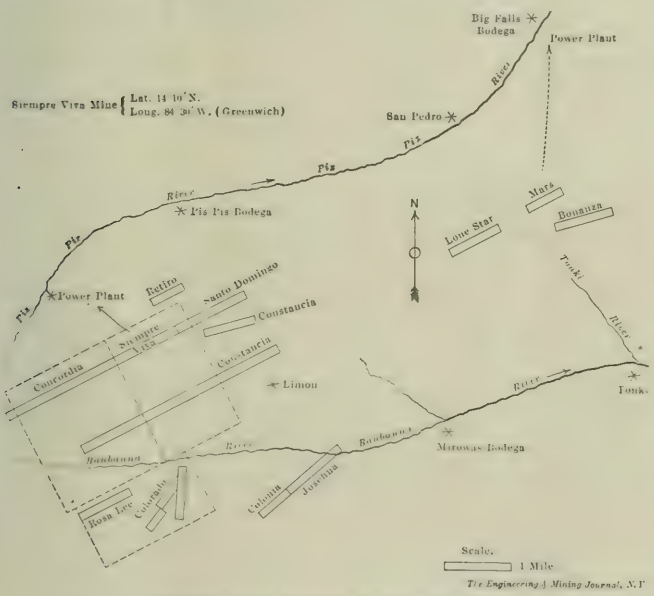
"Siempre Viva mine is owned and operated by a New Orleans company. Hydroelectric power is generated near the mine on the Piz Piz river, and about 200 h.p. are in use, 100 of this being leased to neighboring properties; 20 stamps; cyanide plant; 150 employees; ship 700 to 900 oz. of gold per month.

"Bonanza owned and operated by Joe Lapere. Water power runs 8 Huntington mills; cyanide plant; 60 employees, mostly Indians; said to ship 1000 oz. per month.

"Lone Star operated by close corporation controlled by R. Lehman & Co. Water power; 30 stamps; cyanide plant; 55 employees; shipments low.

"Rosa Lee owned by N. J. Martin *et al.*, managed by Martin. Water power; 1 Huntington mill; 20 employees; ships 125 oz. per month.

"Concordia owned by Paul Rener. Water power used when adequate, otherwise electric power rented from Siempre Viva; 10 stamps; mine was recently operated by leasers who gutted it, and owner has not reëstablished sufficient reserves for profitable operation.



SKETCH MAP OF PIZ PIZ DISTRICT, NICARAGUA

"Constancia owned by a company, financed by R. Lehman & Co. Rents electric power from Siempre Viva; 10 stamps; 35 employees; has large untouched reserves.

"Colorado has same management as Rosa Lee. Steam power; 2 stamps; 15 employees; no reserves; spasmodic operation.

"Josefina run by Peyrera y Cia. Steam power; 6 stamps; 20 employees; in litigation with Colonia.

"Colonia owned by Sam Weild *et al.* Water power; 5 stamps; operated under receivership pending litigation over titles with Josefina; has produced at rate of 300 oz. per month.

"Mars owned by Sherrick, Charles Lobner *et al.* Steam power; installing large hydroelectric plant; 2 Huntington mills; 25 men; locally considered a bonanza.

"On the Prinzapolca river, about 20 miles south of Piz Piz is the La Luz mine, and near it the Los Angeles mine, both belonging to the United States & Nicaragua Company, and said to be the most profitable holdings of their owner."

Veins—Rainfall—Labor

The veins are roughly parallel, striking northeast and southwest, dipping usually about vertically. Minor faults are everywhere, generally of only a few feet throw. Most of the prominent veins have been prospected over a distance of a mile or more. The rocks are so disintegrated by tropical rains that the cost of timbering lower workings may eventually limit the life of the mines. The average monthly rainfall is about 12 in.; several months of 1908 showed 19 in.; February is considered the driest month with from 2 to 4 in. The temperature is invariably mild.

The labor is of three classes, viz. Native Central Americans of distinctly Spanish strain and generally called Spaniards, Nicaraguan Indians, and so-called Creoles (with negro blood) from the various Caribbean countries and islands. The Spaniards probably give the best general satisfaction, earning about $18 United States currency and board per month. The Indians always work in cliques, flit around from place to place, and give the best results at task work, earning about $15 and board per month; their language is the Mosquito dialect, but most of them understand some English. The Creoles hold such positions as carpenters, mechanics, underforemen, clerks, etc., earn $50 per month and board, and usually speak English, Spanish and Mosquito; their number is small but they constitute a very important portion of the labor supply. An Indian's board costs his employer about $10 per month, while a Creole's board probably costs closer to $25 per month.

Transportation Facilities a Drawback

The great drawback to cheap operation of the mines is the cost and difficulty of transportation. This difficulty is aggravated by the fact that nearly all supplies are imported, the country supplying only timber, bananas and sweet potatoes. Timber is plentiful, its cost slowly rising, due to longer hauls. The roads are impassable to horses, but native mules and oxen have been trained to use them; their tracks make a road look like a tramway from which the ties have been removed, since they follow in each other's footsteps as closely as people do in climbing stairs. Almost all freighting is done by three concerns: from Cape Gracias to Waspook mouth on river steamer by United States & Nicaragua Company, by government concession covering steam navigation; from Waspook mouth to interior points by R. Lehman &

*Mining engineer, Box 89, Houghton, Mich.

Co. (also concessionaires) with bateaux and ox teams; from Prinzapulca to interior points on Prinzapulca river and tributaries by Silverstein & Kelting (Bluefields, Nic.) with bateau.

From the Honduras line down to the Banbanna river, all unacquired mineral rights are covered by a government concession to the United States & Nicaragua Company. It is periodically rumored that this company is to lose its concession on account of unfulfilled obligations to the government. Below the Banbanna river for an undetermined distance, the rights are covered by a concession to Paul Rener *et al.* It is locally asserted that Rener holds a minority interest, the balance belonging to President Zelaya and other officials who are trying to bleed Rener. It is probable that the holders of either concession are willing to make terms with independent parties who care to prospect their holdings.

Under the above conditions, several mining concerns are doing a good business. It is a local rule that ores running less than $15 per ton are not profitable. Little sorting is done. It may therefore be concluded that the ores generally run better than $15 per ton. About 55 to 60 per cent. of the gold is caught on the amalgam plates. The resultant tailings are about 70 per cent. slimes and 30 per cent sands. Where these sands are cyanided, a total saving of 85 per cent. is asserted. It may be concluded therefore that the gold occurs in coarse grains, since otherwise the excessive sliming would result in a heavy loss. It will probably not be gainsaid that the freighting business pays much better than the mining, and it would seem that some sort of cooperation among the mining interests would be of great value in reducing freight charges.

The New Cochran Crusher

By J. T. Barkelew*

The Cochran crusher embodies particularly a novel crushing movement upon which it depends for its efficiency. The movement used differs from that of the Blake and other jaw crushers, in that, instead of using a direct crushing movement in a direction approximately vertical to the faces of the crushing jaws, the new Cochran crusher uses a movement of one jaw diagonally to the faces of both jaws. The result is a combined crushing and torsional effect on the rock, allowing the rock to be split more uniformly along its planes of least resistance.

Arrangement and Action of Jaws

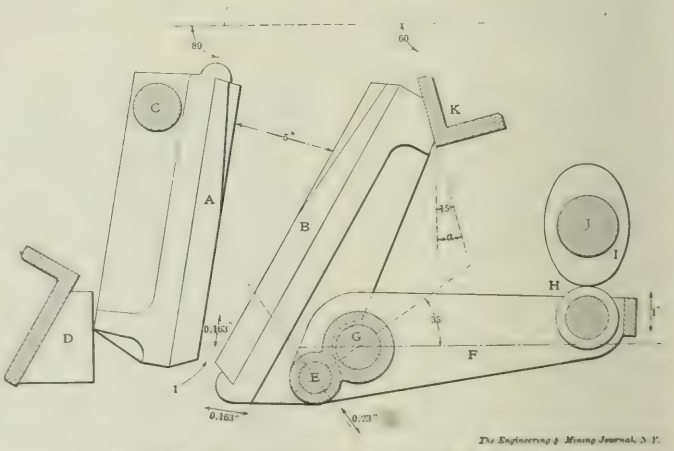
The crusher has an adjustable stationary jaw [illegible] and a movable jaw *B*. The stationary jaw is hung on a trunnion *C*, and is adjusted by means of a wedge *D*. The movable jaw is mounted at its lower end on pivot *E* and connected thereby with the short arm of operating lever *F*. The lever is fulcrumed at *G*, and has on its outer end a cam follower *H* coöperating with a cam *I* mounted on drive shaft *J*. The upper end of the movable jaw rests against a stationary abutment *K*, the angle *a*, at which the face of this abutment is set to the vertical, being arranged to suit any particular class of work or size of delivery and intake, as is explained hereinafter.

In one of the present small-sized machines the effective opening between the jaws at the mouth is 5 in. The width of the throat is varied to suit conditions, but for the purpose of this discussion it will be taken at 1 in. The width of the single jaws is 5⅞ in., and the length 14 in. In the machine referred to above there is a duplex arrangement of the jaws, the two sets being arranged side by side so that the combined opening is 5 in. wide by 11¾ in. long. Cams *I* for the two sets of jaws are arranged so that the jaws are operated alternately, thus reducing to a minimum the momentary torsional strain on the drive shaft.

The movement of the cam follower is 1 in., and, the arms being 3 and 13 in. long, the movement of pivot *I* is 0.23 in. The movement takes place in a plane tilted approximately 35 deg. from the vertical, the line passing through pivot *E* and fulcrum *G* being inclined 35 deg. from the horizontal. The stationary jaw, in its position of normal adjustment, stands at an angle of 10 deg. from the vertical.

Resolving the oblique motion of the lower end of the movable jaw into two motions, one at right angles and the other parallel to the face of the stationary jaw, we find that the motion normal to the stationary jaw is 0.163 in., and that along the face is the same. This provides that, at the bottom of the jaws where the finer material is being crushed, the direct crushing movement is equal to the torsional or grinding movement. This particular relation has been found very efficient.

As the gape of the mouth is 5 in., while the width of the throat is 1 in., it follows that a section of the space at the mouth 1 in. deep will hold five times as much as a similar section at the throat. To equalize theoretically the amount passing through the throat with that passing through the mouth, it is necessary that the movement at the throat be five times the movement at the mouth, for then the material in the throat will drop five times as far as that in the mouth on each movement of the jaw. However, the movement at the throat cannot be too large, as a nonuniform product would be the result.



SECTIONAL VIEW SHOWING FUNDAMENTAL PARTS OF CRUSHER

Determination of Angles

By making the angle *a* of correct magnitude, the movement of the upper end of the movable jaw directly toward the stationary jaw can be made to suit the above requirements. The determination of this angle depends upon all of the other factors before noted. The diagonal movement of the lower end of the jaw may be resolved into two factors, the movement parallel to the face of abutment *K* and the movement at right angles to it. The movement parallel to the abutment being designated m', then

$$(1) \quad m' = 0.231 \sin (55 + a) \text{ deg.}$$

This movement may be in turn resolved into movements perpendicular and parallel to the face of the stationary jaw. Designating the movement perpendicular to the jaw by m, we have

$$(2) \quad m = m' \sin (10 + a) \text{ deg.}$$

*Engineer and patent attorney, 728 Central Building, Los Angeles, Cal.

Combining equations (1) and (2), we have

$$(3).\ m = 0.231\ sin.\ (55 + a)\ deg. \times sin.\ (10 + a)\ deg.$$

Transforming this equation, we have

$$(4).\ m = \frac{0.231}{2}\ [cos.\ 45\ deg. - cos.\ 65\ deg.\ \sqrt{1 - sin.\ 2\ a} - sin.\ 65\ deg.\ sin\ 2\ a]$$

Taking one-fifth of 0.163 in. as the movement of the upper part of the movable jaw, we have a value for m of 0.0326 in. Substituting this value in equation (4) and solving the quadratic for *sin. 2a*, we finally obtain for the angle a a value of 2 deg. 45 min. This is the angle, then, which will give us theoretically the results required.

There are several considerations, however, mostly of a practical nature, which will increase the angle to some extent. The first and most important of these considerations is that the space between the jaws at the throat is usually filled to nearer its capacity than the space at the mouth, the throat containing small pieces and the mouth larger ones. It is therefore necessary that the movement of the upper part of the movable jaw toward the stationary jaw should be greater than the theoretical value of 0.0326 in. By trial the value of the angle a has been placed at 15 deg. Substituting this value for the angle in equation (4), we obtain a value for m of 0.0916 in. This figure is probably somewhat reduced by lost motion and other similar causes, but it is sufficiently accurate for determining the amount of work done at the mouth and the throat and of the ultimate possible strain upon the machine.

Since theoretically the movement at the throat should be five times the movement at the mouth in order that the work done on both points be equal, then

$$(5).\quad \frac{5 \times 0.0916}{0.163} = 2.8$$

will represent the actual factor by which the work at the mouth is greater than the work at the throat. This figure is for 1-in. delivery, and a larger adjustment of the delivery reduces it in proportion. When the delivery is made smaller the machine is, of course, more liable to choke up, but in the case of a machine made to run normally on a smaller-sized output the angle a is made smaller.

Stresses in Crusher

In the duplex machines only one jaw is working at a time, so that the strains produced in the various parts of the machine are never more than those imposed by one jaw. All of the stress between the jaws is taken up directly by the portions of the side plates of the machine, being transmitted directly through trunnion C and wedge D from the stationary jaw to the side plates, and by abutment K and fulcrum G from the movable jaw to the side plates.

The average movement of the jaw is approximately 0.1273 in. If the pressure sustained during this movement reaches a maximum of 67,000 lb. and the movement at the shaft end of the operating lever is 1 in., the pressure necessary on the end of the lever is approximately 7875 lb. This pressure is transmitted to follower H from cam I, and the reactionary pressure on the shaft is borne by two sets of ball bearings, one at each end of the shaft. Each of these bearings has a working load of more than the total load carried by both bearings.

The frame and inclosing plates of the machine, as they take up practically none of the stresses, are made comparatively light, of angle iron and boiler plates. The jaws and levers are heavy and strong, the jaw faces being made in a variety of ways to suit conditions, and the jaw-backs and levers made of cast steel. By this construction lightness and strength are combined.

The machines as above described are made in several sizes by the Cochran Jackson Engineering Company, of Los Angeles, California.

West Africa and the Amalgamated Mines

Special Correspondence

The report of the Gold Coast Amalgamated Mines, Ltd., and the address of the chairman at the recent general meeting of the company are of special interest, owing to the presence in the chair of one of the officials of the Consolidated Goldfields of South Africa Company, which has recently given substantial financial support to several of the mining companies of the Gold coast. The support of a company of the standing of the Consolidated Goldfields, one of the more influential of the Rand financial houses, attracts many other people to take an interest in this goldfield. They know that such a company would not risk the large sums that it has guaranteed for the development of the mines if it did not believe in their ultimate success. The official statements, therefore, of the Amalgamated company, reviewing the grounds on which the optimism of the Consolidated Goldfields of South Africa is founded, will receive careful examination.

Up to the present, gold mining in West Africa has been a disappointing business from the shareholders' point of view. There has been, it is true, a large gold production for many years past, but the gold has been won at a loss to those who provided the capital. The Abosso mine is one of the few that can be called a financial success. In spite of the good grade of the ore won, the high cost of working, due principally to the bad climate, has, up to now, prevented the industry, as a whole, from being profitable.

During recent years considerable attention has been paid to the subject of sanitation and health with the result that mining is now carried on under much more favorable conditions and consequently more economically than formerly. Further, the West African mines have profited by the experience of South Africa where great improvements in the methods of mining and milling gold ores have in recent years taken place.

Improved sanitation and more economical mining methods are the two factors that promise more favorable results from West African mining in the future. It is on these two points that special stress is laid in the speech of the chairman of the Amalgamated Mines, who drew attention to the reduction in the cost of working that had taken place on the Rand in the last 14 years, the average working cost of 38s. 10d. ($9.44) per ton for 1894 having been reduced to 18s. ($4.38) last year.

The possibilities of reductions in working costs are, no doubt, great and optimism in this direction appears to be justified. The main consideration, however, is the extent and value of the ore and in this direction the optimism of the chairman does not seem to be on such safe ground. The extent and value of the banket deposit is still an unknown quantity. The outcrop has certainly been traced for a long distance—something like 20 miles—and its continuation in depth as a geological deposit may be counted on. The extent to which it is payable is the uncertain point.

The goldfield has been reported on by many competent engineers and all are agreed that in places, marked by the present working mines, it is highly payable if worked on an adequate scale and with a suitable plant. Whether the banket field is payable in between these best known oreshoots is uncertain. A good deal of drilling and surface prospecting has been done with none too encouraging results. It does not, therefore, seem safe as yet to assume that because ground is underlaid by the banket formation any portion of it will be payable. On the Rand, where the formation has been very widely developed, assumptions of this sort have justification. But in West Africa it is different. The gold there appears to be distributed less evenly than on the Rand and to occur in oreshoots. And until mining of the oreshoots has been put on a profitable basis, it is surely rash to put faith in the undeveloped area, about the value of which so little is known. Optimism of this sort ought, at all events, to be backed by the report of some engineer of repute, which it is not. Otherwise it is merely the optimism of the speculator.

The essential point in the use of electric current underground in gaseous workings is to keep the spark inside the cable.

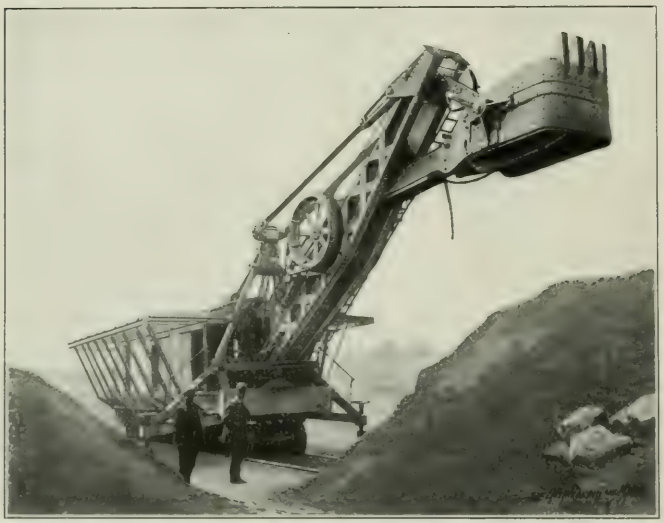
Giant Electrically Driven Power Shovels

The largest electrically operated power shovels ever constructed, having buckets of 4 cu.yd. capacity, and equipped with Westinghouse motors and automatic control, have recently been placed in the service of the Dolese & Shepard Company, of Chicago. The shovels will be used for mining rock in the company's limestone quarries.

The hoist movement of these two 110-ton machines is actuated by a 200-h.p., 220-volt, series-wound, direct-current, Westinghouse type M. T. mill motor, running at 415 r.p.m. The thrust motor, controlling the movement of the dipper handle, is an 80-h.p. machine of similar type, while the swing boom is operated by an 86-h.p. motor. Each motor is controlled independently by Westinghouse type A. automatic, magnetic, switch controllers which secure the greatest nicety of operation of the heavy bucket. This form of control protects the motors from any heavy overloads which may result from the bucket striking solid rock or other obstruction, by opening switches to introduce resistance into the motor circuit. The control panels and resistances are mounted in the seat of the cab, while the controller handles are conveniently placed under the hand of the operators.

The hoist and swing boom motors are mounted within the car. The thrust motor is placed out on the boom, communicating its motion to the bucket staff through reducing gearing connected to a pinion engaging a rack on the staff. The power circuit to the shovel is completed through a feed cable, carried on a retractile reel on the shovel and through the rails on which the shovel advances. The shovel may also be fitted with a standard trolley for deriving power and for propulsion on ordinary electrified track. The machine may then attain a speed of five miles an hour.

Compared with the steam shovel, the electric-driven excavating apparatus has been found to present marked advantages of simplicity, economy and ease of operation. The hauling of water and coal is avoided, fewer operators are required to handle the machine, and an appreciable saving of time is noted. In one case an electric shovel with 75-h.p. hoist, 30-h.p. thrust and 30-h.p. swing-boom is operated at a cost of $0.0164 per cu.yd. of gravel, clay and sand removed. Similar work performed by steam shovels often costs from 3 to 4c. per cubic yard.



LARGEST ELECTRICALLY OPERATED POWER SHOVEL.

Reading the Paper

Power and The Engineer makes some highly sensible remarks as follows:

Did you ever, in looking over some back numbers of your paper, come across an article or a letter, or perhaps even an editorial, which interested you immediately and which you did not remember having seen before? Many of you must have had this experience if you refer to back numbers frequently. It is due to one of two things; either you don't read the paper thoroughly, or else you were not much interested at the time in the subject of the article which appealed to you later. In most cases, however, it is hasty reading of the paper; the interest of a practical engineer does not change widely or often, as a rule.

Occasionally, we receive letters from regular subscribers in which they ask for information which they could have found in a back number of the paper less than a month old. The one sure remedy for this unnecessary pen exercise is to read each number of the paper carefully, record in a card index the title and general character of each article of interest to you, and keep your back numbers in a temporary binder. This sounds like a lot of red tape and trouble, but it isn't after you get the habit. The card index can be kept in a little box about five inches wide and fifteen inches long.

At any rate, whether you are inclined to keep an index or not, read the paper carefully and then go through it again page by page and see if you have skipped anything relating to your own class of work. You will be surprised at the increase in your interest in the paper and in its helpfulness to you. It certainly can't do you much good if you don't read it properly.

Kimberley Diamond Production

SPECIAL CORRESPONDENCE

The report of the inspector of mines for the Kimberley division for last year is now issued. This, of course, is practically confined to a review of the diamond industry. The only mines at work during 1908 were those belonging to De Beers Consolidated, Ltd. Owing to the depressed state of the market, these properties were worked on a greatly reduced scale. At the end of 1907, there were employed 3072 white and 14,509 colored, a total of 17,581 men, at the end of 1908, the number employed was reduced to 1695 white and 10,583 colored, totaling 12,278. During the year there were washed 4,007,038 loads of blue ground, 47,053 of cylinder lumps and 1,511,337 of tailings, and at the end of the year there were 9,627,752 loads of blue ground and 676,834 of cylinder lumps on the floors.

The yield was 1,588,511 carats, valued at £3,085,352, this contrasting very unfavorably with the two previous years, which returned 2,742,867 carats for 1906 and for 1907 2,589,953 carats, valued at £6,092,811 and £6,315,289, respectively. The average yield of diamonds, as given in the last annual report of the general manager of De Beers, was: From De Beers and Kimberley mines, 0.37 carat per load; Wesselton mine, 0.27 carat; Bultfontein, 0.32 carat and from Dutoitspan, 0.23 carat.

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Profit in Mining

Mining in its elemental form consists in digging some valuable mineral with the expenditure of nothing but labor. The prospector who finds gravel from which he can wash out gold with a pan or a long tom is able at the end of the season to reckon as profit the difference between his proceeds and the money expended for his own subsistence. The conditions are still simple when, as in mining zinc ore in the Joplin district, it is necessary to lay out only a small amount of capital for the sinking of a shaft, the installation of a small steam-hoisting plant and the erection of a comparatively inexpensive concertrating mill. There is still no doubt in the mind of the operator as to what is the profit in mining, which, of course, is the difference between the proceeds of the ore and the cost of getting it. But as the necessary methods of mining become more elaborate and complicated, difficult conditions for extracting the ore, or low mineralization of the ore compelling the installation of large and costly plants, with many things that follow as consequences thereof, the problem of bookkeeping quickly becomes involved and at no given time is it easy to determine what is the actual profit in mining. This opens the way to self-deception, it being human nature to overestimate good fortune or minimize ill fortune, and also makes it easy for those who desire to deceive for unworthy motives. Thus it has come to pass that when anyone speaks of a profit in mining it is necessary to establish whether he means real money or money on paper, and in speaking of the cost of mining (or of smelting) it is essential to learn whether the figures are for all of the cost or only a part of it. This failing is not confined to mining and smelting, but extends to almost all kinds of industrial operations, as we shall later point out; however, the cost of mining and smelting is naturally our theme.

Jumping into the midst of the subject, the difficulty pertains to the question of amortization, which term is merely a brief way to express the idea that the principal invested in an enterprise must be returned. The life of a mine is limited, and the net yield must not only pay interest upon the principal, but also must return the principal itself. The same thing must be contemplated in the cases of smelting works, factories and railways, the life of which is not necessarily limited. However, the machinery and apparatus in which capital is invested, gradually wear out, and an adequate fund must be provided for their replacement. Indeed, it is not only wear that may necessitate replacement. The entire system, although maintained in excellent repair, may become antiquated through the invention of improved methods and rendered so uneconomical by comparison that its usefulness is ended. The careful administrator must be prepared to meet this contingency.

The commonly perplexing problem that arises is, however, the charging of improvements that are constantly being made, and which may increase earning capacity. Some ultra-conservative managers charge all of such outlays to operating expense. This has one great advantage, viz., all chances for self-deception are eliminated; at least, all of the unfavorable chances. Also, it has been amply proved in the cases of many large mining enterprises that the need for extraordinary outlays arises year after year. The other method is to charge these expenses to capital account on the ground that stockholders should not be deprived of actual earnings in one year at the expense of improvements that are going to be of benefit in future years. Also the management, aiming to effect a distribution of the stock, may be inspired to make what is really a fictitious showing of earning capacity by charging items of operating expense to capital account. The things represented by these credits cease to exist sooner or later, being used up in the long run of operation, with the result that capital account is reckoned too high and operating expenses too low, and the upshot is a bond issue to supply the necessary things that capital account should show. This species of financiering—the payment of dividends out of principal, or what comes to the same thing—is by no means confined to mining enterprises. We have no doubt that many of the bond issues of the railway companies have been to replace items in their capital account that have ceased to exist.

In the accounting of mining and metallurgical companies the safest method is to charge all improvements, ordinary and extraordinary, to current operating expenses. If the other method be adopted

and some expenses conceived to be extraordinary are charged to capital account an adequate writing-off of the latter should be made annually and careful inventories should be taken to prove whether the book value has really continued to exist. This is a way wherein the services of the independent consulting engineer, in the truest sense of that term, ought to be generally employed in the interest of the stockholders of a company. Expenses of production may be deferred temporarily, but in the long run they have to be met and the only real profit is the difference between gross yield and all expenses in the exhaustion of the mine.

The Cape Breton Strike

The strike in the Cape Breton coal mines, which is making much trouble for the Dominion Coal Company, and incidentally for the Canadian authorities, has some peculiar features. It originated in the action of the United Mine Workers—the coal miners' union of the United States—which already has a foothold in the mines of western Canada, and more recently decided to extend its branches into those of Nova Scotia. The Canadian mines already had a union of their own, but the organizers sent by the United Mine Workers succeeded in securing a large membership among them. Some trouble arising among the employees of the Dominion Coal Company, the union intervened, and offered to negotiate a settlement. The company, however, refused to recognize its officers, on the ground that they represented a foreign organization, whose central offices were outside of Canadian jurisdiction and not bound by Canadian law. An offer to adjust working differences under the Lemieux act—as the Canadian law providing for boards of arbitration is called—was rejected, and a strike was ordered. The greater part of the company's miners went out and the operation of its important collieries was stopped, or badly crippled.

It does not appear that the original differences were impossible or even difficult of adjustment. Indeed it is said that the miners who were not members of the Canadian Workingmen's Association—the home union—were willing to continue at work and to have their claim for increased wages adjudicated under the Lemieux act. This, however, over-awed by the more numerous and aggressive members of the United Mine Workers. Practically, therefore, the strike turns now on the recognition of the United Mine Workers as a factor in Nova Scotia coal mining. The Dominion Coal Company is firm in its refusal to do this, and it is apparently backed by general public opinion in Canada.

Unfortunately, the strike has been accompanied, as it progressed, by violence and by assaults on men who remained at work, of the kind with which we are only too familiar. The violent methods obtained such headway that a military force was sent from Halifax to Sydney to maintain order, which the local authorities seemed unable—perhaps unwilling—to do. The increasing tendency to violent outbreaks may perhaps be taken as evidence that the strikers feel that they are in a losing fight.

After all, public opinion may be a great help to a strike, or the contrary. Canadians are proud of their nationality, and they may be pardoned for taking sides against what they consider a foreign organization. It is foreign, however close the relations between the two countries may be. The United Mine Workers' organization must always be ruled by the members on this side of the line, where the great majority live; and that majority will not have much consideration for conditions in Nova Scotia.

The Settlement of the Tariff

The long drawn-out contest over the tariff has practically been settled. As regards the mining industry it is safe to say that no injury will be done by any reductions that have been made to any branches of business whose prosecution is justified by natural conditions, except in those cases where differentials have been bungled by congressional stupidity. Among others, this is the predicament of the zinc smelters and the rollers of sheet zinc. There are some industries laboring under the natural handicaps of remoteness from markets, poverty of the ore deposits, etc., that have been unnaturally stimulated by prohibitory rates of duty on imports. The reduction or removal of such duties, of course, operates adversely to the producers directly concerned, but it is the general good of the nation that should be especially considered, rather than the advantages of special interests. On the whole, the new tariff does not make any great reduction. The importance of the settlement is in marking for the first time since the Civil War a tendency toward revision downward rather than upward.

British Coal Troubles

Great Britain will not be subjected to the disturbance of trade and business which would inevitably have resulted from a general strike of the coal miners. The vote taken by the Federated Miners of Great Britain, to which reference was made in a recent issue, resulted by a large majority in favor of a general strike in case no settlement should be made with the Scotch miners. A conference was thereupon called by the Board of Trade which resulted, after prolonged discussion, in the abandonment by the Scotch operators of their demand for a reduction of the minimum wage to 5s. 6d.—$1.32—per day. The Scotch miners had decided to go out on Aug. 1; almost at the last day, on July 30, the agreement was made. By this the old contract is continued, under which the minimum wage is 6s. or $1.44 per day, the increase or decrease in wages being based upon the selling price of coal. The general strike, as arranged, was to have followed the going out of the Scotch miners.

The revival in the iron and steel trades, which set in when prices were reduced and an open market declared, has progressed to a point that must have been entirely unexpected by the advocates of high prices. Our columns from week to week have given accounts of the rapid improvement in trade and the large business transacted. Already the markets have risen to some degree above the lowest point established by open competition, and last week we had announcements of several advances in staple materials, such as bars, wire, and structural steel. These are made because the mills are full of work and their managers believe that the demand will enable them to maintain their new position. Of course, general business conditions have had something to do with this improvement, but there can be no doubt that the reduction in prices was the starting point now, as in former years.

July Dividends

In the accompanying table are shown the amount per share and total amount of the dividends paid during July, 1909, by a number of mining and industrial companies in the United States, Canada and South and Central America.

JULY DIVIDENDS.

U. S. Mining Companies.	Location.	Am't per Share.	Am't Paid.
Alaska Mexican, g	Alas.	$0 60	$108,000
Alaska Treadwell, g	Alas.	1 00	200,000
Alaska United, g	Alas.	0.40	72,080
Boston-Sunshine	Utah	0 03	4,500
Boston & Montana, c	Mont.	3.00	450,000
Bunker Hill & Sull., l.s.	Ida.	0.15	45,000
Colorado, l. s	Utah	0 08	80,000
Copper Range	Mich.	1.00	384,185
Daly West, s. l	Utah	0 30	54,000
Davis Daly, c	Mont.	0.50	300,000
Gold Dollar, g	Colo.	.	12,500
Golden Star, g	Ariz.	0 05	20,000
Goldfield Con., g	Nev.	0 30	1,059,711
Hecla, s. l.	Ida.	0.02	20,000
Homestake, g	S. Dak.	0.50	109,200
Iron Blossom, s. l. c.	Utah	0.08	80,000
Jamison, g	Cal.	0 02	7,800
New Indria Quicksilver	Cal.	0.30	324,000
Pioneer Leasing	Nev.	0 05	44,046
Silver King Co't'n.	Utah	0 15	183,666
Sioux Con., s. l. g	Utah	0 07	52,247
Skyline, g, s	Nev.	0 05	50,000
Tonopah of Nev	Nev.	0.35	350,000
U. S. Sm., Ref. & Min., com	Utah	0.50	175,466
U. S. Sm., Ref. & Min., pf	Utah	0 875	425,114
Utah Con., c	Utah	0 50	150,000
Vindicator, g	Colo.	0.01½	22,500

U. S. Industrials.	Location.	Am't per Share.	Am't Paid.
Amer. Cement	Penn.	$0 30	$60,000
Amer. Sm. & Ref., com	U. S.	1.00	500,000
Am. Sm. & Ref., pf	U. S.	1.75	875,000
Col. & Hock. C. & I., pf	Ohio	1.50	103,866
Gen'r'l Chemical	U. S.	1 50	150,000
Nat. Lead, com	U. S.	1 25	186,317
Republic I. & S., pf	U. S.	2 00	408,338
Sloss Sheffield, pf	U. S.	1 75	117,250
Va. Car. Chem	U. S.	2 00	360,000

Foreign Mining Companies.	Location.	Am't per Share.	Am't Paid.
Buffalo Mines, s	Ont.	$0 05	$45,000
Crown Reserve, s	Ont.	0 15	262,500
Dominion Coal, com.	N. S.	1.00	150,000
Esperanza, g	Mex.	0 37	168,350
Guanajuato D., pf	Mex.	3 00	30,000
Guggenheim Exp'l	Mex.	2.50	262,500
La Republica	Mex.	0 05	20,000
La Rose, s	Ont.	0 20	228,673
Lucky Tiger, g	Mex.	0 70	45,500
Mex. Mill & Trans., pf.	Mex.	3 00	31,500
N. Y. & Hond. Ros.	C. A.	0 10	15,000
Nipissing, s	Ont.	0 25	300,000
Right of Way, s	Ont.	0 06	29,971
United States & British Columbia	B. C.	0 50	60,000

Leasing Transvaal Mining Land

SPECIAL CORRESPONDENCE

The Transvaal government has introduced a rather novel proposition into the history of mining on the Rand by offering on certain terms, to the highest bidder, two of its large mining areas on the eastern extension of the Witwatersrand. The areas offered comprise 1275 and 1358 claims (a claim is 400x150 ft.) and are situated on the dip of the New Modderfontein and Modderfontein B. properties, the former of which has proved a good producer, and the latter having given encouraging results from borehole prospecting.

On one side of the area is the Brakpan and on the other the Geduld mines, both of which have been extensively developed. These areas may be considered the pick of the government ground on the eastern extension of the Witwatersrand, since something is known of the surrounding ground, whereas little is known of the value of the rest of that large area underlaid by the Main Reef conglomerates. During the year ended June 30, 1908, the New Modderfontein company milled 300,000 tons at a working profit of £210,000.

The government invites application for a lease of the exclusive right to mine precious metals on these areas, the lease to terminate on the exhaustion of the payable precious metals in the block—in other words, until the payable portion of the Main Reef underlying the whole of these big areas has been extracted and treated.

It is estimated that, provided no unforeseen difficulties arise, a sum of at least £350,000 will be required for shaft sinking and preliminary development, and a further sum of about £350,000 for bringing the property to the producing stage.

Each application must be accompanied by an undertaking from a banker of standing that he guarantees the applicant in a sum of not less than £35,000, such guarantee to hold good until the flotation of the company and to be forfeited to the government if the successful applicant fails to form a limited liability company (registered in the Transvaal) within two months after acceptance of the terms.

This last condition seems a bit heavy but no doubt the government does not expect to receive any tenders except from the local mining corporations, as it is unlikely that any corporation unfamiliar with Witwatersrand conditions would finance, on these terms, such totally unproved areas.

The applicant must also indicate to the government his scheme of exploitation, including the milling program. No vendors', promoters' or founders' shares may be created and no underwriting or other commission will be allowed. No shares may be issued at less than par and in providing the capital required for shaft sinking and preliminary development, all shares must be issued at the same price.

Twenty-five per cent. of the capital required for shaft sinking and preliminary development must be offered for subscription to persons resident in the Transvaal, but no person may apply for less than 10 nor more than 200 shares. The rules and conditions, under which applications for shares are invited, and the allotment thereof, shall be submitted for approval to the minister of mines.

The consideration to be quoted by the applicant as payable to the government for the lease of these rights must take the form of a percentage of the annual net production and the applicant must tender according to an approved sliding scale. This provides that the minimum share to accrue to the government shall be 10 per cent. as under the profit tax; the maximum shall be 50 per cent. Within these limits the government roughly has the same ratio to the profits as the profits bear to the gross production of the mines. Bidders for the ground are asked to state what percentage, if any, of the amount due under the sliding scale they are prepared to pay to the government, in addition to the amount above provided.

If these properties prove capable of supplying a 200-stamp mill with $7.30 ore—the value roughly of that treated at the New Modderfontein and at the same cost, namely $4.86, which is much above the Witwatersrand average and is likely to be brought down lower—then 450,000 tons would be crushed per annum at a working profit of £225,000. What the life will be under these conditions, however, is uncertain. The reef here lies flat and so has a much less tonnage per claim than on the main portion of the Witwatersrand. Without making any allowance for a decreased reef width, a larger proportion of waste will have to be handled.

Quicksilver Mining in Mexico

SPECIAL CORRESPONDENCE

There is a noticeable reawakening in regard to the quicksilver deposits of Mexico. With the decline in the consumption of quicksilver in the patio process many of the deposits of this metal, which were formerly worked for a time under the subsidy of the government, were abandoned. For a number of years Mexico has been importing quicksilver, last year an excess of 180,000 kg. The operations in Mexico were generally conducted on a small scale and, owing to the wasteful metallurgical processes, only high-grade ore was available.

The diminution of the mercury supply from California and the failure of the Texas district to materialize a large production has resulted in attention being turned to the Mexican quicksilver deposits. Several new operations are under way and negotiations are on for other properties. There are numerous quicksilver deposits in central and southern Mexico, most of them being found in connection with geographically recent thermal-spring action. They are ordinarily not extensive individually, but afford considerable ore, averaging 0.5 per cent. or better. Inasmuch as the European and California practice profitably treats ores as low as 0.25 per cent., these Mexican deposits, which were of no value to their former operators, are becoming attractive

Views, Suggestions and Experiences of Readers

Comments on Questions Arising in Technical Practice and Debatable Points Suggested by Articles in the Journal

CORRESPONDENCE AND DISCUSSION

Electro Magnetic Separation

From a statement in the introduction to C. Godfrey Gunther's recently published work on "Electro Magnetic Separation," it may be inferred that the author is under the impression that magnetic separation, or concentration, was first employed, in a commercial way, in the United States in 1852, when the American Mineral Company erected a plant at Moriah, N. Y., to remove about 20 per cent. of magnetite, by means of the Ransom Cook separator (patented Feb. 20, 1849), from the apatite ore the company was organized to market; whereas the process was in successful commercial operation at the smelting works of J. Richardson, Franconia, New Hampshire, as early as 1830, using for the purpose the apparatus invented by Samuel Browning, and presumably the process was used there for a considerable term of years.

The mine and smelting works at Franconia have long since been abandoned and Messrs. Browning and Richardson were long ago numbered with their fathers, while methods of ore separation are so greatly improved that what they did is only a matter of antiquarian interest. Still, these gentlemen seem to have been the first to have applied magnetic separation to a commercial use in this country, and it is unfortunate that Mr. Gunther did not give them credit for their inventive ingenuity and enterprise.

Magnetic Separator at Franconia Iron Works

Prof. Charles U. Shepard, of Yale College, made a trip through northern New England in the fall of 1829, and published a series of articles on his observations in the *Journal of Science and Arts*, and from the July number of 1830 is taken the following:

"Since the publication of my remarks upon the Franconia Iron Works in the first number of the volume, Mr. Richardson, proprietor of the Upper works, has very obligingly communicated to me some additional information relating to his establishment, which I consider worthy of insertion in the present memoir. Mr. Richardson has introduced into his factory, since our visit, the valuable magnetic separating machine invented by Samuel Browning, of Boston, and on which a patent has been secured. The following abstract of Mr. Browning's description of the apparatus will conclude my remarks upon the Franconia Iron Works.

"The machine consists of a frame 4 ft. long, 3 ft. wide, and 6 ft. high, containing two cylinders, which embrace nearly 3000 magnets, together with a third cylinder furnished with cams to move a wire screen placed on friction rollers. The ore, after being roasted in the kiln, is wheeled to the pounding house which contains the machine. Here it is pounded through grates, the bars of which are ¼ in. apart, and thence conveyed to the hopper of the machine, from which it runs into the sieve in required quantities, regulated by a gage. Passing through the sieve it is conveyed by an apron or guide under the first or largest cylinder, from which the magnets take up all the ore they are capable of holding, leaving the remainder to pass on, regulated by another apron, to the second cylinder, which attracts the balance, while the residue, being silicious matter, is suffered to drop down and is thrown away, as it accumulates, by the workmen. The cylinders constantly revolve on their axes, and the sieve is subjected also to a slight motion. A large brush is maintained in front of each cylinder, which, as the cylinder turns, removes the ore accumulated during its revolution. The ore thus brushed from the cylinders is conveyed by a spout or trough, adjusted at a proper angle, from the pounding house to the forge. The whole machine is kept in motion by water power.

"By the use of this apparatus Mr. Richardson assures me that he saves 100 bushels of coal in the manufacture of every ton of iron; and besides, he is enabled to produce iron of a superior quality and with a considerable saving of time. advantages, it would appear, of sufficient consequence to introduce the invention of Mr. Browning into very general use."

Again, in Vol. XXI, 1832, there appears the following extract of a letter from Mr. Richardson, dated Sept. 26, 1831:

"The magnetic separator continues to answer a valuable purpose. Mr. Browning has recently put one of his machines in operation in Peru, which brings into use an ore bed that before was worthless."

A Philosophical Instrument

Samuel Browning, a resident of Franconia, New Hampshire, was granted patents for "a magnetic cylinder" on Oct. 13, 1810, and Nov. 25, 1814, which are recorded in the patent office, not among the metallurgical inventions, but as a philosophical instrument, but, owing to the subsequent burning of the office, no information concerning the specifications of the cylinder, nor of the claims granted, can be obtained at Washington. Unquestionably permanent magnets were employed in the cylinder as patented, but as the apparatus was not introduced into Mr. Richardson's establishment until 1830, or some years after the development of the electromagnet, it seems possible that Mr. Browning may have modified his original construction and used electromagnets to gain greater intensity of magnetic field. On the other hand, if electromagnets were used, it would seem as though Mr. Richardson would have stated it, as their employment would have been a novelty. Possibly he did so, but Professor Shephard failed to mention it in his abstract of his letter, although, from the interest then taken by educated men in electrical development, it does not seem likely.

Browning Separator at Franconia

While my search was by no means exhaustive, I have been to some little trouble in endeavoring to learn how long the Browning separator was employed at Franconia, but to no purpose, since the citations given are the only references to it which have come under my observation. Yet, from the exceeding richness of the ore smelted in 1830, as compared with that treated in 1829, it would seem as though the apparatus at the later date must have been used to concentrate the ore sent to the blast furnace, and, if so used in 1830, it doubtless was used until such time when it was possible to replace it with a more efficient construction, and the next separator patented was that of Mr. Cook in 1849. Hence the inference that it was used for a considerable period.

According to Professor Shepard, in 1829 there were two smelting establishments drawing ore from the Franconia mine. One, the so-called Lower works, belonging to the New Hampshire Iron Manufactory Company, was making pig iron in a blast furnace, which was built in 1811 and finally abandoned in 1870, while the other establishment, the Upper works, of Mr. Richardson, was making bar iron with the Catalin forge. Professor Shepard did not state what the ore assayed, but reported that when smelted in the blast furnace it gave a yield of 50 per cent. pig iron, which, with Mr. Richardson's use of the separator, indicates that the crude ore probably contained about 58 per cent. of iron. On the other hand, Dr. Charles T. Jackson, writing in 1840, incidentally mentioned that the price of bar iron was too low to permit of its being made with the Catalin forge, and, as the Upper works were not alluded to by him,

they presumably had been finally closed, but just when does not appear. The blast furnace, however, was running and Doctor Jackson reported that the yield of pig iron was about 60 per cent. of the ore smelted, while, according to his analysis, the ore contained: Magnetic oxide, 96.2 per cent. (iron, 69.04); silica, 2.3; and titanic oxide, 1.5.

While no specific mention of the introduction of the Browning machine, nor of any other system of concentration into the Lower works has been found, yet ore of the grade stated must have been a concentrated product, and, all the things considered, it seems reasonable to infer that it had been concentrated by means of Mr. Browning's apparatus.

JOHN N. JUDSON.

New York, Aug. 2, 1909.

Borax in Assay Fluxes

An excessive amount of borax as a flux undoubtedly has the effect assigned to it by J. E. Clennell, in the JOURNAL, April 3, 1909, of making a stony slag which adheres firmly to the lead button, causing a thin skin of lead to become detached with the slag. That this small quantity of lost lead explains the reason why duplicate assays are often wide, I do not admit, for the following reasons:

(1) The quantity of lead thus lost I have never found to exceed 10 grains and the average not more than 4 grains which on an average button is less than 1 per cent.

(2) Reassaying slags on wide assays has not shown any gold.

(3) Where the wide results have persisted, panning a portion of the sample usually showed the presence of coarse gold.

(4) With buttons having a perfectly smooth surface, wide assays still result.

In assaying, for several years, concentrates from batteries throughout the State of Victoria, it was notable that the finer concentrates from slime tables and blankets, where preceded by concentrating tables, rarely gave any difficulty in yielding quite concordant results. On the other hand, in several cases where the concentrates have been coarse and badly sized, and where coarse gravel bore eloquent testimony to broken battery screens, the results have been wide, due to coarse gold.

The results on three separate quarterings of a sample of concentrates obtained on a percussion table are appended. Roasting and panning some of the ore showed both coarse and fine gold.

First Quartering.		Second Quartering.		Third Quartering.	
0.036		0.038		0.0385	
0.0335	mean	0.0425	mean	0.0355	mean
0.0385	0.0373	0.0365	0.0381	0.038	0.0371
0.0415		0.0355		0.0365	

These assays are on 400 grains of ore and the buttons obtained would average 600 grains. If the discrepancy between the highest and lowest assay in the first column were due to loss of lead, it would mean that 19 per cent. or 114 grains of lead had been lost. Subsequent treatment of the above parcel of 50 tons proved the assays substantially correct.

PERCY A. PRATT.

Melbourne, Victoria, Australia. June 23, 1909.

Smelter and Smeltery

The vocabulary of the mining and metallurgical profession has not grown apace to meet the demands of the ever developing fields of operation of the miner and metallurgist. The result is the ambiguous use of the few technical words we possess, in our efforts to express in reports and letters the condition or progress of the mines or smelting plants we visit.

For instance, consider the everyday misuse of the word "smelter." Surely a "smelter" performs the operation of "smelting" in a "smeltery." A smelter may be either the metallurgist or an individual who owns, or directs, the management of a smelting plant. Likewise a company such as the American Smelting and Refining Company may style themselves "smelters." But by all established precedent in terminology, the word "smelter" may not be applied to express the plant in which the operation of smelting is performed. This surely is rightly called a "smeltery."

Will the JOURNAL not use its good offices to favor the old English precedent which obtains in "brewery," "tannery," "distillery," etc., and in writing of a smelting plant use the word "smeltery?"

F. T. HAVARD.

Helena, Mont., July 28, 1909.

[All that Mr. Havard says is quite correct. The JOURNAL has for many years used the word "smeltery" when precision has been necessary.—EDITOR.]

The Simultaneous Displacement Method of Slime Treatment

With reference to my article in the issue of the 15th ult. and the comment that its publication elicited from the Butters Filter Company, published in the JOURNAL of June 5, I may state that the method of simultaneous displacement of pulp with wash solution, described in the article referred to, is applicable to any type of vertically suspended filter mat. On this account and also in view of the wide difference that existed between the original design of the plant and the method of working, as described in the article, and any of the equipments and methods attributable to the Butters company, that I consider that no apology is needed because the latter were not afforded a gratuitous advertisement in the technical columns of the JOURNAL.

ARTHUR W. ALLEN.

Cia. Minera de Rio de Plata, Guazapares, Chia., Mexico.

June 19, 1909.

Useful Formulas

The following modification of the hydraulic formula as given by F. Close in the JOURNAL, June 19, is simple and easily remembered:

One circular inch of water 1 yard long = 1 lb. The Imperial gallon weighs 10 pounds.

Therefore

$$\text{Diameter}^2 = \text{lb. per yard.}$$

$$\frac{\text{Diameter}^2}{10} = \text{Imp. gal. per yard.}$$

Working out the example given:

A 6-in. pipe contains 36 circular inches = 36 lb. per yard = 3.6 gal. per yard.

A. H. BROMLY.

Zihuatanejo, Guerrero, Mexico, July 16, 1909.

Automobiles in California

SPECIAL CORRESPONDENCE

One of the longest and most tedious stage rides remaining in the mining sections of California, is the 55-mile drive between Redding in Shasta county, and Weaverville in Trinity county. The whole road is mountainous and the grade from French gulch to the top of Oregon mountain or from Weaverville to the top of the mountain is steep and heavy. Mining men and tourists are deterred from visiting the Weaver basin by reason of this 12-hour stage ride over dusty, steep roads. Now a company has been organized in Weaverville to operate automobiles on the road and it is expected that the trip from Redding to Weaverville can be made in six hours. Heavy freighting is done on the road also and big teams are employed. On the narrow road on both sides of the mountain, teams can only pass at the points or corners.

According to Robert Williams, managing director of the Tanganyika Company, the Southern Railway is already financed from Broken Hill, Rhodesia, to the Star of the Congo mine in Katanga: 70 miles of grading are completed and 35 miles of rails are laid. The railway will be at the Congo frontier within four or five months, and at the Star of the Congo mine in about 18 months. The smeltery to produce 2500 tons of copper from the Star of the Congo mine is now being constructed, funds having been provided for this plant. Important modifications have just been negotiated for the Benguella railway, which will now be pushed onward forthwith

Details of Practical Mining

Notes of Interest to the Operators of Small Mines as Well as of Large Mines. The Things That Have to Be Done in Everyday Mining

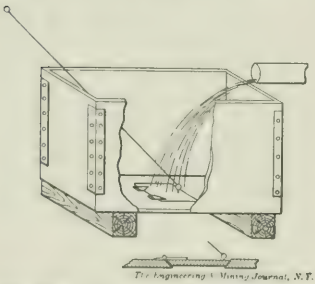
REPORTS FROM EXPERIENCE

Readers of the JOURNAL are invited to contribute to this department. Articles should be brief, thoroughly practical, and preferably illustrated by drawings or sketches. Our draftsmen will prepare properly any kind of a pencil sketch that is intelligible. Something that is an old story in one district may be quite unknown in another. Articles accepted and published are suitably paid for.

A Simple Arrangement for Measuring Pump Discharge

BY JAMES A. SEAGER*

In view of the large amount of pumping, both by means of centrifugal and ram pumps, which is done in keeping mines free from water, it is sometimes difficult to determine exactly how much is being pumped. It is not enough to put down a plant sufficiently large to cope with all



BOX FOR MEASURING PUMP DISCHARGE AND SECTION THROUGH TRAP DOOR

the water that may be in the mine; it is necessary at frequent intervals to ascertain the quantity of water or other liquid which a pump is delivering at any time, and the following description of a simple and inexpensive arrangement may be of assistance to many having control of pumping plants, as it is an apparatus which can be made on the spot without much expense.

The tank shown in the accompanying illustration is a strong timber box that can easily be made. The thickness of the timber will, of course, vary according to the capacity of the tank but may be from 1 to 1½ in. The joints should be tongued and grooved and well fitted in order to avoid leakage, and the sides and ends should be dovetailed together and strengthened with corner plates. The box should have a coat of good waterproof paint to further safeguard against leakage and prevent rot.

The shutter should be of cast or wrought iron and, when closed, should rest on a leather or rubber facing nailed along the edge of the aperture in the tank bottom; the weight of the water entering the tank will then make it fit tight. If preferred, or if an iron shutter is not readily obtainable, it can be made of timber similar to that used for the tank itself but if this is done, it should be a taper fit as shown in lower part of cut, otherwise the swelling of the wood may cause it to jam tight in the hole and prevent its being opened quickly.

The shutter is preferably hinged as shown and actuated by an iron rod; this arrangement enables it to be closed quickly and insures its fitting directly into its place and in addition avoids errors due to leakage when a loose shutter is used.

The tank must be so placed that, with the shutter open, the stream of water falls directly through the hole. If the flow is regular, as from a centrifugal pump, the shutter may be a comparatively small one; if however, the feed pulsates it will be necessary to make the shutter long in proportion to its width, so that water does not splash and remain in the box.

To measure the flow of water at any time, the tank must be set level with the shutter open, and the water flowing directly through. It is advisable that the measurement should be taken by two persons, so that one can note the time and the other attend to the closing of the shutter and give the signal when the water has risen to a given mark. The time from the closing of the shutter to the rise of the water to the mark must be accurately taken and it is better to do this several times and take the average so as to avoid inaccuracy.

The dimensions of the box being known, the volume of water delivered in a given time is easily ascertained. The delivery of water in gallons per minute =

$$\frac{\textit{capacity of tank in cu.ft.} \times 6.2355 \times 60}{\textit{time in sec. taken to fill}}$$

For example, if the dimensions of the tank are 4 ft length, 3 ft 6 in breadth, and 2 ft depth from the bottom to the vertical mark, and if the time taken to fill to the vertical mark is 30 sec., then the gallons of water flowing per minute are:

$$\frac{4 \times 3.5 \times 2 \times 6.2355 \times 60}{30} = 349.185 \text{ gal.}$$

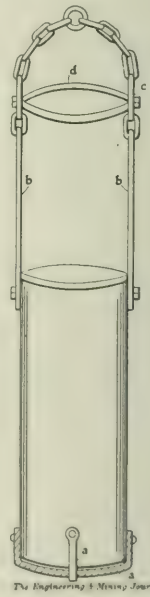
or say 350 gal. per min.

It should be noted that, if the tank is too small, there will be a swirl in the water and it will not be so easy to find the exact instant at which the water has reached the vertical mark.

*Civil engineer, Newcastle-on-Tyne, Eng.

Drill-steel Bucket

A bucket for handling drill steel in stopes can be easily and cheaply made as follows: The essential parts are the bucket, handle and a ring *d*. The bucket



BUCKET FOR DRILL STEEL

is made of about 3/16 in. sheet steel, 30 in. deep and 10 or 12 in in diameter. The bottom is made of heavier steel, and reinforced by straps *a* riveted over the bottom plate. The ring *d* is of the same diameter as the bucket and is made of ½x2-in. iron or steel. It is fastened by two rivets on each side to pieces *c*, 4 in. long, ½x2 in., which form one link in the handle and hold the ring in a horizontal position. The straps *b* are also ½x2 in., and are 20 in. long. This, however, should be

regulated by the length of steel to be hoisted. The ring is fastened to the long straps by a link, and three or four links above the ring will be sufficient to fasten to the hoisting rope. The bucket may be made light or heavy, according to the work to be done. A bucket of this description is being used by the Vermont Copper Company.

Some Notes on Sampling

By B. H. Bennetts*

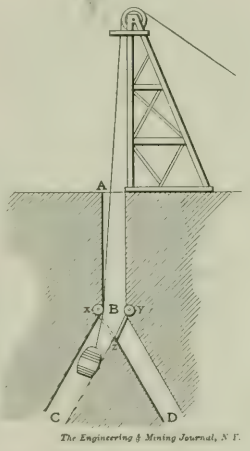
In smelting plants having their own ore supply the general practice is to take a portion of the ore tonnage for sampling. This is especially true when the ore treated is low grade. Various ways of taking this sample obtain in different smelters and reduction plants. At Hadley, Alaska, we had peculiar conditions to surmount in sampling the supply of ores. The ore was very low grade and, at the prevailing price of copper, the margin for mining and smelting was small; so anything we could save in sampling, consistent with proper sampling, allowed us to treat lower-grade ores. Labor was scarce, and by adopting the method we used we made available the millmen at times of necessity.

The method of sampling used when the plant first worked was to send all the ore through a large crusher and then through the various sampling devices. The ore coming from the mines was received by an aërial tram and dumped into four terminal bins. The bins held about 250 tons. The lots averaged in the neighborhood of 250 tons, or the bin capacity. My first objection to this method was based on the fineness of the resulting lot; second, the cost, which varied somewhat, the average being somewhere around 35c. Then, again, the labor shortage had to be considered. To change the method of sampling, all that was necessary in the way of new work was the placing of a stout partition wall in one of the 250-ton terminal receiving bins. This gave us two bins of 125-ton capacity, designated as sample bins Nos. 1 and 2. As the ore was received over the aërial tram, every tenth bucket was dumped into the proper sample bin, the others going to one of the large bins, from which the ore was transferred to the smelter receiving bins. We made the lot 1000 tons, giving us 100 tons for sample. When we had two lots nearly complete, we started up the mill and ran through the sample lots. Under this arrangement it was necessary to operate the sampling mill only one day a week. We checked this method of sampling against the old method and obtained concordant results. Our sampling costs were cut to 9c. per ton—a very appreciable advantage when handling 300 tons per day. The furnace did better work on the coarse ore. This was especially noticeable because we had a sulphur shortage. The amount of flue dust produced was reduced 50 per cent. It might not be out of place here to state that some of the pieces of coarse ore weighed from 400 to 500 lb. At Mount Lyell, Tasmania, a somewhat similar method of sampling is used on low-grade ores.

*Metallurgical engineer, 3821 North Thirty-fifth street, Tacoma, Wash.

A Two-way Shaft

We once observed in Colorado a unique method of prospecting a vein, which is not to be generally recommended, but in this case well served its purpose, and conformed to the cardinal principle of prospecting, namely, "Follow the ore."



AN UNUSUAL TWO-WAY SHAFT

A vertical shaft had been started on a vein outcropping at *A*. About 50 ft. down, at *B*, the vein was found to split. The chances seemed to be that it was going around a horse, the latter appearing to be of large size, and both branches of the vein looking equally good. In order to follow them both, the vertical shaft was converted into a two-way shaft as shown in the accompanying sketch. Hoisting was done regularly from both branches. Skids were laid in branches *B C* and *B D*, the buckets sliding down and being dragged up upon them. The upper end of the skids were extended by a movable switch, constructed of two pieces of timber, pivoted at the lower end. In hoisting from *B C*, the switch was thrown in the position *Z Y*. When it was desired to hoist from *B D*, the switch was thrown over to *X Z* causing the bucket to descend in the desired direction. Of course, it was necessary to place rollers for the cable at *X* and *Y*, which are shown in the accompanying sketch in an exaggerated form, in order to make the arrangement quite clear.

A Mine Signal-Whistle

A novel device employed by the Davis Sulphur Ore Company at Davis, Mass., for a signal system consists of a speaking tube made of ½-in. gas pipe with a whistle at the upper end near the hoisting engineer's seat. At each level a T is inserted between the joints of pipe, to which a mouthpiece is attached. Between the mouthpiece and the main pipe is a spring valve which is closed at all times, except when it is opened by a small handle when the station tender desires to signal the engineer. This he does by blowing through the pipe. A signal code is used similar to that used with the gong.

This device has been used successfully for 8 or 10 years and is operated from 14 levels. It is simple, durable and cheap. In case the pipe rusts out and leaks, the leak is easily found by attaching the air hose from the compressor to the pipe. The escaping air will indicate the leak. Where acid water is encountered a lead pipe may be used.

In this installation no whistle is used except at the surface and on the 1400-ft. level. All the intermediate levels are equipped with mouthpieces containing no whistle. In these levels, when the signal is given the engineer, he answers by blowing through the tube, the miner holding his lamp in front of the tube and noticing the effects of the air current on his lamp, thus reading his signal. A whistle could be used on each level but it is not considered necessary.

Housing a Pelton Wheel

On a property in California situated in a district where quartz mining has been carried on for many years and where the only power in use is water power on Pelton wheels, a local millwright was told to set and house a small Pelton to run a few concentrators. The main pipe line was tapped and a 3-in. line run from it to the concentrator building. The millwright set his wheel and worked two days framing a wooden casing

When the work was done the wheel would not give nearly the speed required. Different nozzles were tried, the pipe line taken apart in search of possible obstructions, and in all two more days were consumed in a fruitless effort to locate the trouble. It was finally discovered that the housing was so small that the waste water choked the wheel. A new housing was then built, necessitating a new setting for the wheel.

The Clubhouse at Mineville, N. Y.

The use of a clubhouse for the employees of mining companies is a matter which deserves some attention. Employees appreciate some place where they may assemble and spend a few hours in reading, talking, or in social games. Unless they have this they will congregate around saloons and other resorts. A few years ago Witherbee, Sherman & Co., built a hall in memory of Silas H. and Jonathan G. Witherbee, which is shown in the accompanying illustration. This hall is open to the employees of the company. It has to splendid dormitory rooms that are occupied by a number of office and technical men.

MEMORIAL HALL, MINEVILLE, N. Y.

There is also a kitchen and dining room where excellent meals are prepared and served for the men living in the building, for which they pay a reasonable price.

On the same floor is a large parlor, reading room with daily papers and magazines, and an auditorium that will seat 250 to 300 people. The doors of the reading and dining rooms open into the auditorium, which adds materially to its capacity. One large room is reserved as an emergency hospital and a professional nurse is in attendance. In the basement is a large pool room, bath rooms and a barber shop. In addition to this there are two rooms which are used as class rooms for some of the primary pupils of the public school, which is in an adjoining building. The building is steam heated, has hot water throughout, and is lighted by electricity. The reading, school, bath and pool rooms are free to all employees, and are used quite extensively.

United Mine Workers' Convention

SPECIAL CORRESPONDENCE

The first convention of the United Mine Workers of America, since the new agreement between the operators and the mine workers went into effect, was held recently in Wilkes-Barre, Penn., when delegates from the first district assembled to elect executive officers, and transact other official business incidental to the development and cohesion of the organization.

The convention was important from two standpoints. The delegates were far from displaying that submissiveness to the formal and aggressive dictation of the union officials that characterized much of the procedure at former district conventions. Heretofore the officials of the three districts considered their positions, although elective, as permanent sinecures, in fact they are, for the same men have held the same offices during the past decade. For the first time there is an indication that this condition will no longer prevail, and this is the second point of importance in the consideration of the proceedings of the first district convention. All the offices were contested at the last election.

The newly elected president of the first district made a speech on Saturday before the close of the convention that is of considerable importance. "I have come to the conclusion," he said, "that the United Mine Workers of America must interest themselves in reducing the number of accidents to a minimum, and the organization must be prompted by proper and honest motives in the undertaking, and political, social and friendly relations must not and will not stand in the way of having punishment meted out to those who fail to do their duty." Admirable words, and admirably conceived! If they are carried out in the spirit in which President McEnaney has enunciated them, the exercise of such supervision over the mines should lead to a diminution of accidents, and the introduction of ameliorating conditions in the mines. But how is he going to do it? It is an incontrovertible fact that the majority of the accidents that take place in the mines are attributable directly and indirectly to the miners themselves. Negligence to observe or obey the primary rules of mining and deliberate disregard of the laws are the factors that culminate in great mortality and innumerable accidents. If President McEnaney is determined to make his words good, he will have to coöperate with the mine inspectors in bringing to justice and punishment the guilty parties. In the anthracite regions there are practically no prosecutions for the infractions of mining laws. Mr. McEnaney implied rather than declared in his speech that the mine inspectors have not been punished or reported for their neglect of duty, owing to political, social or family affiliations. There is, no doubt, some truth in the allegation. The mine inspectors work hard, and considering the circumstances of their appointment they work well. At the same time, they are bound hand and foot to a policy of compromise from the fact that their position is not appointive or obtained through civil-service examinations. If Mr. McEnaney is able to eliminate personal, social, and above all, political aberrations in the supervision of the mines, he will be accomplishing an incalculable service to miners and operators, and even to the mine inspectors themselves.

President McEnaney says that he will establish a system of mine inspection which, it is to be assumed, he will put in operation as far as he can. We shall have to await the application of this "system" to see if it is practicable, and, if practicable, how far it can be put into operation, without coming in collision with the fundamental rights of the operators to take care of their own business, and in relation with the inspectors to carry out their sworn duty to the commonwealth without the direct interference of an organization that has no legal status.

Facilities Offered to Prospectors in Southern Rhodesia

A booklet just published by the British South Africa Company tells how mineral claims may be acquired in Southern Rhodesia. Prospecting licenses, which confer upon the holder the right to locate a block of 10 reef claims (each claim being 150x600 ft.) may be obtained at the office of a mining commissioner on payment of £1. These claims must be registered with the Mining Commissioner and within six months after registration the holder must execute 30 ft. of development work. Failing to execute this amount he may obtain an inspection certificate on payment of £5. In the following six months he must then execute at least 30 ft. of development work, or else obtain a second inspection certificate for £15; this second certificate covers a period of one year, during which 60 ft. of development work must be accomplished. Certificates which are obtained by work bear a stamp of 10s. value. Failure to obtain an inspection certificate makes a holder's block of claims liable to forfeiture. These inspection certificates must be obtained until the property begins to yield a profit, when claim licenses cost 10s. per claim, for each block from which ore is taken in any month, or 5s. per claim in case there is no production. Claim licenses are payable for periods of six months.

So as to lighten the burden, in times of low production, the 10s. fee per claim is reduced to half that amount in any month when the output does not exceed a gross value of £100. Further, in order to allow facilities for the prospecting of reefs, trial crushing tests for one, two or three months are allowed, and the licenses are only payable for the actual months in which such crushing is carried on.

When the output of gold commences, the following royalties are payable: (1) On a monthly output of under £100, nil; (2) On a monthly output between £100 and £3000, 2½ per cent.; (3) On a monthly output of over £3000, 5 per cent.; (4) For a greater output, where ore produced yields more than 1 oz. of gold per ton, 7½ per cent.; (5) On output exceeding £3000 from a product of not less than 5000 tons yielding a value not greater than 22s. per ton, 3½ per cent.; (6) For a value exceeding £3000 from a product of not less than 10,000 tons, yielding not more than 16s. per ton, 2½ per cent.

The holder of a prospecting license may stake an area equivalent to not more than 30 reef claims of 90,000 sq.ft. each for the purpose of working base metals. The same regulations regarding inspection certificates apply, except that a claim license costs £5 per block, per month, when the working for profit commences. The royalties payable vary from 2 to 3 per cent., according to the mineral worked. Coal areas may be acquired under the provision of the Mines and Mineral Ordinance, by which the output is subject to a royalty of 6c. per ton of coal raised. The holder of a prospecting license may also locate an alluvial claim 200 ft. square, for which no inspection certificate or royalties are required. One month after the date of registration a license at the rate of £1 per month must be paid, however, failing which the claim is liable to forfeiture. In order to transfer claims application must be made to the local Mines Office.

This region comprises, approximately, 150,000 square miles to the northwest of the Transvaal and is reached from Cape Town or from Beira. The train journey from Cape Town to Bulawayo requires 3 days, from Beira to Salisbury, about 32 hours. Good facilities for the development of claims are afforded prospectors and every advantage is being offered in order to get men into the region.

Mexican Zinc Ores and the Tariff

SPECIAL CORRESPONDENCE

The zinc mining interests of Mexico, while fully recognizing the certainty of the enactment of the tariff on zinc ores imported into the United States, are in doubt as to the future course of the zinc business because of the uncertainty of the effect that the tariff will have on the price of spelter in the United States and the corresponding effect on the price of zinc ore. It is hoped that as a result of the tariff the American prices will still be such as to permit the continuation of the export of zinc ore to the United States. While the facilities for shipment to Europe are fair, and the transportation cost comparatively reasonable, the Mexican zinc-ore producers would rather continue to ship to the United States, because they can get quicker settlements and are in closer relation with the buyers.

Moreover, the American ore goes through without breaking bulk and without the necessity of sacking for small lots, and there is less loss in transit and no expense for sacking. However, the present ruling, which requires the assessment of the full lead duty on all lead over 0.1 per cent. in zinc ores, recently imposed, is a factor against the American market. The American smelters also are more particular than the European about the lead and iron content in the zinc ores, and they object to small amounts of fluorine or arsenic. The European smelters, as a rule, offer more favorable terms for zinc ores containing precious metals.

The assessment of the lead tariff on all the lead and zinc ores is considered by the Mexican shippers as an arbitrary discrimination, since this lead cannot enter into the American market, and the American government is simply adding more expense to an item which is already a loss. In the settlement of the refund for the tariff paid on zinc ores, pending the decision which sustained the board of arbitration, the American port officials are reassaying all samples and are assessing the lead duty on all lead over 0.1 per cent., so that the rebate paid in most cases by the ore buyer will be greatly diminished

Relative Costs

C. L. Hancock, general manager of the Wallaroo & Moonta copper mines, says in his latest report: "In any attempt to compare the practice of various places, particularly in regard to costs of mining operations, due allowance must be made for differing local conditions. For instance, in the Western States of America and in the Spanish mines, there are immense mineral deposits which enable work to be conducted on a scale impracticable elsewhere. In America wages are high, in Spain they are low, consequently in the former mechanical devices are installed wherever practicable, while in Spain not even stone breakers are used—hand labor being cheaper. Some mines possess natural advantages not found elsewhere; ore may be cheaply mined by open-cut methods, or it may be suited to direct smelting, thus saving the preliminary costs and losses of mechanical concentration; or, as at Rio Tinto, it may be amenable to treatment by a very cheap wet process. Cheap supplies of fuel and mining timber, as well as proximity to the seaboard, are obvious advantages as affecting costs of production.

"The magnitude of operations has generally a very important bearing on costs per ton of material handled. Where circumstances justify a heavy capital outlay on labor-saving machinery labor costs will obviously be lower than where no such expenditure is justified. In smelting operations some transport appliances which work well and afford considerable economy on a large scale would be ineffective with a smaller output, where in many cases it would be best to run out intermediate products and allow them to cool, notwithstanding the expense incurred in breaking, handling, and re-melting. General charges are often the same in amount, notwithstanding the turnover, and thus impose a heavier burden on smaller tonnages than larger ones. Obviously other things being equal, an increase of output tends to decrease the cost per ton treated, especially in the smelting."

The Girod electric steel furnace is being adopted by the Gutehoffnungshutte at Oberhauser, Germany, and the Stahlwerk Becker, at Crefeld, Germany, which are putting in a six-ton and a three-ton furnace, respectively. A contract has also been signed to furnish a Girod furnace to an American plant

Chronology of Mining for July, 1909

July 1—The eight hours act, limiting the working hours of coal miners in Great Britain, went into effect except in the counties of Northumberland and Durham, where the new rule will not be effective until January 1, 1910.

July 2—The town of Cobalt, Ont., swept by fire, destroying the surface buildings of some of the mines.

July 6—Strike of employees belonging to the United Mine Workers of America, in the Cape Breton mines of the Dominion Coal Company for recognition of their organization, as against that of the Provincial Workingmen's Association, the members of which remained at work.

—Explosion at the Cedar Coal and Coke Company's mine at Tollerville, near Trinidad, Colo., killed nine men who were descending in a cage.

July 7—The Delaware, Lackawanna & Western Coal Company organized to handle the sales and transportation of coal mined by the Delaware, Lackawanna & Western Railroad Company, this action being taken to comply with the Hepburn law prohibiting railroads from carrying coal which they own.

July 8—Militia called to Glace Bay, Nova Scotia, to preserve order at the Dominion Coal Company's collieries.

July 10—Announcement of acquisition by the Cananea Consolidated Copper Company of the old W. C. Greene concessions for constructing four lines of railroad in northern Mexico, mainly in Sonora.

July 11—Serious explosion in the Belmez coal mine in Spain.

July 12—Formal organization of the Mexican Institute of Mining Engineers.

July 14—Approval of the Secretary of the Interior of the right of way for an 8-in. pipe line to be laid by the Prairie Oil and Gas Company from the Glenpool field in Oklahoma, southeasterly to the Oklahoma-Arkansas State line, and to be eventually extended to Baton Rouge, La.

July 16—Fire started by lightning destroyed two tanks containing 100,000 bbl. of oil, belonging to the Prairie Oil and Gas Company, at Bartlesville, Okla.; also, one tank, each, belonging to the Creston and the Mutual companies.

July 22—New agreement, running until Sept. 1, 1910, signed by the coal miners and operators in Wyoming.

July 24—Announcement of purchase by C. Lomer & Associates, interests at the San Pedro gravel, comprising 400 pertenencias in the Arizpe district, Sonora, Mexico.

July 25—The German-French Syndicate concluded a temporary agreement for one year for sulphur sales abroad. Sell credit notes, with which the American Trading Company had dealt, stood a favorable condition.

July 26—Publication of the MINERAL INDUSTRY, Vol. XVII.

July 27—Formal announcement of the plans of the Consolidated Connellsville Coke Company, into which it is proposed to consolidate a number of the independent coke companies in the Connellsville region.

July 30—Repeated earthquake shocks in Mexico, being particularly severe at Acapulco and Chilpancingo.

July 31—General strike in the coal mines of Great Britain averted by an agreement providing a minimum wage of 6s. per day for the striking Scotch miners.

A Notable California Mine

SPECIAL CORRESPONDENCE

The sale of the old Morning Star drift mine at Iowa hill in Placer county, Cal., is noteworthy in that the mine has a record of 212 dividends. The sale includes valuable timber and water rights and was for a small price, as the mine is supposed to be nearly worked out. Many years ago, before the mine was purchased by the Coleman brothers of Grass valley, and the late J. H. Neff—for years president of the California Miners' Association—they had the mine examined by two of the most noted gravel-mining experts of the day, and men who are still famous in the mining line. Both these experts turned the mine down and advised against its purchase at the price asked.

The reasons given were the supposed limited extent of the gravel and its low average value. Mr. Neff, an old mining man familiar with drift properties, was not satisfied with the reports and finally induced Coleman Brothers to consider again the purchase of the mine, although its price had meantime been raised over 25 per cent. They organized a company, purchased the ground and started work. The mine paid from the commencement, and in the end made the record mentioned of 212 dividends. They finally sold it for a good price to the company which has just disposed of it.

California Petroleum in 1908

A statistical bulletin soon to be issued by State mineralogist Aubury will show that eight counties in California produced 48,366,010 bbl. of petroleum, valued at $26,566,181, in the calendar year of 1908. The eight counties making this production are, in order of output, as follows:

County	Barrels	Value
Kern	18,777,874	$9,488,935
Fresno	10,725,489	5,898,964
Santa Barbara	8,817,889	4,435,791
Los Angeles	6,711,317	4,082,057
Orange	3,376,689	2,537,517
Ventura	289,625	317,219
Santa Cruz	3,400	17,500
San Luis Obispo	10,000	5,000

The rapid growth in the petroleum industry of California is shown by the accompanying table of production since 1887, taken from a bulletin previously issued by the State mineralogist.

PRODUCTION OF PETROLEUM IN CALIFORNIA

Year	Barrels.	Year.	Barrels.
1887	678,572	1898	2,249,088
1888	690,333	1899	2,677,875
1889	303,220	1900	1,329,950
1890	307,360	1901	7,710,315
1891	323,600	1902	14,356,910
1892	385,049	1903	24,340,839
1893	470,179	1904	29,736,003
1894	783,078	1905	34,275,701
1895	1,245,339	1906	32,624,000
1896	1,257,780	1907	40,311,171
1897	1,911,569	1908	48,366,910

In 10 years the annual output of California petroleum has increased practically 20 fold. Classified under the general heading of hydrocarbons and gases alone, as they will appear in the annual statistical summary of California for 1908, are substances that collectively make up a total of $28,232,959. This includes the following items of interest: Asphaltum $1,082,376; bituminous rock, $109,818; natural gas, $474,584; petroleum, $26,566,181. The combined values of hydrocarbons and gases produced in 1908 surpassed the total value of all mineral substances produced in any year in California between 1887 and 1897, inclusive of both years, by about $3,000,000.

Phosphate Rock in Pacific Islands

SPECIAL CORRESPONDENCE

The countries having interests in the Pacific ocean are giving attention to the exploitation of the important phosphate rocks contained in their insular colonies. England was the first to look into this question. In 1900, the Pacific Phosphate Company, Ltd., was floated to work the deposits of Pleasant and Ocean islands. During the first three years it paid dividends of 15, 30 and 50 per cent., exporting about 130,000 tons per year. Then the Deutsche Südsee Phosphat Aktiengesellschaft obtained the concession of Anguar island from the German government. It was floated in 1908 at a capital of 5,025,000 marks, and will soon start working.

France has two phosphate companies in Oceanica. The older is the Compagnie Française des Phosphates de l'Océanie with a capital of 6,000,000 fr. It was floated in 1908 by an Englishman, Mr. Arundel, with English and French capital. The more recently organized company, the Compagnie Française des Phosphates du Pacifique, has a capital of 600,000 fr. and for the present it aims only at prospecting certain Pacific islands, using the steamer "Natuna," carrying a specially equipped technical staff. These two companies took possession of Makatea island, and suits are now pending before the tribunal of Papeete to determine the rights of each.

The New Tariff

The new tariff bill has not become law at the present writing, Aug. 4. A final vote on its passage in the Senate was to be taken Aug. 5. It does not appear at all probable that any of the rates agreed on in the conference committee between the House and the Senate will be changed, and we give, therefore, some of the important duties as fixed by the bill:

	Present Law.	New Tariff.
Lead, per lb	2¼c.	2¼c.
Zinc, per lb	1¼c.	1⅜c.
Zinc sheets, per lb	2c.	1½c.
Zinc in ore, per lb	20%	1c.
Aluminum, per lb	8c.	7c.
Antimony, per lb		1 5c.
Antimony in ore, per lb		1c.
Quicksilver, per lb	6c.	7c.
Nickel and oxide	6c.	6c.
Iron and Steel.		
Iron ore, per ton	$0 40	$0 15
Pig iron, per ton	4 00	2 50
Ferromanganese, per ton	4 00	2 50
Ferrosilicon	4 00	5 00
Billets, steel, per lb	0 4c.	0 3c.
Bars, per lb	0 6c.	0 4c.
Rails, per ton	$7 84	$3 92
Tin plates, per lb	1 5c.	1 2c.

Bituminous coal is placed at 45c. per ton; coal dust or culm going through a ½-in. screen being admitted at 15c. Anthracite is continued on the free list.

In the chemical class arsenic is on the free list. Borax is reduced from 5 to 2c. per lb. In colors, white lead is reduced from 3¼ to 3c. per lb.; if in oil, from 2⅞ to 2½c. In miscellaneous minerals, mica is reduced by 1c. per lb., and gypsum from 50 to 30c. per ton.

The bill is so long, and some of its provisions so complex, that a careful analysis is needed before reaching its full meaning. With the exception of zinc, the changes on metals are not important.

Waihi Grand Junction Gold Company, Ltd.

SPECIAL CORRESPONDENCE

The prospects of this New Zealand company, the property of which adjoins that of the famous Waihi mine, have been much improved recently on account of the cutting of additional reefs of that mine. The principal workings of the Grand Junction have so far been on the Martha lode and it is only recently that the two other important lodes of the Waihi, namely, the Empire and the Royal, have been exposed in the Grand Junction ground. A long crosscut driven at the fourth level has cut the two lodes mentioned, besides several smaller lodes, and the development on these lodes gives promising indication.

The report for the year, ended December, 1908, records driving on the Empire or No. 4 lode 211 ft. east and 436 ft. west of the crosscut. Going east the ore was mostly low grade, but there was a stretch 80 ft. long, exposing a section of the lode 30 in. wide worth 48s. Going west 280 ft. in length showed ore 38 in. wide worth 94s., and other smaller streaks of higher grade than the average of the lode. On the Royal or No. 6 lode, levels have been driven 50 ft. east and 37 ft. west, and pay ore has been met with. During the current year the further development of these lodes has been of an encouraging nature.

The main shaft at the close of 1908 had reached a total depth from the surface of 976 ft., the lowest level (No. 5) being at a depth of 944 ft. On the Martha lode, No. 4 level was driven to a total distance of 788 ft. east of the main crosscut. From 586 ft. to 672 ft. the reef averaged 78 in. in width and had a value of 54s. per ton. These developments open up the possibility of the Grand Junction mine some day rivaling its famous neighbor. The ore reserves, which at the close of 1907 were 81,000 tons, were increased to 93,100 tons at the close of 1908.

During the past year important additions and alterations have been made to the reduction plant, and the extraction has been raised from 85.6 per cent. to 87.5 per cent. During the latter part of the year crushing with cyanide solution was put into practice and the concentrates were treated along with the general ore and not as previously by a separate process.

The average tailings value for the year have been $1.20 per ton, a figure which, by the addition of further tube mills and concentrating appliances, is expected to be reduced to 73c. The working costs for the year on 48,477 tons treated have amounted to $6.89, made up as follows: Ore production, $3.33; milling, $2.24; general expenses, $0.44; mine development, $0.88; total, $6.89 per ton.

The average grade of ore treated was $7.01. This is a lower yield by about $1.20 than during the preceding year. Taking into account administration expenses in London and depreciation of plant, machinery and buildings, there was a loss of £10,815 on the year's operations.

The development work, however, has been of so encouraging a character that a more satisfactory showing is looked forward to in the future, when a larger tonnage of a higher value is expected to be treated.

To meet the cost of development and of an increase in the plant, the capital of the company during the current year has been increased to £400,000 by the creation of 100,000 new shares of £1 each. Of these, 70,000 have been alloted. These shares embrace option rights for an additional 35,000 shares up to March 31, 1910, at a price of 30s per share. Assuming that these options are exercised, the company will be able to liquidate a loan of $61,425 outstanding, and will have a sum of about £60,000 for additional equipment and development.

Who Should Extinguish a Mine Fire?

A curious situation has arisen with regard to a mine fire at Carbondale, Penn., in the anthracite district. The mine is on land owned by the Watt estate and was operated by the Finn Coal Company, under lease. In 1903 fire started in the mine from some cause unknown. The company failed to put out the fire by direct efforts, and also failed in an attempt to check it by blocking it off and smothering, and finally abandoned the mine. The fire smouldered for several years, but about a year ago increased so that residents of a part of the town were seriously inconvenienced by gases arising from it; and it also seemed probable that it would come to the surface. In the meantime it was also causing trouble from sinking of the ground resulting from the burning out of the coal seam.

Suit was brought against the Finn Coal Company to compel it to put out the fire. The company pleaded in defence that it was bankrupt owing to the heavy costs it had undergone from the fire and to the necessity of abandoning the mine. Nevertheless the County Court issued a peremptory mandatory order, requiring the company to extinguish the fire. Appeal was taken to the Supreme Court, which reversed the decision of the lower court, and admitted the company's plea of bankruptcy and consequent inability to do anything.

In its opinion in the case, the Supreme Court intimated that it was the duty of the municipality—the city of Carbondale—to suppress the fire as a nuisance and a possible danger to a part of its citizens. Relying upon this an application has been made for a mandatory order to compel the city government to act at once. As the city is not equipped to handle an extensive underground fire, it looks as if it had rather a difficult problem to face.

Consul Alfred A. Winslow, of Valparaiso, reports that according to the latest published figures the tin mines of Bolivia produced 65,833,891 lb. of tin in 1908, against 60,891,116 lb. in 1907, showing a gain of 4,972,775 lb. for the year. The great Potosi mines produced nearly one-half of the entire output. On the tin exported the Bolivian government in 1908 collected an export tax of $240,270 United States gold.

According to the British South Africa Company the average working costs, in Southern Rhodesia, for a 10-stamp mill vary from 15 to 17s. per ton, exclusive of development and amortization. The costs are naturally higher for smaller plants.

Personal

Mining and metallurgical engineers are invited to keep THE ENGINEERING AND MINING JOURNAL informed of their movements and appointments.

Dr. R. W. Raymond is spending the summer at Atlantic City.

E. C. Thurston, mining engineer, has now temporary headquarters at Geneva, Ohio.

C. Colcock Jones is in Alaska, and expects to remain in the interior until September.

A. E. Drucker has been visiting the goldfields of Bendigo and Ballarat in Australia.

Edwin J. Collins, of Duluth, Minn., is examining some gold and copper claims in northern Sonora, Mexico.

H. W. Shanks, manager of the Rio Plata Mining Company, Chihuahua, Mexico, has been in San Francisco.

A. S. Dwight sailed for Europe on July 31 on professional business. He expects to return early in September.

Donald G. Forbes, of Victoria, B. C., has left for England. He expects to return to British Columbia next summer.

M. S. Davys, who is largely interested in mines in the Nelson and Slocan districts of British Columbia, has returned to England.

Gerald Hopkins, manager of the Cherokee Goldfields, Ltd., at San Julian, Chihuahua, Mexico, has gone to London on business.

Robert R. Hedley has resigned as manager of a mine situated near Sudbury, Ontario, and will shortly return to British Columbia.

Algernon P. Seymour has been appointed superintendent of the Cobalt Lake mine at Cobalt, Ont., succeeding E. L. Fraleck, deceased.

W. S. Keith last week returned to Los Angeles, Cal., from a trip through southern California and Arizona, and left soon after for Seattle.

Charles E. Mills, of the Detroit Copper Mining Company, has returned to Morenci, Ariz., after an absence of four months in Europe.

H. F. Collett has resigned as general manager of the Pioneer lease at Goldfield, Nev., and Oscar J. Smith has been appointed to fill the vacancy.

William Lawrence has been appointed superintendent of the Florence-Goldfield Mining Company, filling the vacancy caused by the death of Frank A. Lucy.

James Ashworth, of Congleton, England, has been spending several weeks examining the Crow's Nest Pass Coal Company's coal properties in British Columbia.

Oscar R. Whitford, for some years connected with the American Smelting and Refining Company, has returned to Pachuca, Mexico, after a visit to Syracuse, New York.

R. W. Brock, director of the Geological Survey of Canada, left Victoria, July 22, in company with Hon. Wm. Templeman, Dominion minister of mines, for northern British Columbia.

J. R. Mitchell, manager of the Perseverance gold mine, Juneau, Alaska, was lately in Vancouver, B. C., to meet Colonel Sutherland, of London, president of the Alaska Perseverance Company.

Walter Beam, of Denver, Colo., is again in the Similkameen district, B. C., in connection with an option of the Daly estate interest (about 85 per cent.) in the Nickel Plate mine and 40-stamp mill in Hedley camp.

Among recent visitors to the Alaska-Yukon-Pacific Exposition at Seattle, Wash., were Hon. Wm. Templeman, of Ottawa, Ont., minister of mines for Canada, and Wm. Fleet Robertson, of Victoria, B. C., provincial mineralogist for British Columbia.

John W. Powell, of Coleman, Alberta, has resigned as mine manager for the International Coal and Coke Company, to take charge of development work the McGillivray Creek Coal Company has commenced in the same neighborhood. Chas. Emerson is resigning the superintendency of the Bellevue mine of the West Canadian Collieries, Ltd., Blairmore, to succeed Mr. Powell, and Raoul Green, engineer for the West Canadian company, will be manager at Bellevue.

Obituary

Calvin Wells died in Pittsburg, Aug. 2, aged 82 years. He was born in Genesee, N. Y., but went to Pittsburg, 60 years ago. He gradually worked his way up to a prominent position in the steel trade. He organized the Hussey Iron Company and managed it for a number of years. Later he was president of the Pittsburg Forge and Iron Company.

John Beaghan died at Springfield, Ill., July 14, from the result of injuries received while inspecting one of his mines. He was 56 years old, and was born in Durham, England, coming to Illinois 30 years ago. He was a practical coal miner and managed several mines at different times. For some years past he had been president of the Cantrell Coal Company.

Martin W. Fox died in San Francisco, July 17, aged 70 years. He was among the pioneers on the Comstock lode and had been connected with various mining companies. His latest work was with the Hale & Norcross, of which he was president for over 10 years. Under his charge the first exploration work on the Sutro tunnel level in that mine was begun, and it was carried farther west than in any other mine on the lode. Mr. Fox was born in Maine and had been a resident of California and Nevada over 50 years.

Societies and Technical Schools

Massachusetts Institute of Technology—Dr. Harold Pender has been appointed professor of theoretical and applied electricity. He has conducted important experiments in electricity and has been engineer for the Westinghouse Company. His teaching at the institute will consist of a course for third-year undergraduate students in the more advanced theories of electric-current flow and the electric transmission of power, in addition to the direction of experimental research by advanced students.

Oklahoma School of Mines—This school is already organized and has a number of students entered. The first regular term will begin Sept. 16 next. Four courses are offered: (1) General mining engineering, (2) and (3) Mining engineering, specializing, respectively, in metal and coal mining, (4) Metallurgy. The regular course is four years, but a special three years' course in coal mining is offered, part of which will be given in a night school for the benefit of the coal miners of the State, to enable them to pass the State Mine Board examinations. The school is at Wilburton, near the largest coal mines in the State, while near enough for field excursions are the oilfields, the zinc-lead fields, zinc smelters, and the asphalt deposits of southeastern Oklahoma.

Lake Superior Mining Institute—A preliminary program has been issued for the annual meeting, Aug. 25-28. Members will assemble at Ishpeming, Mich., Aug. 25, and after lunch there will be trips to a number of the mines in and about that place. In the evening there will be a business session, at which various papers will be read. The visitors will be taken to the mines at Negaunee Aug. 26, and from there will proceed to Marquette. Here the Pioneer iron furnace and other industrial plants will be inspected, and after dinner on the beach of Lake Superior, a steamer will be boarded for a trip to Munising and Grand island. A business session will be held on the boat. Arriving at Munising, the party will visit the paper mill and other industries and will be taken to Grand island for a few hours' recreation. The excursionists will proceed to the new Swanzy mining district by special train Aug. 27. The Cleveland Cliffs company is opening a number of mines in the Swanzy country, and these will be inspected, the party returning to Ishpeming by special train in the evening. Aug. 28 will be devoted to visits to the underground workings of the Ishpeming mines, the oldest in the Lake Superior iron region.

Special Correspondence from Mining Centers

News of the Industry Reported by Special Representatives at Butte, Denver, Salt Lake City, Goldfield, Cobalt and London

REVIEWS OF IMPORTANT EVENTS

San Francisco

July 28—The anti-dredge convention, held at Sacramento last week, was an absolute fizzle. Even the mayor of Sacramento, who called the convention, did not attend. If the matter is to be judged by the results it is evident that there is no such general feeling in the valley counties against dredging as some interested parties and newspapers had led people to suppose. Several dredgemen appeared at the convention, though uninvited, and offered to give any definite information desired on the subject of operation of dredges. The final action of the convention was to appoint a committee of six men, one from each of the counties interested—Butte, Yuba, Sutter, Sacramento, Yolo and Colusa—to examine and investigate all dredging operations and report the findings. Where damage is evidently being done the committee is to expostulate with the companies, and if the wrong is not remedied, to bring it to the attention of the Anti-Débris Association and the California Débris Commission.

Some complaint is again being made in Shasta county about damage from smelter fumes. It is only, however, where Nevada ores containing arsenic are handled that there is cause of complaint. It is planned to build a bag house at the Mammoth smelter at Kennett similar to one in use at Salt Lake City.

A strike of white miners against working in mines with Chinese miners has caused the closing down of certain mines at Last Chance on the Forest Hill divide, Placer county. The owners decided to shut the mines down for the present. In the drift mines of that section Chinese underground miners have been employed for many years.

The South Fork Mining and Power Company, which owns the Peach Tree and Panoche groups of mines in Mariposa county, has completed the surveys for flumes and power lines and is preparing to build a power plant. The plant will be situated in a forest reserve.

The State Mining Bureau announces that California produced, in 1908, the large amount of 48,306,910 bbl. of petroleum, valued at $25,566,181. This is by far the highest yield ever made in the State in any one year as well as the highest valuation. For the first time the oil values for the year exceed those of gold in California, the gold now taking second place among the mineral products. Last month the output of oil in the State was estimated at 5,000,000 bbl., which makes it the record month. The gain is in the Valley fields, the Coast fields showing some decline. Work will soon be begun on the Associated Oil Company's new pipe line from Coalinga to Port Costa, and it is expected to be finished by Jan. 1 at the latest. The pipe line of the Producer's Transportation Company is expected to be in operation by February, and active work is being carried on arranging for construction work on the line. Some of the 10-in. pipe is being laid into the fields.

Butte

July 28—In the case of the Largey estate against the Montana Central Mining company *et al.*, for the possession of the Black placer claim located in the business section of Butte, a stipulation has been entered into by all parties whereby litigation, extending over a period of 30 years, has been terminated. The property is estimated to be worth $200,000, not including the mineral rights which are also of much value, as the ground adjoins that of the Davis-Daly company. By the judgment entered in accordance with this stipulation the Largey estate acquires one-quarter of the surface, Mrs. Clara Larkin Barth another one-quarter and the remainder of the surface is divided among five other claimants. The Montana Central Mining Company is to have the mineral rights to the ground in question.

At a recent meeting of stockholders of the Butte-Ballaklava Copper Company the question of listing the stock on the Boston exchange was discussed and it is understood that steps will be taken to comply with the exchange requirements so that the stock may be listed.

The Tuolumne Copper Company has sent to its stockholders the annual report which states that the three-compartment shaft has been sunk an additional 400 ft., making a total depth of 1450 ft. since operations were commenced. An additional 1615 ft. of crosscuts and drifts have been run, making a total of 3515 ft. Since the previous report a steel boiler house and air compressor room have been erected, and there have been installed six 150-h.p. Erie City boilers, a 20 drill Nordberg air compressor and a Nordberg hoist good for 2500 ft. General Manager Sheehan has recommended the sinking of the shaft to a depth of 2000 feet.

Considerable interest has been aroused by the contention of B. J. Daniels that he has discovered a rich deposit of tungsten on Sugar Loaf mountain at the head of Race Track creek, near Danielsville, in Deer Lodge county. A sample of the ore was sent to the United States Geological Survey and pronounced tungsten; further samples have been requested so that more thorough tests may be made.

Denver

July 30—A recent strike at Leadville of high-grade ore, running about 15 oz. gold and 9000 oz. of silver, in the Cambrian quartzite, within about 40 feet of the granite, indicates that the pay ore is gradually being followed down through the lower sedimentaries to the granite, in which some of the mining engineers now believe pay veins will be found underneath or adjacent to the great oreshoots in the ground above. It is rumored that the Iron-Silver company will shortly sink the Tucson shaft into the granite. It is difficult to get exact information regarding the operations of this company, as its policy has always been that of reticence to the press, and to quietly pursue the developing and shipping of its ore. The company is today the largest operator in Leadville, employing the greatest number of men and shipping the heaviest tonnage. The Tucson property has recently been equipped with a complete electrical outfit—electric pumps in the mine and electric hoist on the surface. There is now in operation on this shaft the largest electric hoist in the State.

All the electric power is obtained from the Shoshone plant of the Central Colorado Power Company, this being the first mine to which power was furnished by the Shoshone plant. The Yak tunnel is being driven ahead steadily, and the owners are giving leases on veins intersected, which is furnishing employment to a large number of men.

In the Cripple Creek district, a strike is reported on the Vindicator, which is important inasmuch as it was made on the 1400 level, additional evidence of the permanence of values with depth in this wonderful camp. The width of the ore is stated to be 6 ft., and it is of smelting grade. The July dividend amounts to $22,500, making a total of over $2,000,000 paid by this company. A similar strike is reported in the Trilby mine, at a depth of 900 ft., the ore being 4 ft. wide, but of lower grade than the Vindicator ore. The output of the Trilby is now from 30 to 40 tons per diem. About 200 men are being employed in and about the building of the new Portland mill. The Gold Issue mill and aerial tram, for the treatment and transportation of Gold hill

ores, are completed, and the mill will be started as soon as the bins are full.

In the Red mountain district, between Ouray and Silverton, the Koehler tunnel, being driven to cut the oreshoot developed in the shaft of the Carbon Lake mine 200 ft. above, has broken into an orebody estimated at 15 ft. in width. It is enargite, the same as mined from the upper workings, and probably the same shoot. This, however, has not been determined as yet. Particulars will be given later of this strike, which was made about 2300 ft. from the tunnel portal. T. M. Chestnut is manager of the San Antonio company, which owns the property.

Among the many old camps which throughout the State are taking on new life, is that of Alma, in Summit county, where the output is rapidly increasing, and like others which, in the early days, were looked on solely as silver camps, is now producing its quota of gold, both from lodes and placers. The London has always been the chief producer of that section.

Salt Lake City

July 30—Although it has been repeatedly reported that the sale of the Knight interests, including the Colorado and Iron Blossom mines and the Tintic smeltery and railroad had been declared off, negotiations are still under way for the transfer of these holdings to Eastern smelting concerns. Ernest R. Woolley, who has been the central figure in the dealings thus far, is in New York again, in another attempt to fix up a proposition satisfactory to both parties.

The United States Smelting Company will immediately take steps to reopen its copper smeltery at Bingham Junction. Judge Marshall has granted the company's application for a modification of the injunction, and the company will be permitted to smelt copper and other ores under certain conditions which include the neutralizing of the acid gases and the baghousing of the fumes. It has been demonstrated to the satisfaction of the court, by the operation of the company's lead smelting plant, that the gases can be rendered innocuous by the Sprague zinc-oxide method, and all solid particles recovered by filtering through the baghouse. The lead smelting department has been in operation for nearly a year under a modified form of the injunction and the smelting of copper ores will be resumed in the course of six or eight months, as soon as a new $50,000 baghouse and flue system can be constructed.

An [illegible] of consolidation seems to have struck. Upon mining enterprises, several large deals having already been made and others [illegible] in the early stages of consummation. Little is heard lately relative to the Boston Consolidated Utah Copper company, but those who should be in a position to know claim that the property is still under consideration. The original proposal of consolidation on a 3 to 1 basis was unsatisfactory to Boston Consolidated shareholders, and it is understood, has been modified. In Park City several combinations are in contemplation, among them being those of the Thompson, West Quincy, Daly-West and Ontario; the Keystone, Comstock and California; and eight or more of the prominent properties on the south side of the district. With these rounded out, Park City should develop a decided increase in activity before the end of the year.

It is stated that Samuel Newhouse has severed all connection with the Fink smelting enterprise. This information comes from a reliable source, but owing to personal reasons, cannot be divulged. Under Mr. Newhouse's handling it was hoped that the Fink furnace would be evolved into a commercial success. It is said that plans are still being made to put the furnace on the market shortly, on a royalty basis.

Goldfield

July 27—A strike of importance to the Goldfield Consolidated Company and to the district in general, has been made on the 730 ft. level at the Clermont shaft. The secretary of the company is the authority for the statement that $30 ore has been encountered at the above level, but there has not been sufficient development to show the extent of the discovery. The ore is less base than heretofore encountered, and is believed to be the extension of the Mohawk Jumbo shoot.

The fourth dividend amounting to $1,067,304, has been declared payable July 31, 1900, making a total to date of $2,834,332, and leaving over $1,000,000 cash still in the treasury. The Consolidated company is the plaintiff in a suit instituted against D. Mackenzie & Co. to recover $135,000, alleged to have been wrongfully withheld while the defendants were operating a lease upon a royalty basis on the Mohawk ground prior to the consolidation.

At Tonopah the Mizpah shaft of the Tonopah Mining Company has reached a depth of 1454 ft., with no change in the formation, the bottom of the shaft still being in the rhyolite-dacite intrusion. The shaft will be continued to 1500 ft., when a station will be cut and considerable cross-cutting performed. For the past 800 ft. the shaft has penetrated the dacite intrusion, and when sinking is discontinued it is more than likely that a diamond drill hole will be bored to a depth of 2500 ft., in order to determine the formation. At the Tonopah Extension company's mill on a large force of men are being employed grading and laying the foundations for the new mill.

Toronto

July 30—An amalgamation of the principal cement companies of Canada, representing about two-thirds of the total output, is being effected. The merger will be known as the Canadian Consolidated Cement Company, and will have a capitalization of $25,000,000. Arrangements are in charge of Rudolphe Forget, of Montreal. Seven or eight companies will be embraced in the amalgamation, including the International Cement Company, of Hull, Quebec. Among those interested are J. S. Irvin, manager of the International, Sir Sandford Fleming, Senator W. C. Edwards, C. H. Cohan and W. M. Aitken.

Cobalt

July 29—General meetings of the shareholders of the John Black Mining Company and the Black Mines Limited were held recently in Montreal, to consider a plan for the amalgamation of the two properties, and to confirm a contract entered into by the directors of the different companies. The stock of the old companies is to be exchanged for stock in the amalgamated company on a share for share basis. This new company will be known as the Black Mines Consolidated, Ltd. The capital will be $3,000,000, and there will be 500,000 shares held in the treasury. The cash assets amount to about $30,000. Besides the two properties in Coleman, the company also has 280 acres in the Gowganda and Muller lake districts, and one claim in the Montreal river section.

The work of building the extensions to the Northern Customs concentrator is being pushed, and when completed, the capacity of the mill will be more than doubled. Thirty-five new stamps are being installed, bringing the total number in the mill up to 55. This company has contracted to treat the big dump of the La Rose mine on a royalty basis.

The Trout Mills Reduction and Smelting Company, operating about three miles from North Bay, has succeeded in having the freight rates reduced on the low-grade ores from Cobalt. After this ore assaying up to 35 oz. in silver, will be carried for $1 per ton, between 35 and 50 oz. the rate will be $1.50 per ton, and above 50 ounces, $2 a ton. Previous to this the rate to Trout Mills was $2 per ton for all low grade ore. This company has a concentrator capable of handling about 40 tons per day. A smelter, to treat the high grade ores from this district is also being installed.

The new O'Brien mill, which is to use both concentration and cyanuding, will probably start operating next week. The cyanide plant will not be ready by that time, and until it is completed only the concentrating section will be run. The company is putting in a small electric road, to haul the ore from the various shafts to the mill, and the branch to the No. 1 shaft is completed. The other lines have been graded, and everything is in readiness to lay the rails. When completed this mill will be the largest now

operating in the camp, and will have a capacity of about 125 tons per day.

An important surface find has been made on the property of the Nipissing Mines Company, a little to the east of the No. 54 shaft. The vein where found showed a width of 6 in. of high-grade ore. As far as can be ascertained no finds of any importance were made by the extensive prospecting carried on over the burned area of the town. The McKinley-Darragh is considering the advisability of increasing the capacity of the mill by about fifty per cent. The present mill will hardly handle the amount of ore that comes out of the mine, and it is proposed to install an additional 10 stamps, together with the other necessary equipment.

The vein recently found on the Waldman lot on the Gillies Limit, has been traced to the adjoining property owned by Young & O'Brien. Where stripped on the former claim it varies in width up to 8 in. of high-grade ore.

Mexico

July 20—In an interview with a delegation of the officers of the newly organized Mexican Institute of Mining Engineers, the minister of fomento, Senor Molina, explained at length that the controverted section 144 of the proposed mining law, which section has now been eliminated from the law as it stands, was not intended to be in any way hostile to the important mining interests of the country. The primary intention, he declared, was to afford the government an opportunity to protect the large number of small investors in Mexican mining companies, particularly those from the United States, who were the victims of fraudulent or incompetent flotations. He assured the committee of the government's desire to aid the mining industry, and of its continued friendly attitude toward foreign investments.

There are a large number of American prospectors in western and southern Mexico, this season; more than at any other time in the history of Mexican mining. Some of these prospectors have responsible backing, but all are diligently prying into unexplored nooks and corners of the Sierra Madre Occidental and the Sierra Madre del Sur. Although Mexico is a very old country in its mining development, there are still large areas which may be called unexplored, and there are many unlocated properties, which were not available to Spanish miners, that now offer large possibilities with modern mining and metallurgical methods, and with the changed conditions of transportation, resulting from the extensions of the railroad systems of the country. With the subduing of the Yaquis, in Sonora, the danger to the miners from hostile Indians has disappeared in the republic, and the country generally is as safe as any part of western United States or Canada. The physical difficulties are not to be compared with the rigors of the north and the facilities for travel and for living on the country, when necessary, are quite as good as they were in the western part of the United States, twenty years ago.

An ore containing cadmium was discovered in lead-zinc mines of Tehuacan, state of Puebla, some months ago, and samples were sent to Germany for testing. Local assays gave as high as 14 per cent. cadmium. The cadmium occurred in a lead-zinc mineral in close combination with the zinc, and did not indicate outwardly any of the familiar cadmium minerals. As yet no attempt has been made to exploit the deposit commercially.

A unique deposit of rose garnet, embedded in wollastonite, is being developed in the state of Morelos, producing a handsome ornamental stone, and an abrasive of particularly good quality.

The failure of the new mining law to permit of the denouncement of bauxite and other aluminum minerals, is considered unfortunate. Important deposits of these minerals are known to exist but under the present and new law they probably belong to the owners of the land, although this point is not clear in the new law as construed by some. The matter was discussed in the chamber of deputies but the legislators did not see their way clear to make a differentiation between aluminum ores and clays. Representatives of German firms are in Mexico looking for deposits of manganese and for a supply of native sulphur.

London

July 23—The prospectus of a new company formed to work wolfram mines in Portugal has been issued. The mineral to be worked is of comparatively small importance and the demand is limited, consequently an enterprise of this sort must be of a speculative character. The selling price of wolfram fluctuates considerably. In 1904 it was 40s per unit of tungstic acid; in 1905, it was 20s.; in 1906, 30s.; in 1907, from 20 to 50s., and in 1908, 20 to 35s. These are the figures given in the prospectus. In calculating the profits of the company a price of 28s. is estimated on. The veins are of quartz and occur in agillaceous and schistose rocks. During the last 12 months the ore has averaged 1.2 per cent. wolframite.

The property has been favorably reported on by J. D. Kendall, an engineer, who presented, in 1901, before the Institute of Mining and Metallurgy, a paper on "Ore in Sight," which gave rise to much discussion and which led to the circulation, by that institution among its members all over the world, of recommendations regarding the use of the term "ore in sight," when making reports on mines. Attention is drawn to this because in reporting on the wolfram mine Mr. Kendall seems to have disregarded the admirable advice that he formerly gave to the mining profession.

It is true that he does not use the term "ore in sight," but he makes estimates of the "ore available," on the assumption that certain tunnels still to be driven will strike the veins in depth. These deep tunnels will command, he says, at least 100,000 tons of ore. This is a novel expression of ore valuation and attracts comment.

Another item of interest this week is the announcement that Wernher, Beit & Co. have acquired an interest in one of the West African mines. On the advice of Arthur Wilkinson, formerly on their engineering staff in South Africa, they have decided to take up 200,000 shares at 24s. per share in the Prestea Block A mine, one of the quartz group. This is one of the producing mines, but for a time the mill is to be shut down and a more extensive plant is to be erected. Mr. Wilkinson estimates the reserves at 300,000 tons of $10 ore, and the costs, with 150 stamps, at $4.86 per ton; with 200 stamps, the costs are estimated at $4.14 per ton. The capital of the company is to be £750,000, and at market prices a good deal more, a capitalization which many people will think, on the data given above, is quite as high as the mine can stand.

Paris

July 23—The Société des Mines et Usines de Cuivre de Chañaral, operating in Chile, has lately erected a third smelting furnace, and has installed a special device for automatically cleaning the dust chambers. The company smelted last year 20,475 tons of copper ores averaging 8.36 per cent. copper, and resulting in the production of 3036 tons of 57.2 per cent. matte. The company has arranged to purchase the property of the Las Animas Copper Company, Limited.

The Societe des Mines de Cuivre de Catemoru (Chile) is installing an aërial cableway for preventing the stoppage of its smelting works by lack of ores as was the case in 1908, owing to difficulties of transport. Through this cause the production of copper, which was 1908 tons in 1907, dropped to 1842 tons in 1908. The financial troubles which the company experienced after the Valparaiso earthquake are not yet entirely over.

The latest reports received from Guiana by the Societe Anonyme du Sparwin (Maroni) state that the erection of the dredge was well advanced and that it would be probably completed by the end of July. The dredge buckets are of 5 cu ft capacity. Recent drillings have indicated that the gravel contains over $1 in gold per cu m., according to the engineer's report. The results of the operation of this dredge are anxiously awaited by all the Guiana gold companies in Paris, as it is the first attempt made in Guiana by a French company with a modern gold dredge.

Mining News from All Parts of the World

New Enterprises, Installations of New Machinery, Development of Mines and Transfers of Property Reported by Special Correspondents

THE CURRENT HISTORY OF MINING

Alabama

CALHOUN COUNTY

Shinbone Valley Iron and Timber Company—This new company has secured control of a tract of 25,000 acres of land near Anniston, which is covered with timber. It also includes proved deposits of brown-iron ore and of kaolin. R. F. Kolb, Anniston, Ala., is president; J. D. Hunter, engineer. The plans include the building of 16 miles of railroad to connect with the Atlanta, Birmingham & Atlantic road at Pyriton.

Arizona

COCHISE COUNTY

Arizona & Michigan—The shaft at this property, near Johnson, is down over 500 ft., and crosscutting has been started at the 500 level.

Copper Belle—This group of claims at Gleeson, operated by the Shannon Copper Company, is shipping two cars of ore daily to Clifton. George K. Reed, superintendent.

Shattuck-Arizona—High-grade ore continues to be shipped from the sixth level of this property where the orebody is said to have been developed for 300 ft. in length and 275 ft. in width. Approximately 1500 ft. of development work has been done this year.

GILA COUNTY

New Keystone Copper Company—The option on the Keystone mines, held by the Lewisohn interests, has been transferred to this new company, capitalized at $3,000,000, and stockholders of the old Keystone Copper Company will receive stock in the new company in exchange for the property, which comprises 300 acres in the vicinity of the Miami Copper Company. The Keystone holdings have been prospected by churn drills, which are still in use at the property; a shaft is now down 350 ft. and drifting has been commenced.

Pasco—This group of eight claims between the Warrior and Miami properties, has been acquired by interests identified with the Miami Copper Company.

Arizona Commercial—The drift from the 600 level of the Eureka shaft has been driven [illegible] ft., and the breast of the drift is in a good grade of smelting ore.

MARICOPA COUNTY

Vulture—Since the new company took charge of this old property near Wickenburg, [illegible] have been spent in equipment and development. The mine has been unwatered, the 400- and 500-ft. levels opened, and work started on the 600 level. Little attention is being given to the upper workings which are largely caved and the management is endeavoring to develop a new mine at depth. By operating 20 of the 80 stamps in the old mill on ore taken out during development, it is expected that the property will be self-supporting until the management is prepared to build a new mill. Angus Mackay, manager.

MOHAVE COUNTY

Tom Reed—High grade ore has been encountered in a winze from the 250-ft. level of this property. A heavy flow of water has been encountered in the main shaft and a pump will be installed to deliver this water to the mill tank. F. S. Jones, manager.

Gold Roads—The 300 ton stamp and cyanide mill will be placed in operation about Sept. 1.

PINAL COUNTY

Ray Consolidated—The 200,000 shares of new stock will be offered at $15, and allowing for the underwriting and other expenses, will probably net the company about $14. This, together with the cash now in the treasury, should amply provide for the construction and development that are in contemplation.

Arizona Mines—Excavations are in progress for the new copper furnace to be erected near the Republic shaft in the vicinity of Casa Grande.

YAVAPAI COUNTY

Consolidated Arizona Smelting—The reorganization committee has selected the following directors, the first named of whom has been elected president: William Schall, Jr., Charles A. Kittle, Victor I. Cumnock, Julius Kessler, Edwin S. Hooley, Charles A. Greene and Frank A. Dillingham. The Blue Bell and the De Soto mines are to be unwatered at once and in a few months the smelting plant at Humboldt will probably be put in commission again. The consulting engineer, Martin J. Heller, 43 Exchange place, New York, is now at the property, temporarily supervising the resumption operations.

YUMA COUNTY

Clara Consolidated—The smeltery under construction at Swansea will have a capacity of 350 tons of ore per day, the converter plant being of 40 tons daily capacity. The smeltery is expected to be ready to operate as soon as the Arizona & Swansea railway is completed.

California

AMADOR COUNTY

Amador Gold—This company, H. G. Torrence, superintendent, is now operating the Bay State and Rhetta properties about four miles north of Plymouth. The surface works are being put in good shape and the mill is in operation.

Keystone—This mine at Amador City, one of the first quartz mines opened in the State and for many years operated by McDonald Brothers, has been sold to the California Consolidated Mines Company. New machinery is to be installed and the property worked at greater depth.

INYO COUNTY

Skidoo Mining Company—This property, which recently paid its first dividend of $50,000, is situated at Skidoo, 14 miles west of Death valley and is mainly owned by E. A. Montgomery, the president of the company. Five stamps have been added to the old 10-stamp mill. The water for power at the mine is piped 23 miles.

MONO COUNTY

Alden—This company, of which Byron Alden, of Oakland, is president, is developing a group of claims in Blind Spring Hill district, just north of the Inyo county line. Both tunnels and shafts are being driven.

NEVADA COUNTY

Pittsburg—The electric motors for the compressors, hoist and mill have arrived and are being installed. When all are in place additional pumps will be set at work. Mark B. Kerr, manager, Nevada City.

American Mining and Development—At this property at Snowdon hill, the tunnel is being driven to intersect the main gravel channel, of which 4000 ft. has not yet been mined. Fred Joubert, Nevada City, is superintendent.

SHASTA COUNTY

Sybil—The mine at French Gulch has been sold for $10,000 to satisfy judgment. Chas. O. Rose bought it in the interest of bondholders.

Hazel Gold Mining Company—This company, with offices in San Francisco, purchased the Uncle Sam mine at Kennett and has appointed Louis A. Monahan as superintendent.

SIERRA COUNTY

Alaska—The recent rich strike in this mine at Pike City is on the 500 level. Specimen rock is being taken out and it

is supposed this is a continuation of the rich shoot worked in the upper levels. George St. John, manager.

YUBA COUNTY

Tarr Mining Company—The company is preparing to work the old Blue Point ground at Smartsville. The old flume is being rebuilt. Both ditch and flume have been unused for a number of years and considerable repair work is necessary.

Colorado

CLEAR CREEK COUNTY

American Mines Development and Investment Company—Southern people have purchased a controlling interest, and active work on the crosscut tunnel is to be carried out under management of E. E. Grubb, Georgetown, Colo.

Georgetown Tunnel—Manager S. McKirihan, of Georgetown, has returned from the East, and funds have been provided for the active development of the tunnel.

GILPIN COUNTY

Maumee Gold Mining Company—This new company will install machinery on the Nebula property in the Russell district. J. W. Bellis, Central City, Colo., is manager.

Druid Mining Company—Scotch capitalists interested in the Haseltine property in Willis gulch will install hoisting machinery, as well as a compressor plant, intending to sink a cage shaft 1000 ft. deep, for the development of their holdings. C. W. Anderson, of Central City, is superintendent.

Perrin—Denver people, leasing on the property, are sinking a new shaft and will install machinery if present indications continue. G. W. Adams, Central City, Colo., is superintendent.

LAKE COUNTY—LEADVILLE

Highland Mary—The shaft on Breece hill is now down 60 ft., and is still in ore, averaging an ounce in gold. The orebody lies northeast of the Weston fault and seems to be an overflow that can be traced from the Penn on the west.

Cleveland—The drifts north and south are now 75 ft. from the shaft, and the fissure vein has been opened a distance of 80 ft., with 8 ft. of shipping ore.

Garbutt Consolidation—Local people have taken an option on this property, also the King Solomon, Nigger Infant, St. Crispin and Maud Hicks, adjoining claims on Breece hill, and all will be worked from the Garbutt shaft. The latter is still in good ore and shipping regularly, and the consolidation was formed to prospect for the extension of the Garbutt orebody.

OURAY COUNTY

Torpedo-Eclipse—The new 10-stamp mill and the tramway 2100 ft. long will shortly be put in commission. Power drills have been installed in the mine.

Camp Bird Extension—The Amity Mining Company, which now controls this property, has let a $5000 tunnel contract for the driving of the Windsor tunnel from a point in Spirit basin, with a view of cutting the Connecting Link vein.

Silver Bell—A lease has been taken by George Crawford and associates on this old property, southeast of Ironton. The mine at one time was under the management of W. H. (Coin) Harvey.

ROUTT COUNTY

Farwell Mountain Copper Company—It is reported that the company intends to install a large power plant in Hinman park on Elk river; also erect a mill. Dr. E. A. Hewitt, Steamboat Springs, Colo., is manager.

TELLER COUNTY

Blue Bird Mining and Leasing—This company, leasing on the Blue Bird mine on Bull hill, shipped a car per day during July, the ore being mined from five levels between 400 and 1350 ft. Exploratory work is being done at the bottom of the mine by a winze, sunk in ore below the 1350-ft. level.

Uintah Leasing—This company, leasing the Necessity mine of the Uintah-Ajax company, on Battle mountain, is now on a dividend basis, ore of good grade having been encountered. F. E. Wheeler, superintendent.

Idaho

SHOSHONE COUNTY

Gold Dredge Mining Company—Development is to be resumed at this property, and a double-compartment shaft sunk as soon as the new equipment arrives. The property is 6 miles south of St. Joe, and the office of the company is at Cœur d'Alene City. D. Davis, manager.

Rockford—Development is to be resumed at this property southeast of the Bunker Hill & Sullivan group.

Illinois

MARSHALL COUNTY

Toluca—This coal mine at Toluca has been finally transferred by the trustees in bankruptcy of the Devlin estate to the Jackson-Walker Coal Company, of Topeka, Kan., which arranged the purchase some time ago.

VERMILION COUNTY

Catlin—Mining machines have been introduced into this mine near Catlin; they are the first machines to be used in the district.

WILLIAMSON COUNTY

The new colliery at Rendville, near Herrin, owned by W. P. Rend, of Chicago, will be ready to ship coal early in August. The mine is well equipped, and has a tipple nearly 100 ft. high. It has a capacity of 1000 tons daily.

Indiana

CLAY COUNTY

Two hundred employees of the Seeleyville and O. S. Richardson mines have resumed work after several weeks of idleness. The trouble grew out of the demand of the operators that the men leave 6 in. of coal in the roof of the mine to strengthen the roof and to prevent accidents. The men demanded pay for mining the coal that was left up, on the ground that it was more trouble for them to leave this coal that it was to mine it. By agreement the matter has been left in hands of President Lewis for adjustment.

VIGO COUNTY

The executive board of the Indiana United Mine Workers held a meeting in Terre Haute, July 28, to consider the strike situation at three mines in the bituminous district. The Operators' Association committee had presented President Lewis with a formal and detailed communication in which they contended that the Mine Workers' officials have violated the wage agreement in respect to the quality of coal mined and the refusing to work pending a settlement of differences.

Kentucky

HOPKINS COUNTY

Hopkins County Coal Company—This company has been organized to purchase and work the Oak Hill coal mine near Madisonville. The tract bought includes 3000 acres of coal land. The new company will extend the present mine and build one mile of track to connect with the railroad. S. T. Castleman, Madisonville, Ky., is managing the enterprise.

Michigan

COPPER

Allouez—The No. 2 shaft is well established in the lode, after making the turn to conform with the pitch of the formation. Work on the addition to the stamp mill, which is owned jointly by this company and the Centennial, is going forward and will be completed in time to take care of any increase in production from the two properties.

Old Colony—The company has discontinued operations, after having carried on exploratory work for nearly six years. The greater portion of the work has been done at a depth of 1000 feet.

Osceola—This company has let a contract for a series of drill holes to be put down in the eastern portion of its tract.

Ahmeek—The company is shipping about 1500 tons of rock daily. The new mill buildings will soon be ready to receive the machinery.

Lawson—A shaft is to be sunk at a point about ½ mile north of the La Salle company's Tecumseh shaft. The company owns about 440 acres carrying the Kearsarge lode, and is capitalized at 40,000 shares, 26,000 of which are now owned by the Calumet & Hecla.

Seneca—The shaft has reached a depth of 450 ft., at which point the second level will be established and lateral openings started.

Osceola—No. 1 shaft has reached the 950-ft. level and will soon cut the formation at this point. No. 2 shaft is at the same depth and a crosscut to cut the lode will soon be under way. Drifting on the lode at the 800-ft. level betwen the two shafts continues with the breast of the drift in good copper ground.

Winona—Operations at this property are confined to No. 4 shaft, developments at No. 3 being carried to such a point that it was deemed expedient to discontinue further opening until a mill was procured. No. 4 shaft is down to the 11th level; a station is being cut at this and also the 10th level preparatory to crosscutting to the lode; as soon as this is finished, sinking will be resumed. At the ninth level drifting is in progress both ways, and good ground is being exposed, the north drift showing a little the better. At the new mill, which is to be owned jointly by this and the King Philip company, all excavating has been done, and the foundation work is well under way; a spur has been laid from the shaft house to the mill site. This piece of road, which is to be electrically operated, will soon be in commission, and will materially help in the erection of the mill. Power will be furnished by this company's generating plant.

Missouri

JOPLIN—ZINC-LEAD DISTRICT

Hercules—The company has let the contract for a 500-ton mill on the Luke land, west of Joplin. This will be the most complete mill yet built in the Joplin sheet-ground district. The plans call for two 18-in. crushers and four sets of 36-in. rolls, two large roughing jigs and one concentrating jig of the Forest type. Thomas Douglas, of Joplin, is manager.

M. K. & T.—The litigation over the name at Baxter Springs has been settled and work will be resumed at once by a new company. George Ward, of Kansas City, is interested.

Baxter Quapaw—At Baxter this company is installing two large hoisters, a Corliss engine and a large air compressor.

Lone Star—The lease, west of Joplin, was the scene of a strike of rich ore in an old stope. C. M. Porter, of Joplin, is superintendent.

Quindaro—This company, at Webb City, operating on the Quinn land, has built a 200-ton mill and sunk two shafts to the ore and is now drifting to open up the ground.

Old Dominion—The company has nearly completed the new mill in Gordon hollow, south of Joplin, and is rushing development of the ground.

Lee Hall—This mine, formerly called the Nortonia, started recently under new management. The mine is located on the Norton land, west of Joplin.

Montana

BUTTE DISTRICT

Bamar Copper Company—The property is situated about 7 miles south of Silver Bow. On the Linda claim a raise is being run from the tunnel to the surface, a distance of about 100 ft., after which a 500-ft. shaft is to be sunk. P. J. Scott is in charge.

CASCADE COUNTY

Johannesburg—General Manager Andrew Nelson has ordered an Ottumwa hoisting engine and a 100-h.p. boiler for this property, comprising seven claims, about five miles north of Neihart.

JEFFERSON COUNTY

Lion Gulch Development Company—About 10 men are employed under the direction of John Hewitt, foreman. The 3 compartment shaft is down 400 ft., at which point a station is being cut. Drifting is in progress, and several machine drills are being operated.

Hegman Group—W. S. Larsen and Alexander Hanfield have taken a lease and bond on the Hegman group situated between the Bluebird claim and the property of the Corbin company at Wickes.

Dailey Copper Mining and Smelting Company—A payment of $15,000 has been made to Dailey Brothers, of Wickes, by an eastern syndicate which is to acquire the property near Wickes. At present there is a 300-ft. shaft on the property.

Nevada

ESMERALDA COUNTY—GOLDFIELD

Goldbutton Leasing Company—Under the management of F. E. Browne, a shaft has been sunk to a depth of 205 ft. From the 250-ft. level a crosscut is being driven westerly to the contact between the alaskite and andesite. The ground under lease is on the Mattie claim of the Goldbutton Mining Company on the east slope of Vindicator mountain.

C. O. D. Consolidated—A lease has been granted to F. A. Lister upon a portion of the C. O. D. claim. The block is immediately west of the main shaft of the Gold Bar.

Florence Goldfield—The aerial tramway from the Little Florence shaft to the mill is about completed and will soon begin the transportation of ore. The work of enlarging the main Florence shaft to one of three compartments is also nearly finished.

ESMERALDA COUNTY—MONTEZUMA

Montezuma-Gold King—W. L. Jackson, of Washington, Ind., after visiting the property has completed arrangements for the erection of a 50-ton mill.

ESMERALDA COUNTY—ROCKLAND

Rockland Syndicate Mining Company—Grading has been started for a 10-stamp mill, which is to have a tube mill and cyanide adjunct. E. J. Reynolds, manager.

LINCOLN COUNTY—PIOCHE

Smelting Plant—The erection of a lead-smelting plant for this camp is again under active consideration by interests affiliated with the Nevada-Utah company. A separate corporation is to be formed, but no definite action is expected for several weeks.

NYE COUNTY—GEORGES CANON

Several prospecting outfits have recently started for this section, where it is stated ore has been found running several hundred dollars to the ton. The new discovery is about 86 miles northeast of Goldfield.

NYE COUNTY—TONOPAH

MacNamara—During the week, ended July 24, the company shipped to the smelters 350 tons of ore. The grade of the ore has been improving.

WHITE PINE COUNTY—ELY

McDonald-Ely—A contract has been let for sinking one of the shafts from the 300- to the 600-ft. level. David Keith and Thomas Kearns, of Salt Lake, are large stockholders.

Steptoe—The fourth unit of the concentrator has been placed in operation and approximately 6000 tons per day are being treated, the Nevada Consolidated supplying practically the entire tonnage since the shutdown at the Cumberland-Ely.

New Mexico

SOCORRO COUNTY

Magdalena Gold and Copper Company—A reorganization of this property has been effected, and it is expected that the mines will be actively exploited.

Socorro Mines—The 30-stamp mill at this property is expected to be ready for operation early in August.

Ohio

COLUMBIANA COUNTY

The West Point coal basin, after long preliminary work, has been made accessible by the completion of a section of the new Youngstown & Ohio River railroad. The first shipments of coal to market were made late in July.

Oregon

LANE COUNTY

Blue Bird—This company at Blue River is sawing lumber preparatory to the erection of a 10-stamp mill. A. H. Taylor, manager.

Pennsylvania

Several suits have been brought in the courts of Somerset county, which involve a question of some importance. The test case is that of Samuel Weaver against the Berwind-White Coal Company. The complaint alleges that in 1895 the plaintiff sold to the defendant company the B or Miller seam of coal underlying 50 acres of his farm, together with the mining rights and privileges. The plaintiff alleges that the defendant, instead of mining the B seam, mined and removed the C Prime seam of coal, which is located directly above the B seam. The plaintiff, under Pennsylvania law, therefore, claims damages in treble the value of the coal thus wrongfully removed.

The plaintiff also sets forth that the mining operations of the defendant company were carried on negligently and in such manner as to cause injury to and decrease the value of veins of coal, limestone, and other minerals over the C Prime seam of coal. The leaving of insufficient surface support, the consequent depressions and subsidences in the surface, the drying up of springs, etc., are grounds for further damage claims. There are three suits of this kind pending, over $2,000,000 damages being claimed.

South Dakota

PENNINGTON COUNTY

Pahasa Mining Company—The holdings of the Harney Peak Mining, Milling and Manufacturing Company in the vicinity of Hill City have been acquired by this company and are being prospected under the direction of Dr. A. R. Ledoux, of New York City. There is a mill on the property, but this will not be operated until further developments warrant production on a commercial scale. The local work is in charge of C. H. Kamman.

Utah

BEAVER COUNTY

Beaver Carbonate—A special meeting will soon be held to discuss the proposition of bonding the property for the purpose of erecting a milling plant, the developments at the mine having now reached such proportions as to justify a mill.

EMERY COUNTY

Castle Valley Coal Company—This company has been incorporated for $5,000,000 to develop the Cedar Creek coal deposits. A half interest has been purchased in the Utah Southern railroad now building out of Price, and which, at a distance of 16 miles, connects with the Castle Valley line, which is to be about 10 miles in length. J. G. Berryhill, of Des Moines, Ia., is interested, together with capitalists connected with the Nevada-Douglas Copper Company. The deposit comprises 2000 acres and will be used as a basis of fuel supplies for the Nevada-Douglas operations in Lyon county, Nevada.

JUAB COUNTY

Grand Central—The orebody encountered recently on the 2000-ft. level is increasing in value as drifting progresses. Drifts are now being run on the 1800- and 2100-ft. levels to determine the exact extent of the ore, and these are nearing the points where the shoot should be encountered.

Sioux Consolidated—The original strike made at a depth of 335 ft. has been followed to the 450 level. In the laterals it is said that ore has been exposed for 900 feet.

Gemini—The sale of the Gemini to the United States Smelting interests has been declared off, and active operations at the property have again been resumed.

SALT LAKE COUNTY

Utah Copper—The copper production of this company during June was on a basis of 63,000,000 lb. per annum, the production for the month being 5,250,000 lb., at a reported cost of 8.125c. per pound.

American Smelting and Refining—Some converters of unusual length, the design of E. A. C. Smith, of the Baltimore Copper Smelting and Rolling Company, are being tried at the Garfield plant. It is claimed that a decided reduction in converting costs is being attained. The converters are lined with magnesia brick.

Silver Shield—A proposition to double the capital stock of this company will be presented to the stockholders. Of the 300,000 new shares, 120,000 are to be used to acquire the property of the United Bingham Company. It is proposed to use the balance to erect a new mill, and as a bonus to the buyers of the bonds.

Virginia

LEE COUNTY

Keokee Consolidated Coke Company—This new company has secured control of 10,000 acres of land near Keokee, the tract running over into Wise county. The intention is to open a mine on this tract and to build a number of coke ovens. The company has its main offices at No. 2 Rector street, New York, and the following officers: President, C. P. Perin; vice presidents, R. W. Hale and T. V. Church; treasurer, Thomas Ward; secretary, R. S. Pierrepont.

RUSSELL COUNTY

Clinchfield Coal Corporation—The company is preparing for a large increase in the output of the mines near Dante. J. M. Roan, local manager.

Washington

FERRY COUNTY

New Republic—A vein 6 ft. wide, and containing seams of high-grade gold ore, was recently encountered at this property, near Republic.

KITTITAS COUNTY

A strike of rich gold ore is reported in the old Swauk district, and many prospectors are leaving from Ellensburg, the nearest outfitting point.

SNOHOMISH COUNTY

Bornite—The property, near Darrington, was recently leased to Lyman B. Currier, of Brewer, Me., and associates. The mine was opened about six years ago, and shipped high-grade ore at various times. An aërial tram connects the property with the town.

West Virginia

RALEIGH COUNTY

The Virginian railway is arranging to build six short branches for the purpose of developing coal lands in this county.

WOOD COUNTY

E. L. Sternberger and associates, of Jackson, Ohio, have secured control of about 500 acres of coal land near Williamstown, and intend to open a mine. The property is near the Ohio River division of the Baltimore & Ohio.

Wisconsin

ZINC-LEAD DISTRICT

Benton—The Wisconsin Zinc Company has acquired and will reopen the Pittsburg-Benton; the mine is a big zinc producer and dividend payer.

Corr—This company is building a 75-ton mill to replace the plant destroyed by fire last fall; Edward Bullock, of Beloit, Wis., is secretary.

Frontier—This company has acquired the Sedgwick eighty, 1½ miles east of New Diggings; the ground revealed good lead and jack by churn drill and shaft.

Lucky Twelve—Stockholders have voted to purchase a mill for the property at New Diggings. S. W. Eldred, of Quincy, Ill., is secretary.

Shullsburg—Rodham Brothers will construct a small milling plant on their own land, four miles northeast of Shullsburg.

Wyoming

The Wyoming Coal Operators' Association has completed an agreement with the United Mine Workers of District 22 as to the wages to be paid and rules under which the miners will work for the year, beginning Sept. 1, 1909. The contract was concluded without dispute, and is practically an extension of the Cheyenne agreement of 1908. It is based on an eight-hour day, and the wages established are $3.40 per day for pick miners, $3.00 for machine runners, $3.00 for shot-firers and $3.10 for inside laborers.

Canada

BRITISH COLUMBIA—BOUNDARY DISTRICT

British Columbia Copper—Labor troubles in the Crow's Nest coke regions and those of this company with the local miners' union at Greenwood having been settled, the company has resumed operation of its mines and smeltery, the latter now comprising three copper furnaces; an additional furnace, or an extension to one of the present furnaces, will probably be installed. The principal ore supply is from the Mother Lode mine, but four other mines are to be operated. J. Edgar McAllister, general manager.

Consolidated Mining and Smelting—A fourth copper furnace has been blown in at this company's plant at Trail. The equipment of the smeltery now includes 4 copper furnaces and one lead furnace.

BRITISH COLUMBIA—SLOCAN

Van Roi—About 60 men are employed at this mine, in Silverton camp, Slocan lake, and silver-lead concentrate of good grade is shipped regularly to the Trail smelter.

Whitewater—The concentrating mill is again being operated after the winter shut-down.

Lucky Jim—About 1800 tons of crude ore averaging about 53 per cent. zinc have been shipped during recent months. Facilities are being increased so as to admit of shipment of about 200 tons per day. Operations are under the direction of G. Weaver Loper, vice-president of the Lucky Jim Zinc Mines, Ltd., Spokane, Washington.

ONTARIO—COBALT

Ore Shipments—The ore shipped from Cobalt during the week ended July 24 was as follows: La Rose, 388,400 lb.; Nipissing, 256,000; Crown Reserve, 185,530; City of Cobalt, 64,000; O'Brien, 63,990; Chambers Ferland, 60,200; Kerr Lake, 60,100; Buffalo, 48,030; Temiskaming & Hudson Bay, 62,600; Temiskaming, 48,200; King Edward, 42,560; total, 1,271,100 lb. Of the 22 cars shipped, 9 were high-grade.

Beaver—A third drill has been put at work on this property. A winze is being sunk on the vein to the east of the shaft.

Cobalt Lake—The vein recently encountered in the drift from No. 6 shaft has widened from 2½ to 6 in. and carries high silver content.

Nova Scotia—Another new vein has been found at the surface, about 400 ft. south of the Finlay vein. It is about 4 in. wide.

ONTARIO—SOUTH LORRAINE

Hollinger—The No. 2 vein has been cut at the 100 ft. level and is of good grade.

Mexico

CHIHUAHUA

Zinc Exports—According to recently published customs statistics, the exports of zinc ore from this state through the port of El Paso, for the three months ended June 30, were about 14,000 tons of a value of approximately $150,000. These figures are significant in that they are a considerable increase over the preceding three-months' period and are explained in a measure by the pending increased tariff on these ores.

United Metals Mining Company—This recently organized company is doing development work in the Nueva Santa Eulalia section. C. C. Harris and William Adams, of Chihuahua, and L. S. Ferry, of New York, are interested.

Bullion Shipments—Recent bullion shipments passing through Chihuahua were: Republica Mining Company, 26 bars of a value of 50,000 pesos; Dolores Mining Company, 110 bars, valued at about 100,000 pesos.

Dinamiti—The company will purchase a gasolene hoisting plant of about 50 h.p. S. G. Burns, Santa Eulalia, is manager.

Americana—An important strike of high-grade lead-silver ore was lately made in this mine in the Terrazas camp. The property belongs to the Chihuahua Investment Company and is operated by Capt. Felix McDonald.

Parral Output—The production of the district, for the week ended July 23, was 7490 tons of milling ore and 3520 tons of smelting ore, a total of 11,010 tons. The June output amounted to 36,205 tons.

Las Cuadras—The daily production from this Santa Barbara mine is now about 25 tons, the product going to the smeltery at Torreon.

Dios de Guia—These properties in the Sierra Madre range, west of Chihuahua, have been leased by Qualey Brothers. B. F. Noehl is in charge.

DURANGO

Corralejo—These properties in the Indé district of Durango, reached via Parral, are being operated under the management of N. C. Thompson. Plans for a milling plant are said to have formulated.

JALISCO

Buena Fe—Additional machinery, including a stamp mill, is contemplated for this property, near Ojuelos. Fred B. Irvine, manager.

SONORA

Dawson Mining Company—Operations have ceased on the Creston de Oro property near Nacozari and the mine has been attached to cover labor bills and other accounts. W. C. West is still in charge of the company's affairs.

Silver Seal Exploration Company—A new strike of high grade silver ore is reported in the lower tunnel of the property near Nacozari. J. A. Judah, of Los Angeles, is president.

Lucky Tiger-Combination—The stockholders recently voted to increase the capitalization from $650,000 to $8,000,000, and contemplate additions to the concentrator, cyanide and power plants. The headquarters of the company are at 215 Gibraltar building, Kansas City, Mo., and the mine is at El Tigre, in the Moctezuma district.

Africa

RHODESIA

Gold production in June was 51,678 oz.; for the half-year ended June 30, it was 300,446 oz. In 1908 some of the reports were made in bullion; this year they are all in fine gold. Comparing by values, the total was $6,099,646 in 1908, and $6,154,640 in 1909; an increase of $54,994 this year.

The production of metals other than gold, and of metallic ores, for the six months was: Silver, 127,757 oz.; copper, 49 tons; lead, 456 tons; chrome ore, 11,228 tons; tungsten ore, 2500 lb. In June there were 20 tons of asbestos mined. The production of coal for the half-year was 79,122 tons.

TRANSVAAL

Gold production in June was 617,228 oz., or 7270 oz. less than in May, but 21,012 oz. more than in June, 1908. For the six months ended June 30 the total was: Witwatersrand, 3,522,289 oz.; outside districts, 114,369 oz.; total, 3,636,658 oz., or $75,160,721. This is an increase of 230,701 oz. over the first half of last year. At the beginning of June there were 78 mills running, having a total of 9610 stamps.

The production of silver in the Transvaal for the five months ended May 31 was 328,022 oz., all of which was contained in gold bullion. The production of copper ore for the five months was 886 tons; tin ore, 900 tons; lead ore, 1000 tons.

The labor report for June shows that 12,339 natives were discharged, including those dead, and that 7717 arrived at the mines, a net loss of 4622 men. There were 2344 Chinese sent home during the month. On June 30 there were 154,200 Kafirs and 5378 Chinese at work; an increase of 24,389 Kafirs and a decrease of 10,258 Chinamen, as compared with June of last year.

WEST AFRICA

Gold production of the Gold Coast and Ashanti in June was 17,340 oz. bullion, a decrease of 7760 oz. from May, and of 6090 oz. from June, 1907. For the six months ended June 30, the total was 149,110 oz. in 1908, and 131,341 oz. 1909; a decrease of 17,778 oz. The bullion reported this year was equal to $2,577,220, or 124,684 oz. fine gold.

Metal, Mineral, Coal and Stock Markets

Current Prices, Market Conditions and Commercial Statistics of the Metals, Minerals and Mining Stocks

QUOTATIONS FROM IMPORTANT CENTERS

Coal Trade Review

New York, Aug. 4—The coal trade in the West is about in the same condition as by our last report. The demand continues to increase in some degree, but prices are kept down by the continued tendency to over-shipment. At some of the more important centers this has resulted in sales at low prices to avoid demurrage charges.

Lake trade is going on steadily, and shipments look as if they would make up a very good total for the season. At the same time it is not anticipated that there will be any great rush in September, as current shipments will probably take full care of the demand.

In the East the bituminous trade improves rather slowly, but still shows a gain. The competition of West Virginia coals on the seaboard is being felt. The Clearfield miners probably will not accede to the demand of the operators that they accept a lower wage scale.

Anthracite trade is quiet and steady without any special feature. Quite a number of the collieries have been running short time. On Aug. 2, the Delaware, Lackawanna & Western Railroad Company, began the new arrangement under which all its coal is sold at the mines to the Delaware, Lackawanna & Western Coal Company, which will hereafter market the coal. In preparation for the change most of its collieries were closed for a week, while stock was taken.

Mississippi River Trade—The West Kentucky Coal Company, at Caseyville, Ky., has made a contract to ship 600,000 tons of coal, at the rate of 200,000 tons a year, down the Mississippi to New Orleans. The coal is to be used chiefly as bunker coal for steamships.

Coal Traffic Notes

Tonnage originating on Pennsylvania railroad lines east of Pittsburg and Erie, years to July 24, short tons:

	1908.	1909.	Changes.
Anthracite	2,925,651	2,769,958	D. 155,693
Bituminous	18,165,406	19,855,345	I. 1,689,939
Coke	3,799,751	5,647,645	I. 1,847,894
Total	24,890,808	28,272,948	I. 3,382,140

The total increase this year to date was 13.6 per cent.

Coal tonnage reported by Southwestern Interstate Coal Operators' Association in May was: Missouri, 183,801; Kansas, 414,657; Arkansas, 123,237; Oklahoma, 159,490; total, 881,185 short tons. No shipments were reported in May, 1908, on account of the suspension of mining.

Coal tonnage originating on Southern Railway, five months ended May 31 was: Tennessee district, 539,445; Alabama district, 932,010; total, 1,471,455 short tons, an increase of 415,274 tons, or 39.3 per cent., over last year.

Coal shipments of the Pittsburg Coal Company, six months ended June 30, short tons:

	1908.	1909.	Changes.
Pittsburg district	5,033,901	5,272,790	I. 238,889
Hocking district	388,151	316,426	D. 71,725
Total coal	5,422,052	5,589,216	I. 167,164
Coke	4,146	214,174	I. 210,028

The total increase in coal shipments this year was 3.1 per cent.

For the fiscal year ended June 30, 1909, the coal tonnage of the Baltimore & Ohio Railroad was:

	1907-8.	1908-9.	Changes.
Coal	23,933,943	22,715,823	D. 1,218,120
Coke	3,700,908	3,883,605	I. 182,697
Total	27,634,851	26,599,428	D. 1,035,423

The total decrease last year was 3.7 per cent.

New York

Anthracite

August 4—There is nothing to be said except that the market continues dull with a very small spurt of business early in the week, which quickly subsided.

On Aug. 1 the summer discount was reduced 10c.; the schedule prices for prepared sizes are now $4.65 for lump, and $4.90 for egg, stove and chestnut, f.o.b., New York harbor. For steam sizes quotations are: Pea, $3.15@3.25; buckwheat, $2.35@2.50; No. 2 buckwheat or rice, $1.70@2; barley, $1.35@1.50; all f.o.b., New York harbor. Occasional lots that are a little off quality can be had for less.

Bituminous

The bituminous trade is rather uninteresting, though slight improvement is reported here and there. New England buyers continue to take a little more coal, especially in the far East. The Sound ports are doing a little better business, but are still rather slow in ordering. All-rail trade is fairly good. Cars are plentiful, but transportation is a little behind time.

New York harbor trade shows very little improvement, and prices are low. Good Miller vein steam coal can be had at a delivered price which nets $1.30@1.35 at mines, while lower grades bring 90@95c. per ton at mines, and gas coal can be had at 60@65c. per ton at mine for run-of-mine.

In the Coastwise trade vessels are still in good supply. Freights continue low, and boats are in many cases shading the standard rates, which are 60c. from Philadelphia to Boston, and the same price from New York to points around the Cape. There is some complaint of slowness in unloading at the Sound ports.

Birmingham

Aug. 3—Coal operations in Alabama have taken on a decided improvement. No less than 800 men were given employment during the last week in July. The Tennessee Coal, Iron and Railroad Company in addition to starting up all of its own mines has made some contracts with smaller mining companies for coal to cover a period of at least six months. The estimates of the output at the Alabama coal mines for the first half of the year show a big decrease.

Preparations are still under way for much development in the coalfields of this State, plans having been drawn for four new coal mines. The Atlanta, Birmingham & Atlantic railroad is pushing the completion of its line to the Mulga coal mines in Jefferson county. The Southern railway already has a line to Mulga.

Chicago

Aug. 3—General conditions in the wholesale coal market are improving. The summer demand for fine coals is large, and the consumption of lump has increased steadily with the ripening of the harvests of the West and Northwest. It is said in the trade that the harvesting demand probably never was so great and never was for so high-grade coals everywhere. Prices are slightly higher on some grades of lump. The increased buying for domestic supplies is also in evidence, with anthracite sharing, in a slight spurt to get the advantage of the July discount that ended with the close of the week just passed. Eastern coals have bettered, smokeless showing less surplus consignments on tracks and sold at sacrifice prices to escape demurrage, than for several weeks. Shipment to this market from Western mines is now, in general, nearly regulated to prevent demurrage complaints, but any increase in receipts of lump or fine coals without a notable increase in the consumptive power of the market, would revive the old conditions.

Illinois and Indiana lump and egg sell for $1.75@2.25; run-of-mine brings $1.60@1.75, and screenings sell for $1.40@1.60. There are still some demurrage sales of

smokeless and Hocking, the former bringing $3.05@3.35 for lump and $2.85@3.05 for run-of-mine. Hocking sells for $3@3.15, though occasionally cut a little lower in a demurrage sale. Gas coals are in light demand, Youghiogheny holding to $3.15 for ¾ in. gas.

Cleveland

Aug. 3—Coal shipments are increasing to such an extent that there is some talk of a possible shortage of cars. So far, however, no such shortage has materialized. Local trade is good, and dealers are beginning to put in winter supplies, and the domestic coal trade is looking up accordingly.

No. 8 district steam coal sells at $1.90@2.05 for lump; $1.70@1.80 for run-of-mine; $1.40 for slack. Middle district steam coal is about 10c. less. Pittsburg lump is $2.15@2.25; run-of-mine, $2@2.05. Pocahontas brings $2.80 for lump and $2.35 for run-of-mine. For domestic coal, Massillon lump is $2.70, Cleveland.

The steamer "De Graff" of the Western Transit Company last week took 12,800 tons of coal from Lorain for Milwaukee. This is said to be the biggest coal cargo ever taken up the Lakes.

Indianapolis

Aug. 2—The mining and movement of coal in Indiana fields has gained during the past week. Operators report an increase in the number of orders and new contracts placed. The railroads are putting many idle cars in commission. With the exception of two mines where strikes prevail, all the mines in the State are putting on full forces of miners. How long this condition will prevail is dependent on the demands for domestic coal and on shipment orders for the Northwest. The public service corporations are at present contracting for their winter's supply.

The appeal of the Indiana association made to T. L. Lewis, international president of the United Mine Workers, in the matter of the strike situation in several portions of the Indiana field, has been withdrawn. P. H. Penna, secretary of the association, has advised Mr. Lewis that they will be able to handle the strikes and that there would be no need for his presence since all difficulties are being settled.

Pittsburg

Aug. 3—The coal market continues quiet and prices irregular. Lake shipments are heavier than formerly, and [illegible]

Connellsville Coke—The market is unchanged in the week, prices continuing at the slightly higher level recently established. Standard Connellsville coke is held at $1.65@1.70 for prompt furnace, and $1.75@1.80 on contract, and 72-hour foundry at $1.85@1.90 for prompt and $2@2.40 for contract.

The *Courier* reports the production in the Connellsville and lower Connellsville regions in the week ending July 24 at 385,452 tons, a gain of about 1000 tons in a week, the net gain in three weeks being about 60,000 tons. Shipments are reported at 4155 cars to Pittsburg, 7198 cars to points west of Pittsburg and 670 cars to points east of Connellsville; a total of 12,023 cars, being a loss of 400 cars in a week, but a gain of 900 cars in two weeks.

Foreign Coal Trade

United States Coal Exports—Exports of coal and coke from the United States, with coal bunkered or sold to steamships in foreign trade, six months ended June 30, long tons:

	1908.	1909.	Changes.
Anthracite	1,353,060	1,470,464	I. 117,404
Bituminous	3,885,168	3,803,216	D. 81,952
Total exports	5,238,228	5,273,680	I. 35,452
Bunker coal	2,968,842	2,986,055	I. 17,213
Total	8,207,070	8,259,735	I. 52,665
Coke	322,758	468,368	I. 145,610

Canada took this year 4,043,068 tons of coal, or 76.7 per cent. of the total exports. The coke went chiefly to Mexico and Canada.

United States Coal Imports—Imports of coal and coke into the United States, six months ended June 30, long tons:

	1908.	1909.	Changes.
Anthracite	15,023	3,125	D. 11,898
Bituminous	816,810	556,841	D. 259,969
Total coal	831,833	559,966	D. 271,867
Coke	59,533	97,844	I. 38,311

Canada sent this year 477,484 tons of coal and nearly all the coke; Australia 61,310 tons of coal. Imports are chiefly on the Pacific coast and on the northern border, into Montana and Washington.

Belgian Coal Trade—Exports and imports of fuel in Belgium, six months ended June 30, were, in metric tons:

	Exports.	Imports.	Excess.
Coal	2,456,029	2,796,011	Imp. 339,982
Coke	501,220	143,667	Exp. 357,553
Briquets	267,740	70,628	Exp. 197,112
Total	3,224,989	3,010,306	Exp. 214,683
Total, 1908	2,809,594	2,835,133	Imp. 25,539

The increase in the total exports this year was 415,395; increase in imports, 175,173 tons.

Welsh Coal Prices—Messrs. Hull, Blyth & Co., London and Cardiff, report current prices of coal as follows, on July 24: Best Welsh steam, $4.14; seconds, $3.96; thirds, $3.84; dry coals, $3.84; best Monmouthshire, $3.60; seconds, $3.48; best small steam, $2.28; seconds, $1.92. All per long ton, f.o.b. shipping port.

Iron Trade Review

New York, Aug. 4—There is not much change in the iron and steel trades to be reported this week. The tendency continues the same as for several weeks past, notwithstanding the season. Trade is active and purchases by manufacturers generally indicate that a large quantity of finished products is going into consumption.

In pig iron probably the greatest activity has been in Eastern territory, where manufacturers have been making good purchases of foundry iron and also of basic pig. Very much the same condition prevails in the central West, where the demand for basic is large and that for foundry iron on the increase. In the West and Northwest business has not been as active as in the East, but there has been a very good total of small orders. Under these conditions prices are naturally firm and in some cases advances have been made, but not to a sufficient extent to discourage business. It is also to be noted that both merchant furnaces and steel company furnaces are taking into their stockyards larger quantities of ore than was expected early in the season. Bessemer pig has been quiet, so far as sales are concerned, but additional furnaces are reported put in blast by the steel companies.

In finished material there is a steady demand for bars, plates and sheets, and also for wire products. Structural material is rather quiet, fewer large contracts being on the market. Small orders continue coming in, however, and there is a heavy demand for nails and similar products, indicating activity in general building.

While the railroads are still holding back on rails, orders for equipment are on rather a liberal scale. The Pennsylvania railroad and the Baltimore & Ohio are each in the market for 5000 new steel freight cars, and several smaller orders are reported. The Long Island railroad has ordered a number of steel passenger cars for use on its lines, which will soon be running through the tunnel under the East river into New York.

Lake Superior Ore Shipments—Shipments of Lake ore are increasing rapidly, and many mines will be called on to furnish a larger tonnage than was expected at the beginning of the season. The July shipments were kept down by the heavy storm which delayed work on the Mesabi range for several days and interfered with the operation of the railroads. This will not prevent the forwarding of a heavy tonnage in August.

Baltimore

Aug. 3—Exports for the week included 558,414 lb. tin scrap to Rotterdam and 3,277,000 lb. steel billets to Liverpool.

Imports included 2070 tons ferromanganese, 951 tons ferrosilicon, 81 tons spiegeleisen and 1000 tons silicious hematite pig; 26,064 tons iron ore from Cuba; 5700 tons manganese ore from Brazil.

Birmingham

Aug. 2—Southern pig-iron quotations continue to look upward and car lots, immediate delivery, have brought $13.50 per ton, No. 2 foundry. Several furnace companies are still out of the market for third-quarter iron and are asking a better price than the prevailing quotations for fourth-quarter deliveries. The make is being increased. Four furnaces were blown in during the month of July and one put out for repairs. Two furnaces will be blown in this week and before the end of the month three others will be put back in operation. The stocks of iron were reduced to a great extent during July, and, with but little exception, all of the iron that is still to be seen at the furnaces in the South belongs to consumers or speculators. There is a steady line of inquiries for iron being received.

The cast-iron pipe trade in the Southern territory continues brisk. Announcement is made that the pipe works at Sheffield, Ala., which have been idle for almost two years, will resume operations this week. Foundries and machine shops are putting on more men as their business improves.

The material has been ordered and the erection of the steel rod, wire and nail mills by the Southern Iron and Steel Company at Gadsden, Ala., is now under way, the plant to be in operation by the first of next year.

Chicago

Aug. 3—Increasing firmness marks the iron market, both sales and inquiries being more numerous. For 1910 delivery the increase is especially notable and has caused the Southern furnaces to hold up stiffly to $13 Birmingham ($17.35 Chicago), with some interests demanding and getting $13.50. On some last-quarter contracts $12.50 is done, but it seems doubtful whether any more will be sold at that figure. The average melter is buying more heavily, now that the tariff uncertainty is about over, and the larger interests are occasionally placing a heavy order. Everything about the general situation goes to indicate an advancing market—at least a strengthening one. There is still an inclination on the part of many melters to buy in small quantities and frequently, but this is disappearing as the market gains more and more confidence.

Northern No. 2 iron brings $16.50@17, the latter figure obtaining on most contracts, and with some sales made for 1910 delivery at higher figures. Most Northern sales are for last-quarter delivery, and in small lots, the demand being widespread and comparatively steady. General conditions of the market for iron and steel products are highly satisfactory to the trade, sales being steadily increasing at advancing prices. The coke market is somewhat dull, with the best Connellsville at $4.70, Chicago.

Cleveland

Aug. 3—Iron ore buying has fallen off, and furnaces are, apparently, not anxious to fill their yards. Sellers look for active business later in the season. Prices are unchanged.

Pig Iron—No large business is reported, but a fair run of small orders. Iron is generally firmly held, though no advance has been made. Bessemer is $16.50@16.75, Cleveland, while $15.75@16 is asked for No. 2 foundry.

Finished Material—The advance in bars and wire products has been generally accepted. Structural steel is quiet for the present. A heavy demand for nails is reported, and small trade in bars is good.

Philadelphia

Aug. 4—The feature of the week has been the buying of large quantities of basic pig, put at 60,000 tons, by concerns which have just closed contracts for finished material calling for basic. The stronger tone of Southern irons has imparted strength to Pennsylvania irons and inquiries received today were answered on the basis of a 50c. advance. Pipe iron has also been contracted for, to be delivered in September and October. Contracts for coke have also been placed. The improvement in forge and foundry has not been so marked, but higher prices are being asked, especially in fourth-quarter deliveries. The mills are more liberal buyers of forge. Local and Eastern markets are taking iron much more freely than for a year. The present indications point to a general advance. Furnace men are willing to sell for immediate or near-by deliveries and are soon to book late-delivery business.

Steel Billets—Billets maintain the advance they have made and manufacturers are booking all the orders they can. Calls are being made by a number of concerns for forging billets.

Bars—During the week there has been an exceptionally good run of small orders from handlers of bar iron, especially for refined. All mills from which reports can be had report more business. Sales at 1.55c. for refined today.

Sheets—After a week or 10 days of quietude, sheet mill orders, especially for corrugated, are now coming along. Prices are about the same.

Pipes and Tubes—The activity in locomotive building and in boiler shops is reflected in tubes. Prices are firm and the next change will be an advance. Pipes are also strong and active.

Plates—The mills are all doing a good business. Prices are firmer on early deliveries of small lots.

Structural Material—The developments are unimportant. Local building operations are taking more steel than usual, but in small lots. Pending car-building requirements for Eastern roads aggregate about 35,000 cars, but the major portion of these wants will not be considered definitely until later in the year unless there should be an alarm set up over advancing prices.

Scrap—Dealers have sold but little. The larger buyers are temporarily supplied. Heavy steel, milling and railroad scrap are high and scarce.

Pittsburg

Aug. 3—The whole iron and steel trade continues to be pervaded with an intensely enthusiastic bullish feeling, so much so that there is some reason to doubt whether the very favorable prognostications can all be carried out. The tone of the market is certainly supported in part by enthusiasm. There is no question that there is a solid foundation, but there is a question as to whether too much is being built upon this foundation.

Nominally the market on bars, plates and shapes has advanced $1 a ton, to 1.30c. on bars and 1.40c. on plates and shapes. This arises from the Carnegie Steel Company having departed from its previous practice of selling generally at 1.25c. and 1.35c. respectively. None of these prices on bars, plates and shapes lately have been the minimum of the market, for there is no regular established market, each sale being made on its merits. Thus, while the steel-bar market for several weeks has been reported at 1.25c. as a minimum, and with most mills doing nothing below 1.30c., we note that we have thorough authentication of the fact that last Friday, July 30, a regular market sale of steel bars was made at 1.20c., Pittsburg, to an Eastern buyer. The prices of 1.30c. on bars, 1.40c. on plates and shapes and 1.50c. on hoops are the regular quotable ones this week, but they do not represent the minima of the market.

The Pennsylvania appears to have placed, or to be about to place, orders for about 3000 steel cars, but authoritative information is not yet available. The entire program for the present appears to cover about 8000 cars, in round figures 3000 for the lines east and 3000 for the lines west, to be built by outsiders, and about 2000 to be built in the company's shops at Altoona.

The advance in merchant steel pipe which was expected to be announced yesterday has not been heard from and it is possible it may be deferred for a time. The independents await action on the part of the leading interest. There has been no information as to shading of merchant-steel pipe prices since the reduction last February, but there has been shading of

line pipe and oil country goods and so far as known this shading continues.

Pig Iron—Producers have been enthusiastically marking up prices, and on a less volume of business than is normally considered sufficient to warrant such a movement. The current make of the merchant furnaces has been steadily increasing in the past few weeks, and the increased make seems to be shipped without difficulty, but little if anything has been done in the way of reducing stockpiles, which are probably as large on the average as they were a couple of months ago. Any advanced price obtained for any grade, even under special conditions, is at once seized upon as legitimate ground for regarding the market as established upon the higher level. While the United States Steel Corporation dropped its project to buy a large tonnage of bessemer, up to 100,000 tons, in the Valley market, there is a new project, to buy about 30,000 tons. This, it is said, arises from the position in the East: the Steel Corporation intended to buy about this tonnage of basic from Eastern furnaces, for its Pencoyd works, but found prices had so advanced that it was preferable to ship basic to Pencoyd from some of its Central Western furnaces, and the idea is to buy bessemer in the Valley market to make up for this iron. It is not at all certain, however, that the purchase will be made. Late last week one or two sales of bessemer were made to Eastern consumers at $16, Valley, and the market immediately was regarded as quotable at that price. The previous sales to consumers in this market had been at $15.50; 25,000 tons to the Youngstown Sheet and Tube Company and a smaller tonnage to a steel-casting concern in Pittsburg. Basic iron has advanced 25c. in the week, the minimum now being $15.25, Valley, which has been obtained on several moderate lots. Foundry iron has been firm at last week's quotation of $15.25, Valley, several sales being made at this price, while furnaces in most cases have withdrawn the figure and do not quote at under $15.50, Valley. We note a sale of 1500 tons Saturday at $15.25, Valley, for delivery August and September and a similar tonnage between the same parties yesterday at the same price, for fourth quarter. We quote as follows, depending on delivery: Bessemer, $16; basic, $15.25@15.50; No. 2 foundry and malleable, $15.25@15.50; forge, $14.50@14.75, all f.o.b. Valley furnace, prices delivered Pittsburg being 90c. higher.

The basic average for July was $15, Valley, or $15.90, Pittsburg, 6c. higher than the June average. The bessemer average for July was $15.17, Valley, or $16.37, Pittsburg, 2c. higher than in June.

Steel—The market has been quiet, but very firm. Bessemer billets cannot be had under $24, Pittsburg, and open hearth not under $25.50, while sheet bars are about $26, all prices being Pittsburg plus freight to destination.

Sheets—The market has been about the same, quiet but with a fair demand sufficient to maintain the rate of production. Prices remain at 2.20c. for black and 3.25c. for galvanized, 28 gage.

Ferromanganese—The market has been fairly active, with prices firm at $41.50@42, Baltimore, for this year and about $43 for next year, at Baltimore, freight to Pittsburg being $1.95 per ton.

Foreign Trade in Iron and Steel

Iron and Steel Imports—Exports of iron and steel, including machinery, from the United States for the six months ended June 30 are valued by the Bureau of Statistics of the Department of Commerce and Labor at $81,114,450 in 1908, and $74,980,203 in 1909; a decrease of $6,134,247, or 7.6 per cent. The leading items of export were, in long tons:

	1908.	1909.	Changes.
Pig Iron	27,643	71,301	I. 43,658
Billets, ingots & blooms	63,683	50,718	D. 12,965
Bars	26,220	36,894	I. 10,674
Rails	82,976	120,644	I. 37,668
Sheets and plates	47,002	79,873	I. 32,871
Structural steel	60,840	70,778	I. 9,938
Wire	70,639	86,069	I. 15,430
Nails and spikes	20,505	23,056	I. 2,551
Pipe and fittings	57,163	72,507	I. 15,344

Increases are shown in a number of items, chiefly due to heavy exports in May and June.

Iron and Steel Imports—Imports of iron and steel and of machinery into the United States six months ended June 30 were valued at $10,220,106 in 1908, and $12,648,003, in 1909; an increase of $2,427,807, or 23.4 per cent. Leading items of imports were, in long tons:

	1908.	1909.	Changes.
Pig iron	46,448	59,602	I. 13,154
Scrap	2,158	2,250	I. 92
Ingots, blooms, etc.	4,977	6,372	I. 1,395
Bars	11,945	6,146	D. 5,799
Wire-rods	5,795	5,685	D. 110
Tinplates	35,991	29,821	D. 6,170
Sheets and plates	1,288	1,883	I. 595

The only considerable changes were the decreases in tinplates and bars.

Iron Ore Movement—Imports and exports of iron ore in the United States, six months ended June 30, long tons:

	1908.	1909.	Changes.
Imports	333,798	572,547	I. 238,749
Exports	71,863	152,331	I. 80,468

Of the imports this year 368,042 tons were from Cuba. Exports were chiefly to Canada.

Imports of manganese ore, six months ended June 30, were 105,332 tons in 1908, and 92,190 in 1909; decrease, 13,142 tons.

Foreign Iron

Iron Ore in Belgium—Imports of iron ore in Belgium, six months ended June 30, were 1,699,143 metric tons in 1908, and 2,057,267 in 1909; an increase of 358,124 tons. Exports of iron ore were 228,138 tons in 1908, and 201,437 in 1909; a decrease of 26,701 tons.

German Iron Production—The pig-iron make of the German blast furnaces in June is reported by the German Iron and Steel Union at 1,067,421 metric tons, being 23,046 tons less than in May. For the six months ended June 30 the total was, in metric tons:

	1908.	1909.	Changes.
Foundry iron	1,122,890	1,163,459	I. 40,569
Forge iron	349,506	351,520	I. 2,014
Steel pig	501,962	523,350	I. 21,388
Bessemer pig	211,533	201,027	D. 10,506
Thomas(basic)pig	3,863,830	4,013,133	I. 149,303
Total	6,049,721	6,252,489	I. 202,768

Total increase this year was 3.4 per cent. Steel pig includes spiegeleisen, ferromanganese, ferrosilicon and all similar alloys.

Metal Markets

New York, Aug. 4—The metal markets on the whole have been quiet, and have tended to weakness, but without any decided changes in prices.

Gold, Silver and Platinum

UNITED STATES GOLD AND SILVER MOVEMENT

Metal.	Exports.	Imports.	Excess.
Gold:			
June 1909	$ 8,346,446	$ 2,417,735	Exp. $ 5,928,711
" 1908	8,626,718	3,449,673	Exp. 5,177,045
Year 1909	63,834,337	20,185,592	Exp. 43,648,745
" 1908	53,517,975	21,141,348	Exp. 32,376,627
Silver:			
June 1909	5,504,437	4,339,275	Exp. 1,165,162
" 1908	4,437,360	3,453,198	" 984,162
Year 1909	29,359,066	22,872,028	" 6,487,038
" 1908	25,514,545	21,141,348	" 4,373,197

Exports from the port of New York, week ended July 31: Gold, $910,300, principally to Argentina; silver, $954,360, chiefly to London. Imports: Gold, $65,698; silver, $119,541, both from Mexico, Central and South America.

The total gold exports noted up to date this year have been over $77,000,000. Of this amount a total of $40,400,000 has gone to Argentina.

Gold—The price of gold on the open market in London, continued at the minimum, 77s. 9d. per oz. for bars and 76s. 4d. per oz. for American coin. There was no special demand for the gold arriving, except from Germany and a considerable part of it was taken for Berlin, the balance going to the Bank of England. In New York there was $1,000,000 gold taken today for Argentina.

Platinum—Business continues quiet and sales small. The market is rather uncertain, but there is no change in quotations, refined platinum being obtainable at $21@22.50 per oz. Hard metal is $26 per oz. Scrap sells for $17@18 per oz., if in good order.

Our special correspondent writes from St. Petersburg, under date of July 22, that the market remains unchanged. Business is very quiet, but that is usually the case through the summer. The large dealers are quoting nominally at Ekaterinburg 4.30@4.50 rubles per zolotnik for crude platinum, 83 per cent. metal. In

St. Petersburg, the quotations for the same grade are 17,500@18,500 rubles per pood. The average of these figures is equivalent to $16.54 and $17.64 per ounce, respectively. Small quantities of crude platinum, however, can be obtained from the smaller dealers at a lower price.

Silver—The silver market has continued steady around 23½d. in London, and closes firm at that figure on buying by the Indian bazars.

SILVER AND STERLING EXCHANGE

July.-Aug.	29	30	31	2	3	4
New York....	50¾	50⅞	50¾	50¾	51	50⅞
London.....	23⅜	23 7/16	23 7/16	...	23 11/16	23½
Sterling Ex.	4.8720	4.8700	4.8690	4.8680	4.8685	4.8685

New York quotations, cents per ounce troy, fine silver; London, pence per ounce sterling silver, 0.925 fine.

Exports of silver from London to the East, Jan. 1 to July 22, as reported by Messers. Pixley & Abell:

	1908.	1909.	Changes.
India.....	£ 4,467,193	£3,723,800	D. £ 743,393
China.....	516,400	1,174,700	I. 658,300
Straits.....	90,510	82,800	D. 7,710
Total.....	£ 5,074,103	£4,981,300	D. £ 92,803

Imports for the week, £12,000 from New Zealand, £2500 from Mexico and £209,500 from New York; total, £224,000. Exports, £2500 to Port Said, £19,500 to China and $405,500 to India; £427,500 in all.

Copper, Tin, Lead and Zinc

July.-Aug.	Copper. Lake, Cts. per lb.	Copper. Electrolytic, Cts. per lb.	Copper. London, £ per ton.	Tin. Cts. per lb.	Lead. New York, Cts. per lb.	Lead. St. Louis, Cts. per lb.	Zinc. St. Louis, Cts. per lb.
29	13⅛ @13⅜	12¾ @13	58½	29¼	4.30 @4.32½	4.15 @4.17½	5.27½ @5.30
30	13⅛ @13⅜	12¾ @13	58¾	29⅜	4.30 @4.32½	4.15 @4.17½	5.30 @5.32½
31	13⅛ @13⅜	12¾ @13	....	29⅜	4.30 @4.32½	4.15 @4.17½	5.30 @5.32½
2	13¼ @13⅝	12⅞ @13	....	29½	4.27½ @4.30	4.15 @4.17½	5.32½ @5.35
3	13¼ @13⅝	12⅞ @13	58⅝	29½	4.27½ @4.30	4.15 @4.17½	5.35 @5.40
4	13¼ @13⅝	12⅞ @13	58 11/16	29⅜	4.27½ @4.30	4.15 @4.17½	5.40 @5.42½

London quotations are per long ton (2240 lb.) standard copper. The New York quotations for electrolytic copper are for cakes, ingots and wirebars, and represent the bulk of the transactions made with consumers, basis, New York, cash. The price of cathodes is usually 0.125c. below that of electrolytic. The quotations for lead represent wholesale transactions in the open market. The quotations on spelter are for ordinary Western brands; special brands command a premium.

Copper—Consumption in this country is steadily increasing, and as a result orders from domestic consumers are coming into the market from day to day. Business with Europe leaves a great deal to be desired. The large exports are reflected in a steady increase in the visible supply, and reports on July 31, showed an addition to the visible supply in Europe of 6100 tons. The market closes steady at 13¼@13⅜c. for Lake, and 12⅞@13c. for electrolytic copper in cakes, wire bars or ingots. The average of casting copper for the week is 12¾@12⅞ cents.

Copper sheets are 17@18c., base for large lots. Full extras are charged, and higher prices for small quantities. Copper wire is 15c. base, carload lots at mill.

When the news of a large increase in the visible supply was published, it was found that it had previously been discounted, and prices rallied, holding fairly steady to the close at £58 13s. 9d. for spot, and £59 12s. 6d. for three months.

Refined and manufactured sorts we quote: English tough, £62; best selected, £61@62; strong sheets, £73@75.

The copper market in July repeated the experience of several months during the last two years. Business having become dull during the latter part of June, and the price for electrolytic having fallen to the basis of 13c., there was a further sagging off in the early part of July under some pressure to sell. The United Metals Selling Company maintained an asking price far above the actual market, which signified simply that it was temporarily out of the market. All of the other agencies, however, engaged in active competition for the comparatively small business that was offered and thus brought the price for electrolytic down to a basis of 12¾c. That price interested manufacturers, both here and abroad, and beginning about July 15 there was some large buying, sales during the following 10 days amounting in the aggregating to 50,000,000 lb. or more, and the price for electrolytic rose to 13¼c., delivered, 30 days, equivalent to about 13⅛c., cash, New York. The United Metals Selling Company then entered the market, July 23, announcing asked prices of 13⅜c. for Lake and 13¼c. for electrolytic, delivered, 30 days, to domestic consumers; and £61 for electrolytic, delivered in Europe. This price was promptly shaded by competitors, and the more active demand having been satisfied, the market immediately began to assume a weaker tone, and a sharp decline followed. Indeed, there was never any great buoyancy to the market, the purchasing of the third week of the month having raised the price only about ¼c., and this in the absence from the market of the largest seller. Throughout July, Lake copper maintained an unusual disparity with respect to electrolytic, owing solely to the absence of any pressure to sell this kind of metal, the market for which is now very closely held. About the middle of the month Calumet & Hecla sold at 13½c., while other producers sold as low as 13¼c. But at the close Lake was readily available at 13¼ cents.

Tin—The increase in the visible supply of 2400 tons was generally expected and had no effect on the market. Buying is rather confident, both here and in Europe, in the expectation of higher prices later on. The close in London is cabled as quiet at £133 7s. 6d. for spot, £134 17s. 6d. for three months; while business in this market is being done around 29⅜ cents.

Lead—There has been some desire by local dealers to force lead for sale, and prices are slightly easier at this end at 4.27½@4.30c., while in St. Louis quotations are unchanged at 4.15@4.17½ cents.

The London market has been a little firmer, and the close is cabled at £12 10s. for Spanish, and £12 12s. 6d. for English lead.

Spelter—It would almost seem as though the rank and file of consumers are only beginning to realize the effect which the tariff is likely to have on the spelter market, as hitherto they have not been trying to prepare themselves for an enactment of the tariff law by laying in liberal supplies. Inquiry has been very urgent this week; prices have advanced from day to day on relatively small transactions, as producers, on account of the uncertainty of securing their raw material, are conservative in their commitments. The close is firm at 5.55@5.57½c. New York, and 5.40@5.42½c. St. Louis.

Spelter quotations in New York, July 29, were 5.42½@5.45c.; July 30 and 30, 5.45@5.47½c.; Aug. 2, 5.47½@5.50c.; Aug. 3, 5.50@5.55c.; Aug. 4, 5.55@5.57½ cents.

Base price of sheet zinc has been advanced to 7¼c. per lb., f.o.b. La Salle-Peru, Ill., less 8 per cent. discount.

The London market is unchanged at £22 for good ordinaries, and £22 5s. for specials.

Other Metals

Aluminum—No. 1 ingots can be had at 20@23c. per lb. for large lots. The higher price is that asked by the American maker.

Antimony—Quotations continue nominal at 8⅜c. per lb. for Cookson's; 7⅝c. for Hallett's; 7⅞c. for U. S., and 7⅜c. for outside brands.

Quicksilver—Business is steady, with New York prices unchanged at $43.50@44 per flask of 75 lb. San Francisco, $43@43.50 for domestic business, and $2 less for export orders. The London price is £8 5s. per flask, with £8 2s. 6d. quoted from second hands.

Nickel—Large lots, contract business, 40@45c. per lb. Retail, spot, from 50c. for 2000-lb. lots, up to 55c. for 500-lb. lots. The price for electrolytic is 5c. higher.

Imports and Exports of Metals

Exports and imports of metals in the United States, six months ended June 30,

are reported as follows, in the measures usual in the trade:

Metals	Exports	Imports.	Excess.
Copper, long tons	152,781	71,522	Exp. 81,259
Copper, 1908	169,399	36,546	Exp. 132,853
Tin, long tons	295	22,004	Imp. 21,805
Tin, 1908	142	18,393	Imp. 18,251
Lead, short tons	50,793	58,852	Imp. 8,059
Lead, 1908	37,083	56,451	Imp. 19,268
Spelter, sh. tons	2,188	1,687	Exp. 501
Spelter, 1908	1,813	482	Exp. 1,331
Nickel, lb.	5,850,122	7,792,374	Imp. 1,942,252
Nickel, 1908	489,865	2,631,817	Imp. 1,142,152
Antimony, lb.	1,042	6,339,430	Imp. 6,335,398
Antimony, 1908	.....	4,156,555	Imp. 4,156,555
Platinum, oz.	.....	55,527	Imp. 55,527
Platinum, 1908	.....	18,988	Imp. 18,988
Quicksilver, lb.	163,018	.....	Exp. 163,018
Quicksilver, '08	101,284	....	Exp. 101,284
Aluminum, value	$271,398	.....	Exp. $271,398
Aluminum, 1908	181,229	.....	Exp. 181,229
Ores, etc.			
Zinc oxide, lb.	17,606,692	.....	Exp. 15,606,692
Zinc oxide, '08, lb.	12,658,979	.....	Exp. 12,658,979
Zinc dross, lb.	10,699,970	.....	Exp. 10,699,970
Zinc dross, '08, lb.	11,981,222	.....	Exp. 11,981,222
Zinc ores, long tons	7,081	54,074	Imp. 46,993
Zinc ores, 1908	14,691	19,759	Imp. 5,068
Antimony ores, lb.	504	3,463,897	Imp. 3,463,393
Ant. ores, 1908	.....	590,497	Imp. 590,497
Chrome ores, tons	.....	18,175	Imp. 18,175
Chrome ores, '08	.....	.....	.....

Copper, lead and nickel include the metal contents of ores, matte, bullion, etc. The exports given include reëxports of foreign material. Imports of zinc ores in 1909 included 43,589 tons calamine and 10,485 tons other ores, against 11,721 and 8,938 tons, respectively, in 1909. Chrome ore was not reported separately last year.

Zinc and Lead Ore Markets

Platteville, Wis., July 31—The base price of 60 per cent. zinc ore was $43.00 43.50 per ton; no premium price was paid. The bulk of the shipment was of intermediate grade; only two cars of roasted ore were sent out. For 80 per cent. lead ore $53.00 54 was paid.

SHIPMENTS, WEEK ENDED JULY 31.

Camps	Zinc ore, lb.	Lead ore, lb.	Sulphur ore, lb.
Platteville	686,010	.....	308,400
Days Siding	140,000	.....	.....
Benton	385,900	138,980	.....
Hazel Green	374,000	.....	.....
Cuba City	665,905	.....	.....
Strawbridge	242,000	.....	.....
Harker	238,400	.....	.....
Linden	186,730	.....	.....
Bewey	180,000	.....	.....
Livingston	160,000	.....	.....
Galena	88,000	.....	.....
Total	3,247,895	138,980	308,400
Year to July 31	74,841,949	3,897,705	6,348,440

Highest is not reported. In addition to the above there was shipped to the American Zinc Ore Separating Company, 203,370 lb., and to the Joplin Separator Works, [illegible] lb. zinc ore.

Joplin, Mo., July 31—The highest price paid for calamine zinc ore was $47, the bulk ranging from $41 to $44.50 per ton; 60 per cent. zinc. Very little ore sold under $44 base price, the market generally ranging on all medium grades. Sixty per cent. zinc sold on a base of $[illegible] per ton, 50 per cent. zinc, with the high price at $[illegible]. The average price all grades was $41.[illegible] per ton. The highest price paid for lead ore was $[illegible] per ton, [illegible]. Advances were anticipated this week, and the market developed a firm tone at the close of the week. The average price of zinc ore was $41.[illegible] per ton.

SHIPMENTS, WEEK ENDED JULY 31.

	Zinc, lb.	Lead, lb.	Value.
Webb City-Carterville	3,652,190	394,800	$ 89,377
Joplin	1,928,660	249,420	49,414
Galena	1,514,980	58,750	34,185
Duenweg	598,150	143,040	16,330
Prosperity	549,390	20,530	12,455
Aurora	374,840	67,170	8,578
Zincite	286,580	.....	6,590
Granby	461,900	21,600	6,005
Quapaw	273,740	15,470	5,895
Alba-Neck	148,230	61,980	4,964
Badger	205,620	.....	4,523
Cave Springs	209,800	.....	4,500
Shoalsburg	232,910	10,470	3,360
Jackson	128,890	.....	2,834
Carthage	86,040	.....	1,901
Sarcoxie	59,270	.....	1,274
Totals	10,711,620	1,043,130	$252,119
7 months	316,889,150	52,251,580	$7,908,662
Zinc value, the week, $223,503;		7 mos.,	$6,502,702
Lead value, the week,	28,616;	7 mos.,	1,405,960

MONTHLY AVERAGE PRICES

Month.	Zinc Ore. Base Price. 1908.	Zinc Ore. Base Price. 1909.	Zinc Ore. All Ores. 1908.	Zinc Ore. All Ores. 1909.	Lead Ore. All Ores. 1908.	Lead Ore. All Ores. 1909.
January	$37.60	$41.25	$35.56	$38.46	$46.88	$52.17
February	36.63	36.94	34.92	34.37	49.72	50.50
March	36.19	37.40	34.19	34.71	49.90	50.82
April	35.40	38.63	34.08	37.01	52.47	55.63
May	34.19	40.06	33.39	37.42	56.05	56.59
June	33.06	44.15	32.07	40.35	60.48	57.52
July	34.55	43.06	31.67	41.11	59.90	55.74
August	36.53	.....	33.42	.....	60.34	.....
September	37.63	.....	34.44	.....	54.59	.....
October	35.95	.....	33.28	.....	52.63	.....
November	39.13	.....	35.02	.....	54.53	.....
December	42.75	.....	39.63	.....	49.68	.....
Year	$36.63	.....	$34.31	.....	$53.93	.....

NOTE.—Under zinc ore the first two columns give base prices for 60 per cent. zinc ore; the second two the average for all ores sold. Lead ore prices are the average for all ores sold.

Petroleum

June 10—Exports of mineral oils from the United States, six months ended June 30, in gallons:

	1908.	1909.
Crude petroleum	48,241,312	69,922,756
Naphthas	17,418,549	36,924,361
Illuminating oils	555,065,566	506,457,233
Lubricating oils	79,706,235	69,461,497
Residuum	28,014,189	51,296,872
Total	722,445,851	735,061,719

Paraffin is included in lubricating oils. The total increase this year was 12,615,868 gal., or 1.7 per cent.

Chemicals

New York, Aug. 4—The general market continues quiet. The tendency has been to await the final settlement of the tariff before placing heavy orders. It is generally expected that the settlement will come this week, and that few changes, if any, will be made in the conference committee report.

Copper Sulphate—Only a moderate business is reported, and there has been no change in prices. Quotations are $4.25 per 100 lb. for carload lots, and $4.35@$4.45 per 100 lb. for smaller parcels.

Arsenic—Dealing has been quiet on account of the uncertainty as to the tariff. The committee report puts arsenic on the free list and this will probably go through. Meantime quotations are 3@3¼c. per lb. for white arsenic.

Nitrate of Soda—Trade in this article is steady and a good business continues to be done. Futures are steady, but spot is a little lower on account of large arrivals. Quotations are 2.12½c. for all positions.

Imports and Exports—The imports and exports of chemicals and raw materials in the United States, six months ended June 30, were as follows:

	Imports.	Exports.	Excess.
Copper sulph. lb.	.....	1,974,995	E. 1,974,995
Bleach, lb.	43,827,247	10,607	I. 43,816,640
Potash salts, lb.	266,419,891	1,688,550	I. 204,731,345
Soda salts, lb.	7,469,848	348,668	I. 7,121,180
Acetate lime, lb.	.....	42,362,135	E. 42,362,135
Nit. of soda, tons	167,136	4,886	I. 162,250
Phosphates, tons	6,086	548,565	E. 542,479
Sulphur, tons	13,727	9,858	I. 3,869
Pyrites, tons	354,631	.....	I. 354,631

Estimating sulphur contents of pyrites the total imports of sulphur this year were 155,570 tons. Exports include reëxports of foreign material.

Mining Stocks

New York, Aug. 4—A stronger market has been apparent on the Stock Exchange, especially during the latter part of the week. There were fair advances in several stocks, and Steel Corporation issues were particularly firm. There is a general impression on the Exchange that the public is coming in to a greater extent than has been the case for some months past. Probably this is the case, though not so great in extent as many brokers would like to see; and the market still bears the impression of inside work to a great extent.

On the Curb, copper stocks were in much greater demand than for some weeks past. Advances were reported in Nevada Consolidated and one or two other stocks, of which there was rather free buying. On the other hand, several of the coppers showed fractional losses. In the gold stocks there was more dealing, and considerable activity was displayed. The Cobalt shares held well and in some of the better known issues there was a good deal of trading. There was considerable trading in Southern Iron and Steel, the reorganized company, which was made quite a feature.

Boston, Aug. 3—Mining shares are at the boiling point and advances have been sharp and rapid. Speculation at the present time is largely in the Lake Superior issues especially those affiliated with Calumet & Hecla interests. Superior Copper has made a record price at $62.50, which represents in advance of $16 within a week. This is due to the rich showing made by rock tests, said to be 35 lb. to the ton. As the Calumet & Hecla owns 50,000 shares of the 100,000 outstanding

it has been an easy matter to mark the price up. When it is considered that but $1 per share has actually been paid in on these shares the price is phenomenal. The mine, as yet, is in the development period, yet it is spoken of as a second Ahmeek. This latter stock, by the way, sold at $200 on the Curb.

Lake Copper touched $30 today, an advance of $0.50 in the week. The showing at depth is extraordinarily good. North Lake is up $1.75 to $10.50, in sympathy.

American Zinc has also been at the front with a $2.50 advance to $32.75. This and other zinc-mining companies are favorably affected by the new tariff. North Butte is now in a better position and the price has risen $3.25 to $59.50. U. S. Smelting stock has been well bought and records a $4 advance to above $55.

Calumet & Hecla is up to $675 per share. Allouez touched $47.50 today; Centennial, $36.75; Isle Royale, $30.75; La Salle, $10.75, and Osceola, $147 per share. Copper Range has advanced $2 to $84.50. Arizona Commercial $3 to $45, and U. S. Oil is up to above $34. Amalgamated is up $2.02½ to $86.12½.

Curb trading has broadened and the better grade of stocks record advances with but few exceptions. Rhode Island Coal holds firm up close to $7.50. Davis-Daly is up almost $1 to $7.25. Yukon showed strength on early dividend talk and Vulture made a new high mark at $8.87½. Ohio Copper and La Rose were soft spots today, in spite of an otherwise strong market.

STOCK QUOTATIONS

NEW YORK	Aug. 4	BOSTON	Aug. 4
Name of Comp.	Clg.	Name of Comp.	Clg.
Alaska Mine	.11	Adventure	7½
Amalgamated	85⅝	Allouez	46½
Anaconda	49½	Am. Zinc	32½
Balaklala	22½	Arcadian	4¾
British Col. Cop.	7⅛	Arizona Comm.	44¼
Buffalo Mines	3½	Atlantic	10¼
Butte Coalition	25¾	Boston Con	16
Colonial Silver	7½	Calumet & Ariz.	108
Cum. Ely Mining	7½	Calumet & Hecla	675
Davis-Daly	7⅛	Centennial	36
Dominion Cop.	7	Copper Range	84
Douglas Copper	1⅛	Daly-West	8
El Rayo	23	East Butte	13½
Florence	2⅞	Franklin	18¼
Foster Cobalt	.32	Greene—Can	10½
Furnace Creek	.05	Hancock	19¼
Giroux	9⅞	Isle Royal	29¾
Gold Hill	½	Keweenaw	3¼
Goldfield Con	7	La Salle	16¼
Granby	103½	Mass	9¼
Greene Gold	⅞	Michigan	10¾
Greene G. & S.	29	Mohawk	65
Guanajuato	1⅛	Nevada	24½
Guggen. Exp.	200	North Butte	58½
Hanapah	‡15	Ojibway	12¾
Kerr Lake	7⅝	Old Colony	‡.50
McKinley-Dar.	.88	Old Dominion	58
Miami Copper	16⅝	Osceola	145½
Miemac	¾	Parrot	39¾
Mines Co. of Am.	¼	Quincy	92
Montezu. of C. R.	29	Rhode Island	7¾
Mont. Sho. C.	1⅝	Shannon	16⅛
Nev. Utah M. & S.	1	Superior	58
Newhouse M. & S.	27¼	Superior & Bost.	16½
Nipissing Mines	10¾	Superior & Pitts.	17¾
Old Hundred	⅝	Tamarack	72
Silver Queen	‡.35	Trinity	13⅛
Stewart	½	U. S. Smg. & Ref.	55
Tennessee Cop'r.	38⅞	U.S.Sm.&Re.,pd.	52
Tri-Bullion	⅝	Utah Con	46
United Copper	9⅞	Victoria	4½
Utah Apex	6¾	Winona	6⅛
Utah Copper	52⅝	Wolverine	155
Yukon Gold	5⅞	Wyandotte	3

‡Last quotation. ‡Last quotation.

N. Y. INDUSTRIAL	
Am. Agri. Chem.	45
Am. Smelt. & Ref.	99½
Am.Sm.& Ref.,pf.	135
Colo. Fuel & Iron	47⅝
Federal M. & S.,pf.	92
National Lead	89⅞
National Lead, pf.	113⅝
Pittsburg Coal	17¼
Republic I. & S.	36¾
Republic I. & S.,pf.	106½
Sloss-Sheffield	86
Standard Oil	‡685
U. S. Steel	75
U. S. Steel, pf.	129⅛
Va. Car. Chem.	53⅞

BOSTON CURB	Low.
Ahmeek	200
Chemung	‡14
Chino	67⅞
Corbin	6⅞
Globe Con	¾
Gila	7
Ray Central	3
Ray Con	17⅛
San Antonio	‡10

Furnished by Hornblower & Weeks, N. Y.

ST. LOUIS	July 31	
N. of Com.	High.	Low.
Adams	.40	.30
Am. Nettie	.09	.07
Center Cr'k	1.75	1.50
Cent.C.& C.	82.50	81.00
C.C. & C. pf.	81.00	80.00
Cent. Oil	110.00	100.00
Columbia	9.00	7.00
Con. Coal	19.00	17.00
Doe Run	110.00	100.00
Gra. Bimet.	.29	.25
St. Joe	12.00	11.00

LONDON	Aug. 4		
Name of Com.	Clg.		
Dolores	£1	5s	0d
Stratton'sInd.	0	3	3
Camp Bird	1	7	3
Esperanza	2	16	3
Tomboy	1	1	3
El Oro	1	5	6
Oroville	0	12	6

Cabled through Wm. P. Bonbright & Co., N. Y.

NEVADA STOCKS. Aug. 4.
Furnished by Weir Bros. & Co., New York.

Name of Comp.	Clg.	Name of Comp.	Clg.
COMSTOCK STOCKS		Silver Pick	.10
Belcher	.65	St. Ives	.05
Best & Belcher	.35	Triangle	.01
Caledonia	.18	BULLFROG STOCKS	
Challar	.18	Gibraltar	02
Comstock	.28	Homestake King.	...
Con. Cal. & Va.	.71	Mont. Shoshone C.	1 56
Crown Point	.43	Tramp Cons.	.04
Exchequer	.27	MISCELLANEOUS	
Gould & Curry	.17	Cumberland Ely.	7.12½
Hale & Norcross	.26	Giroux	10.00
Mexican	.92	Greenwa'r Copper	.04
Ophir	1 22	Nevada Con.	23.87½
Overman	.24	Nevada Hills	.70
Potosi	32	Nevada Smelting.	1 00
Savage	.36	Nevada Wonder	.45
Sierra Nevada	.36	Nevada-Utah	1 93
Union	.45	Penn-Wyoming	...
Utah	.05	Pittsburgh S. Pk.	.45
Yellow Jacket	.79	Ray Central	2.93½
TONOPAH STOCKS		Ray Con.	19.00
Belmont	.82	Round Mt. Sphinx	10
Extension	.47		
Golden Anchor	...		
Jim Butler	.07		
MacNamara	.25		
Midway	.19		
Montana	.75		
North Star	.02		
Tono'h Mine of N.	7.06		
West End Con	.14		
GOLDFI'D STOCKS			
Adams	.01		
Atlanta	.14		
Blue Bell	.03		
Booth	.09		
C.O.D. Con	.12		
Columbia Mt.	.10		
Comb. Frac.	.60		
Con. Red Top	...		
Cracker Jack	.01		
Dia'dfield B. B. C.	.02		
Goldfield Belmont	.04		
Goldfield Daisy	.21½		
Great Bend	.05		
Jumbo Extension	.17		
Kendall	.02		
Lone Star	.02		
May Queen	.04		
Oro	.05		
Red Hill	.06		
Sandstorm	.07		

COLO. SPRINGS	July 30
Name of Comp.	Clg.
Acacia	.07¾
C. C. Con	03
Dante	‡.05½
Doctor	.10¾
Elkton	.70
El Paso	.59½
Findlay	‡.13¾
Gold Dollar	.13¾
Gold Sovereign	.03¾
Isabella	.26
Jack Pot	.09
Jennie Sample	.08
Jerry Johnson	.06¼
Lexington	‡.02
Mary McKinney	.44
Pharmacist	‡.03
Portland	.84
U. G. M.	.05⅝
Vindicator	65
Work	.05

Assessments

Company.	Delinq.	Sale.	Amt.
Alpha, Nev.	July 15	Aug. 6	$0.05
Belcher, Nev.	July 20	Aug. 10	0.10
Best & Belcher, Nev.	July 20	Aug. 10	0.10
Caledonia, Nev.	July 23	Aug. 13	0.05
Con. Virginia, Nev.	Aug. 16	Sept. 7	0.25
Crown Point, Nev.	Aug. 21	Sept. 17	0.10
Ely Con. Copper, Nev.	July 16	Aug. 28	0.03
Exchequer, Nev.	Aug. 16	Sept. 13	0.05
Gold Mt. Champion, Utah	July 26	Aug. 10	0.005
Massasoit, Utah	Aug. 21	Sept. 14	0.005
Mountain Dell, Utah	July 19	Aug. 5	0.01
Pittsburg Con., Utah	Aug. 20	Sept. 17	0.01
Savage, Nev.	July 28	Aug. 18	0.10
Seven Troughs Mon., Nev.	Aug. 18	Sept. 8	0.005
Sierra Nevada, Nev.	July 15	Aug. 10	0.10
Silver Bell, Utah	June 30	Aug. 20	0.01½
Tarbax, Idaho	July 29	Aug. 24	0.005
Tombsy Grand C., Utah	July 19	Aug. 19	0.00
Wasatch Utah, Utah	July 19	Aug. 16	0.01
W. Con. Va., Nev.	July 16	Aug. 10	0.10
Yellow Jacket, Nev.	July 13	Aug. 17	0.25

Monthly Average Prices of Metals

SILVER

Month.	New York.		London.	
	1908.	1909.	1908.	1909.
January	55.678	51.750	25.738	23.834
February	56.000	51.472	25.350	23.706
March	55.365	50.468	25.570	23.227
April	55.505	51.428	25.133	23.708
May	52.795	52.905	24.377	24.343
June	53.663	52.538	24.760	24.166
July	53.115	51.043	24.514	23.519
August	51.683	.....	23.858	.....
September	50.000	51.472	23.877	.....
October	51.431	.....	23.725	.....
November	49.647	.....	22.933	.....
December	48.766	.....	22.493	.....
Total	52.864	.....	24.402	.....

New York, cents per fine ounce; London, pence per standard ounce.

COPPER

	NEW YORK.				LONDON.	
	Electrolytic		Lake.			
	1908.	1909.	1908.	1909.	1908.	1909.
January	13.726	13.893	13.901	14.280	62.386	57.688
February	12.905	12.949	13.098	13.295	58.786	61.198
March	12.704	12.387	12.875	12.826	58.761	56.231
April	12.743	12.56	12.928	12.93	58.331	57.363
May	12.598	12.893	12.788	13.238	57.387	59.338
June	12.675	13.214	12.877	13.548	57.842	59.627
July	12.702	12.880	12.933	13.06	57.989	58.556
August	13.462	.....	13.639	.....	60.500	.....
September	13.388	.....	13.600	.....	60.338	.....
October	13.354	.....	13.287	.....	60.139	.....
November	14.130	.....	14.386	.....	63.417	.....
December	14.111	.....	14.411	.....	62.943	.....
Year	13.208	.....	13.424	.....	59.902	.....

New York, cents per pound. Electrolytic is for cakes, ingots or wirebars. London, pounds sterling, per long ton, standard copper.

TIN AT NEW YORK

Month.	1908.	1909.	Month.	1908.	1909.
January	27.380	28.060	July	29.207	29.125
February	28.978	28.290	August	29.942	.....
March	30.577	28.727	September	28.815	.....
April	31.702	29.445	October	29.444	.....
May	30.015	29.225	November	30.348	.....
June	28.024	29.322	December	29.154	.....
			Av. Year	29.465	.....

Prices are in cents per pound.

LEAD

Month.	New York.		St. Louis	London.	
	1908.	1909.	1909.	1908.	1909.
January	3.691	4.175	4.025	14.469	13.113
February	3.725	4.018	3.868	14.250	13.313
March	3.838	3.986	3.835	13.975	13.438
April	3.993	4.168	4.051	13.469	13.297
May	4.253	4.287	4.214	12.938	13.225
June	4.466	4.350	4.291	12.600	13.031
July	4.744	4.321	4.188	13.000	12.563
August	4.580	.....	13.375	.....	.....
September	4.515	.....	13.125	.....	.....
October	4.351	.....	13.375	.....	.....
November	4.330	.....	13.538	.....	.....
December	4.213	.....	13.156	.....	.....
Year	4.200	.....	13.439	.....	.....

New York and St. Louis, cents per pound. London, pounds sterling per long ton.

SPELTER

Month.	New York		St. Louis.		London.	
	1908.	1909.	1908.	1909.	1908.	1909.
January	4.513	5.141	4.363	4.991	20.563	21.426
February	4.788	4.889	4.638	4.789	20.875	21.589
March	4.665	4.757	4.527	4.607	21.075	21.438
April	4.645	4.965	4.495	4.815	21.344	21.531
May	4.608	5.124	4.458	4.974	19.906	21.975
June	4.543	5.402	4.394	5.252	19.000	22.000
July	4.486	5.402	4.338	5.252	19.031	21.469
August	4.702	.....	4.556	.....	19.350	.....
September	4.769	.....	4.619	.....	19.563	.....
October	4.801	.....	4.651	.....	19.750	.....
November	5.059	.....	4.909	.....	20.875	.....
December	5.137	.....	4.987	.....	20.625	.....
Year	4.726	.....	4.578	.....	20.163	.....

New York and St. Louis cents per pound. London, pounds sterling per long ton.

THE MINING INDEX

The editors of this paper read all the important publications of the world that relate to mining and the treatment of minerals. This index is published as a reference for all interested and to make it impossible for readers of the ENGINEERING AND MINING JOURNAL to miss any important article published anywhere.

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ALUMINUM

9891—LATERITE—Analysen dreier Laterite aus Brasilien. A. Atterberg. (Centralblatt f. Mineralogie, June 15, 1909; 4½ pp.)

ANTIMONY

9892—METALLURGY—Ueber die Abscheidung des Antimons aus seiner Sulfantimonitlösung. W. Schulte. (Metallurgie, April 8, 1909; 5½ pp.) 40c.

9893—PERU—El Antimonio en el Peru. Eugen Weckwarth. (Boletin del Cuerpo de Ingenieros de Minas del Peru, No. 68, 1909; 96 pp.)

ASBESTOS

9893a—PRODUCTION of Asbestos in 1908. J. S. Diller. (Advance Chapter from Mineral Resources of the U. S., Calendar Year 1908; 10½ pp.)

CALCIUM CARBIDE

9894—MANUFACTURE. La Fabrication du Carbure de Calcium. J. Mauduit. (Journal du Four Electrique, July 15, 1909; 1 p.)

CALCIUM CYANAMIDE

9895—MANUFACTURE—Les Progrès de la Fabrication de la Cyanamide. (Journal du Four Electrique, July 15, 1909; 2½ pp.) 40c.

CEMENT

9896—DECOMPOSITION. Étude sur la décomposition des ciments. H. Le Chatelier. (L'Echo des Mines, June 10, 1909; 1 p.)

9897—TESTING. Portland Cement: The Le Chatelier Test for Soundness. Arthur Charles Davis. (Proc. Inst. Civil Engrs., 1909; 12 pp. illustrated.)

CLAYS

9898—CHINA CLAY, as Worked in Cornwall. Lionel Ball. (Queensland Gov. Min. Journ., May 15, 1909; 2 pp. illustrated.) 60c.

9899—CLAY MINING and Its Relation to Coal Mining. Richard R. Hice. (Eng. and Min. Journ., July, 1909; 2½ pp.) 20c.

COAL AND COKE

9900—ANTHRACITE MINE. A Visit to an Anthracite Coal Mine. Warren O. Rogers. (Power, July 20, 1909; 4 pp. illustrated.)

9901—BRIQUETS—Value of Briquetted Coal as Railway Fuel. C. T. Mathewson. (Eng. News, June 24, 1909; 1½ pp. illustrated.) 20c.

9902—BRIQUETTING. A Commercial Coal Briquetting Plant. C. T. Mathewson. (Black Diamond, June 12, 1909; 1½ pp. illustrated.) 20c.

9903—BRIQUETTING TESTS of the United States Fuel Testing Plant, Norfolk, Virginia. C. L. Wright. (U. S. Geol. Surv. Bull. 379, 1909; 40 pp. illustrated.)

9904—CANADA. The Coalfields of Alberta and Saskatchewan. Philippe Thompson. (Eng. and Min. Journ., July 3, 1909; 1½ pp.) 20c.

9905—COAL CUTTING by Machinery. W. B. Gatewood. (Univ. of Birmingham Eng. and Min. Journ., July, 1909; 10½ pp. illustrated.)

9906—COAL DUST—La Lutte contre les Poussières de Houille dans les Mines. (Le Génie Civil, July 17, 1909; 3 pp. illustrated.) 40c.

9907—COAL DUST. The Method of Dealing with the Danger from Coal Dust in the Westphalian Coal District. Bergassessor Forstmann. (Coll. Guard., June 18, 1909; 1 p.) Continuation of article previously indexed. 20c.

9908—COKE—Etude sur la Fabrication du Coke la récolte et le traitement des sous-produits de la Distillation de la Houille. Adrien Say. (Bull. de la Soc. de l'Industrie Minérale, June, 1909; 43 pp., illustrated.) Conclusion of article.

9909—COKE—Steel Corporation's Plant at Joliet for the Manufacture of Coke. (Black Diamond, July 21, 1909; 2½ pp., illustrated.) 20c.

9910—COKE OVEN—Huessener Waste Heat Coke Oven. (Coll. Guardian, July 16; 1909; 2½ pp., illustrated.) 40c.

9911—COKE OVEN PRACTICE—The Pyrometry of the Beehive Coke Oven. J. R. Campbell. (Eng. and Min. Journ., July 17, 1909; 3 pp.) 20c.

9912—COKE OVENS—The Bee-Hive Coke Oven as a Power Plant. J. R. Campbell. (Chem. Engr., June, 1909; 3 pp., illustrated.)

9913—EFFICIENT ENGINEERING—The Value of Efficient Engineering in Coal Mining. L. B. Abbott. (Eng. and Min. Journ., July 24, 1909; 1 p.) 20c.

9914—ELECTRICITY—Dangers Attending Use of Electricity in Coal Mines. James Ashworth. (Eng. and Min. Journ., July 17, 1909; 1 p.) 20c.

9915—ELECTRICITY in Coal Mines. Robert Nelson. (Electrician, July 9, 1909; 2½ pp.) 40c.

9916—ELECTRICITY—Safe Use of Electricity in Coal Mining. George R. Wood. (Eng. and Min. Journ., July 3, 1909; 2½ pp.) 20c.

9917—ELECTRICITY. The Electrical and Coal Mining Industries. F. C. Albrecht. (Eng. and Min. Journ., July 24, 1909; 2 pp.) 20c.

9918—EUROPEAN COAL MINES. J. W. Paul. (Can. Min. Journ., July 15, 1909; 1½ pp.) Address before the Coal Min. Inst. of America. 20c.

9919—EXPERIMENTING STATION at Lievin, France. Tony Valle. (Eng. and Min. Journ., July 3, 1909; 4 pp. illustrated.) 20c.

9920—EXPLOSIONS IN SWITCH BOXES. Sydney F. Walker. (Eng. and Min. Journ., July 24, 1909; ½ p.) 20c.

9921—FIRES. Beitrag zur Bekämpfung der Kohlenstreckenbrände. (Bergbau, June 24, 1909; 1 p. illustrated.) 20c.

9922—FIRES. The Reduction of Fires in Mines. A. G. Moses. (Eng. and Min. Journ., July 24, 1909; ½ p.) 20c.

9923—ILLINOIS. The Coal Mining Industry in Illinois during 1908. (Eng. and Min. Journ., July 10, 1909; 1½ p.) 20c.

9924—ILLINOIS. The Ziegler District Coking Company, Illinois. R. S. Moss. (Min. Wld., June 26, 1909; 2 pp. illustrated.) 20c.

9925—ILLINOIS COAL FIELD, The. A. Bennett. (Colliery Guard., June, 1909; 68 pp. illustrated.) 40c.

9926—MINING THICK SEAMS. Thick Coal Working in South Staffordshire. A. W. Gatewood. (Univ. of Birmingham Eng. and Min. Journ., July 1909; 2 pp.)

9927—PEAT. A Combination of Gas Producer and Coking Chamber. O. K. Zwintzscher. (Journ. Am. Peat Soc., July, 1909; 3½ pp.) $1.

9928—PEAT. Indiana Peat. Its Origin and Value. A. E. Taylor. (Journ. Am. Peat Soc., July, 1909; 3 pp.) Continuation of article previously indexed. $1.

9930—PEAT—Investigation of the Peat Bogs and Peat Industry of Canada, During the Season 1908-9. Erik Nyström and S. A. Anrep. (Canada Dept. of Mines, Bull. No. 1, 1909; 24½ pp., illustrated.)

9931—PEAT—Some Notes on the Swamp Lands and Peat Deposits of North Carolina and Chemical Analysis of North Carolina Peats. G. M. MacNeder. (Journ. Am. Peat Soc., July, 1909; 5½ pp.) $1.

9932—PEAT—The Possible Use of Peat Fuel in Alaska. Chas. A. Davis. (U. S. Geol. Surv., Bull. 379, 1909. 3½ pp.)

9933—PERU—Yacimientos Carboníferos de los Departmentos de la Libertad, Cajamarca y Ancachs. Enestos du Bois Lukis. (Boletin del Cuerpo de Ingenieros de Minas del Peru, No. 69, 1909; 63 pp., illustrated.)

9934—RECOVERY OF PILLARS—Recovering Abandoned Coal Pillars. W. L. Hamilton. (Eng. and Min. Journ., July 3, 1909; 2 pp., illustrated.) 20c.

9935—RESCUE WORK. Henry Cunnynghame. (Univ. of Birmingham Eng. and Min. Journ., July, 1909; 8 pp., illustrated.)

9936—TRANSPORTATION PROBLEM—Mine Inspection with Respect to Car Allotment. H. B. Douglas. (Eng. and Min. Journ., July 3, 1909; 2 pp.) Paper read before the Coal Min. Inst. of America, June 29, 1909. 20c.

9937—TRANSVAAL COAL INDUSTRY, The. (So. Afr. Min. Journ., June 19, 1909; 1½ pp.) 20c.

9938—VENTILATION. The Regulation of Gas in Mine Air Currents. John G. Smyth. (Eng. and Min. Journ., July 3, 1909; 3 pp., illustrated.) 20c.

9939—VIRGINIA—Coal Mining in Southwestern Virginia. D. A. Patterson. (Can. Min. Journ., July 1, 1909; 2 pp., illustrated.) 20c.

9940—WEST VIRGINIA—Coal Mining in Central West Virginia. Floyd W. Parsons. (Eng. and Min. Journ., June 26, 1909; 5 pp., illustrated.) 20c.

9941—WEST VIRGINIA—Coal Mining Methods at Gary, West Virginia. John S. Walker. (Eng. and Min. Journ., July 3, 1909; 1½ pp., illustrated.) 20c.

COPPER

9942—ALASKA. Copper Mining and Prospecting on Prince William Sound. U. S. Grant and D. F. Higgins, Jr. (U. S. Geol. Surv., Bull. No. 379, 1909; 10 pp. and 1 map.)

9943—ANALYSIS. Determination of Copper in Ores, Mattes, etc. Richard K. Meade. (Min. Wld., June 26, 1909; 4 pp. illustrated.) 20c.

9944—BRASS AND COPPER. Laitons et Cuivre. Essais Mecaniques. Étude Micrographique. C. Girard. (La Technique Moderne, June and July, 1909; 24 pp., illustrated.)

9945—CHEMISTRY IN BRASS AND COPPER INDUSTRIES. The Chemist's Relation to the Copper and Brass Industries. Part II. Ernest A. Lewis. (Journ. Soc. of Chem. Ind., June 15, 1909; 6 pp.)

9946—CONVERTING. Copper Converting. A. J. Wendt, J. B. Lowell and F. F. Frick. (Bull. Colo. Sch. of Mines, May, 1909; 12½ pp.) 60c.

9947—METALLURGY. Termo-química de la metalurgia del cobre. (Bol. de la Soc. Nacional de Minería, Mar. and April, 1909; 17 pp.)

9948—MICHIGAN—In the Michigan Copper Country. R. E. Hore. (Can. Min. Journ., July 15, 1909; 2 pp., illustrated.) 20c.

9949—QUEENSLAND — The Cloncurry Copper District, Queensland. Gerard W. Williams. (Eng. and Min., Journ., July 24, 1909; 5 pp. illustrated.) 20c.

9950—ROLLING MILL—An Electrically Operated Reversing Copper Rolling Mill. Alfred Gradenwitz. (Elec. Rev., June 18, 1909; 2 pp. illustrated.) 20c.

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Grains .03½@.04
Naxos Dust .01½@.02
Grains .03½@.04
Chester Dust .01½@.02
Grains .03½@.04
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Rottenstone, ground .02@.04
Lump, per quality .05@.30
Rogue, per quality .05@.30
Steel Emery, f.o.b. Pittsburg .07½@.07¾

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" 48% .06
" 60% .10
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Nitric acid, 38° per lb. .04½@.04¾
Sulphuric acid, 50°, bulk per ton. $12 up
60°, 100 lb. in carboys. .85@1.12½
60°, bulk, ton 16.00@18.00
66°, 100 lb. in carboys. 1.00@1.10
66°, bulk, ton 18.00
Oxalic .....per lb. .06¾@.07

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Denatured .45@.47
Refined wood, 95@97% .50@.55

ALUM—Lump .....100 lb. $1.75
Ground 1.85
Chrome Alum .03¾@.05

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26 deg. lb .04½@.05¾

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Bromide .....lb. .28
Carbonate .07¾@.09¼
Muriate grain .05¾@.06½
Lump .09½@.09¾
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" chem. pure .40

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Precipitated 96@98% 36.00@40.00
Powdered, 80@90% .lb. .02@.02½
Chloride com'l .....ton. 37.00@39.00
Nitrate, powdered, 96@98% lb. .06½@.06¾
Blanc Fixe, dry, bbl....per lb. .02@.04

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Floated " 17.00@20.00
Ground Washed " 20.00@22.00

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BLEACHING POWDER—35% per ton 1.25@1.50

BLUE VITRIOL—Copper sulphate, crystal, per 100 lb. 4.25@4.55

BONE ASH .....lb. .02½@.04

BORAX, 99% " .04½@.05

CALCIUM—
Acetate, gray, 100 lb. 1.75@1.80
Carbide, 100 lb., f.o.b. N. Y., for Jersey City, N. J. .....sh. ton 65.00
Carbide, f.o.b. N. Y. 11.00@14.00

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Portland, domestic 1.50@1.60
Portland, imported 2.50@2.60
Portland, German .85
Portland, English .85
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Neutral, 48% dry, f.o.b. Balt. 14.00@16.00
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FIRE BRICK—
American .....per M. 30.00@40.00
Imported " 30.00@45.00
St. Louis " 16.00
Extra " 20.00@23.00
Special extra " 30.00@35.00

FIRE CLAY—F.o.b. St. Louis.
St. Louis, extra quality, per ton. 5.00
ordinary " 2.50

FLUORSPAR—
Domestic f.o.b. shipping port:
Lump .....lg. ton. 8.00@10.00
Ground " 12.00@14.00
Foreign crude ex. dock 8.00@10.00

FULLER'S EARTH—Lump, 100 lb. .80@.85
Powdered " .80@.85

GRAPHITE—Ceylon.
Flying dust, finest to best..lb. .02½@.04
Dust " .02½@.05
Chip " .04@.08
Lump " .05½@.12
Large lump " .08½@.10½

GYPSUM—
Fertilizer .....sh. ton. 5.00
Ground " 4.00@7.00

INFUSORIAL EARTH—
Ground Am. Best .....lb. .01¾@.02½
German " .02½@.02¾

LEAD—Acetate (sugar of) brown, ...lb. .07¾@.08
Nitrate, com'l " .07¾@.08½

MAGNESITE—Greece.
Crude (95%) .....lg. ton. 7.50@8.50
Calcined, powdered....sh. ton. 26.00@37.00
Bricks, domes, per qual. f.o.b. Pittsburg M. 160@200

MAGNESIUM—
Chloride, com'l .....100 lb. .90@1.25
Sulphate (Epsom salt) 100 lb. .90@1.00

MANGANESE—
Foreign, crude, powdered:
70@75% binoxide .....lb. .01@.01½
75@85% binoxide " .01¼@.01½
85@90% binoxide " .01½@.04
90@95% binoxide " .06½
Ore, 80%-85% .....sh. ton. 16.00@32.50

MARBLE—Flour .....sh. ton. 8.50@9.00

MINERAL WOOL—
Slag, ordinary .....sh. ton. 19.00
Selected " 25.00
Rock, ordinary " 32.00

MONAZITE SAND—
Guar. 97%, with 5% Thorium oxide, normal .....lb. .08 and up

NICKEL—
Oxide, crude, lb. (77%) for fine metal contained .47
Sulphate, single .....lb. .09@.11
Sulphate, double " .06½@.08

NITRATE OF SODA—
100 lb. 95% 2.15
Duty, per 100 lb. 2.15
96% is 2½@7½c. higher per 100 lb.

OZOKERITE—best .....lb. .14@.17

PAINTS AND COLORS—
Litharge, Am. powdered....lb. .05½@.06½
English glassmakers' " .08½@.09½
Lithopone " .03½@.07
Metallic, brown .....sh. ton 16.00@22.00
Red " 14.00@15.00
Ocher, Am. common... " 8.50@9.00
Best " 16.00
French washed ...lb. .02¾@.03
French washed " .01½@.02
Paris green, pure, bbls. 17½@.20½
Red lead, American " .06@.06½
Foreign " .08½@.09½
Turpentine, spirits bbl., per gal. .60@.65
White lead, Am., dry .05½@.06½
American, in oil .06½@.07
Foreign, in oil .10½@.10¾
Zinc white, Am. extra dry .05½@.06½
French, pipe's seal dry .06½@.07
French, pipe's seal oil .07½@.07½

PHOSPHATES—Acid .....per unit
*Florida, land rock 77% 6.50@7.50
Land pebble 68% 3.75@4.00
†Tenn., 78% 3.50@3.50
" 76 4.75@5.00
" 74 4.25@4.50
‡So. Car. land rock 60% 3.00@4.00
*f.o.b. Florida or Georgia ports. †f.o.b. Mt. Pleasant. ‡On cars at Charleston, S. C.

POTASSIUM—
Bicarbonate crystal .....lb. $.08½@.09
Powdered or granulated..." .08¾@.08¾
Bichromate, Am. " .08¾@.08¾
Scotch " .10¾
Bromide " .20
Carbonate (80@85%) " .03¾@.04
Caustic, ordinary " .06¾@.06¾
Elect. (90%) " .05¾@.06
Chloride (muriate), 100 lb. 1.90
Chlorate, powdered " .09¾@.09¾
Crystals " .09@.09¾
Cyanide (98@99%)
Carloads (30,000 lb.) " 18c.
5-ton lots 18½c.
Less than 5 tons .20@.22½
Kainite, long ton, bulk, 8.50; bags, 9.50.
Permanganate .....lb. .09½@.10½
Prussiate, yellow " .13@.13¾
Red " .30@.33
Sulphate (basis 90%) ..100 lb. 2.18@2.21

PYRITE—
Domestic, non-arsenical, furnace size, f.o.b. mines per unit. 11@11½c.
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Imported, arsenical, furnace size, per unit .11½@.12
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Pyrite prices are per unit of sulphur. A deduction of 25c. per ton is made when furnace size is delivered in large lumps.

SALT—N. Y. com. fine 280 lb. bbl. .72@1.13
N. Y. agricultural .....sh. ton. 3.80@4.50

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Refined, crystals " 5.50@6.00

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Ground quartz, ord'ry..lg. ton. 10.00@15.00
Silex, ground " 13.00@15.00
Silex, floated " 35.00@40.00
Lump quartz " 5.00@5.50
Glass sand " 2.75

SILVER—Nitrate, crystals..oz. .33½@.36¾

SODIUM—Acetate .....lb. .04½@.05
"Alkali," per 100 lb., 58/48... .80@.87½
Bicarb. soda, per 100 lb 1.00@1.30c.
Soda, caustic, per 100 lb., 78/60 1.90@2.00
Soda, caustic, powdered .02¾@.03½
Salt cake, per 100 lb., bulk... .40 up
Salt cake, bbl " .65@.85
Soda, monohydrate, per lb. 1.40@1.75
Bichromate .....lb. .06½@.06¾
Bromide " .20
Chlorate, com'l " .08½@.09½
Cyanide ("100% KCN")
Carloads (30,000 lb.) " 18c.
5-ton lots " 18½c.
Less than 5 tons " 19c.
Hyposulphite, Am. " 1.30@1.50
German " 1.60@1.70
Phosphate .....100 lb. 2.20@2.50
Prussiate " .08¾@.09
Sal-soda, f.o.b. N. Y. " .65@.75
Foreign, f.o.b. N. Y. " .80@1.00
Silicate, com'l " .65@1.50
Sulphate, com'l (Glauber's salt) .....100 lb. .60@.80
Sulphate, com'l, calcined " .65@.85

STRONTIUM—Nitrate .....lb. .07½@.08

SULPHUR—Louisiana (prime) to New York .....lg. ton. 22.00 up
To Boston, Philadelphia or Baltimore " 22.50 up
Roll .....100 lb 1.80@2.15
Flour " 2.00@2.25
Flowers, sublimed " 2.00@2.60
Sicilian, extra qual., unmixed seconds, crude brimstone to New York .....lg. ton. $22.00
Other ports 22.50

TERRA ALBA—Fr. & Eng. 100 lb. .80@1.00

TALC—Domestic .....sh. ton 15.00@20.00
French " 18.00@25.00
Italian, best " 30.00@40.00

TIN—Bichloride, 50% .....lb. .09
Crystals " .20½@.23
Oxide, lb. " .32½@.35

URANIUM—Oxide .....lb. 3.50

ZINC—Chloride sol., com. 20° " .02¾
Chloride, granular .05@.06
Dust .05½@.06½
Sulphate .02½@.02¾

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Economic Features of the Birmingham District

Connections with Eight Railway Lines; Cheap Water Haul to New York; Iron Ore, Coal and Flux Occur in Close Proximity

BY JOHN LEGGETT PULTZ*

The Birmingham district has no well defined limitations, but it is generally regarded as comprising the area which yields the principal raw materials for the numerous furnace operations located at Birmingham, and the adjacent cities of Ensley and Bessemer. These three important industrial centers are situated in the most highly developed portion of the mineral belt of Alabama and together they have made the Birmingham district the second most important iron-producing section in the country.

The most important feature of the district and one that has been the paramount cause of its rapid industrial growth is the proximity of raw materials. This fact, together with a self-fluxing quality possessed by some of the ores and their low initial cost, has offset a comparatively low metallic content and allowed pig iron to be produced in the Birmingham district at an exceptionally low figure.

The southeastern edge of the Warrior coalfield and the outcrop of the red ore occur, respectively, in Sand and Red mountains; which extend in a northeast-southwest direction with a distance from summit to summit, near Birmingham, of about five miles. The interval between these mountains consists of two valleys, Opossum and Jones valleys, extending along the base of Sand and Red mountains, respectively, and separated by a narrow ridge having the same general trend as the ridges comprising the coal and iron measures.

The city of Birmingham lies in Jones valley, while its suburbs extend across the dividing ridge and into Opossum valley to the northwest and nearly reach the summit of Red mountain on the southeast. Ensley is situated in Opossum valley about five miles west of Birmingham, while Bessemer is situated about 12 miles southwest in the continuation of Jones valley.

The greater portion of the interval between Sand and Red mountains, from a point some miles north of Birmingham to the southern limits of Bessemer, has become almost one continuous zone of industrial development. Jones and Opossum valleys and Red mountain are comparatively only minor features included in a greater valley, known as Birmingham valley, which extends from Springville southwest for a distance of 75 miles and is bounded on the northwest by the Warrior and on the southeast by the Cahaba coalfield and is separated from Red mountain, about two miles distant, by Shades valley and another minor ridge whose crest line attains about the same elevation as Red mountain.

The minor valleys have greater elevations than the dissected areas comprising the coal measures and in consequence the system of drainage is transverse to the general trend of their axes.

Transportation Facilities

The Birmingham district possesses excellent transportation facilities. Eight important railroads enter the city and there are two terminal stations. The St. Louis & San Francisco system approaches Birmingham from the northwest, and, in connection with the Rock Island and Chicago & Eastern Illinois Railroad, reaches a territory extending from New Mexico to the Great Lakes.

The Illinois Central, pending the completion of its Birmingham division, enters the city over the Frisco and gives direct connections with St. Louis and Chicago, besides reaching the Gulf coast. Communication between northern and southern points is facilitated by the Southern and its allied roads, the Alabama Great Southern and the Mobile & Ohio, which terminate at Mobile and New Orleans. The Seaboard Air Line passes through Atlanta and serves an extensive coastal territory. The South Atlantic coast is also reached by the Central of Georgia and the Atlanta, Birmingham & Atlantic roads at Savannah and Brunswick respectively, the distance from Birmingham to tidewater by these routes being 448 miles. The latter road has only recently been constructed and, pending the completion of its Birmingham division, gains entrance to the city over the Louisville & Nashville. It parallels the latter road through Readers gap, one of the natural cuts affording comparatively light grades

ENTRANCE OF TENNESSEE COAL, IRON AND RAILROAD COMPANY SLOPE ON BIG SEAM, RED MOUNTAIN

PIG AND IRONDALE SEAMS ON RED MOUNTAIN OPPOSITE BIRMINGHAM

*Consulting engineer, 165 Broadway, New York, N. Y.

across Red mountain, while a spur crosses the valley just north of Bessemer and extends into the Warrior coalfield and terminates at the mines of the Birmingham Coal and Iron Company.

The Louisville & Nashville Railroad passes through Birmingham, giving a direct connection with Cincinnati, Louisville and Nashville, to the north; St. Louis and Memphis, to the northwest; Atlanta and Knoxville, on the east and northeast; and touching the Gulf at Mobile, New Orleans and Pensacola.

The Mineral division of the Louisville & Nashville Railroad serves the local territory and hauls a large tonnage of raw materials from the mines to the furnace plants. It reaches the Warrior coalfield, touches practically all the ore mines located on Red mountain, and runs from Bessemer up Jones valley, connecting numerous industrial plants. The division, as a whole, forms a complete loop, in the Birmingham district, distinct from the main line. The characteristic administrative policy of this road to create new business and stimulate development, by the construction of new lines and giving an efficient service, has been an important factor in the rapid growth of the district.

Some of the largest iron operations in the district control their own railroads for the transportation of raw materials to their plants. The United States Steel Corporation owns and operates the Birmingham Southern Railroad which consists of main line and branches connecting a number of the company's mines and furnaces. The Republic Iron and Steel Company also carries a portion of the raw materials over its own rails, while the Woodward Iron Company controls its haulage facilities.

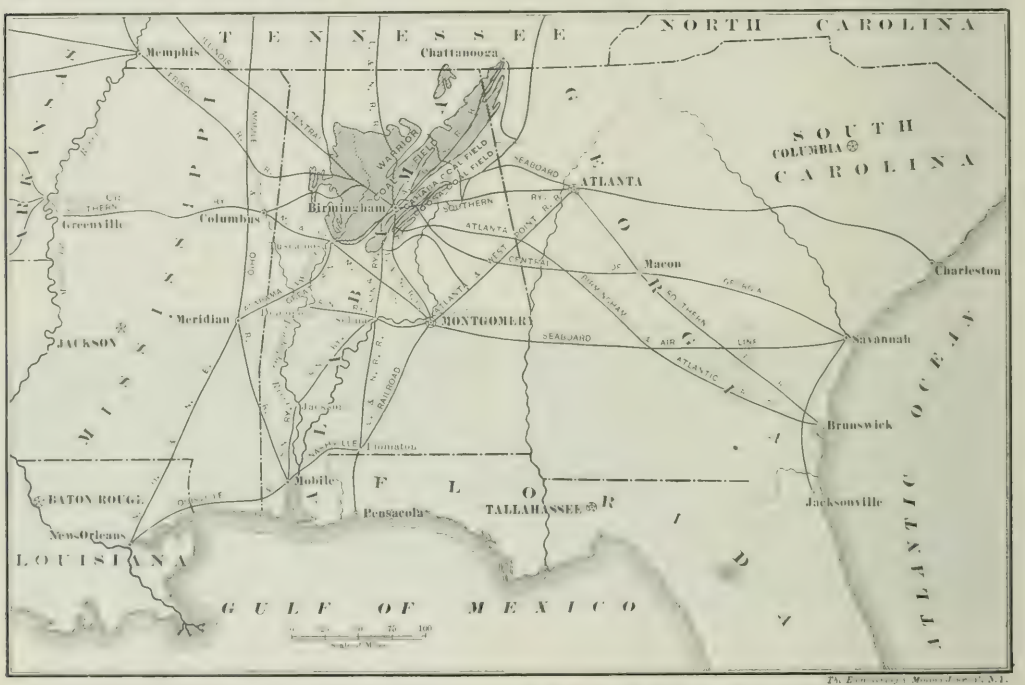
The mining development has been governed, to considerable extent, by the local freight rates applying from the mines to the furnaces. There is a minimum tariff on raw materials to Birmingham. The district rates, broadly speaking, are based upon a maximum haul within a radius of 25 miles of Birmingham. Coal, iron ore and limestone take a rate of 12½c. per ton and coke 15c. The rate for coal and coke is on a net-ton basis, while that for ore is per long ton. These charges are very low and illustrate the policy to encourage development by placing the cost of the initial haul on raw materials at a minimum.

The Birmingham district is centrally located with respect to both the South Atlantic and Gulf coasts. The transportation systems of these two coast lines are distinct from each other, in consequence of which there is active competition. The distance by rail to Savannah and Brunswick is 448 miles as against 260 miles to Pensacola and 273 miles to Mobile. These ports rank among the finest harbors on our coast line and offer excellent facilities for the shipment of coal and iron.

The Louisville & Nashville Railroad has recently completed a large coal dock at Pensacola. The dock is 2440 ft. in length, has 28 ft. of water alongside nearly its entire length, and possesses loading facilities adaptable to the coaling of vessels of various sizes. During 1908, there were shipped from this port, 96,391 tons of coal from the Alabama fields, of which 77,026 tons was bunker coal mostly for foreign vessels.

Mobile is the only seaport of Alabama. It is situated at the head of Mobile bay and is nearly 30 miles from the Gulf. A ship channel is supposed to be 23 ft. in depth but at the present time there are places where it is shallower than this. The coal business of Mobile for 1908 amounted to about 200,000 tons. Mobile is greatly in need of efficient facilities for coaling vessels directly from the railroad coal pockets. Over a thousand miles of navigable waterways within the State empty into Mobile bay through the Mobile river, a fact that must necessarily be an important feature influencing the development of this port.

The Atlanta, Birmingham & Atlantic Railroad Company controls nearly two miles of deep water frontage at Brunswick where it has spent a large sum in the construction of docks and terminal



SKETCH MAP SHOWING RELATION OF BIRMINGHAM DISTRICT TO THE SOUTH ATLANTIC AND GULF COASTS

facilities. The road offers an eastern outlet for the numerous lines terminating at Birmingham. The Brunswick terminal consists of three slips, situated 10 miles from the open sea, capable of accommodating vessels of 28-ft. draft.

Savannah, Brunswick, Pensacola and Mobile are all excellent ports offering facilities for the cheap exportation of the products of the Birmingham district.

The export rate on coal in carload lots to the Gulf is $1 per ton and $2.25 for pig iron. The through rate on pig iron to New York via Pensacola and Savannah is $4.25 per long ton. This joint rail and water rate could undoubtedly be lowered under favorable transportation conditions.

The railroads from Birmingham to the South Atlantic and Gulf coasts penetrate the rich cotton region of the southeast. The ports named are large cotton-shipping points. This fact will undoubtedly have an important bearing on the shipment of pig iron which is a desirable ballast for ships loaded with cotton, large quantities of which are consigned to coastwise and foreign ports.

Water Transportation

The Alabama and Tombigbee rivers and their tributaries have over a thousand miles of navigable waterways and penetrate the heart of the cotton belt. The former river is navigable beyond Montgomery and has a depth of 4 ft. throughout the year, while the Tombigbee and its tributary, the Warrior river, are open to navigation for the greater part of the year. The Warrior river traverses the Warrior coal basin for a distance of over 100 miles. The Government is expending a large amount in the construction of a system of twenty locks on this river which will create a depth of 6 ft. over lock sills and will insure perennial navigation. The head of navigation will be at the forks of the Mulberry and Locust rivers at a point about 23 miles west of Birmingham. The Warrior is a comparatively narrow winding river and will not permit of as large tows as the Tombigbee.

Up to the present time, the products of the Birmingham district have never been regularly shipped to the Gulf by this route. The cost of transporting coal from the Warrior river to tidewater should not be in excess of 40c. per ton if done on a large scale, the up-river tows being consolidated into larger ones at a point down stream where the condition of navigation permits. This estimate applies to coal mined directly on the river and includes the approximate cost for the return haul on the empty barges. If the district rate, 12½c. for an initial rail haul not to exceed 25 miles from the mines to the river, is added to the cost of the water haul, together with 12½c. for rehandling, etc., the total cost from the Birmingham district to tidewater would be approximately 65c. per ton.

The actual cost of transporting pig iron by the river should not vary greatly from the estimates for barging coal. The Central Coal and Iron Company has a modern furnace plant situated directly on the river at Holt about eight miles above Tuscaloosa and will have the advantage of a low water rate to Mobile and the Eastern markets. Transportation costs depend, for the most part, on the volume of business, but it seems safe to say that the cost of the all-water haul to New York should approach the present rate on the rail haul from Pittsburg to New York, which is $2.60 per ton.

It will be a number of years, however, before the improvements to the Warrior river are completed. This river besides being narrow and winding is subject to sudden rises of 50 ft. or more. These conditions, however, will not prohibit the Warrior being a very important means of transportation for the products of the territory through which it flows. To derive the greatest benefit from the improvements to this river, it will be necessary to dredge a deeper and wider channel from Mobile to the Gulf, thereby allowing vessels of deep draft to load to their maximum capacities.

It is therefore evident that both locally and with respect to outside markets, the Birmingham district has excellent transportation facilities. There are also sufficient railroad interests in the field to create active competition and insure good service.

Water transportation must necessarily create low rates and influence moderate rail rates to the Gulf. These conditions must naturally enlarge the markets for Birmingham products. At present the Gulf trade means little to the Birmingham district. The total annual shipment of coal to Mobile does not equal the output of one good-sized mine, while the tonnage at Pensacola is approximately one-half that of Mobile. The combined coal tonnage at both these ports amounts only to about 3 per cent. of the total coal production of Alabama. The Gulf coast in the future will undoubtedly be a far more important outlet for Alabama fuels than it has been in the past. On the completion of the Panama canal, there must be a coaling station at some convenient point, possibly Colon, where vessels from European ports can refill their bunkers. Mobile is about 1371 nautical miles from Colon, while the course from Newport News is about 1800 miles, the difference being approximately 400 miles in favor of the Alabama port. The Gulf coast and Cuba consume several million tons of coal annually. They are the natural markets for the products of the Birmingham district.

BIG SEAM NEAR BIRMINGHAM SHOWING METHOD OF STRIPPING AND OPEN CUT MINING

Occurrence of Red Hematite Ore

The main producing portion of the iron-bearing formation occurs on Red mountain from Morrow gap to Sparks gap, a distance of about 26 miles. The ore-beds outcrop on the northwestern slope of Red mountain near its summit and dip toward the southeast. Four seams have been recognized, only two of which are of economic value at the present time. They are, in sequence, the Hickory Nut, Ida, Big, and the Irondale seams. The first two seams are each several feet in thickness and are separated by an interval of about 16 ft. These seams are often nothing more than ferruginous sandstones and of practically no commercial value, although leached portions of the Ida seam, in which the percentage of iron has necessarily been raised, have been worked. The Big seam and the Irondale seam are the source of practically the entire production of red ore in the district. The Big seam occurs 35 to 50 ft. beneath the Ida seam, while a part-

ing of only a few feet separates it from the Irondale seam beneath. The Big and the Irondale seams are so closely associated in the northern portion of the district, that they are considered practically one.

The outcrop of the Big seam is continuous throughout the extent of Red mountain within the limits of the district. In thickness it varies from 16 to 40 ft. In the northeastern portion of the district, near Irondale, the seam has a thickness of nearly 40 ft. and five miles to the southwest of Irondale it has only about half this thickness. The next interval of five miles to the southwest shows the seam to be about 22 ft. thick, while opposite Bessemer, it is reduced to about 18 ft. including a parting of 3 ft., several feet from the bottom. The continuation of the seam southwest from Readers gap shows it to gradually decrease in thickness until conditions do not warrant mining development at the present time. The thickness of ore recovered probably ranges from 6 to 12 ft. and even as high as 15 ft.

A geological description of the district would only be a repetition of the exhaustive reports of the United States and the Alabama Geological Surveys. Recent investigations undertaken by the United States Geological Survey under the direction of E. F. Burchard, have shown the chemical and physical characteristics of the Big and Irondale seams in the Birmingham district. The resulting valuable report of this thorough examination shows the changes that take place in the ore along the outcrop. Near Irondale, the first 7 ft. of the Big seam ranges from 16 to 20 per cent. metallic iron, 40 per cent. insoluble, and 18 per cent. lime. The next 7 ft. averages in percentage of iron, insoluble and lime respectively 36, 26 and 20; the next 26 ft. shows the iron to range 35 per cent. at the top to less than 20 per cent. at the bottom, while the insoluble rises to over 60 per cent. At the second locality, al-

AVERAGE THICKNESS AND IRON CONTENT OF IRONDALE AND BIG SEAMS

	Average Per Cent. Met. Iron of Outcrop	Average Thickness
1. Irondale seam, Morrow gap to and including Gilliam gap	37	1.51 ft.
2. Irondale seam, Bald Eagle to Clifton gap	40	1.24 ft.
3. Big seam, Bald Eagle to Long Pine gap	26	8.5 ft.
4. Long Pine gap to Graces gap	36	9 ft.
5. Graces gap to a point between Edgewood and Greenwood	31	8 ft.
6. Edgewood to [illegible] Corp. No. 10 slope	36	[illegible] ft.
No. 10 slope to north lip of Woodstock and Lone Oak [illegible]	36.6	5.3 ft.
8. Middle of Woodstock [illegible] to Steele gap	36.8	8.32 ft.

[illegible] described, the upper 10 ft. averaging [illegible] respectively. The iron content decreases gradually below the first 10 ft. At the [illegible] slope on the

[illegible] E. F. Burchard

United States Steel Corporation, midway between Graces gap and Reading, the report shows 8 to 10 ft. of almost a self fluxing ore of 35 per cent. iron, 18 insoluble, and 10 lime. In a number of localities the lime is in excess of the silica content. The interval between Graces gap and Readers gap probably contains the best of the red ore and has the largest producing mines of the district. In the early days of the region only the soft leached ore was mined and practically the entire outcrop of the Big seam was opened up by trenches. Comparatively little of this soft ore remains. Its iron content probably runs over 40 per cent. with a large amount of insoluble and only a trace remaining of the lime content.

[illegible] AND IRONDALE SEAMS AT HILLMAN BESSEMER MINE, SHOWING JOINTS IN BIG SEAM

The Irondale seam is most highly developed in the vicinity of the town after which it is named. It is of little value southwest of a point on Red mountain nearly opposite Birmingham, and farther to the southwest, completely disappears. At Irondale the seam is about 5 ft. in thickness. At a point five miles southwest of Irondale it contains about 38 per cent. metallic iron, 16 insoluble, and 24 lime carbonate.

One of the slopes on Red mountain has been driven down the dip of the Big seam for a distance of over 2,200 ft. and the character of the hard ore has undergone little change in chemical constituents since it was first encountered, a fact which appears to have been borne out in other portions of the outcrop and which substantiates the theory of original deposition. Practically the same conclusions have been obtained by the recent exploitations of the Clinton ores in New York, undertaken by the Geological Survey of that State. A systematic sampling of the hard ore in one mine showed by the resulting analyses that the iron and lime contents increased 1 per cent. for each 1000 ft. down the dip of the hard ore. Before the hard ore is encountered the iron and silica contents decrease and the lime increases.

The Big seam is generally considered as extending from its outcrop on Red mountain to Shades mountain and is thought to flatten out somewhat beneath Shades valley which it underlies at considerable depths.

Limestone and Dolomite

Both limestone and dolomite are used as fluxes in the furnaces of the district. The former is known as the Bangor limestone and occurs at Blount Springs and Bangor. The Knox dolomite outcrops on the eastern side of Opossum valley and is quarried on an extensive scale by the Republic Iron and Steel Company at Thomas, and the Sloss-Sheffield Steel and Iron Company at North Birmingham. The dolomite makes a good flux, being practically a pure carbonate of calcium and magnesia, almost free from silica. Its occurrence in the valley floor in proximity to the furnaces has made its use specially desirable.

Brown Ore Occurrences

The brown ore, or limonite, occurs in the continuation of Jones valley in the vicinity of Woodstock and about 18 or 20 miles southwest of Bessemer. Previous to the development of the red ore on a large scale, the brown ore supplied the furnaces of the district. At the present time, however, it constitutes probably only from 20 to 25 per cent. of the average ore burden. In general this ore is associated with a quartzite, silicious dolomite and chert formation and is very irregular in extent. The ore varies considerably in character. The report of the Alabama Geological Survey gives the following analysis as being characteristic for the brown ores of the region: Lime, 0.75 per cent.; phosphorous, 0.40; sulphur, 0.10; metallic iron, 51; silica, 9; alumina, 3.75.

In 1907, Alabama produced 805,442 tons of brown ore and ranked first in production, with Virginia second and Tennessee third. In the same year, the Greely locality near Woodstock had an output of 132,088 tons. In the Woodstock area, the ore is mined by steam shovels and washed before shipment to the furnaces.

Mining Development

The entire development of the red ore, with the exception of one or two mines on West Red mountain, has been confined to Red mountain, on which active mining

operations are strung along the interval from Irondale to Sparks gap.

The red ore was first attacked by surface workings which consisted of mining by cutting trenches along the outcrop on the northwestern slope of Red mountain and by stripping and open cuts on the southeastern side.

The greater part of the soft ore along the outcrop was removed by the former method which was the general practice in mining the red ores throughout their exposures from Canada to Alabama. In the early days, it was often necessary to haul the ore in wagons for considerable distances to the furnaces. As a rule, the recovery of the ore by the method of trenches entailed only a comparatively small amount of dead work and was accomplished economically. It was the most primitive means of mining and was carried on when the leached ores with their high content of iron were in greatest demand.

The open-cut method of extracting the ore was confined entirely to the southwestern side of Red mountain, owing to the uniformity of the surface with respect to the dip of the ore seam, where the thickness of the measures overlying the seams permitted stripping to be carried on economically. The soft and semi-soft portions of the ore were extracted in this manner.

Underground Mining

The method of underground working as carried on in the past, may be divided into two methods depending on the mines developed by means of adits along the strike, or slopes in the general direction of the dip of the seams.

The first method of underground work was used on the southwestern slope of Red mountain where ravines had cut the ore, leaving it exposed on both banks and permitting adits to be driven in both directions on the strike of the seam with grades in favor of the loads. The method employed in recovering the ore was by a series of upsets driven from the adit tunnels.

The three methods of mining the Big seam, which have just been described, are well illustrated at the Helen Bess mine, situated on Red mountain directly opposite Birmingham. The property is owned by an ore company and the practice in the past has been to dispose of the output to furnace operators. The old trenches which constituted the first method of attacking the Big seam, can still be observed on the northwestern side of the mountain. On the southeastern side, the Big seam is being worked by open cuts. After the stripping takes place the rich portion of the ore is recovered. In mining the ore, advantage is taken of well defined joint planes occurring in the seam. The Irondale seam has been worked to some extent at this locality by means of underground workings. The seam is exposed for a distance along a ravine which has about the same dip as the ore. At regular intervals along the exposure of the seam, adits have been driven in the general direction of the strike. The seam at this locality dips at a fairly steep angle and the ore is dumped from the tipples of the different openings into cars operated on a gravity plane, at the foot of which is located the railroad tipple.

The method of mine development in general practice on Red mountain, is accomplished by slopes driven nearly on the line of the dip of the seam and from the outcrop on the northwestern side of the mountain. Cross entries are turned at regular intervals on both sides of the slope. Mining takes place on the up-dip sides of the cross entries until robbing is commenced. A number of slopes exceed 1000 ft. in length; many are from 600 to 900 ft., while some more recent openings probably do not exceed 200 or 300 ft. in length.

Mining development on Red mountain has reached about the highest stage of economic efficiency. As the workings advance down the dip from the outcrop of the ore seams the costs of production must necessarily increase until it will probably be advisable to sink shafts to overcome the long haul in the slopes.

Coal

During the last three years Alabama has ranked fifth among the coal-producing States. The production has steadily increased since 1872 when mining on a systematic basis was first undertaken. In 1907 the annual production amounted to 14,424,863 short tons. Owing to the depressed condition of the coal market and the labor troubles, the output for 1908 decreased to 11,523,299 short tons. These figures include the tonnage extracted from the several distinct coalfields within the State. The 1907 production comprised 827,531 tons of lump coal, 981,889 tons of steam and nut, 965,786 tons of slack and 11,649,657 tons of run-of-mine. Over 50 per cent. of the output for 1907 was produced from five of the largest mines in the State. The accompanying table shows the outputs of several of the largest companies operating in the region.

OUTPUTS OF SEVERAL OF THE LARGEST COMPANIES OPERATING IN THE REGION.

Company.	Short Tons.
Tennessee Coal, Iron and Railroad	3,362,640
Pratt Consolidated Coal (exclusive of its Tennessee mines)	1,518,521
Sloss-Sheffield Steel and Iron.	1,237,100
Republic Iron and Steel	750,865
Alabama Consolidated Coal and Iron.	688,018
Choctaw Coal and Mining.	605,824
Corona Coal and Iron	456,650
Woodward Iron	424,032
Southern Steel	397,500
Central Iron and Steel	288,736

The greater portion of the output of the Warrior field comes from the Brookwood, Milldale, Pratt, American, New Castle, Mary Lee, Blue Creek, Jagger, Jefferson, and Black Creek seams. These have been given in their geological sequence, the first named being the highest in the group. With the exception of the Milldale and Brookwood seams, they all outcrop along the southeastern margin of the Warrior field. The Pratt and Mary Lee seams furnish the largest proportion of the total coal production. The Mary Lee is the thickest seam in the group and ranges from 54 to 120 in.; the Blue Creek comes next with from 72 to 108 in.; then the New Castle from 48 to 78 in.; the Jagger, from 36 to 78 in.; the Pratt, from 32 to 60 in; the Jefferson, 40 to 48 in.; the American, 42 to 48 in., and the Black Creek, from 30 to 36 in. These figures are taken from mines in operation.

The coals of the Warrior basin are extensively used for the manufacture of coke and supply the entire consumption of fuel for the furnaces in the Birmingham district.

Mining—Labor

The favorable mining conditions and the proximity of the seams to the furnace plants has caused extensive development along the southeastern margin of the coal measures. At the close of 1907 there were 114 slopes, 9 shafts and 201 drifts, comprising a total of 324 openings.

The cost of production is low. It is necessary, however, to wash the coal before converting it into coke. Many mines have been opened in the interior of the field and the Birmingham Coal and Iron Company has recently completed a shaft at Mulgay from which mine a large production will be made.

The methods of mining employed in the Warrior field do not vary from the general practice in other regions where similar conditions exist. The larger proportion of the mines are free from explosive gases and ventilation is accomplished both by means of furnaces and fans, and in a few cases, by exhaust steam. The scarcity of water for the numerous furnace plants is a problem which can probably be solved most advantageously by constructing a pipe line from the Coosa river.

In the past, labor conditions in the Birmingham district have been unsettled. During 1908 a strike of the coal mines lasted for two months and was the cause of many outrages. The strike was due to the commercial operators declining to renew their contracts with the union. The strike was stopped in September with the result that a large proportion of the mines of the State are now being operated upon the basis of the open shop.

The International Acheson Graphite Company is enlarging its branch works at Niagara Falls, Ontario, by the addition of a new 1000 h.p. furnace.

Development and Design of the Steel Oil Derrick

A Discussson of Construction and Stresses Induced in Drilling Rigs; Latest Improved 80-ft. Steel Derrick Represents Highest Type of Excellence

BY R. B. WOODWORTH*

In the shallow Eastern oilfields the derrick in ordinary use is 55 ft. high and is equipped with crown pulley, sand-line pulley, bull wheel, walking beam, band wheel and sand reel only. The drilling of a well in this field produces a working load of not to exceed 40,000 lb. on the bull-wheel rope and about 10,000 lb. on the end of the walking beam. After the wells are drilled and for the purpose of cleaning, a much lighter derrick can be employed with a load on the bull wheel rope not to exceed 20,000 lb., and on the walking beam 4000 pounds.

In southwestern Pennsylvania and in West Virginia the standard derrick is 80 ft. high, proportioned for a drilling load not to exceed 60,000 lb. on the bull rope and 17,000 lb. on the walking beam.

The California Type

In California, however, there has been developed an especial type of derrick known as the California type. These derricks are made 72 ft. high and the bull wheel is supplemented by a calf wheel which carries the reamers and other tools used in connection therewith to enlarge the holes in advance of the casing, to maintain the alinement and to save time, which last is a very important element in well drilling. Ordinarily the same size timbers are employed in their construction as are used on the 80-ft. derrick in the East. In some cases it is necessary to strengthen the legs of the derricks and bracing, producing what is known as a double derrick. A load of 80,000 lb. on the bull rope is not uncommon in cases of this sort, and instances have been known of the use of a string of casing weighing up to 80,000 lb. For these deep wells a drilling load of 80,000 lb. on the bull rope and 20,000 lb. on the walking beam is not unreasonable. With these heavy loads extra heavy rig irons are necessary, the band-wheel shaft being made 6 in. diameter instead of the customary 4½ inches.

Lumber Required for Wooden Derricks

The weights of the lumber required to build these wooden derricks are approximately as follows:

55 ft. high—18-ft. base—40,000 lb.
72 " " —20-ft. " —57,000 "
80 " " —20-ft. " —67,000 "

Owing to their exposed position on the sides and tops of hills, the oil derricks, houses, etc., are subject to high wind pressures and members must be calculated accordingly. These wind pressures vary in different localities, but the generally assumed load of 30 lb. per sq in with conservative unit stresses should take care of all contingencies. This pressure corresponds to a velocity, figured by the ordinary formulas, of 78 miles per hour.

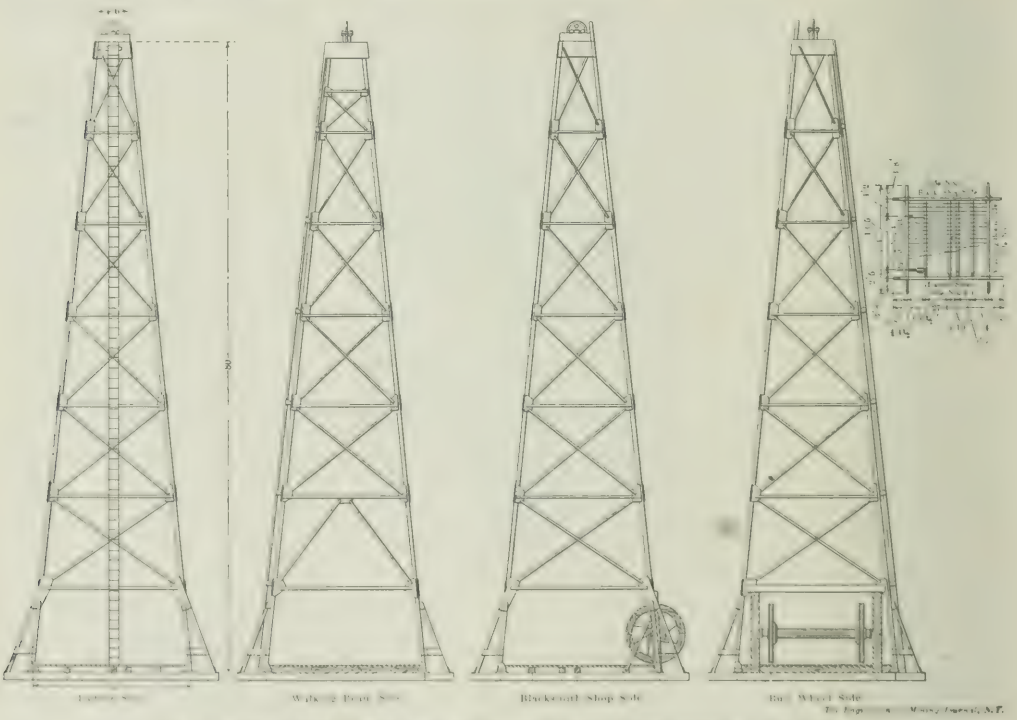


FIG. 1. STANDARD TYPE 80-FOOT STEEL OIL DERRICK, CARNEGIE STEEL COMPANY, 1903 DESIGN

NOTE—Part of an article presented before the structural section of the Engineer's Society of Western Pennsylvania, and published in the June 1909, *Proceedings*.

*Engineer with the Carnegie Steel Company, Pittsburg, Penn.

A recent storm in Pittsburg showed a velocity of 68 miles, which would correspond to a pressure of 23 lb. per square foot.

Character of Induced Stresses

During the operation of drilling and especially when tools or casing are lowered into the wells by the action of gravity, the derrick is subject to intense vibratory stresses which increase with the depth of the well. These stresses, however, are not constant in duration, periods of comparative steadiness being alternated with periods of vibratory strain. In no case are these vibratory stresses likely to exist coincident with high wind pressure. The designer of a steel derrick, therefore, must take account of varied conditions. The problem is that of a machine intermittently in motion.

The bull rope from the string of tools or casing passes over the crown pulley at the top of the derrick and is wound around the bull-wheel shaft. Any drilling load thereon produces a stress of twice its amount on the bearings of the crown pulley. The loads are not exactly vertical, but the crown block distributes them over the top of the derrick, producing direct compression in the legs of the derrick. These stresses are constant from top and bottom and are only increased at the panel points by the vertical increment due to wind pressure. The diagonal bracing and the girts in the tower take wind stresses only, except the girts at the top of the second panel from the bottom. The roof of the house is constructed at this level and the girts have to be figured for bending in addition to direct compression.

The upward pull of the bull rope produces vertical compression in the bull-wheel posts which is transmitted by bending into the girts at the top of the first panel point, or else is converted into tension on the foundations by the anchoring of the bull-wheel posts to the mud sills. The girt at the top of the bull-wheel posts is usually made much stronger and stiffer than the other girts at that level. The pull of the driving ropes from the band wheel produces a horizontal stress in these same posts which must be resisted by diagonal bracing. What applies to the bull wheel applies also to the calf wheel and its supports.

Stresses in the Walking Beam

The walking beam acts as a cantilever, the load on the temper screw being balanced by the pull on the pitman rod, their combined effect being to produce a vertical compression on the samson post. The easiest way to figure a walking beam, however, is to consider it as supported at the temper-screw and pitman ends and loaded at its center with twice the load on the temper screw. The samson post needs to be braced for stiffness only, there being very little stress in anything but a vertical plane and no twisting occurs except the small amount due to the releasing and re-application of the pitman from and to the wrist pin. The jack posts must be anchored down to resist the upward pull of the pitman rod and braced against the derrick by compression braces to resist the pull of the tug rope toward the bull wheel, and against the sill underneath the sand reel to resist the pull of the belt toward the engine.

The stresses in the jack posts are quite complex; they are simplified, however, by making each brace take stresses of a definite character. The knuckle posts are likewise in a condition of indeterminate stress. When the bailer or sand pump is in the well, the wire line with its load produces an upward stress on the inner post acting at an angle of about 25 deg.

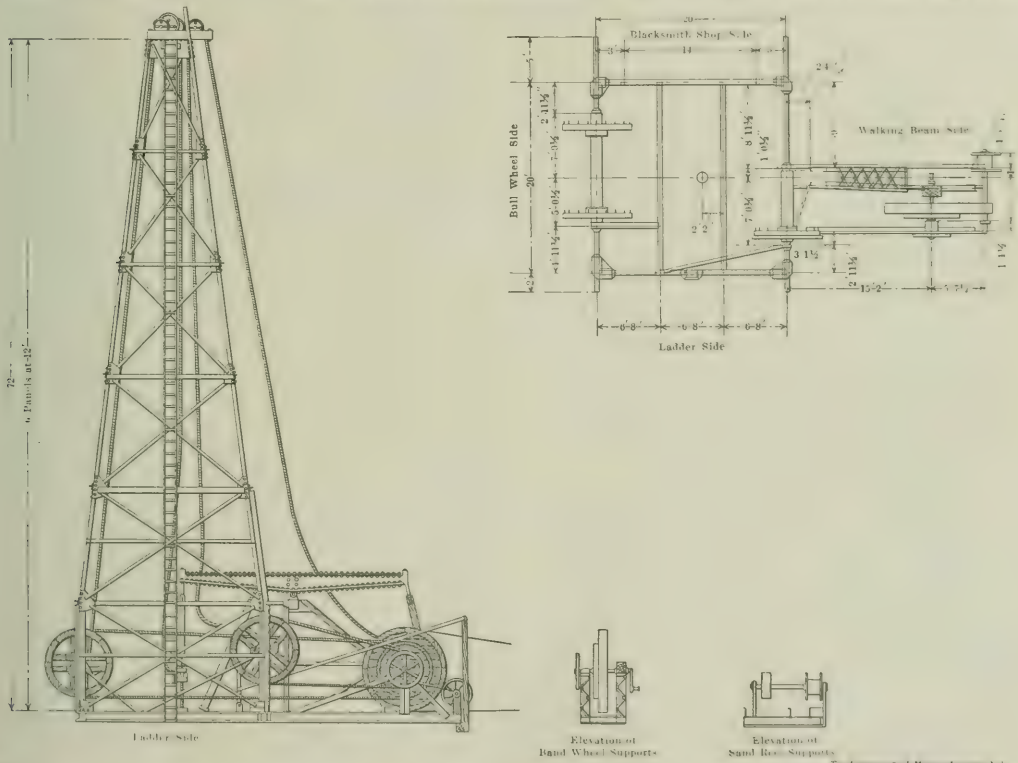


FIG. 2. 72-FOOT STEEL OIL DERRICK CALIFORNIA TYPE, CARNEGIE STEEL COMPANY, 1904 DESIGN

This action is not direct for the reason that the drum of the sand reel is usually several feet off at the working line of the derrick, the shaft being set at an angle and the friction wheels beveled to bear against the band wheel. In the construction of the California-type derrick this complexity has been recognized and allowed for by the use of a special form of sand reel and a special arrangement of knuckle posts. In the steel rig hereafter to be described the working line of the sand reel has been made practically coincident with the working line of the derrick and this complexity of stress eliminated; in general, judgment in the arrangement of braces plays a large part in the designing of drilling equipment and must ever be an accompaniment of theories of structural design. The designer will meet intermediate stresses; he will eliminate them wherever possible.

Foundations

The wooden construction of the foundation has heretofore been extremely heavy, much heavier than observation would indicate as necessary. The four corners of the derrick need to be rigidly supported and the floor immediately around the well hole must be strong enough to bear up the weight of two or three joints of casing, the weight of the string of tools, the sand pump, etc. This usually requires placing transverse joists about 2 ft. each way from the well hole, which ordinarily is 14 to 16 in. off the derrick center. A strong transverse sill is needed under the knuckle posts and the jack posts and the samson post or the longitudinal sills must be strong enough and stiff enough to resist bending. The sill under the knuckle posts also takes an inclined thrust from the engine block brace which abuts against it, and it is necessary to provide stiffness in the sill or a counterbrace against the jack post sill.

Specifications

To meet these stresses the derricks designed under my supervision are subject to the following specifications:

Members in tension under vibratory stress to withstand live load stresses at the rate of 12,500 lb. per sq in. Members in compression to be figured by the formula:

$$\text{Unit stress in lb per sq in} = \frac{50,000}{1 + \frac{l^2}{36,000 r^2}}$$

with a factor of safety of 4, on the assumption that while the derrick may be subject to heavy temporary stresses while drilling the deeper sections of the well, these stresses will be of comparatively short duration with frequent intervals of rest and the derrick will have an opportunity to regain its strength, even though temporarily overstressed. Wind stresses in tension to be figured on the basis of 25,000 lb. per sq in. Length of compression member not to exceed 125 times least radius of gyration except when taking wind stresses only. In all cases the dead load of the structure itself to be considered, especially in the lower leg members. Sills to be figured for bending at 16,000 lb. per sq in. on extreme fibers. At points of concentrated loading, webs of beams and channels to be figured to resist buckling by the formula

$$\text{Allowable unit stress not to exceed} \frac{12,000}{1 + \frac{d^4}{3000\, t^2}}$$

where d is the depth of the beam and t the thickness of web.

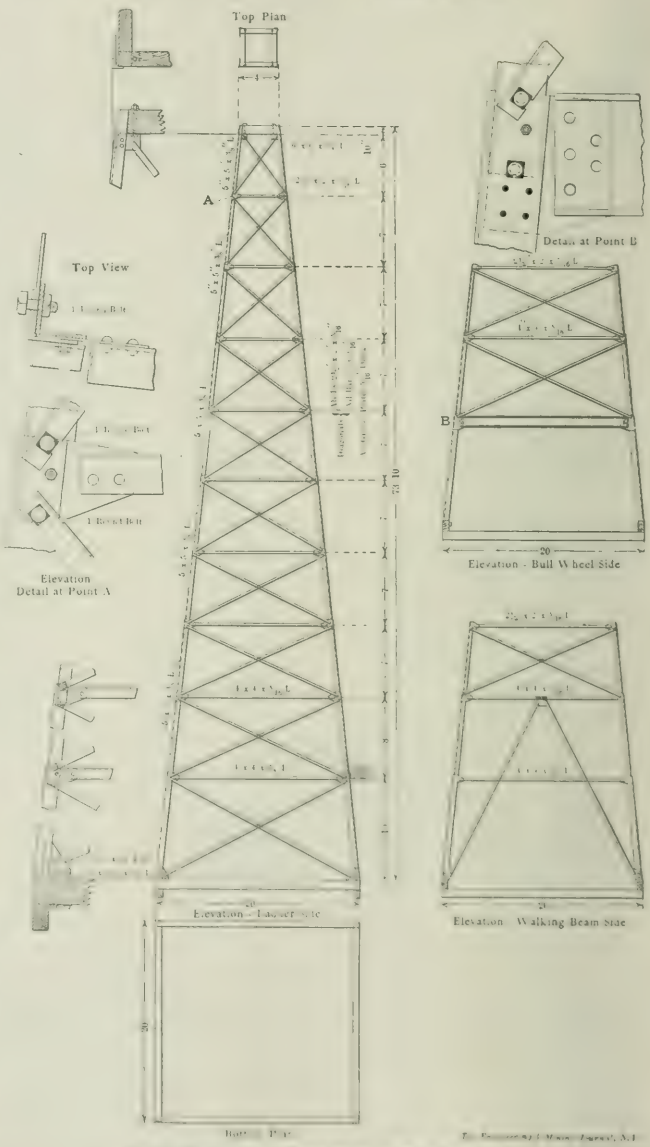


FIG. 3. 72-FOOT YORKE PATTERN STEEL OIL DERRICK

Gusset plates, diagonal braces and other small members to have a minimum thickness of 5/16 in., no material of less thickness than 5/16 in. to be used unless for fillers. Small angles to be used for the diagonals except on the bull wheel

side where angles and bars are to be used so as to present a smooth surface for the slack of the bull rope to strike against. The thickness of angles and plates used for bases and for details in the machinery supports to be 3/8 in. except where increased thickness is necessary to provide proper bearing for shafts, in which cases the formulas covering the bearing value of pins have their application.

The wind stresses require but very little material in the diagonal braces and horizontal girts and in the ultimate analysis the sizes of diagonal braces are fixed by the minimum sizes considered practicable in good shop workmanship, and the sizes of the horizontal girts in like manner are regulated by the proportion of length to the least radius of gyration.

Complete Drilling Machine, 1909 Design

The complete drilling machine manufactured by the Carnegie Steel Company represents the culmination of a development and incorporates in its construction the experience of successful oil-well operators and manufacturers of oil-well supplies combined with the skill of the engineer trained in the theories and practice of structural design. As already intimated, past endeavors in the substitution of steel for wood in the construction of oil- and gas-well derricks have been without much success owing to the lack of intelligent cooperation on the part of the operators and the structural designer.

A Recently Constructed Pipe Derrick

The first metal oil derricks were probably constructed of secondhand steel or iron tubing used in drilling operations with forged connections and diagonal braces made of rods and turn buckles or wire cables. The most recent development of this class of construction is a pipe derrick constructed by the South Penn Oil Company and used over old wells. The legs and girts of this derrick are made of 2½-in. and 3-in. pipe; the diagonal braces of 2-in. and 1-in. pipe; and the ladder of pipe also. The diagonals are fastened together at their intersections by U-bolts, and at their ends they and the girts are forged out flat and fastened to the legs by bolts passing through steel castings which are clamped tightly into position over the abutting ends of the legs by bolts passing through flanges on the outside of the derrick. At the bottom special flange castings are provided into which the legs of the derrick are screwed and which in turn are bolted to the sills. The bull wheel turns between white-oak posts and the upward strain due to drilling is transmitted as tension into the sills. Special castings are also provided at the top to receive the crown block and the crown pulley. This type of construction seems to be very well adapted for use in cleaning purposes over old wells. It requires six men about three days for its erection complete. The material is obtained secondhand in the oilfields and is, therefore, economical. The forging and special castings would seem to a structural man to be an item of considerable expense. Its chief advantage is that the materials can ordinarily be furnished and the work done by the operators in their own shops. The weight of the derrick proper is about 7000 pounds.

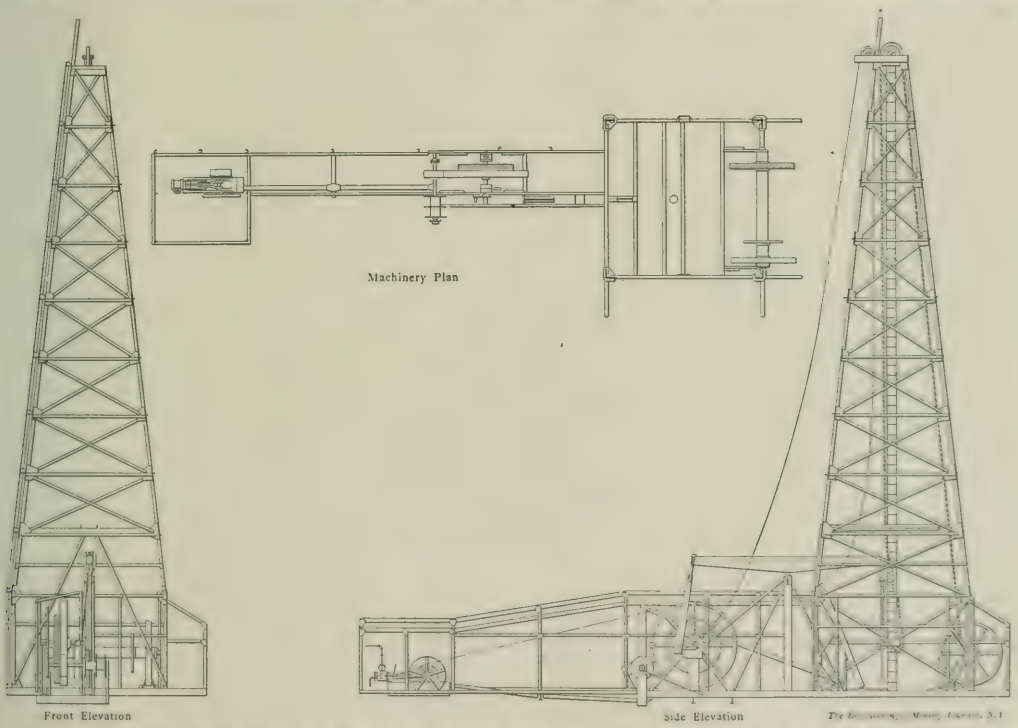


FIG. 4. GENERAL ARRANGEMENT OF 80-FOOT STEEL DRILLING MACHINE, CARNEGIE STEEL COMPANY, 1909 COMPLETE DESIGN

80-Foot Steel Derricks

In 1903 the Carnegie Steel Company built for the South Pennsylvania Oil Company and the Carnegie Natural Gas Company 12 oil derricks which were used in the Pennsylvania and West Virginia oilfields. These derricks were 80 ft. high with a 20-ft. base and were constructed along the lines of the structural steel tower, as shown in Fig. 1. The derrick proper weighed 24,000 lb. and provision was made at the top for the crown pulley and at the bottom for wooden bull wheel supports. No endeavor was made to de-

sign a complete drilling machine. They proved to be fairly satisfactory, were stiff and steady under strain and have been removed from their original location and re-erected in the drilling of more than one well.

72-foot Derrick, California Type

In 1904 the Carnegie Steel Company took counsel with the Oil Well Supply Company for the construction of a standard steel oil derrick 72 ft. high with a 20-ft. base, California type, and the intention in the design which was produced was to construct proper supports for all the machinery, bull wheel, etc. This derrick likewise was constructed along the lines of a structural-steel tower with high panels, requiring the use of gin poles and scaffolding for their erection. Fig. 2 shows their construction, which includes a number of improvements in the arrangement of the crown pulleys, the supports for the bull wheel, calf wheel, walking beam, band wheel, etc., one of the most important of which was the location of the sand reel on the working line of the derrick.

The first derricks constructed under this design were shipped to South America for use in the oilfields of Argentina and Peru after the lower panel of one of them had been erected at Upper Union mills for the proper adjustment of all working parts. The derricks were then shipped to New York via rail and thence via steamer to South America and were hauled inland 300 or 400 miles. The first derrick from which reports were received was erected over a well that had been drilled 1000 ft. deep. The drilling was continued 500 ft. farther when it was decided to move the derrick to a new location. To do this the sills of the machinery supports were disconnected from the derrick foundation and the derrick moved bodily on pipe rollers to a new location two or three miles away. The band-wheel sills with the jack posts and band wheel in place were then hauled bodily by ox team. After arrival at the new location the parts of the derrick were then connected up again and drilling proceeded. This was a severe test, but under such unusual conditions the derrick behaved itself admirably without signs of weakness or injury.

The Yorke Derrick

In the consideration of a proper design for a standard derrick the question has been raised as to whether or not it is possible to construct what might be called a collapsible rig, easy to erect and easy to remove, and in this direction a terrible idea has been brought forward by Patrick Yorke, of the Yorke Derrick Company. Mr. Yorke has introduced numerous improvements in drilling mechanism and practices, one of which is the discovery that in drilling deep wells it is not necessary to revolve the tools. Anything, therefore, which he presents is worthy of careful consideration. Fig. 3 shows a steel oil derrick built for Mr. Yorke along the lines of his design, in wood, covered by letters patent. The essential idea is to so arrange the legs of the derrick that they can be slipped into each other quickly, and the diagonal bracing likewise. The strength of the members to resist wind forces depends on the friction of the angles, etc., against bolts which are secured during erection to the lower members so that the upper members and braces slip readily down over them. Mr. Yorke's derrick has been used in drilling a well 2800 ft. deep and has given entire satisfaction. The idea is new to structural design and use only can determine whether or not it is safe to depart from recognized details of construction.

Later Improvements in Steel Drilling Rigs

The California-type oil derrick shipped to South America was equipped with a steel walking beam equivalent in strength to the best 12x26-in. white oak, but had the disadvantage of requiring the use of scaffolding for its erection. The next step in the development of the steel oil derrick was to reduce the hight of the panels to permit ease of erection and to construct the bull wheel, band wheel and other parts heretofore made of wood, of steel. Fig. 4 shows the latest improved form of steel drilling rig which is now a complete machine designed along well approved lines and fitted for repeated and continuous service as a machine and possessing within itself, so far as consistent with stiffness and strength, all the elements of simplicity and portability. The improvements incorporated in this machine as the results of observation and experience may be summarized as follows:

(1) The reduction in the hight of the panels to permit erection without any special equipment in the way of scaffolding and to facilitate removal of the derrick from place to place, with provision for the proper ladder to enable workmen to ascend and descend as the drilling operations may require.

(2) The square construction of the bottom panel of the derrick with the elimination of buttresses and other extraneous devices for the prevention of overturning under wind stresses. The extra material which these buttresses would require has been utilized for the bull and calf wheel posts, which are preferably vertical. In this type of construction the upward reactions of the drilling loads on bull and calf wheels have been modified in direction and are transmitted not into the girt by bending, but directly into the foundations by a diagonal system of bracing which relieves the derrick itself of any upward stresses which might cause its collapse.

(3) The foundation of the derrick proper is constructed of standard beams and channels so arranged as to distribute the load of the structure to concrete or masonry piers at the corner points of the derrick. The joists have been arranged with such a reference to the well hole as to be in proper position to support the string of tools, casings, etc. The sills for the machinery supports are also beams and channels so arranged as to be directly under the points of maximum loading. The knuckle posts have been arranged so as to bring the center line of the sand reel directly on the working line of the derrick, and in general the arrangement of the bracing, the foundation and the other details is such that indeterminate stresses have been entirely eliminated.

(4) The bull-wheel shaft is made of pipe with a special type of gudgeon threaded into its end and held in place by tap bolts. It carries a tug wheel and a brake wheel made of steel-beam spokes bolted into an angle rim secured to the bull-wheel shaft and carrying at their ends a bent channel rim filled with wood fillers properly grooved for the reception of the tug rope and correctly leveled for the steel band brake. These wood fillers, ordinarily known as "cants," are connected to the channel rims by bolts. They can be very easily taken off and replaced when worn. The spool is made of angles framed into each other and bolted to an angle rim secured in turn to the bull-wheel shaft. The wooden handles for starting the bull wheel off center are replaced by gas pipe held in position by bolts passing through the flanges of the channel rim.

(5) The walking beam is built up in a tapered shape exactly similar to the wooden walking beam by the use of plates and angles. It is slotted at one end to receive the temper screw and at the other end carries a standard stirrup for the attachment of the pitman. The beam itself is supported on a column composed of two channels latticed and braced by an A-shaped structure connected with the derrick itself with provisions for the direct transmission of the load into the foundation sills. The thrusts at the bottom of the A-frame are taken care of by the channels to which they connect in the foundation, acting as ties and preventing any lateral displacement. The top of the frame is braced by angle braces to the derrick proper, forming, in connection with the girt, a triangular truss.

(6) The jack posts are also constructed of short latticed channel columns rigidly framed between the channels of the sills and braced against the derrick and the sand reel sills by angle braces. It will be noted that the inner jack post is also braced to the A-frame of the walking beam, producing great stiffness and rigidity.

(7) The inner knuckle post is framed

directly to the end of the sand-reel sill and stiffened by an angle and plate diaphragm riveted to the top of the main machinery-support sills. The bearing for the sand reel at the top of the inner knuckle post is made adjustable to permit a movement of the sand reel an inch or two in a horizontal line to secure proper bearing of the friction pulley against the band wheel. The outer knuckle post is in two parts, the bottom of which is framed rigidly to the sand-reel sill; the upper portion consists of a long channel with tapered end carrying the other bearing of the sand reel and pivoted at its connection with the lower portion by a 2-in. cotter pin. This channel forms the swing lever for the operation of the sand reel.

(8) The band wheel has been constructed in a similar manner to the bull wheel by the use of steel plate flanges keyed on the standard band-wheel shaft and carrying spokes to which is connected a channel rim similar to that used in the construction of the bull wheel. This channel rim is cambered about 3/8 in. at its center to provide proper bearing against the friction pulley on the sand-reel shaft and for the proper application of the belt. This rim has been furnished in two ways: in the one case with the back of the channel turned out where it became necessary to use an old canvas belt to obtain proper friction against the iron pulley on the sand-reel shaft; in the other case the flanges of the channel have been turned out and filled with wooden cants exactly similar to those employed on the brake side of the bull wheel. The tug portion of the band wheel is made of a smaller channel bent to a circle and connected to the spokes of the band wheel by angle and plate gussets. The flanges have been turned out and the wheel lined with wood to receive the tug.

(9) The sand reel used on these derricks is the regular California double-drum iron reel and in general an endeavor has been made in all instances to use standard rig irons such as are kept by dealers in oil-well supplies. The crown pulleys, bull-wheel bearings, temper-screw and pitman bearings, saddle blocks, jack-post bearings and sand-reel bearings are of the regular standard type of construction; so also are the band-wheel shaft, wrist pin and pitman.

These rigs have been employed in drilling wells 3000 ft. deep. They have been taken down and moved from place to place and have given excellent service. They possess a rigidity, stiffness and reserve strength which imparts confidence to the driller. It has been intimated that a derrick ought to possess a certain amount of elasticity and springiness. I do not believe the point well taken. I look upon a drilling rig as a machine and like a machine it ought to possess stiffness under all working conditions. In actual operations when a derrick trembles, I tremble also.

In connection with the derrick, machinery supports and drilling mechanism, proper provision has also been made in the 1909 standard drilling machine for a light angle frame to take corrugated sheet covering to protect the workmen from the wind and the weather. This frame is punched for the bolting of wooden nailing strips to which the corrugated sheets are attached by roofing nails so as to be easily removable when drilling operations are completed. The only wood employed in the construction of this drilling machine, apart from that already indicated, is the 2-in. planking of the derrick floor.

The weight of a standard 80-ft. drilling machine, including derrick proper, base, ladder, walking beam, machinery supports, structural material for house, corrugated iron, bull and band wheels, crown pulleys, sand reel, etc., etc., is 57,000 lb. It is confidently believed that this drilling machine, combining engineering skill with practical experience, is absolutely reliable and adequate to the service it has to perform and, therefore, represents the highest type of excellence.

Reports of Some French Companies

SPECIAL CORRESPONDENCE

The Société Minière et Métallurgique de Peñarroya smelted, in 1908, 86,225 tons of ore and produced 57,946 tons of lead and 79,082 kg. of silver, an increase of 3213 tons of lead and 4103 kg. of silver over the 1907 production. The company has erected a zinc-dressing plant, but this was not ready to operate during 1908. The gas produced in roasting blende is to be utilized for making sulphuric acid, and later a superphosphate plant will be added.

The company buys much ore from the miners of the region of Peñarroya and is interested in various mining enterprises in Spain. The development work at the mines of Villanueva del Duque confirmed the promising indications previously reported and induced the company to erect a new concentrating plant and equip the mines with a complete electric-power station, compressor, etc. The company has recently bought the property of the Nueva Sociedad de las Minas del Horcajo, and a group of mines at San Eduardo in the Conquista region.

The company also owns important collieries, the output of which was 400,001 tons, an increase of nearly 20,000 tons over 1907. The new Antelin colliery is to be equipped at the end of this year with a coal washery, screening plant and electric hoist. At Panka, 10 new coke ovens are under erection and a new electric hoist and air compressors are to be installed.

The new 44x156-in. water-jacket lead furnace, recently shipped by Fraser & Chalmers, will be erected by September, when the old Pertusola furnace will be dismantled. A dividend of 52.80 fr. per share was declared, and since the formation of the company in 1881 the sum of 57,397,980 fr. has been written off for depreciation of the various plants.

OTHER COMPANIES

The Compagnie Française des Mines et Usines d'Escombrera-Bleiberg did not declare any dividend for 1908, the profit of which was only 672,071 fr. The sudden drop in price of lead and zinc caused the company a loss in 1907. During last year the works owned, leased or managed by the company produced 25,831 tons of lead and zinc and 20,129 tons of iron. The works in Spain and Belgium produced 4642 tons of zinc, 317 tons of oxide, 6606 tons of lead and 7295 kg. of silver. The results of the Escombrera smelting plant were poor, owing to the low price of lead and spelter. On the other hand the results of the Bleiberg works were pretty good and have still improved. The company is interested in mines situated in the neighborhood of its own on zinc-lead lodes in the Sierra de Carthagène. Further it has interests in two companies it helped to float, the Société des Mines de Charbon de Puertollano and the Compagnie Minière de Villanueva del Duque.

The Laurium Français, operating in Greece, reports only 326,000 fr. in 1908 against 733,500 in 1907. The dividends were brought down in consequence from 22.50 fr. to 10 fr. per share. This reduction is due chiefly to the fall in lead and zinc. To guard against the exhaustion of its concessions, the company has joined the Iron Ore Corporation in the working of iron-ore deposits in Locrida. It is also interested in the Caramanian Iron Corporation, reported to be developing favorably, and has finally annexed the Dardessa mines at a cost of 270,187 francs.

The year 1908 closes for the Compagnie d'Aguilas with a loss of 161,255 fr. against a profit of 1,106,704 fr. made the year before. The company, indeed, has been engaged on specially large development work. The output amounted to 8857 tons lead and 11,038 kg. silver, showing a falling off of 208 tons lead and 210 kg. silver from 1907. The report ascribes to the fall in metals a decrease of about 1,200,000 fr. in the receipts, but gives no particulars about the works. The Mazzaron mines still supply most of the output, though the narrowing of the veins makes costs higher and causes larger developments to be necessary. Work is hampered by water difficulties at the mines of Gorguel and Carolina. Conditions are improving at Azagra and at the Joaquina mine production is assured for two years.

At the end of June, 1909, the number of Chinese remaining in the Transvaal was only 53,78

Railway Construction in Copper River District, Alaska

The Guggenheim-Morgan interests are building a railroad, known as the Copper River and Northwestern railway, into the heart of the Copper river district, southern Alaska, starting from tidewater at Cordova (Eyak), Prince William sound. Its inland terminus, for the time being, is to be in the vicinity of the Kennicott Mines Company's Bonanza copper mine, in the Chitina valley, a distance of nearly 200 miles from Cordova. Last year 54 miles were completed; about 48 miles to Miles Glacier lake, across which, pending the erection of a steel bridge, a ferry is operated, and thence six miles to Abercrombie rapids. Trains are run to the lake, transporting men, supplies and construction materials.

This [illegible] construction work embraces the section of the road from the end of the completed track along the Copper river to just beyond the junction of the Tribal river with the larger stream. It is expected that by the close of the season the road will have been completed [illegible] to a point [illegible] from Cordova and [illegible] weather and other [illegible] throughout the [illegible] miles from its ocean terminus. The railway is standard gage, and is being substantially constructed with a view to permanence and suitability for heavy traffic.

The construction of a branch railway through Katalla to the Bering river coalfield has also been commenced. This branch will be 66 miles in length, but construction work has been suspended until some difficulties that have arisen in connection with title to coal lands shall have been overcome.

The Copper river region, the prospective abundant mineral resources of which have induced capitalists to undertake railway construction at an estimated cost of $20,000,000, has been given much attention during the last 10 years by the U. S. Geological Survey, reports having been made by Schrader, Spencer, Mendenhall, Moffit and Maddren.

CAISSON AT MILES GLACIER BRIDGE, COPPER RIVER RAILWAY

According to a British consular report, the production of mica, which is found chiefly in the Uluguru Mountains, near Morogoro, German East Africa, has largely increased in the last two years. There are now 35 mines in operation employing about 500 men. The mica is split, trimmed and packed in boxes. Mica also exists in smaller quantities at the north end of Lake Kivu and near Mahenge.

Two Records of Costs in Drilling Rock with Electric Air Drills *

The Temple-Ingersoll drill is operated by air furnished by an electrically operated pulsator. The machine is manufactured by the Ingersoll-Rand Company, of New York. Where electrical power can be had for operating the pulsator, and the drill is not needed for continuous work such a style of drill has special advantages, as it is not necessary to keep up power during the whole day as must be done when the drill is operated by either air or steam. The pulsator is portable, thus allowing both it and the drill to be moved easily from place to place.

The Brier Hill collieries, of Crawford, Tenn., have been using one of these drills, a 5 D, in their mines for about 18 months for drilling holes in the roofs of several entries. The rock varies from slate to sandstone and conglomerate rock, and F. B. Taylor, general manager of the mines, who has kindly furnished us with the information regarding this drill, states that the drilling was done through the hardest roof he had ever encountered in 30 years' mining experience.

* Abstract of an article in *Engineering Contracting*, April 7, 1909.

A 5 D drill is equivalent to an Ingersoll-Sergeant 3½-in. drill, and has a stroke of a little more than 8 in. It will drill a 16-ft. vertical hole from 1¾ to 2¾ in. in diameter. It has a 5½-h.p. motor. Such a drill is intended for the heaviest work in large tunnel headings, open cut work in quarries or railroad grading, or in shaft sinking, or mining.

Some Details of 16 Months' Work

During 16 months' work with this drill, holes were drilled in the roof of the main entry of one mine, a distance of 600 ft.; in driving three entries of another mine, a distance of 250 ft. in a new haulway, 200 ft. in the second left entry, and 275 ft. in the third left entry.

These three entries were driven simultaneously, the drill being moved from one entry to another as it was needed. Only one hole was drilled in the roof of each of these entries each day, the average depth of a hole being 7 ft. It took the drill runner and a helper from 20 to 30 min. to unload the drill from a car and set it up, while the hole was drilled in about 20 min. About a half day was consumed in drilling the three holes and making the necessary moves, more than three quarters of the time being taken up in moving and setting up the drill.

With wages for the drill runner at $3.50 for a 9-hour day and $2 for the helper, this gives a labor cost of 13c. per ft. of drilling. Upon one occasion, the crew drilled 7 holes in a 9-hour shift, aggregating 42½ ft., which substantiates the cost of 13c. per ft. Mr. Taylor states that during the 16 months this work was going on, outside of sharpening the steel bits, not one cent was spent in repairs or for maintaining the drill—a rather unusual record for any drill.

Low Cost in Quarrying

The Superior Portland Cement Company, of Superior, O., have three 5 C size of these drills at work in their limestone quarries. We are indebted to J. B. John, manager of the company, for the following account of work done by these drills.

The vein of limestone averages about 8 ft. in thickness. To blast out this limestone, holes 6 ft. deep and 2½ in. in diameter are drilled. Each drill puts down, on an average, 17 of these holes per day. Thus three drills do 306 ft. of drilling per day. There is blasted out on an average of 500 tons of limestone per day, equivalent to 220 cu.yd. This gives an average of 1.4 ft. of drilling per cubic yard of rock blasted, place measurement.

With wages for the drill runner at $3.50 per day, and helper at $2 per day, this gives a cost for labor for drilling of 5.4c. per ft., and 7.5c. per cu.yd. of rock blasted, which is a very low cost, accounted for, however, by the rapid drilling done by this machine.

Another factor that enters into the rapid work done by one of these drills is its tremendous back-pull or stroke, making the drill work itself loose in a bad hole and preventing it becoming "stuck." Even when the steel binds, there is a pull and push on the piston, at full power, for every revolution of the pulsator, and this works it loose almost instantly. Mr. John states that the wear and tear on these drills has been very light.

It is reported that the Japanese government has made a contract for 500,000 tons of iron ore to be shipped from Lower California to Japan. Whether this contract means the realization of the more ambitious plan which the Japanese government has been investigating, namely, of securing extensive raw material, including iron ore, from the Pacific coast of Mexico, will perhaps depend on the outcome of this contract. A representative of the Japanese government has been more than two years investigating the matter. Undoubtedly Mexico can supply a large amount of iron ore from points tributary to the Pacific coast and the field seems a mutually promising one for Japan and Mexico. Recently an investigation has been made of the possibility of supplying zinc oxide from Mexico for the Japanese paint industry.

The United States army transport "Dix" is now making a voyage across the Pacific, supplied, coined, with coal from Batan island in the Philippines. The voyage is intended to be a working test of Philippine coal.

CHILDS GLACIER FROM MILES GLACIER BRIDGE

Mineral Resources of the South of Colombia, South America

By J. P. Gamba*

The area which I designate as the South of Colombia is a zone of approximately 250 km. in width and probably 200 km. in length, just north of the boundary line between Colombia and Ecuador. In this zone is not included the immense region of the Caqueta and Putumayo rivers. The area is divided into three departments, Pasto, on the north, Ipiales on the south and Tumaco on the west. The last named department is the only one which possesses direct communication with the Pacific ocean; the other two departments, in the interior, are in communication with the ocean partly by the Patia and Telembi rivers and partly by a road which will be described further in another part of this article. The chief town or capital of each department bears the same name as the department; Tumaco is the common seaport for the South of Colombia; Pasto is the most important city.

This country is practically unexplored, and it is only during the last five years that attention has been directed toward its mineral resources. In some localities where the ore is rich, mining operations are being carried on with great success. Lack of capital and the characteristic reserve of the people of the country are the principal causes for the little progress that has been made and so, although the possibilities for the mineral industry are great, the actual production is as yet scarcely significant.

Topography and Geology

Topographically, this territory is very rough and broken; the rivers usually follow a torrential course through profound, abrupt cañons, and navigation is only possible on the littoral. All land communication is difficult, there being few roads.

The most striking geological feature is the volcanic appearance of the country and the almost absolute predominance of eruptive rocks. A few localities show sedimentary rocks, but on account of extreme metamorphism they are quite unrecognizable. The eruptives are chiefly of the andesitic type. Granites, emerging occasionally into syenites, occupy vast areas, in some places they are entirely decomposed, probably through dynamic action. In places the granite is mineralize-bearing. Examples of magmatic segregations of molybdenite and magnetite oxides are not rare. This has not yet been found.

The Cordilleras are high and steep, and generally made up of modern erup-

*Mining Engineer, Bogota, Colombia, S. A.

tives. In connection with the mineralized zones, there are to be noted evidences of volcanic action; in fact, there is one volcano now in activity. Almost the whole surface of the area is covered with tuffs and ashes, so much so that the volcanic material is a great obstacle to prospecting and research.

The Ore Deposits

Exploration of the vein deposits has been conducted in two districts, Samaniego, on the boundary of the departments of Pasto and Ipiales, and Mallama (Piedrancha), in the department of Ipiales. The first-named deposits present a true type of gold-quartz ore; the latter of auriferous silver ore. The mineralized area in both classes of these deposits is of wide extent.

The ore-bearing formations in the two districts comprise two different types of deposits, stockwerk deposits in the altered granite, and fissure veins formed in eruptive or highly altered schists. The stockwerk deposits are somewhat pockety; the fissure veins, however, have proved to be notably regular in mineral content. All the stockwerk deposits carry free gold, but I do not consider them of great importance.

Lode Deposits

Samaniego gold-quartz ores answer well to amalgamation on copper plates. In this district two mines are in operation. They both use native wooden mills, the efficiency of which is about 40 per cent. The amount of gold saved varies from 0.5 to 0.75 oz. per ton; the tailings carry as high as 1 oz. per ton. The average value of the ore is from 1 to 1.5 oz. per ton, but some rich stringers carry as high as 10 oz. or more. Preparations are being made to erect more modern mills and cyanide plants at some of the mines in this region. The yearly production of the district is approximately $360,000.

The Mallama gold-silver ores are complexes of pyrite, mispickel, sphalerite, galena and chalcopyrite, named in the order of their importance, with a little free gold and native silver carried in a gangue of quartz. The richest ore, in which galena predominates, assays as high as 1000 oz. silver per ton, the pyritic ores carry as high as 8 oz. gold per ton. The average value of the ores may be said to be 50 oz. silver and 1 oz. gold per ton. Only exploration work has been conducted in this district. Aside from these districts, the most noteworthy area is in a locality called Tambo, near the town of Pasto. Here a very acidic eruptive rock of the dacite type carries stringers of free gold and pyritiferous quartz. This formation has been worked for many years with varied results. The dacite is covered by a porphyritic rock in which all of the quartz is in lapis-mitted crystals from ½ to 1 in. in width. Rich pockets have occasionally been found here.

Placer Deposits

In the littoral placers have been worked since the time of the Spaniards and the richness of the deposits surpasses all exaggeration. The district of Barbacoas is world-famed and the district of Sanabria is doubtless one of the richest in the world. All work at present in this district is reduced to batea washing by the negroes. The yearly production, calculated from the taxes paid for the exportation of gold, is $240,000.

The total production for the three departments, Pasto, Ipiales and Tumaco, is more than $900,000 per year.

Climatic Conditions

Tropical climates are classified according to altitude. The following classification is used here: Tierras ordientes (torrid climates), temperature 25 to 27 deg. C., elevation above sea level, up to 600 m.; generally unhealthy. Tierras calientes (hot climates), temperature 23 to 25 deg. C., elevation, 600 to 1000 m.; generally unhealthy. Tierras templadas (middle climates), temperature 18 to 23 deg. C., elevation, up to 2000 m.; generally healthy. Tierras frias (cold climates), temperature 13 to 18 deg. C., elevation, up to 3000 m.; very healthy. Paramos (very cold climates), temperatures 3 to 13 deg. C.; healthy. Above an elevation of 4000 m. the country is generally uninhabitable.

Capital Required

A large amount of capital is not essential for mining operations in this district. An experienced miner with from $10,000 to $30,000 can doubtless, with economy and proper methods, obtain good profits. Although English speaking people are well thought of, there are but few of them in the country. Mine labor is scarce. A small uptodate cyanide plant could obtain splendid results, especally in the province of Mallama, which is so well situated with respect to transportation.

The Barbacoas Highway

The Barbacoas road, which is not yet finished, establishes communication between the whole of the South of Colombia with the Pacific ocean, all articles imported to or exported from the interior passing over it. From the seaport of Tumaco merchandise is shipped to Barbacoas by the Patia river, the fluvial navigation being fairly good. The road begins at Barbacoas and terminates at Tuquerres, being 150 km. in length. The general gradient is 10 per cent., with short stretches approaching 16 per cent. The actual traffic over the road amounts to about 3000 tons yearly. By the expenditure of about $200,000 it would be possible

to transform this road into a good wagon road; if automobile traction were introduced the traffic capacity could be increased tenfold.

The freight charge for the 150 km. is $40 gold per ton, that is, $0.27 per ton-km. for commmon cargo; heavy machinery cannot be transported at present. The limit of weight for heavy pieces is 200 kg. and, in this case, the freight is increased to $2 gold per ton-km. A high freight rate could be maintained were the road improved, as indicated; 10c. per ton-km., for instance, would be a fair charge both for the shipper and the constructor of the road. In addition to the freight charge, shippers pay a tax for the maintenance of the road. At present the yearly revenue is $50,000 gold, leaving a net profit of $20,000. The improvement of this road presents a good investment, for with the high freight tariff and the tax I feel sure that the invested capital would be returned in three years.

As may be readily understood, the future progress of the mineral industry in the South of Colombia depends almost entirely on the transformation of this muleback road into an improved wagon road.

D. Guggenheim on Alaska

Daniel Guggenheim, before sailing for Europe on July 14, distributed a typewritten statement containing the following:

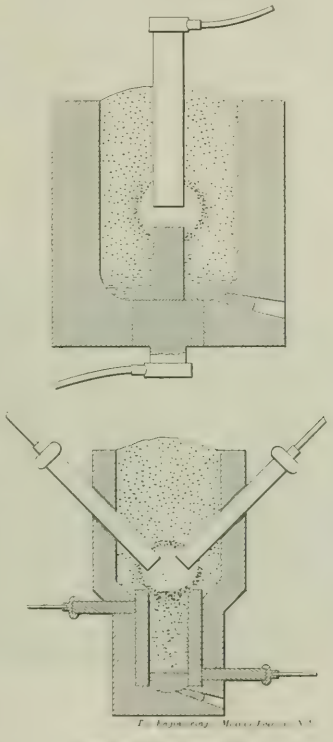
"I have no objections to giving a few suggestions to young men of the East. Vigorous Americans of Greeley's time were advised to go West. My advice to sturdy young men who want to gain the wealth and victory of pioneer development, is to go to Alaska—the magnetic North. In a comparatively few years thousands of men who are now poor in the East will be working, with wealth gained in Alaska, to add new States to the Union, carved out of the enormous areas of this territory. With health, rugged determination, and enough ready cash to tide over the first periods of development, thousands of young Easterners will make their fortunes in this new country.

"Alaska is not a frozen, barren country. It has millions of acres of fertile lands and vast mineral wealth. It is a country in which the poor man can settle and grow rich. Homesteads can now be entered on unsurveyed lands. Mining claims can be staked in a territory which for precious and base metals I consider the richest undeveloped country in the world.

"The Western States were developed with the millions appropriated by the Government and grants of large tracts of land to the railroads. Government aid of this kind, I am convinced, will not be needed in Alaska. The land can be taken by the homeseekers. The financiers who are building railroads in the southwestern section, are certain of the enormous growth of this section of territory. The completion of important sections of the Copper River Railroad by the end of next year will mark a new era in the commercial history of this country.

Electric Reduction Furnace

In U. S. Pat. 921,183, May 11, 1909, Frank J. Tone, of Niagara Falls, N. Y., describes an electric furnace for reducing



TONE ELECTRIC FURNACES

or smelting refractory ores, the products descending from the reaction zone of the arc along an electrically heated resistance conductor. Typical furnaces are illustrated in the accompanying engraving. One of the furnaces has vertical electrodes, the lower electrode being set in a carbon base-block. On the block is a resistance conductor of carbon or other refractory material, offering resistance to the passage of the current and heating the product of the furnace as it descends from the zone of reaction.

The charge of ore or compound containing the material to be reduced, together with the reducing agent, fills the furnace and surrounds the upper electrode. As the reduction progresses the reduced products descend along the heated conductor into the bath below, and are drawn off through the tap hole. The electric circuit which maintains the arc may constitute the same circuit or a different one from that used to heat the resistance conductor. In the lower furnace two electric circuits are used. Here the resistance conductor consists of a cylinder or tube of carbon with separate electric terminals and the upper electrodes project through holes in the sides of the furnace.

Both furnaces are especially applicable to the reduction of elements which, at the temperature of reduction, are subject to losses by volatilization, as silicon and aluminum. It is important in reducing such elements to avoid excessive localizing of heat and to remove the products from the zone of great heat as soon as they are formed. This is accomplished by the resistance conductor, which heats the products and assists in keeping them in a fused condition, facilitating their removal.

Commonwealth Oil Corporation, Limited

SPECIAL CORRESPONDENCE

The Commonwealth Oil Corporation, Ltd., a company of recent formation, owning oil-shale deposits in New South Wales, is creating a new issue of capital for the extension of its operations and the development of the property. Since the formation of the company coal deposits have been found which produced a good coke for which there is a ready sale. There are now 40 coke ovens at work and 60 in course of erection. The capital required for this part of the business of the company was not provided for in the original capitalization, and the fresh capital now being raised is partly to meet the demands that the coal and coke industry requires.

A railway has been constructed to the principal shale deposits in the Wolgan valley, and is now connected with the government railway of New South Wales. The company also owns mines and works at Turbane. In addition to these two interests, a purchase has been made of an oil-producing property at Hartleyvale. This property had been producing oil with an inefficient and wasteful plant, and it is intended to introduce more uptodate machinery and methods of extraction. Several changes have been made in the directorate. Sir John Brunner, of Brunner, Mond & Co., succeeding Sir George Newnes.

A Koppers by-product coke oven, specially designed for the experimental treatment of Western fuels, is being built for the Colorado Fuel and Iron Company, Pueblo, Colo. If the trial unit proves satisfactory, it is understood that a large plant will be installed.

The Middlesboro Coalfield in Kentucky

A General Review of Conditions Prevailing at the Different Mines, with Brief Reference to the Management and Equipment at Each Property

BY JOHN HOWARD*

The coalfields in the vicinity of Middlesboro, Kentucky, have begun to exhibit a marked reaction from the effects of the panic which stopped all progress about a year and a half ago. While there has been a feeble effort to keep the operations going during the dull period, it has been painfully evident that nerve rather than business, acted as the motive power. Taking up the operations immediately adjacent to Middleboro, which are divided into two groups, we will consider the "Mingo Hollow" operations; these are all situated on the waters of Bennetts Fork of Yellow creek, which flows through the city. These operations are situated along about 15 miles of track owned by the Louisville and Nashville Railroad Company, and the Southern Railway Company, and operated by the latter, for which this group of operations is the principal source of supply for engine fuel.

At the head of the Bennetts Fork Branch railroad, which is 9 miles long, is the plant of the Sterling Coal and Coke Company at Mauring, Tenn., one of the best operations in the district, and one of the largest producers. C. S. McManus is president and Walter H. Finkes is superintendent. This is a drift mine, as are all others in this district, and has an incline plane of about 1000 ft. Fenton [illegible] are used in lowering the coal.

This company has a complete electrical equipment both for haulage and for mining machines. Three hundred men are employed and a good quality of steam coal is produced, all of which is taken by the Southern Railway Company. Adjoining the Sterling plant is the lease of the Bryson Mountain Coal and Coke Company, main office Middlesboro, Ky., which under the able management of J. H. Keeney, has been a steady producer for many years. This coal is not only a good steam coal but has an enviable reputation for domestic purposes, and a great deal of it has been shipped for the domestic market during recent years.

Bryson Mountain was the pioneer in installing electric haulage in the Middlesboro district, and the successful demonstration of its advantages by this company was largely instrumental in inducing the numerous other operations to put in similar efficient systems of haulage. This company has also a system of compressed air for its mining machines. The old mine of this company has the drift mouth at tipple height, but it has a new mine higher up on the mountain side which is reached by a retarding conveyor of several hundred feet. For an example of a successful operation, no better could be selected. About 150 men are employed and the output is above the average for the number of employees.

The Reliance Coal Company

The Reliance Coal and Coke Company of Hartranft, Tenn., adjoins the Bryson Mountain lease on the north, and operates the same seam of coal. Daniel Cooper Swab, one of the best known coal operators in the South, and one of the principal owners of the mine, has had immediate supervision for many years. His natural business ability, combined with an inventive insight into coal operating, has enabled him to make his plant an excellent dividend payer. The coal is mined by pick, and tail-rope haulage is used. A short chute is used to get the coal from the drift mouth to the cars. About 225 men are employed and the Southern Railway takes the output.

The Fork Ridge Coal and Coke Company's lease adjoins the Reliance property, and its mines are on the Cabin branch of Bennetts Fork. This is the largest operation in the district; its lease comprises 3000 acres, and the company employs over 400 men. Its main office is at Fork Ridge, Tenn., and A. H. Rennebourn is in charge of the mines. Of this company's two older operations, one mine is at tipple height, and the other uses a slope with an endless-rope haul. During the past few years, the company has installed a plant in a 5 ft. seam requiring an incline of [illegible] ft. Both mines are equipped with electric haulage and electric mining machines.

The coal, which is an excellent steam coal, is easily mined and this company is one of the largest producers in the district, its entire output being under contract to the Southern Railway. The lease

COAL TIPPLE, HOUSES AND COMMISSARY OF THE RELIANCE COAL AND COKE COMPANY, HARTRANFT, TENN.

*[illegible] Middlesboro [illegible]

extends over to the head of the Clear Fork of the Cumberland river, but no operation of this company has been started in that field.

On the opposite side of Bennetts Fork, the Mingo Coal and Coke Company at Hartranft, Tenn., the pioneer operation of "Mingo Hollow" and the company which for years led everything in the district, is still operating under the management of that veteran coal man, Robert L. Rolston. This is the only company in the immediate vicinity of Middlesboro that is truly entitled to have "coke" in its name, as it is the only one that mines coking coal. For several years past, however, both batteries of ovens have stood idle. The company uses compressed air in mining the coal, though a large proportion is still mined by hand. Mules are used for haulage.

The Nicholson Coal Company, at Middlesboro, Ky., leases the property adjoining the Mingo lease and has three operations, No. 1, No. 2, and No. 3. All of them are in different seams and are reached by incline planes of about 2700 ft. length

The Nicholson Coal Mining Company

A. C. Carr, formerly superintendent of bridges and buildings for the Louisville & Nashville railroad, with offices in Middlesboro, is largely interested in, and is in charge of the large plant of, the Nicholson Coal Mining Company. This company produces a fine grade of steam coal, all of which is mined by hand. The system of haulage is by mules and a steam locomotive. This locomotive is built so that it can enter the mines and it has given entire satisfaction during the few years it has been in use.

The Nicholson Coal Mining Company has recently acquired another large lease on the north side of Bennetts Fork directly opposite its present operations This lease will probably not be developed at present as the mines now being worked are furnishing a good output, all of which is taken by the Southern Railway. Adjoining the Nicholson property on the east, lies the lease of the Yellow Creek Coal Company, with main offices in Middlesboro, Ky. This company has two operations, the first being reached by a 1900-ft. incline, and the other being reached by a 600-ft. retarding conveyer, extending from the head of the incline to the upper tipple.

The lower seam is a 4-ft. bed with a small sandstone parting, and produces a fine steam coal; the upper seam is the famous "Poplar Lick" bed, which is a valuable domestic as well as steam coal. The entire product, however, is taken by the Southern Railway, so it all goes for steam coal. The Yellow Creek Coal Company was the first company in this district to do any prospecting with a diamond drill, and recent tests on its leasehold on the south side of Bennetts Fork show two valuable seams of coal only a short distance under drainage. It is probable that these beds will not be operated for many years as there are seven workable seams on the property above drainage. All those seams that can be operated by drifts will be exhausted before shaft mining will be undertaken.

Equipment at the Yellow Creek Mines

Both of the Yellow Creek mines are equipped with a complete electric installation for haulage, and electric cutting machines are used to a great extent, although a large proportion of the output is still mined by hand. Ten-ton monitor cars are used to lower the coal from the head of the incline, which latter is laid with 60-lb. steel rails and is one of the best inclines in the district. The output is from 700 to 1000 tons per day, and the number of employees varies from 250 to 300. The Yellow Creek Coal Company takes great pride in its camps, and the cottages, offices and commissary, are all well built. This company also has a large lease on the north side of Bennetts Fork opposite its present operation, which is still undeveloped. Adjoining the Yellow Creek lease, now in operation, is the lease of the Winona Coal and Coke Company, which has proved one of the best operations on the creek considering the size of its lease.

C. S. McManus, president and general manager of the Sterling Coal Company, is also president and general manager of the Winona. The principal office of the company is at Mauring, Tenn. The drift mouth is a short distance above tipple hight and steam coal is produced. The coal is mined by hand and hauled by mules. Directly opposite the Winona plant, on the north side of Bennetts Fork, is the lease and operation of the Columbia Coal Company at Middlesboro, Ky E. R. Vowels is president of the company and John Willis is general manager. This company operates a 6-ft. seam and has been very successful The bed it is working has not been found under such favorable circumstances at any other place in the district.

An incline of 600 ft is necessary to reach the coal and ten-ton monitor cars are used to lower the output, the track being laid with heavy railroad iron. The company employs about 100 men in the No. 1 mine. The coal is mined by hand and mules are used for haulage This company has recently installed a plant to work the Winona seam, which is found here a little below tipple hight In this mine a six-ton electric motor is used, the power being transmitted from the Yellow Creek power plant

On Stony Fork, which joins Bennetts Fork in the western portion of Middlesboro to form Yellow creek, there has been great activity for the past year or more, both in the installation of new

TIPPLE AND POWER HOUSE OF YELLOW CREEK COAL COMPANY, MIDDLESBORO, KY.

HAULAGE MOTORS AT PIT MOUTH, STERLING COAL AND COKE COMPANY, MAURING, TENN.

plants and in the improvement and enlargement of old operations.

The Stony Fork Coal Company, with its principal office in Middlesboro, is getting out an especially good grade of domestic coal. Shaker screens and a good compressor plant help materially, in producing the coal shipped from this mine. This plant is owned and operated by the Ralston family, the pioneer coal men of this district. Jolin Ralston opened up the Mingo Coal and Coke Company's operation, which was the first in the Middlesboro district. The same people are now about completing the new plant of the Ralston Coal Company, on the south side of Stony Fork, and only a short distance from their other plant.

Other Operations in the Middlesboro District

The Sagamon Coal Company at Logmont, Ky., is also making improvements and is producing a good domestic coal. This lease adjoins the lease of the Stony Fork Coal Company, and is in the same seam. Shaker screens are used and the coal is mined by hand. The Leeke & Drummond Coal Company, Logmont, Ky., has two mines in operation just across Stony Fork, from the Sagamon plant. This company is well known for the excellent manner in which it mines its coal and prides itself on producing a "clean" domestic fuel, although a great deal of its output is sold for steam purposes. Mining machines and a compressor plant have added wonderfully to the quantity and quality of coal produced by this company; mules are used for haulage.

The Monarch Coal Company, Middlesboro, Ky., has just completed its plant on the north side of Stony Fork, and has one of the best plants in the section. Wm. Costello is in charge of the plant, and S. Hollingsworth of Middlesboro, and D. C. Swab of Hartranft, Tenn., are interested. The company has a lease on a large area of the best coal land in this county, and its success is assured.

The Shamrock Coal and Coke Company, Shamrock, Ky., is increasing its output steadily. This company has an incline of about 1500 ft. to reach the bed it is working. Monitor cars are used in lowering the coal to the tipple. J. H. Ralston is in charge of the operation.

The Edgewood Coal and Coke Company, Middlesboro, Ky., has a lease on 582 acres of coal land east of the Shamrock lease. It is operating the "Poplar Lick" seam using an incline of 2700 ft. to reach it. Monitor cars are used in hauling the coal. The company has recently secured the services of Ray Moss, of Middlesboro, who is rapidly increasing the output. An electric haulage and machine plant has been installed and the output doubled within a short time. The company is now preparing to operate the same seam that is at present being worked by the Shamrock and Yellow Creek companies and will soon have a large output.

During the past year, the Hignite Coal Mining Company, under the management of W. E. Gunn, has constructed three miles of standard gage track up to its operations on Hignite creek. This company has under lease 1300 acres of land containing several workable beds, lying on the north side of the Hignite creek; the management has completed the installation at one operation and has been shipping coal for some time. The company is composed of Middlesboro and Covington, Ky., capitalists and has offices in both cities.

The Mountain Lake Coal Company and the Turner Coal Company, whose operations are just at the southern boundary of Middlesboro city limits, have made great improvements recently, both inside and outside the mines, and are preparing to increase their outputs. Just beyond the northern city limits, at Middlesboro, the Excelsior Coal Company is taking a new lease on life and is preparing to open up some bodies of coal that will give several years' more work. As the Excelsior people have an important coaling station on the Louisville & Nashville railroad, this is gratifying to the railroad.

The Marymoore Mining Company at Middlesboro, Ky., which company started another operation just across the Louisville & Nashville railroad from Excelsior, two years ago, is now prepared to produce a substantial amount of coal as soon as business improves. This company operates the same seam as the Excelsior and is obtaining satisfactory results. As a general rule, the mine operators in and around Middlesboro expect a great improvement in the coal trade after August, 1909, and the indications are that they will not be disappointed. The entire district is absolutely dependent on the mines, and any slackness in the coal trade is immediately felt in all branches of business. Conditions as a whole, however, are satisfactory and at the offices of the Cumberland Fuel Company, the largest coal selling agency in Middlesboro, it is stated that the improvement in the coal business can easily be noticed. All the mines are running on full time again and it is hoped that the present indications of returning prosperity will materialize into reality. The coal is here, plenty of it, and of good quality. What we want is some one to burn it as fast as we can produce it.

On the Mesabi range the plan most in favor is to operate the mines on the open-pit plan wherever possible. The greatest depth so far stripped to the orebody is 100 ft. The rule now adopted is that it will pay to strip a cubic foot of overburden for every ton of iron ore proved.

Coal Mining as an Investment

By H. M. Chance*

The present annual output of bituminous coal in the United States is, in round numbers, nearly 400,000,000 tons, and the profit available for distribution in interest and dividends approximates $60,000,000. If the ratio of increase in output for the last 50 years be maintained during the next decade, the consumption in the year 1919 will approximate 800,000,000 tons. The increase in mine capacity to meet this demand will require during the intervening period, an investment in plant and equipment alone, of more than $400,000,000. Increased profits of about $60,000,000 annually should be available for interest and dividends on the cost of lands, plants and improvements necessary to produce this increased tonnage.

Food, clothing and shelter are but slightly more important to mankind than fuel, for fuel is essential to the arts upon which civilization is founded. It is required in large quantities in all thickly settled regions. So far as we know, coal lands constitute the only reliable source of supply. To furnish the fuel demanded by present civilization is beyond the possibilities of timber culture. Oil and gas fields, although locally important, are usually depleted, if not entirely exhausted, in a few years.

As wheat, or any other food, is valuable because it will sustain life, so coal is valuable because it will produce warmth to protect in winter, power to operate machinery (to do work) and heat for metallurgical and other industrial uses. It therefore has a certain intrinsic value that must always be recognized.

As the value of coal does not depend upon special uses, or upon demands subject to wide fluctuation, such as may affect other products (e.g. silver) not necessary to life, it is apparent that investments in coal lands or in coal-mining enterprises possess important elements tending to stability and safety.

Coal Investments are Regarded as Speculative

While for these reasons securities based upon coal lands and coal mines should take high rank as investments, as a matter of fact such securities are commonly regarded as speculative or semi-speculative, and quite unsafe as investments. No attempt will be made to refute this popular idea, for it is largely justified by a long record of bankruptcies and reorganizations, followed by failures, foreclosures and in some cases by abandonment, or by liquidation of the operating corporations; but it may be useful to

*Mining engineer, Drexel building, Philadelphia, Penn.

show the cause of failure and to point out how projects which are unsafe or of doubtful safety may in advance be distinguished from those that are safe.

For several reasons, it is impossible to apply the conclusions here reached to securities based upon lands or mines located in the anthracite coalfields of Pennsylvania. Anthracite coal is a luxury—is a necessity neither of life nor of civilization. It is almost unknown in Continental Europe, and is an unimportant and negligible factor in the fuel supply of Great Britain. Its markets, costs, profits and conditions surrounding the industry are totally distinct and differ radically from those of bituminous coal. The statements with which it is proposed to deal relate to the bituminous coal-trade and to mines producing bituminous coal—some of which produce coking coal, especially adapted to metallurgical uses, some lignitic coal (mined principally in the West) of poor quality, but all of which produce coal useful for heating and power generation.

Causes Responsible for Failure

The causes responsible for the financial failure of many coal-mining companies are usually apparent and in many cases could easily have been remedied or avoided.

As in every decade for the last 50 years, the consumption of coal in this country has more than doubled, it is apparent that but few coal-mining failures can be attributed to lack of a market, for in the last ten years, the consumption has increased at the rate of about twenty-two million tons per annum, and new companies, properly managed and financed, should have obtained a sufficient portion of this increased business without destructive competition with older corporations, and without encroaching upon the established trade of such corporations.

Perhaps the most frequent cause of failure of new mining enterprises, is such deficiency in the quality of the coal as renders it salable only at the lower range of market prices. Next in frequency is deficiency in the thickness of the coal bed, or the presence of other conditions unfavorable to low mining costs.

Possibly poor management should be named as the cause of failure next in frequency, but it is quite possible that over-capitalization, involving fixed charges larger than the earning capacity, is responsible for a larger number of failures than those due to inefficient management.

Factors Essential to Success

To be successful, that is to be profitable, a coal mine must produce coal at least equal in quality to the average product of the district in which it is located, and the coalbed must have such thickness and mining conditions as will insure its operation at a cost-per-ton not higher than the average cost of mining in that district; if the coal be deficient in quality or more expensive to work, then such condition must be offset by some advantage of corresponding value.

If these requirements be satisfied, it is further necessary to so finance the operation that the fixed charges (bond interest) shall be but a fractional part, say not more than one-half, of the estimated average profit. Experience has amply shown that if the fixed charges be greater than one-half the average profit, default on bond interest and foreclosure or reorganization are tolerably sure to follow any general business depression.

In the development of any coal district it should be remembered that coal beds of second grade, either as to thickness or quality, cannot profitably be worked in competition with those of the first grade; and the development of such coals should be deferred until those of the first grade are exhausted or nearly exhausted.

In coal-mining flotations, the profit of the promoter is usually confined to the sale of the land upon which the company is to operate, for as a rule promoters derive little or no profit from the funds raised for plant, improvements or working capital. Hence, the promoter is tempted to select the relatively cheaper lands (for upon these the profit per acre may be made a larger percentage of the whole investment than would be possible if higher-priced lands be bought) and to have a large portion of the subscribed capital expended in the purchase of land, leaving but a small portion for plant and improvements.

Even if the lands contain good coal that can be mined at low cost, an operation so financed is badly handicapped from the outset, for the investment in plant and improvements being relatively small as compared with that invested in land, the capacity will be relatively small as compared with the capitalization of other companies having a larger portion of the total investment expended in plant and development work, and the profits will therefore be relatively smaller. If the cash capital has been secured by an issue of bonds, or other interest-bearing security, the profits may not be sufficient to pay such interest.

Plausible reasons are advanced for the purchase of a large acreage long life, profits from enhancement in value of lands, etc.—and these are used to satisfy the investor that the bonds are well secured and safe from investment standpoint. No argument could be more fallacious, for the investor should not look for a great margin of intrinsic value as security, but for the assurance that the interest will be paid promptly and the principal will be returned at the maturity of the bond. The investor in bonds does not want to be forced to foreclose, for by such procedure he becomes the owner or operator, a position he is not anxious to assume, naturally preferring that others familiar with the business should operate the property.

An Acreage to Last 20 or 25 Years

The earning of interest and repayment of the principal can best be secured by an acreage sufficient only to maintain the output of an operation for 20 or 25 years, with an investment in plant and in improvements sufficient to produce an annual output which will exhaust the property within that period.

The average profit in bituminous coal mining is small, and under present economic conditions but few companies can earn enough to pay interest on the cost of sufficient coal territory to insure a life of 50 or 100 years. Exceptions to this rule are found in corporations that have acquired large acreages at a very low cost, but the statement is undoubtedly true of operations inaugurated in developed coal districts where a "coal land price" must be paid for the property.

For an example, let us assume coal lands purchased in a developed district to cost $100 per acre, that the land contains 5000 mineable tons per acre, and sufficient acres are to be purchased to secure a supply for 100 years. For each ton of yearly output, ground containing 100 tons of coal must be purchased, equal to 1/50 of an acre, at a cost of $2, and there must be invested about $1 in plant and improvements for each ton of yearly output, making a capital investment of $3 per ton of yearly output. The interest on this sum at 5 per cent is 15c. and at 6 per cent. is 18c., both of which are in excess of the average profit in most soft-coal mining districts. If this interest is made a fixed charge, default is almost inevitable during the first period of business development.

If sufficient lands be bought to provide a supply that would be exhausted in 25 years, the entire investment will be reduced to $1.50 per ton of output and the interest charges at 5 per cent. and 6 per cent., respectively, will be but 7½ and 9c per ton, both of which figures are considerably below the average coal-mining profits. To render the bonds of such a corporation safe and desirable as investments and to market them at par as a 5 per cent. issue, the capital so secured might be limited to $1 per ton of output, which would create a fixed charge of but 5c. per ton of output, the remainder of the capital being represented by preferred or common stock, or by both—a portion of the common stock being given as a bonus to subscribers to the bonds to facilitate the flotation of the issue at par.

Coal-mining Profits

The public is not well informed as to coal-mining profits. Grossly exaggerated

ideas of the profits of the industry are held by those otherwise well informed. The average profit in mining coal is small. The term "profit" as here used may be defined as the sum remaining, after deducting from the *net* price (less cost of selling) received for the coal, the cost of mining (including repairs, renewals, amortization of the investment in plant and improvements, supplies, materials, labor, accident fund, taxes, administrative expenses), and a charge to cover exhaustion of land. It is, of course, evident that the profit will vary widely in the same field and even at mines working the same bed, from differences in markets, in market prices, in management, in thickness, in quality, in mining conditions (depth, water, gas, faults, etc.), and in daily output, and for this reason the figures here given may not be applicable to any particular property.

By summarizing the results of experience in the principal districts of the United States, it is possible to give a general idea of the average profits of the industry, which may be useful as a guide to the investor. Approximate averages for the last 10 or 12 years may be stated thus:

In the Pittsburg region the average profit per ton in mining gas and steam coals does not exceed 25c. In Pennsylvania steam and coking coals (excluding Connellsville), the average profit does not exceed 18c. In Pennsylvania (second-grade steam), Ohio, Maryland and West Virginia, the average profit does not exceed 15c. In West Virginia (second-grade coals), Eastern Kentucky, Tennessee and Alabama, the average profit does not exceed 12c. In Western Kentucky, Indiana, Illinois, Iowa and Missouri, the average profit does not exceed 12c. In the Rocky Mountain regions, the average profits may be taken as between 15 and 30c. These figures represent the average maximum profits available for interest on cost of lands, plant, improvements and working capital, or in other words, available for interest and dividends on the whole investment.

For small two years the coal trade has, in the parlance of soft-coal salesmen, been "dull to bad" prices have been low and profits small, and holders of coal-mining securities are considering conditions and wondering whether there is real cause for alarm. To reassure those so interested it may confidently be asserted that if any property and the method of financing the corporation owning it will bear scrutiny of the kind already indicated, the bonds secured upon it may be considered a meritorious investment, and the growth of the United States and by the necessities of its people.

When a coal company has demonstrated its stability by meet its fixed charges, or by operate at a profit, it is approximating such charges and reorganization appears inevitable, the true cause or causes of failure should be determined before proceeding to reorganization. Security holders too often regard the reorganization of coal companies as similar to that of railroads and manufacturing corporations. The rehabilitation of a coal company is, however, a very different problem. In many cases liquidation, involving sale of property and distribution of assets is the only rational course. Reorganizations involving increased fixed charges are usually followed by subsequent default. In some cases reorganization may be avoided by a change in management with perhaps some improvements in equipment, or the addition of labor-saving appliances, accompanied by the consent of bond holders to defer the payment of the coupons for a short period.

When conditions adverse to profitable operation exist, such as inferior quality of the output, or incurable underground conditions tending to high mining cost, it is futile to attempt to offset these by any readjustment or rearrangement of the invested capital. If, however, high mining cost be due to small or irregular output, to lack of labor-saving appliances, to defective or deficient equipment, or to inefficient or wasteful management, or if the unsatisfactory quality of the output be due to careless or inadequate preparation of the coal, the outlook is reassuring, for these are remediable defects and may often be rectified without resorting to financial reorganization.

No more inviting field for profitable investment can be conceived than that presented by the bituminous coal-mining industry at the present time. Coal lands, coal mines, and coal-mining securities in many districts, especially in the centrally located coalfields, have declined to prices far below their true worth, and present to the discriminating investor opportunities such as can be found but once or twice in a generation.

While the present article is not intended to cover a discussion of the investment possibilities of coal lands operated by leasing to individuals or corporations, nor of the securities of mining companies operating lands held under leasehold, it would be unsatisfactory to dismiss the subject without stating that some of the most attractive and safest investments in coal and coal mining belong to these two classes.

A Recent Decision on a Nevada "Wildcat" Promotion

SPECIAL CORRESPONDENCE

During the early days when the excitement of the goldfields of southern Nevada first attracted the attention of the investing public, many "one man" companies were organized. Gradually as stockholders got together they began investigations to ascertain in what condition their investments were, and in many cases they found a bad state of affairs.

The case of Henry Weber vs. Vulture Mining Company has just been tried before Theron Stevens, one of the ablest jurists in the State, and stockholders in general, who have invested in Nevada mines, may feel assured, from the following decision, that their interests will be protected by the strong arm of the law. In summing up the case Judge Stevens said: "Henry Weber organized a company, appointed his own directorate and gave each one share of stock; he adopted by-laws, which provide that no indebtedness shall be created against the company, except by an order of the board of directors.

"It is claimed, and the evidence shows, that there was no meeting, nor vote of the directors authorizing Mr. Weber to sell any of the treasury stock. There does not seem to have been any meeting authorizing him to do anything.

"From the time of the organization of the company, Mr. Weber assumed full charge and control of all the company's affairs; appointed a general manager; directed him what to do; commenced the sale of stock. He made no report of his acts to the company, but used up all of its funds; he paid $15,000 for development from the company's treasury; he then, without the knowledge or consent of the board of directors, incurred an indebtedness against the company of practically $20,000, which he paid personally; and it is fair to presume that he paid this indebtedness from the proceeds of the sale of stock of the company.

"He now asks judgment of this court for the amount of the unauthorized expenditures, upon which an execution would be awarded and the property of the company sold. Mr. Weber would then have the original property with its machinery and equipment, nicely developed, and in shape for a workable and producing mine.

"Courts were not organized for the purpose of assisting such a palpable fraud. The credit of the mining interests of Nevada has already suffered too much by wildcat mining schemes and the unlawful manipulations of some of its mining corporations, and should it become known that the courts would lend their aid to further transactions of the kind shown by the evidence in this case, we could hope for no further assistance from investors to develop the great resources of this State, and the court itself would be a shame and a disgrace upon the fair name of this great and growing State. I cannot, in conscience, do otherwise than find for the defendant, and that judgment be entered in its favor for its costs, and it is ordered that judgment be entered accordingly."

Handling Miners under the Wage System

By W. L. Fleming*

In metal mines, especially those working veins in which the shoots of ore are irregular in all dimensions and the ore cannot be accurately distinguished from the waste by eye, it is generally impracticable to work men on any basis other than by daily wage. Piece work and tonnage or footage systems may be used in barren ground in these mines but they are not adaptable to work in the ore. When a greater or less amount of waste must necessarily be mixed with the clean ore in mining, any system that puts a premium on quantity of material broken will necessarily tend toward the delivery of that quantity with no thought as to the quality of the product.

Veins or other deposits of workable width carrying ore of uniform metallic contents between well defined boundaries or walls, such as coal, iron, and some metalliferous veins of true fissure type, may be worked by contract and this system is most satisfactory where it can be employed. The usual contracts in metal mining are for dead work, shafts, crosscuts, etc., where uniformity of conditions may be expected. A contract should never be given for rock work unless the contractor furnishes his own supplies and assumes responsibility for machine breakages and repairs. It is a common custom to let a contract for a drive, the contract figure to cover the labor alone, and all powder, candles, etc., to be furnished by the mining company. The contrast between the amount of powder a man can stuff into a hole when he does not have to pay for it and the amount he uses to break his ground when the expense comes upon himself is truly wonderful.

The intention of this article is primarily to deal with the handling of men under the wage system, for in spite of its almost universal use it is surprising to note the many methods of mishandling a crew of men underground, and a few notes from experience gained both as a miner and superintendent may not be out of place. So much depends upon the personality, both of the superintendent and of the crew employed, that no hard and fast rules can be laid down to cover all cases, but there are certain points which are always to be considered when working out a scheme to increase or preserve the efficiency of a working force.

A mine superintendent must first study the particular conditions under which his work is to be carried on. Altitude, climate, health, availability of trained workers, hours of work, wage scale, nationality of men, living accommodations; all have their bearing upon his problem.

Material Comfort of Men

First of all comes the material comfort of the workmen. If the mine is in or near a town, the men live in their own homes or in hotels or boarding houses, and the mine has no responsibility in the matter. If, however, the mine is isolated, it is a wise superintendent who provides good living accommodations for his crew. Miners are as a rule an intelligent class of men and they appreciate comfortable living. Give it to them. Clean bunk houses, clean and comfortable beds, well cooked and abundant food, a room with real chairs to sit on; these make a man want to stay on the property rather than "get a travelling stake and hit the road," and he will exert himself to stay. A mine boarding house should never make a profit. If it pays its own expenses it is doing well. If there is a profit, add to the menu, it pays. A change room where the men coming off shift can hang their working clothes to dry will pay large dividends in health and contentment on the small outlay required. Do not tolerate the scattering of refuse from dinner buckets in or around the mine or buildings.

Put men in a vermin-ridden bunk house, give them carelessly prepared food, let them go to the mine through heaps of scrap iron and junk, walk them through drifts that are half filled with spilled rock and scraps of timber, let them see an untidy office and believe the superintendent is worried about something; then no power of heaven or earth will get more than half-hearted efforts out of the best crew that ever lived.

Classes of Workmen and Supervision by Bosses

Different nationalities represent their own idiosyncrasies. Study your crew and experiment with different methods of arranging the working gangs. Do not condemn a gang or individual because of poor results on a certain piece of work or under certain conditions. A poor driller in hard quartz may be a most valuable man in soft ground requiring careful handling and close timbering, and a hard rock man may be, and frequently is, worthless in soft ground. Any nationality will furnish labor for mucking and tramming and a low class of men is better for this work unless the ranks of the miners have to be recruited from them. A simple tagging system will keep track of each trammer's work and the high wages paid will drive an ignorant man to his utmost to hold his job. When these men are working in gangs they will require a sub-boss to direct them or they will interfere with one another and lose much time.

Among the miners, as opposed to common laborers as muckers and trammers, sub-bosses, or "straw" or "jigger" bosses as they are called, are not relished by the more intelligent workmen, among whom are usually Americans, Irish, English, Welsh, Cornish, Scotch, and many Swedes, and with these men a petty boss will do more harm than good. But low grades of men, and all the Latin races, practically require direct and continuous supervision. For example, Italian miners are rarely able to exercise their own judgment in their work. Their holes are not pointed so as to give the best results, timbers are not used to best advantage, and any unusual condition of affairs requires a long and wordy argument to settle upon a course of action. And yet they may all be conscientious and hard working fellows. A good miner of another nationality working in a stope with a gang like that and acting as foreman of the stope, will take the responsibility from the men and show an increase in efficiency of work and quality of output that is gratifying. Such a job is welcomed at 50c. additional to the daily wage and as an opportunity to qualify for a shift-boss position.

Muckers and trammers are usually of the least intelligent class in any section of the country. In all cases have trammers mark each car with a tag which should show the kind of rock (whether ore or waste), and an indication of the labor necessary to get that car to its destination. The tag should show the name of the stope or drift from which the car was taken and whether loaded from a chute or shoveled from a plat or rough bottom. Use sub-bosses. They will justify their hire even with a gang of only four or five men. The sub-boss may attend to loading the cars from the chutes, keep the chutes open and running free, take out and dispose of large boulders and debris, direct the muckers above, and see that the track is kept clean and open and in repair (the average "Dago" trammer will push his car over a dirty track all day rather than clean it off, or at best will merely scrape away barely the width of the car wheels to allow a passage). Have a sub-boss understand that he is to supply the brains for the other man's muscle. Otherwise a man unused to authority is likely to be found trying to get results from a gang by working like a trojan himself while his subordinates stand around and watch the performance and hand him tools.

With an abundance of experienced men always available, it is not necessary to make any provision for recruiting the ranks of the skilled miners from the laboring crew. But many mines are located out of the beaten path of the wandering miner and although some experienced men would apply for work at the North Pole if there were a mine there,

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yet the chances are none would happen along when wanted and it is embarrassing not to be able to discharge a man when he deserves it, on account of inability to fill his place. In this case always have one or more of the muckers (chosen by service or intelligence), devote a certain amount of time each day to helping a machine man or on the timber gang, let him learn to use a hammer by drilling plugs in boulders, and when a chance occurs to advance him, put him with an experienced man. But be careful in choosing the men for such apprenticeship. Never try to make a miner out of a man who cannot use and depend upon his own judgment. It takes judgment to handle ground and explosives and a miner who depends on rule of thumb is apt to become demoralized at a critical time and allow or precipitate an accident that is easily avoidable.

Use of Shift Bosses

The foreman or shift boss cannot do more than visit each man or gang of men twice each shift and frequently only once if he has much territory to cover. Then he gives his orders and leaves the men to carry them out as best they can. It is an excellent practice to cause the bosses to make their rounds in a different order each time. Too frequently the boss may be expected at a certain spot at or near a regular hour and the incentive to work after the last visit has been made is very small. No definite amount of work can be demanded of any man at all times on account of changing conditions, and the miner may do only half his usual day's work at frequent intervals with little fear of detection, especially if all the broken ground is not removed each shift. Every man has a tendency to taper off at some times and some men are always on the lookout for such an opportunity. When there is always a possibility and probability of being called to account before the powder is put into the holes, this temptation is reduced to a minimum.

Low classes of men require to be kept in fear of the boss. Even if they do good work they must be constantly told to do more. They need to be driven. It is the only system they understand and the only one that will be successful. On the other hand, it is a mistake to try to drive and bulldoze the more intelligent men. As before mentioned they must be left alone practically all the time and when treated right they aim to accomplish a good shift's work. Under a bulldozing boss they rapidly become indifferent to everything and do the least possible amount of work necessary to hold their job until they are ready to move to another camp. Under one of these driving bosses timbers too light to stand the strain were put in as heavier ones would have required too much time in handling. One of these light timbers gave way later with fatal results. Treat your men as men working with you, and let them feel that the responsibility for the manner of working rests with themselves. Do not hesitate to call a man's attention to faults and still more do not neglect to give praise when it is deserved. It is an excellent plan to tell a man about once a week whether his work of the past week has been good or bad. If it has been well done, and he is told so, he will take new interest and work to receive a like commendation again.

Rivalry between Shifts

Rivalry should never be allowed to exist between shift bosses working opposite each other. It may seem a good thing to pit one crew against the crew working the opposite shift but it does not work out that way. True, such rivalry will goad the bosses and through them the men to greater effort in the hope of beating the other fellow, but it will also lead them to take advantage of a thousand and one opportunities for annoying and holding back the man to follow. The shift bosses overlook and encourage the breaking of rules to hasten matters ever so little; they go after the ore that is easiest to mine and leave muck in the way of the miners if it is hard to get out; they crowd the big stopes and neglect the smaller ones; take muck that is needed as a support for the men, thereby requiring the next man to lose time building a staging; they make the other shift do as much of the dead work and timbering as possible; tools and machines are not taken care of, and in every way he can think of each boss tries to leave matters in as bad shape for his partner as he can without causing comment from his superior.

Working Rules

Post all rules conspicuously and see that they are enforced. A man is not to blame for violating a rule or custom with which he is not acquainted. If the period of usefulness of a rule is past, erase it from the notices and particularly do not attempt to enforce a set of rules that were prepared for certain obsolete conditions. For instance, a certain large mine forbade any miner, regardless of where working, to turn the air from his drill before 15 min. before the time set for lighting the fuses. This was permissible with the old style of drills when six to eight holes were a good day's drilling. Now, however, they rigidly enforce the same rule when using the stoping drills which will drill in many of their stopes from 16 to 25 holes per shift. In the time allowed, a man cannot load more than, say, 16 holes, and the result is that he spreads out his work and drills only what he can handle in the allotted time. Do not forbid smoking in a nongaseous mine. A miner will smoke and it is better that he smoke his pipe while working than go and sit where he can watch for the boss's light during the operation.

Some form of accident insurance is always advisable. Subscriptions for the relief of deserving cases are customary, but all lottery schemes, raffles, and subscriptions for presents to officers of the company and popular lodge members should be forbidden.

In general remember that miners are men who have no permanent homes, or if they have, are accustomed to being away from them for long periods. They are ready to move at any time and for little or no reason. Aim to get your men used to your methods and avoid as far as possible the necessity of breaking in new men. Treat them as men, giving a pleasant greeting or commendation as it is deserved, and never allow them to see you any way but cheerful. Remember too, that men do better work when all the work about the property is going right. Make every man under you feel that "the boss is on the job," and knows what is going on in every department.

In the Gilpin county district, in Colorado, the breast of the Newhouse tunnel is now in about 20,000 ft., and is beginning to intersect some of the veins, the great network of which is shown by surface workings. Contrary to expectations, however, but little water from the drowned-out workings of the early gold producers is being encountered, and it may be that most of them will have to be connected by laterals from the tunnel before this will be accomplished. It evidently is not going to drain off in the same way as obtains in Cripple Creek, where there appears to be one water level for the entire district. There the water drains along the walls of the phonolite and basalt dikes and the shrinkage cracks and shear zones which really constitute the so-called veins, and is consequently a much more open country than the granites and porphyries of Quartz hill.

According to a statement given out by D. C. Jackling, the Utah Copper Company is not considering an increase of its mill capacity at the present time. The mills at Garfield and Copperton are running at full capacity and treating 7000 tons of ore daily. Mr. Jackling says that upon short notice they can increase the capacity in these two mills to 10,000 tons daily, whenever the conditions of the metal market justify an increased production. While the mills cannot make so close a saving on the increased output, should copper move up above 18c., it might become advisable to increase the tonnage and profits.

Fair Lead for Saving Wear on Dredge Bow-line Cables

The device here described (U. S. Patent 906,802) is the invention of Eugene L. Horton, of Oroville, Cal., and has been tried for about 18 months on several dredges working in the vicinity of Oroville, giving entire satisfaction. The inventor estimates that the cost of manufacture of the appliance will be about $50 and experience has shown that the only repairs necessitated are the replacement of the 7-in rollers (10 in Fig. 1), about every six months. A great saving in bow lines is claimed through the use of this invention.

In the accompanying illustration Fig. 1 is a front elevation of the device, Fig. 2 a plan of the same and Fig. 3 shows its attachment to a dredge. In Fig. 3 the dredge *A* is moored for oscillation about the spud 2, and bow lines are run from the extension or ladder 3, around bank sheaves 5, and thence to the winding engine or drums 9 on the barge, passing through the fair leads 13 and the double deck pulleys 7. The pulleys and frame of the fair lead slide upon the rod 13, shown in Figs. 1 and 2, thus taking up horizontal deflections of the bow line.

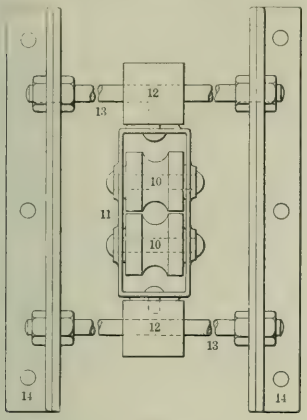


FIG. 1

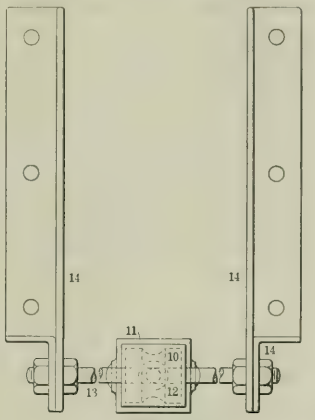
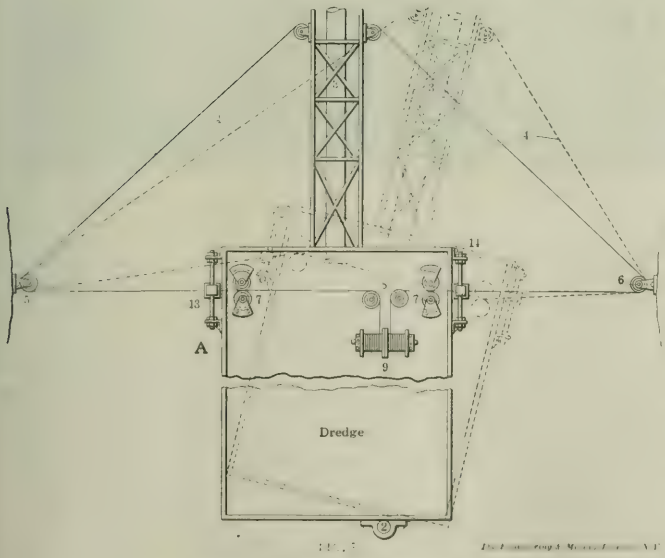


FIG. 2



HORTON'S FAIR LEAD FOR DREDGES

The fair lead may be used on banks from 2 to 30 ft. high and allows the dredge to swing for 200 ft. In taking up the vertical deflection of the bow lines, before they pass through the double deck pulleys, a great saving in wear on the lines is made. In this lies the chief advantage of the invention.

The Current Position of Silver

Under date of July 31, Messrs. Pixley & Abell, London, write of the current position of silver as follows: "In view of the importance which is being attached to the increased production of silver due to the Cobalt output, it may be interesting to consider the general aspect of the market and how far this increased output is likely to be offset by an increase in consumption, leaving out of consideration the question of any decrease in production in other countries owing to low price.

"Stocks in London amount roughly to £600,000, in India to £2,000,000, and in China to £3,000,000. These may be considered ample, but as regards India it must be remembered that there is a considerable short account being carried in London, probably not much less than the total of the stocks in India. Then as regards China, in addition to the £3,000,000 being carried there, there is probably nearly as much again which is being carried in London. This must not be regarded altogether as a bull position, being merely a cover against exchange, and, therefore, forms part of the Chinese stock. The silver is not necessarily for sale—indeed, under present conditions it may very likely be further increased. Low rates of interest make it profitable to carry the silver on this side, but at any moment the stock might be transferred to China, and if this were done, even to a moderate extent, the position of the bears would be far from comfortable.

"Reports from India as to the monsoon are excellent, and if the August rains are satisfactory a larger up-country demand can safely be looked for.

"Silver under 23½d. is undoubtedly at a low level, and a larger consumption can be looked for both from the trade and from countries which see the necessity for increasing their currency within measurable distance. In view of the possibilities of the development of China and the growing need for putting their currency in order, a demand for this purpose may come at any moment, and this might easily be anticipated by a country like America, where growing dissatisfaction is being expressed at the disadvantages under which their export trade to China is conducted owing to the low rate of exchange."

All machinery at the Calumet & Hecla mills, exclusive of the stamp heads, is now run by electric power.

Portuguese Mining Notes

By C. L. Major*

The following notes refer to the Barrancos district, where a part of Portugal, east of the Guadiana river, projects into Spain. Barrancos is 30 miles from the railroad, at Moura. A well kept State road connects the two places. The cart roads leading off are often rough.

Ancient Activity

The district contains many small copper lodes, nearly all with old workings said to be Roman. In one instance the ancients worked a lode, with a flow of about 16,000 gal. of water per day, to a depth of 100 m. below the outcrop, and about 60 m. below water level. It would be of interest to know the method of handling the water. Some old clay lamps and iron wedges were found in this mine.

Iron and manganese also occur in the district, and some iron mines about 30 miles away, across the Spanish frontier, are being worked on a large scale. The ancients also smelted manganiferous iron ores, as slag dumps are in evidence.

Present Operations

Recent operations have been confined to shipping high grade copper ores concentrated either by hand sorting, or by water, usually in hand jigs. The ores are chalcopyrite and chalcocite, usually occurring separately, often with a little tenorite (megellite). The work is being carried on upon a limited scale, and more or less intermittently; the local miners seek work in Spain in the pyrites mines, when there is no work near their homes. Miners and engine drivers are paid 62c., bracemen, 35c., and women, 28c. per 8 hour shift. Carpenters and blacksmiths receive 62c., laborers, 42c., and women, for ore sorting, 18c. per day. Day work is usually from 6 a.m. until 6 p.m. with two intervals of one hour each for meals, and two of 15 minutes termed *cigarro*. The women use light hammers and wooden trays for classifying the ore, which when full they carry on their heads to the ore piles. Ore from ½ to 2½ in. in size is sorted on tables after being washed. Men break up the big stones with sledges.

Although local men make good engine drivers, carpenters, blacksmiths, etc., the low wages do not seem to make underground labor very cheap, even when by contract, sinking especially being very slow. At 100 m. depth, working three shifts in ground of moderate hardness, the monthly advance was only 5 m. in sinking, and about 10 m. in driving, all being with double-handed drilling. Probably payment per centimeter drilled, under good supervision, would greatly cheapen mining. This is done in the Spanish mines across the frontier. Persons able to read or write are rare among the working classes.

Transportation

The ore is taken to the railroad in two-wheeled carts. They are open at the back and front, and are usually drawn by two mules, taking 1100 kg. over the rough side tracks. Notwithstanding grades of 12 per cent. being common, most of the carts have no brakes. The driver sits on the floor, using a single rein for driving. The mules are coupled together in a yoke-like fashion, and when rushing a hill the driver runs forward along the pole between the mules' heads. A cart with harness costs about $60, and a pair of good mules about $220.

For freighting ore 30 miles, about 8 of which are over a rough track, $3.52 is charged per metric ton.

A cart with 2 mules and driver is hired for $1.23 per day for supplying water to boilers, etc., and the same animals worked continuously several months, keeping in good condition. Acorns form a portion of their diet. Wood fuel (evergreen oak) for firing costs $2.35 per metric ton, delivered at the mine.

The above mentioned carts are commonly used for traveling, and as vehicles with springs are hard to get, one is obliged to follow the custom of the country. The carts are provided with white hoods, which are of doubtful advantage, except in the case of heavy rain or excessive heat. The passenger sits on a small chair. After a few hours the stranger will appreciate the defects of the system. When ordering saddle animals, plenty of anticipation is necessary and in remote districts saddles are often difficult to procure, as the natives, including men of fair standing, frequently travel on *aparejos* (pack saddles). This applies also to parts of Spain.

Away from the Spanish frontier Portuguese only is spoken, and though the Portuguese generally understand Spanish, the converse does not apply. Although not indispensable, passports are often useful, especially when claiming letters, etc.

Foreigners may make denouncements in Portugal at a cost of $1.76 (2000 reis), 12 months being allowed for prospecting within a circle of 560 m. radius for metalliferous and phosphate mines, and 707 for non-metalliferous mines.

Money is reckoned in *reis*, the *milreis* (1000 reis) being taken here as equal to 88c. The Portuguese *arroba* contains 15 kg., and the league 5 km. A measure used is the *palmo* (22 c.c.) divided into 8 *pulgadas*. Although the ancients with slave labor worked some mines which would not pay now, new mines are still being opened in the Rio Tinto district, and especially with further transportation facilities, the same may take place in Portugal, where some large orebodies have been found in the past.

In the Idaho Springs district, Colorado, the Seamann tunnel is now in 3500 ft., and is headed for James Peak, where it will emerge near the headwaters of the Frazer river, on the Moffat road, intersecting *en route* the veins of the gold belt of Yankee Hill and other camps, at a depth of from 2000 to 4000 ft. This tunnel is being driven by the Temple Engineering Company, of Denver, using Temple drills.

PORTUGUESE SORTING ORE. MEN, WOMEN AND CHILDREN ARE EMPLOYED

ORE CART. ALSO SHOWS STYLE OF CLIPPING MULES

*Dean Croft, Berkshire, England.

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Transvaal Gold Mines

The Transvaal continues to keep up an increase in its gold production; not quite in so great a ratio as was shown last year, but still making considerable gains. In June the total output of gold was $12,758,103, an increase of $434,318, or 3.5 per cent. over June, 1908; for the half-year ended June 30 it was $75,169,721, a gain of $4,902,610, or 7 per cent., over the first half of last year. The present indications are that the production will remain at about the present level during the second half of the year; indicating a total for 1909 of over $150,000,000, or approximately, 35 per cent. of the world's total. Since the early years of California production no such proportion has come from a single country; and never has so large a proportion been won from such a limited territory, since only a small section of the Transvaal itself is gold-bearing.

The increase in production, this year as last, has come only in a minor degree from the newer deep-level mines, upon which so many calculations for the future are based. It has resulted largely from more intensive working and from the inclusion of lower grade ores in the tonnage milled. While this has reduced the average yield of the ores worked, it has largely helped to increase the total return. The Transvaal managers claim that the practice thus developed is profitable, and the figures of their reports seem to bear out their contention.

What may be called the intermediate deep-level mines, or the first row of deep levels, are now well established as producers. The problem of the future seems to be whether the still deeper levels will make an adequate return on the great amount of capital which has been invested, and is still being invested, in the sinking of shafts and other preparatory work. The investment of such sums and the carrying of them over a period of four or five years before any return at all can be expected is a serious financial undertaking.

The labor supply in the Transvaal at present is sufficient, notwithstanding the deportation of the Chinese laborers, which has progressed so far that only a few thousand remain. In another year the Chinaman will have ceased entirely to be an industrial factor in the country. The supply of Kafir labor is sufficient now, though there are some doubts as to the future.

The New England Coal Trade

New England is a large consumer of coal and is not a producer, nor in any way likely to be, for no coal operator takes seriously the promises that Rhode Island anthracite is to be made commercially available by a chemical treatment. Of course, many things are possible, and an age that sees aërial travel a fact cannot be too sceptical; but the Rhode Island coal proposition will not be accepted till substantial proof is forthcoming. Meantime, New England consumes about one-fourth of the total output of Pennsylvania anthracite for its domestic supply and more than an equal quantity of bituminous coal for its factories and public utilities. This means that about 40,000,000 tons of coal, or more, must be delivered at New England points in the course of a year. This constitutes a large and important traffic.

New England is so situated that a number of its more important cities and towns on its long coast line can be supplied by water. This trade, which is supplied through the ports of New York, Philadelphia, Baltimore and Hampton Roads, was for many years carried entirely by sailing vessels. The introduction of steam colliers by the Reading company some 20 years ago was not altogether a success. In recent years, however, fleets of large barges, towed by sea-going tugs, have made heavy inroads into the trade, though the coal-carrying schooner still maintains its hold. The water transportation is cheap, coal being taken from Philadelphia to Boston at a rate which—calculated by the land distance and not by water—is less than 0.25c. per ton-mile; by the actual sailing route it is much less.

For interior New England a large quantity of coal has always been carried by water as far as some of the coast points, and then by rail to its point of destination. This has been found cheaper, for the most part, although it involved two transfers, one at the tidewater port to which it comes from the mines, and the other at the port where it is again delivered to the railroad. This is a minor matter with anthracite, but is serious with bituminous coal, tending to break it up and to give the consumer an undue quantity of slack. Then, too, in the busy season there are often vexatious delays in the unloading of vessels, when the receiving ports are crowded with coal-carrying craft. This has been especially the case at the ports on Long

Island sound, through which passes most of the coal for the busy factories of the Connecticut, Housatonic and Naugatuck valleys; where dock accommodations are limited, and coal-handling machinery often not of modern type. This gives rise not only to complaints, but to demurrage charges, and in busy times many vessel owners insist on the loading and discharging clause in charters, which provides for extra pay for all over a reasonable time spent in port.

There has always been a large quantity of coal shipped by all-rail routes to interior New England points, the Delaware & Hudson carrying much of its anthracite to Albany and Rotterdam where it is delivered to the Boston & Maine for distribution; that road and the New York Central bringing also bituminous coal to the same points. To these has been added the Poughkeepsie Bridge line, since the control of that line passed to the New York, New Haven & Hartford company. This line brings both anthracite and bituminous coal, since it has been put in condition to carry heavy traffic. The New Haven company now practically controls the whole network of New England railroads, and it has encouraged the all-rail traffic in its own interest. Lately, indeed, many interior towns have begun to prefer the all-rail routes, finding compensation for a higher rate in the better condition in which soft coal is received without the double transfer which the water routes require.

New England receives its bituminous coal from a wide range of mines. The principal sources are the Clearfield region in central Pennsylvania, the Cumberland in Maryland, the Pocahontas and New River in West Virginia. The West Virginia competition there is active, as it is in the West; and promises to be still more aggressive if the Virginian railway carries out its plans for wide and cheap distribution of coal to all points accessible by water. Whether it will do as is threatened and whether its proposed steam colliers will do better than those used in the past, remains to be seen. The prospect is enough, however, to make Clearfield and Westmoreland shippers uneasy.

There has been some talk of larger importations of foreign coal into New England if and when the tariff on coal is reduced. It is not likely that such importations will be large enough to disturb the trade in any serious fashion. The supply of Nova Scotia coal is not sufficient to displace any considerable part of the coal supply now used, and its quality is not such as to help it to an aggressive competition. The anthracite taken for domestic use is, of course, without competition, and will remain in that position.

Eastern Iron Ore Supplies

It is probable that there will be a considerable increase this year in the demand for iron ore by furnaces in the East. In part this has already been provided for by greater activity in the local iron-mining industry, which has now been in evidence for over half the year. The mines of New Jersey, some of which are large producers—though they do not, of course, compare with such Mesabi mines as the Mountain Iron, the Hull-Rust or the Fayal—have been put in condition for a larger output. The mines in the Lake Champlain and Hudson river districts in New York are unusually busy, as are those in the Adirondack region. The smaller local operations in the Lehigh Valley and other districts in eastern Pennsylvania are also active.

In part the demand will be met by imported ores. The receipts of foreign iron ore for the first half of the year increased from 333,708 tons in 1908 to 572,547 in 1909, a gain of 71.5 per cent., and this is likely to be much bettered in the second half of the year. While the greater part of this ore comes from Cuba, imports from other sources are already provided for. The Cleveland *Iron Trade Review*, a good authority in the trade, estimates that engagements for 1909 include "the selling of Spanish product in the neighborhood of 300,000 tons, of Newfoundland about 200,000 tons and of lower Russian perhaps 100,000 tons. Since these sales were made late last year, two Eastern interests have taken on about 135,000 tons of a high grade Swedish product." The Cuban ore brought in is taken largely by the Pennsylvania, the Maryland and the Bethlehem Steel companies, though a fair quantity is sold to outside furnaces. The Cuban production, from all accounts, can be greatly developed, and probably will be, as the ore is of excellent quality.

The reduction of the duty on iron ore from 40c. to 15c. per ton by the new tariff bill is not likely to make any material difference in these imports. Already the duty was less than the difference between the low water freights and the rail rates on Lake Superior ores to most of the blast furnaces in Eastern territory. A number of them have used Lake ores as a part of their mixtures, but that use has been declining on account of the cost of procuring such ores at any furnace distant from a Lake port. It is not at all probable that Southern furnaces, with an abundant supply of ore within a few miles of easy transportation, will buy imported ore.

Omitting 1908 as an exceptional year, the furnaces properly classed as Eastern made in 1907 about 14 per cent. of the pig iron in the country. The production this year bids fair to approach the figures of 1907 much more nearly than was the case in 1908, and the Eastern furnaces will supply their share. On this basis, it is fair to calculate that from 25 to 30 per cent. of their raw material will be foreign ores; and this is a conservative estimate. The balance will be local ores, with Lake ores forming only a small fraction of the total.

Silver seems to have settled down to a point which does not vary far from 51c. in New York, and 23½d. in London. Fluctuations this year have not been great; the highest monthly average has been 52.905c. in New York in May, and the lowest 50.408c. in March, a total variation of 2.437c. The average for the seven months ended with July was 51.658c. The takings of silver in India have been less than last year; China has bought more, but its purchases have been partly balanced by resales, and the Chinese banks have adroitly managed both in such a way as to keep the market down. The prospect at present is for a better demand from India for the remainder of the year.

The retirement of Frank A. Leach as director of the United States mint, to take charge of a private enterprise, is a matter of regret. Mr Leach had been long connected with the mint in various capacities, was thoroughly versed in its affairs, and had been a most satisfactory director. His successor, A. Platt Andrew, is well and favorably known as a student of economic and especially of currency questions.

Utah Copper Company

The executive committee has issued a statement for the quarter ending June 30, the substance of which is given below:

During the entire period, both the Garfield and Copperton plants were operated at practically their full capacity, but the earnings predicted in the previous report were not realized, as the copper contents of the ore were lower for the first two months of the period than anticipated. The deficiency in the grade of the ore, as compared with the previous quarter, amounted to 4 lb. of copper per ton of ore, but as the result of milling a greater tonnage, the gross output of copper for the quarter was considerably greater than that of the previous quarter.

The ore treated during the latter part of the second quarter was of an improved quality and the recovery at the mills correspondingly better, on account of a decreased proportion of copper existing in oxidized form. The lower headings resulted from the necessity of moving a large block of low-grade ore that was encountered in the extension of the lowest steam-shovel level. This particular block of ground had not been thoroughly developed by underground workings, and when we came to remove it we found a great quantity of ore of a grade lower than we had reason to expect from the information gained from developments in surrounding territory.

The gross output of copper contained in concentrates produced and shipped during the quarter was 13,774,412 lb., being greater than that of the previous quarter by slightly less than 1,677,000 lb. The net profit from mining and milling operations for the quarter was $478,425; rents, etc., $4323; total net profit, $482,748. The average price of copper upon which the above earnings were based was 12.85c. per lb., as compared with 12.82c. for the previous quarter. At the end of the second quarter copper sales had been made covering all copper metal due for delivery up to the early part of September. Notwithstanding the lower grade of ores handled during the quarter, the cost per pound was slightly less than in the quarter previous, being 9.192c. per lb. for the net copper produced after deduction of smelter allowances.

Considering the results at the Garfield plant by themselves, the cost per pound was lower, being for the quarter 8.98c. For the month of June, the cost at the Garfield plant alone was 7.91c. The costs at the Copperton plant are uniformly higher than those at the Garfield plant, on account of its smaller capacity. Late in the month of June, some alterations were undertaken at Copperton that are still in progress, which will bring this plant to a condition more nearly similar to that of the Garfield plant as respects its efficiency.

The costs per ton at both mine and mill have been steadily decreased so that the milling cost at Garfield for the month of June, including its proper proportion of all general and fixed charges, was 54.25c. per ton. The direct mining cost, including only the expenses at the mine and applying to all ore mined during the month of June, was slightly in excess of 19c. per ton, this average including both underground and steam-shovel ore. The indirect expense, including development and the proper charge made against each ton of steam-shovel ore for the retirement of prepaid stripping fund, amounted to slightly over 8c. per ton, bringing the total charges for mining up to nearly 28c. per ton, so that, considering the operation of the Garfield plant alone, the total cost of mining and milling was less than 82c. per ton, this figure not including the transportation of ores. The average total cost of mining and milling at both plants for June was less than 80c. The relative percentages of steam-shovel and underground ore for the quarter under discussion were 83.3 and 16.7 per cent.

The average monthly movement of stripping for the quarter was 131,140 cu.yd.; the quantity moved during June was 151,390 cu.yd. The average cost for stripping for the quarter was 34.24c. per cu.yd.; for the month of June only, 32.47c. The average cost for the first quarter of this year was 39.75c., on an average rate of movement of 95,000 cu.yd. per month. The physical condition of the mine is improving rapidly toward a state which will enable us to produce more nearly an average grade and character of ore. The transportation of our ores for the quarter was, generally speaking, satisfactory, and the railroad company is continuing in its application of betterments, which should be completed before the beginning of winter weather.

Pig Iron Production in Canada

The production of pig iron in Canada for the first half of 1909, as reported by the American Iron and Steel Association, was the largest ever reported in a similar period; it was greater than the make of any full year prior to 1905. The details of the production, as compared with the first half of 1908 are as follows:

	1908	1909.	Changes.
Foundry and forge	51,640	84,890	I. 33,250
Bessemer pig	60,226	99,639	I. 39,414
Basic pig	195,209	165,112	D. 30,097
Total	307,074	349,641	I. 42,567

The total increase this year was 13.9 per cent. Of the iron made in 1909 there were 347,482 tons made with coke or bituminous coal as fuel, and 2159 tons with charcoal. The coke iron includes a small quantity of ferrosilicon made in the electric furnace. The total production for four years past has been, in long tons:

	First Half.	Second Half.	Year.
1906	282,010	259,947	541,957
1907	270,100	311,046	581,146
1908	307,074	256,598	563,672
1909	349,641	.....	.....

This year there was a decrease in basic iron and a gain in bessemer pig. The proportion of basic to the total was 47.2 per cent., and of bessemer, 28.5; against 63.5 and 19.6 per cent., respectively, last year.

On June 30, 1909, Canada had 16 completed blast furnaces, of which 10 were in blast and six were idle. Of this total 12 were equipped to use coke and four to use charcoal. In addition one coke furnace was being built. Two coke furnaces were partly erected on the same date, the construction of which is indefinitely suspended. Work on one of these furnaces is to be resumed in August. One coke furnace was also projected, work upon which is to be started this fall.

During the first half of 1909 the total number of furnaces in Canada actually in blast for the whole or a part of the period was 12. The number idle during the whole period was four furnaces.

The Canadian Cement Combine

Special Correspondence

J. S. Irvin, managing director of the International Portland Cement Company, of Ottawa, Canada, announces that the merger of the leading cement companies of Canada has been completed, with the exception of a few legal formalities. The new company, a charter for which has been applied for, will be styled the Canadian Consolidated Cement Company, and will be capitalized at $30,000,000, in place of $25,000,000, as previously stated. Of this, $11,000,000 will be in 7 per cent. preferred stock and $10,000,000 in common stock. There will also be a bond issue of $5,000,000, bearing 5 per cent. interest. The new company will include at least 12 plants, controlling fully two thirds of the present output of Canada.

Mineral Production of Colombia

Special Correspondence

The total mineral production of Colombia for 1908 has an estimated value of $7,088,000, gold or United States currency. This total is made up as follows: Gold, $4,044,000; silver, $1,800,000; emeralds, $858,000; salt rock, $380,000. No platinum is reported. The estimate is considered a conservative one.

The coal mines which supply the Hanyang iron works in China are at Vinghtsiang on a navigable branch of the Yangtsekiang river.

Views, Suggestions and Experiences of Readers

Comments on Questions Arising in Technical Practice and Debatable Points Suggested by Articles in the Journal

CORRESPONDENCE AND DISCUSSION

Patenting Mining Claims

In the JOURNAL of June 5, 1909, page 1146, I have noticed an article entitled "Patenting Mining Claims," by Dwight E. Woodbridge, of Duluth, Minn., dated May 17, 1909; and, as Mr. Woodbridge, without mentioning names, refers to a *recent* chief of field division in the district embracing Arizona, and as I have been chief of the field division having jurisdiction of Arizona for almost four years, it is very evident he is referring to me. Therefore, I have the honor to request that, if possible, space be allowed me in the next number of the JOURNAL to reply to the article—in so far as it refers especially to the work of my office in this district—in an attempt to correct what I claim are, at least, erroneous statements and ideas about the system or practice of the land office in the investigation, through the field divisions, of mining claims, as well as in the construction of the mining laws.

As to the method or system of handling mineral applications and investigating them, Mr. Woodbridge states: "When an application for patent is filed in the local land office, steps are taken at once to have it examined and reported upon by an inspector. If within a forest reserve, inspection is made by a forest supervisor, or by some one acting under his direction, and if not in a national forest, it is examined by an inspector sent by the chief of the field division." From this statement, the reader would understand that *every* application for patent under the mining laws is examined into and reported upon under the direction of the chief of field division, while such is not the fact, for, as in cases of applications to submit final proof under the homestead or desert land laws, it is the policy of the land office to have only those applications for patent or final proof examined into and reported upon where there is a complaint against the individual application, or there is information in the office of the field division that warrants an investigation relative to the bonafides or validity of same.

There is no distinction between the methods of action on mineral applications and homestead or desert land final proof applications by the land office or the field division thereof. Furthermore, while the homestead and desert land entryman have to meet the requirements of the respective laws within certain periods and submit proof thereon, the mining locator under his location has no time in the year within which he may make application for patent; and it is not the policy of the land office to attack a mineral location unless there is apparent fraud in attempting to acquire the land for its timber or other purposes foreign to mining. I do not recall but two cases in my office where I have attacked mineral locations and those are where land is being used for townsite purposes only.

But, as stated by Mr. Woodbridge himself, the United States lode mining laws, as embraced in the federal statutes governing the subject, provide for the "location of mining claims *upon veins* or *lodes* or quartz or other rock in place, bearing gold, silver, cinnabar, lead, tin, copper, or other valuable deposits," and that "no location of a mining claim shall be made *until the discovery of a vein or lode within the limits of the claim located.*" And, under the statutes of the Territory of Arizona, it is provided that the locator of a mining claim must, within a certain time from the date of the location, "sink a discovery shaft in the claim a depth of at least 10 ft. from the lowest part of the rim of the shaft at the surface, *and deeper if necessary*, until there is disclosed in the shaft *mineral in place.*"

And, to me, I confess, the requirements in the above mentioned statutes of the United States and of the Territory mean just what they say, under any construction of the law (whether called liberal or not), the *discovery of mineral* in place on the *land* in controversy and not in the imagination of the mineral claimant or company's agent. And I have yet to find any decision of the court which relieves the claimant, when his entry is involved, from establishing the discovery of mineral required by the statutes at time of entry.

Mr Woodbridge admits that if an unfavorable report is made on a mineral application or entry (and it is the same as to any entry under any of the land laws), the claimant is given due opportunity to answer and to have a hearing where the issues may be tried, and I will add that, in such hearings, the burden of proof of establishing the charges against the claim or entry is voluntarily assumed by the Government; and the chief of field division, or an agent, only endeavors to bring out the facts, whether they are in favor or against the Government or the entryman, and I deny that he acts in direct opposition to the claimant, as alleged though he is there to protect the Government's interests.

The article admits that the mineral claimant must show a valuable discovery of mineral, when attacked by an agricultural or townsite claimant, or some other applicant who seeks to have the land removed from the operation of the mining laws, but intimates that the Government, itself, through the department or officer responsible for the proper administration of the public land laws, has no right to call into question the good faith of the entryman or the bonafides or sufficiency of the location and discovery. On the other hand, the Supreme Court of the United States has held that it is the duty of the Government, through its proper officers, in disposing of its mineral and other lands, to see that they are properly disposed of in accordance with the existing laws passed by Congress and for the benefit of all the people, and that the Government should not be regarded as occupying the attitude of a mere seller of real estate for its market value; that "it is not to be presumed that the small price per acre required from those desiring to obtain title to such lands had any influence in determining the policy to be adopted in opening them to entry. They were held in trust for all the people; and in making regulations for disposing of them Congress took no thought of their pecuniary value." This opinion is in contradiction to the argument some of the involved parties make to me that they had acquired the land, alleged to be mineral, under the most expensive law (lode) and had paid the highest price for the lands—seeming to indicate that, therefore, their good faith should not be questioned.

Referring to Mr Woodbridge's statement as to the Gardner claim or shaft, wherein he alleges that a chief of field division was recently taken over the surface thereof and that, there being no trace of mineral-bearing lode in place on the surface, the chief of field division (evidently referring to me, as before stated) remarked that "if this claim should now come before me for review, I should be obliged to report unfavorably." I beg to state that, inasmuch as I have never had the pleasure of meeting Mr Woodbridge, he is evidently speaking from hearsay relative to this particular matter, as well as others, in his article. And, of course, we all know that hearsay is inadmissable evidence, as well as poor material, to base an article of criticism on; and, while I have examined most of the claims in the mining district in question, both underground and on the surface, my records do not show, and I do not remember, that I

ever examined the surface of the Gardner claim and I never made such a statement. However, it is not the contention of the land office in construing the law, as Mr. Woodbridge indicates in his article, that to meet the requirements of the mining laws there must be mineral in place on the surface; but it is the contention that there must be a sufficient discovery of mineral in place on the land in controversy, either on the surface or below, to warrant a mineral entry or patent. It is immaterial to the Government whether the mineral in place is on the surface or has been discovered in shafts or diamond drill holes or by deep exploration in other workings. And, while the general geological conditions of a district and of surrounding lands may be taken into consideration on the question of the value of the lands for mining purposes and will support a proper discovery in that regard, it cannot take the place, under the law, of an actual discovery of mineral on the land in dispute.

As far as the Gardner claim itself is concerned, I understand that the shaft thereon is used principally in mining the adjoining claims; and, upon reference to Professor Ransome's geological report, Professional Paper No. 21, page 111, I find that he, in speaking of the Gardner shaft, refers to it as being essentially a prospecting shaft for the underground exploration of the country lying east of the Spray and adjacent to the porphyry mass of Sacramento hill. He says:

"The Gardner is a small shaft situated 1440 ft east-northeast from the Spray shaft and at the time of visit, when sinking was in progress, was 700 ft deep. Alternate levels only, the second, fourth and sixth, have been run from the Gardner shaft. These connect directly with the corresponding Spray levels. The Gardner is essentially a prospecting shaft for the underground exploration of the country lying east of the Spray and adjacent to the porphyry mass of Sacramento hill."

Furthermore, anyone acquainted with the district and the geological investigations and conditions therein knows that the Gardner shaft is within the area of principal orebodies of copper exploited and proven by the Copper Queen people, and the geological conditions are altogether different from the conditions outside, although Mr. Woodbridge infers that they should all be treated alike under the law.

As to the charge in the article that the department is placing a strict construction on the law, I will say that anyone familiar with the facts and departmental decisions in the Julia and John Daisy claims in the locality referred to, would hardly make that statement; and, as far as the work and construction of the law of my office is concerned, as an offset to the charge by Mr. Woodbridge that the land office and the field divisions, by their strictness in enforcing the law and constructing same, are making it unnecessarily hard for the mineral claimant to obtain patent, I will say that, upon an examination of my records for the present year, which has been an unusually active one in so far as filing mineral applications for entry are concerned, I find that of 115 applications for mineral patent, containing 477 claims, there was protested by my office only 16 applications, embracing 55 claims, and of these a number were protested by me upon receipt of adverse reports from the forester, the claims being in a forest reserve. From this showing, I do not think that any fair-minded man could claim that I was dealing unjustly or too severely with the mineral claimant.

Most of the mineral entries attacked by me, especially within the district referred to, have been lands acquired under the mining laws and almost immediately used for townsite purposes, or used in connection with other lands as ranch property. It is such cases as these and similar attempts to acquire lands from the Government for purposes foreign to mining that I am prosecuting to the best of my ability, and in so doing and in other ways aiding the actual bonafide miner; and I do not think it can be proven otherwise.

FREDERICK C. DEZENDORF.
Chief Sixth Field Division,
General Land Office,
Dept. of the Interior

Phoenix, Ariz., Aug. 6, 1909.

Wisconsin Mining Maps

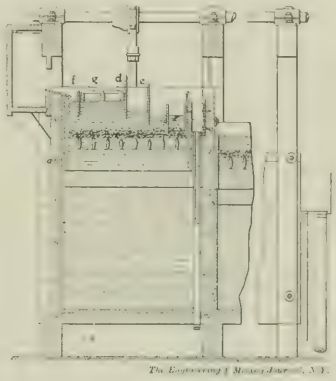
The State Geological Survey of Wisconsin has recently issued a set of geological maps of part of the lead and zinc district. The new maps were made under the supervision of W. O. Hotchkiss and are intended to supplement the maps prepared by Professor Grant and issued by the survey in 1906. The present maps show new areas opened by drilling and mining operations and include the following sections: Cuba City district; the district between Cuba City and Platteville; the district from the Platte mounds south to Ipswich; the Montfort district; the section south and east of Mineral Point; the Meeker's Grove district, including the Vendeventer mine, the Field mine and other diggings.

In addition to the topography and geology, these maps show the names of property owners, the old ranges and lead diggings, the location of recent drill holes and the approximate depths below the surface at which the clay bed is found. Accompanying the set is a little folder explaining the maps and telling how they may be used by persons searching for ore. The survey also supplies record books which are given to any drill man who will use them and report the results of the drilling operations to the survey office. The maps may be secured by addressing Dr. E. A. Birge, director of the State Geological Survey, Madison, Wis., and inclosing four cents for postage.

The Caetani Improved Jig

Gelasio Caetani describes, U. S. Patent 923,328 of June 1, 1909, a water jig for recovering the slimes that are usually carried off with the tailings. The accompanying drawing is a vertical section of his improved water jig, which is of the Harz type, comprising a multiple series of units with screen and hutch compartments, piston chambers, pistons and operating mechanism.

The invention relates to the arranging of one or more vertical adjustable partitions or slime dams *d* transversely across the screen compartments. The slime dams by dipping into the jig bed, cause the slime water to bank up and flow through side discharge openings provided with adjustable gates into a collecting receptacle. The slimes cannot pass below the second or dam partition *c* on account of the pulsating body of water rising through the jig bed. In the first slime-water section is a splash partition *f*, leaving an intervening free space for the ore to pass down from the feed box to the bottom of the screen, and between the partitions *c* and *d* is a wooden float *g*. This floats on top of the trapped slime water and breaks up the waves, that would otherwise result from the violent agitation of the slime water by the action of the reciprocating piston.



VERTICAL SECTION OF CAETANI JIG.

Iron ores have been won, or are known to exist, in nearly every State of the Union, but many deposits, which served as sources of supply for the initial efforts to establish an iron industry in the United States, are now unused. Such is the case with those which sustained the first iron works in Virginia, New Jersey and New England.

Details of Practical Mining

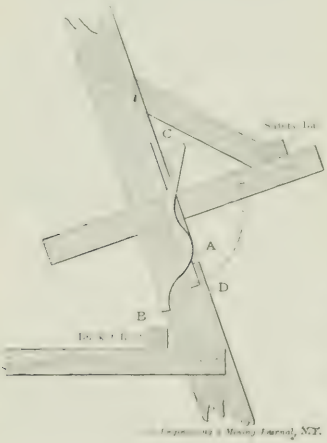
Notes of Interest to the Operators of Small Mines as Well as of Large Mines. The Things That Have to Be Done in Everyday Mining

REPORTS FROM EXPERIENCE

Readers of the JOURNAL are invited to contribute to this department. Articles should be brief, thoroughly practical, and preferably illustrated by drawings or sketches. Our draftsmen will prepare properly any kind of a pencil sketch that is intelligible. Something that is an old story in one district may be quite unknown in another. Articles accepted and published are suitably paid for.

An Automatic Bucket Tripping Device

The accompanying illustration shows an ingenious bucket-tripping device especially adaptable for use in developing prospects. The bucket is made with lugs, which travel



AUTOMATIC BUCKET TRIP

on skids, set below its center of gravity. When, however, these lugs reach the notch *A* the bucket is held, and as soon as the hoisting cable is relaxed it swings about the lugs as an axis and dumps in the bin or on a grizzly, as the case may be. The bar *B* prevents the bucket dropping over too far.

To lower the bucket is hoisted until the lugs clear the end of the trip *C*, then it is lowered away. The trip swings down and being arrested at *D* by a projecting [illegible] in. angle forms a track over the notch *A* into which the lugs engaged in hoisting. The trip is heavier on the straight end, so immediately the lugs pass off it swings back into position.

This simple device is valuable for small mines or prospects where the shaft is inclined at an angle less that about 70 deg., as it saves the labor of the man who usually has to swing and dump the bucket.

Sinking Test Pits

Where deposits of barite, phosphate rock, calamine, or other minerals occur in or under a clay or loam soil 25 to 100 ft. deep, the matter of sinking test pits is no small item of expense. A method used by the New Market Zinc Company, in Tennessee, consisted of sinking test holes with a post-hole digger. The deposit consists of zinc carbonate and silicate in a tough, residual, dolomite clay, from 10 to 75 ft. thick.

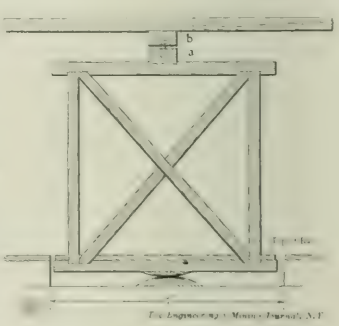
The ore occurs near the bottom of the clay and above the dolomite bedrock. An ordinary posthole digger (not auger) was used for the purpose. In sinking holes with this device, it is necessary to reinforce the strap by which the handle is attached to the cutting portion. The upper end of the handle is threaded to take a 10- or 12-ft. length of 1-in. gas pipe, making the handle about 15 ft. long. A ring is attached to the upper end for a rope. A tripod 18 to 20 ft. high is used, to which a pulley is attached.

The rope passes over the pulley to assist in raising and lowering the tool. The operation of the device is similar to that of a churn drill. In ordinary dirt it is only necessary to drop the tool a half dozen times to fill it, when it is withdrawn and the dirt knocked out by dropping the tool on a stake driven at a convenient place. The dirt is washed and the ore recovered for a sample. This instrument will extract lumps of ore three or four inches in diameter.

In case a large boulder is struck, a stick of dynamite is exploded on it, when drilling may be continued. Two men can sink 20 to 40 ft. per day. This apparatus may be used to a depth of 75 ft. In the case mentioned, it was used to test 10 or 12 acres of zinc land at intervals of 50 to 100 ft. The advantages are that it is rapid, cheap, and gives an accurate sample of the ground through which it passes.

A Turntable Support

The accompanying illustration shows support that may be used, in the absence of roller bearings, or small wheels, for handling cars or motors. The one shown has a table about 7 ft. in diameter. The table itself is made in the usual way with a strong framework of 6x6-in. timber and pivoted in the center. Without the overhead support the table would drop down on one side as soon as the car passed from the main track to the table track. The frame above is made of 6x6-in. timber and is at least 6 ft. high, in order to give ample room for a man to walk across the table. The complete structure consists of two frames as shown, one on each side of the track and fastened together by a



FRAME FOR HOLDING TURNTABLE IN POSITION

heavy piece of timber *a*, at the top. Through this is a bolt, or gudgeon *b*, that extends into the timber above, so that it is impossible for the table to shift even though the weight is on one side.

Powder Magazines

The mining law of the Transvaal is strict with respect to the construction and management of magazines for explosives. Some of the provisions are the following:

Care shall be taken that explosives magazines are erected only at such places where there is a suitable depth of soil or sand. In no case shall an explosives magazine be erected upon rocky ground. In the construction and erection of the magazines only the lightest and most suitable material available shall be used for walls

and roofs. Solid arched roofs are particularly prohibited.

The magazine shall be at least 6 ft. 6 in. in the clear from floor to ceiling, and shall comprise at least two compartments, one called the lobby, which is accessible from the outside, and used for the reception and delivery of explosives; the other called the storage room, which is accessible only from the lobby and is used for the storage of explosives.

The outer door to the lobby must open outward, and be faced with sheet iron about ¼ in. thick, and fitted with a good lock, for which purpose a padlock will not be deemed to be sufficient.

The compartments of a magazine shall be properly ventilated by cowled ventilators in the roof, or properly protected ventilating channels in the gables. The highest temperature allowed in the storage room shall not exceed 95 deg. Fahrenheit.

The ceiling of a magazine shall be of wood, and its inner sides shall be wood-lined, the lining to be at least 3 in. distant from the walls and the intervening space filled with some unimflammable non-heat-conducting material. The floor shall be of wood, of sufficient strength, and shall be well ventilated beneath; it shall also be provided with a proper drain for insuring the dryness of the magazine. Roofs of galvanized iron shall have wood lining immediately against the iron. All nails, fastenings, locks, keys and fittings inside the magazine shall be made of wood, brass or copper.

The magazine shall be fitted with a reliable lightning conductor, supported on a vertical post standing clear of the building, but not more than 18 in. from one of the walls, and rising at least 6 ft. above the highest point of the magazine. This lightning conductor shall be carried to a properly laid earth plate.

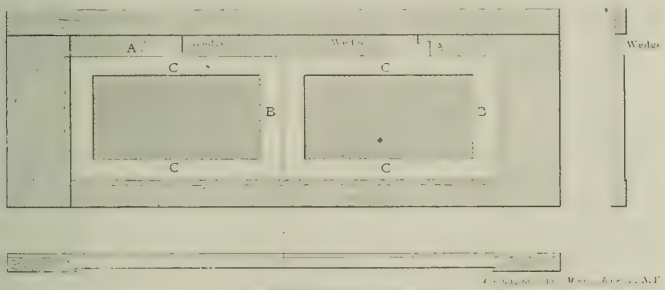
A surface or sub-surface magazine shall be surrounded by an outer earth wall, and the bottom of the inner slope of the same shall not be less than 3 ft. from the sides of the building. This earth wall shall have a natural slope on either side, and be 3 ft. wide at the top, and as high as the highest point of the roof. The approach to the precincts of the magazine, through the outer earth wall, shall have a strongly built gate, which shall be kept locked. The entrance to the magazine shall be either in a broken line, or the door shall be protected by an outer protecting earth wall entirely shielding the entrance.

A reliable self-registering thermometer shall be kept in the storage room of every explosives magazine. At least one pair of magazine shoes shall be kept in the lobby of every magazine, and no person shall enter the storage room of any magazine except when wearing such shoes or when barefooted.

Battery-Screen Frame

The accompanying sketch shows a battery-screen frame in use at several of the mills of the Mother Lode district, California.

The advantage of this arrangement is in the simplicity of the method of changing screens. No tacks have to be pulled or old rusted screen torn loose. To remove the outer frame *B* which holds the screens in position, it is only necessary to loosen the wooden button at *A* and slip it from the grooves in which it is fitted. The entire operation of changing screens need, with this arrangement, require only a couple of minutes. To hold the screen more firmly a narrow partition is sometimes put in the frame from *C* to *C'*.



BATTERY-SCREEN FRAME

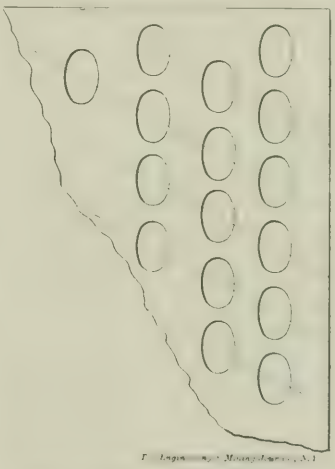
Wrinkle for Piston Drill

Machine runners usually neglect to oil the feed screw and nut on a piston drill, allowing the screw to become coated with dust and sand and causing excessive wear. It is frequently necessary for a machineman to release his hold on the crank to throw water into a hole or attend to the many little details that are constantly requiring his attention, and a freely feeding drill will crank itself back too rapidly to permit its being left. Miners often hang a wrench on the crank or lean a piece of steel against it or twist the hose around it.

The last two expedients are unhandy and inconvenient, and any weight hung on the crank will slip off unless the drill is inclined steeply downward. A hole drilled through the crank at the base of the handle, through which a wire may be slipped to hold the weight will expedite the miner's work considerably and do away with the temptation to allow the feed to work stiffly. A couple of ⅞- or 1-in. nuts bound closely to the crank in this manner will not slip around or get tangled with the crosshead.

A Scheme for Reducing the Mesh of a Screen

In remote mining districts the mill superintendent frequently has occasion to use a screen of smaller mesh than he has on hand, and to secure this screen from a factory may require several weeks. A method used by the Vermont Copper Company for reducing the mesh of a screen is shown in the accompanying illustration. The screens upon which it was used were of the perforated type, with elliptical holes 1x2 in. A wire about ⅛ in. in diameter was threaded through the openings, diagonally across the screen, thus reducing the openings to one-half the original size. The wire can be fastened easily and securely at the edge of the screen either by notching the screen, or running the wire through the wood frames, if one is used.



SCREEN THREADED WITH WIRE TO REDUCE SIZE OF MESH

Personal

Mining and metallurgical engineers are invited to keep THE ENGINEERING AND MINING JOURNAL informed of their movements and appointments.

H. Kilburn Scott, of London, has left for Bulgaria on professional business.

H. W. Turner, of San Francisco, is examining a mining prospect in Washoe county, Nevada.

Kirby Thomas, of Mexico City, is making examinations in the Hostotipaquilla district of Jalisco, Mexico.

P. V. Babb, of Mexico City, is in Boston in connection with negotiations for coal mines in northern Mexico.

Selwyn Goldstein, formerly of Australia, is examining some mines in Guerrero, Mexico, for an English company.

A. C. Ludlum, of New York, has been at the placer of the Compton Gold Dredging Company, at Moe's River, Quebec.

Quincy A. Shaw, of Boston, is at the Lake district of Michigan looking over the various properties in which he is interested.

B. M. Snyder is now smelter superintendent of the new plant of the Arizona United Mining Company, at Johnson, Arizona.

J. J. Brown, Jr., professor of ore dressing at the Oklahoma School of Mines and Metallurgy, is in Colorado on professional business.

Thomas [illegible] has been chosen president and W. D. Greenough, manager, of the Snowstorm Mining Company, Wallace, Utah.

Richard Rodgers, the oldest mining captain on the Marquette iron range, has just returned to Marquette, Mich., from a visit to England.

Dr. A. W. G. Wilson, of the Mines Department of Canada, has been visiting the new placer mines in the Sherbrooke district of Quebec.

John G. Worth, of the Worth and North American Exploration companies, has left Tonopah, Nev., on an inspection of mines in Colorado, Utah and Nevada.

Frank A. Leach has resigned his position as director of the United States Mint, and has been chosen president of the People's Water Company, of Oakland, California.

Doctor Hultberg, of Norway, Mich., is examining the Campbell mica claims in Dickinson and Shields townships, northwestern Ontario, on behalf of an American steel company.

Kenneth B. Smith, a graduate of the Michigan College of Mines, has been appointed head of the assay department of coal and mining engineering at Notre Dame University, Indiana.

The Standard Portland Cement Company, of London, has appointed E. J. [illegible] superintendent of operations, E. C. Miller, of North Carolina, chemist, and C. F. Lewis mechanical engineer.

Dr. P. Heroult, who has been supervising the tests with his electric steel-refining process at the South works of the Illinois Steel Company, sailed for Europe Aug. 5, to be absent about two months.

Otto C. Burkhart, professor in charge of the mining department of the Virginia Polytechnic Institute at Blacksburg, Va., and formerly for several years on the staff of the JOURNAL, has been visiting New York.

Herman A. Prosser and Arthur L. Walker have formed a partnership under the name of Prosser & Walker, with offices at 42 Broadway, New York. They will conduct a general consulting metallurgical and engineering business.

Joseph Brierschmitt, district superintendent of the Philadelphia & Reading collieries in the Mt. Carmel-Locust Gap district for several years, has been retired on account of age. His successor will be Morgan Bevan, superintendent of the Græber colliery at Gilberton.

A. Platt Andrew has been appointed director of the United States Mint, to succeed Frank A. Leach, resigned. Mr. Andrew is assistant professor of economics at Harvard University, but for a year past has been acting as expert for the currency commission appointed by the last Congress. He has published several articles on currency questions as they concern Oriental countries, notably one on the adoption of the gold standard in India. He also wrote a history of the Mexican dollar.

Obituary

Lee Gardiner, superintendent of the Watauga mine, at Joplin, Mo., was killed, Aug. 2, by the explosion of a gasolene engine. He was 45 years old, and had been a long time in the Joplin district.

Louis Philip Ewald, president of the Ewald Iron Company, St. Louis, died in Louisville, Ky., July 31. He was 63 years of age and was a native of St. Louis, but went to Lyon county, Ky., when he was a young man, and there became interested in the iron business. He bought the Coleman Brothers iron mills in Louisville, in 1886, and later founded the Ewald Iron Company.

Lord Mortimer Coe, president and founder of the Cleveland City Forge and Iron Company, died Aug. 2. He was born in Penn Yann, N. Y., in 1828, and entered active life as an engineer on one of the earliest lake steamers. Subsequently he became interested in a large fleet of lake boats, but in 1883 he sold his vessel interest, and the next year founded the Cleveland City Forge and Iron Company.

George E. Fagan, a Chicago mineowner who had been for some time in the neighborhood of Sault Ste. Marie, Ont., where he had several mining claims, was drowned in the Goulais river near Searchmont, Aug. 2. He was in camp with another mining man, who missed him in the morning and going in search found his body in shallow water under Goulais falls. Mr. Fagan was about 68 years of age.

Lee L. Malone, general manager of the Consolidation Coal Company, died in the Johns Hopkins Hospital at Baltimore, July 30, as result of an operation on the brain. He was 47 years old. He was born in West Virginia, in 1862, and his education was secured in the common schools of that State. He became associated with the Montana Coal & Coke Company, 1886-1890, then came to Fairmont, and was appointed superintendent of the West Fairmont Coal and Coke Company and later purchasing agent as well, serving till 1899. Then he became general superintendent of the Montana Coal and Coke Company, West Fairmont Coal and Coke Company and Brier Hill Coal and Coke Company, and subsequently general manager of the Consolidation Coal Company and all its controlled companies. He began when a young man in a subordinate position, and worked his way up by force of character and ability. He was especially noted for his success in managing men.

Societies and Technical Schools

Practical Mining Captains' Institute.—A meeting of this association, which is local to the Mesabi iron range, was held at Hibbing, Minn., July 28. There were 30 members present. Several papers on mining matters were read and discussed.

Lake Superior Mining Institute.—The following is a partial list of the papers which will be presented at the meeting of the institute Aug. 25-28 next:

1. "How Reforestation May be Applied to the Mine Timber Industry;" by Thomas B. Wyman, Munising, Mich.
2. "Mine Accidents;" by John T. Quinc, Ishpeming, Mich.
3. "The Sociological Side of the Mining Industry;" by W. H. Moulton, Ishpeming, Mich.
4. "Biographical Notes;" by J. H. Hearding, Duluth, Minn.
5. "Reminiscences of the Early Days on the Marquette Range;" by George P. Cummings, Marquette, Mich.
6. "Historical Sketch of Copper Mining on Lake Superior;" by Alfred Meads, Marquette, Mich.
7. "Code of Mine Signals, Cleveland-Cliffs Iron Company;" by O. D. McClure, Ishpeming, Mich.
8. "Capillary Attraction in Diamond Drill Test Tubes;" by J. E. Jopling, Ishpeming, Mich.
9. "Sinking Reinforced Concrete Shafts Through Quicksand;" by Frederick W. Edgar, Chicago, Illinois.

Special Correspondence from Mining Centers

News of the Industry Reported by Special Representatives at Butte, Denver, Salt Lake City, Goldfield, Cobalt and London

REVIEWS OF IMPORTANT EVENTS

San Francisco

Aug. 4—The Fairview quartz mine, five miles from Minersville, Trinity county, which a few years ago was the most productive mine of its kind in the county, and employed 150 men about the mine and 40-stamp mill, has been abandoned. The ledge became broken up and the orebody was exhausted. Upward of $300,000 were spent in prospecting without any beneficial result as far as finding the old orebody was concerned. The store, rails, buildings, etc., have been sold and the mill will also be sold.

The Kennedy Extension Gold Mining Company, at Jackson, Amador county, is reopening the old Muldoon mine adjoining the Argonaut property on the south. The old shaft, sunk a number of years ago, is 800 ft. deep, and the surface portion is caved, the property having been idle for some time. Under the superintendence of H. E. Averill, an electric hoist is being installed, as the ground is to be explored at an increased depth.

At the old mining camp of American Hill, about six miles east of Alleghany, Sierra county, a rich strike of quartz has been made by prospectors from Yuba county. The strike was made near Woolsey's Point, across the middle Yuba river from "Sweet Corn" Smith's place, near the old South Eureka crossing. Years ago, American Hill was one of the active prosperous camps of Sierra county. The seams recently found are of the same character as those which lead to rich chimneys of ore in the Alleghany district. It is supposed to be a continuation of the Graniteville gold belt extending north to Sierra City. There is considerable unexplored ground in the vicinity of American Hill, and the recent strike will attract many prospectors. In fact, the whole of Sierra county is now very active, particularly the southern part. Alleghany is the center of attraction owing to the rich finds there, but at Gold Cañon, Forest, Pike City, and thereabouts, much is being done in a mining way. Thus far the mines found have "made good" in the matter of bullion yield.

W. S. Fletcher, of Pasadena, has, with his associates, put considerable money into mines on the Forest Hill divide in Placer county. He is establishing a 2000-h.p. electric-power plant at the Home Ticket mine at Last Chance, 14 miles above Michigan Bluff, and has invested much money in other mines in that section. He has now applied for a franchise for an electric railroad 16 miles in length to extend from Colfax, on the main line of the Southern Pacific, to Bath, one mile east of Forest Hill. It will run virtually over the old stage road now in use and will greatly benefit the towns of Colfax, Yankee Jims, Forest Hill, Todds Valley, Bath, Michigan Bluff and Last Chance, most of which have been small mining camps for over half a century.

Denver

Aug. 6—A well known mining engineer, who has just returned from Silverton, reports that the camp has really taken on new life. The North Star, on Sultan mountain, has struck a fine body of ore in its long tunnel. The Veta Madre silver-lead vein has been reported on by engineers and a payment made, and it will soon start producing. The Iowa and Silver Lake are shipping; also the Kittimac, and the Gold King will shortly resume operations.

In the Cripple Creek district, it is reported that Copper mountain, about two miles north of the town, has a producer in the Bill Nye, which has just sent out a 25-ton test shipment. It adjoins the Fluorine, which years ago produced about $150,000 from surface ore, principally rich pockets in the breccia lying flatly on the granite, and which were worked out. The Bill Nye ore, however, has been found in a vertical vein at a depth of 125 ft. The gross production of the Gold Dollar Consolidated for July was about $20,000. The July production of the Vindicator is given at 3000 tons of ore of a value of from $24 to $42 per ton. The latter came from the deeper (1300 and 1400) levels, which is significant of the permanence of the ore with depth, and points to the creating of much workable ground by the completion of the deep drainage tunnel.

The Victor-American Fuel Company was recently incorporated with a capitalization of $7,500,000, for the purpose of acquiring the property of the Victor Fuel Company, of Colorado, and the American Fuel Company, of New Mexico. It is incorporated under the laws of the State of Maine, and it is said will issue bonds to the amount of $5,000,000. It is managed by Colorado men, although Eastern interests are represented among the stockholders. Officers of the new company, which is expected to be a rival of the Colorado Fuel and Iron Company in the production of fuel, were all formerly connected with either the Victor or American companies, and are as follows: President, G. W. Bowen; vice-president and manager of the milling department, W. J. Murray; vice-president, W. H. Huff; vice-president and secretary, S. I. Heyn; treasurer, G. F. Bartlett, Jr.; general counsel, Caldwell Yeaman; general sales agent, C. P. Heaton; purchasing agent, John McGowan; auditor, J. M. Blee; geologist, R. C. Hills.

The Kuenzel smelting process at Buena Vista has been extensively ventilated lately in the local papers, and also the details of a trial charge of 50 tons, as the result of which, "the whistles blew and the people cheered vociferously." Boiled down, it would appear that the "mass was liquified and a flow of bullion produced," with gas from oil as a fuel. That this could be done is well known. It is stated that no fluxes were used, but the recovery was not stated, nor the cost of operation on a commercial basis.

Butte

Aug. 7—The presence of Senator W. A. Clark in Butte has given rise to reports that disputes of long standing with the Amalgamated company regarding boundaries will be brought to a head. While no details are made public, it is understood that the Clark interests were recently notified to stop mining beyond specified boundaries, and that it is this matter which is mainly responsible for Senator Clark's visit to Butte at this time.

Work was started this week at Great Falls on the big transmission line, which will convey electricity from the Great Falls hydroelectric plants to Butte and Anaconda, for the operation of the mines and reduction works. The first of the dams will not be ready until June, but it is desired to have everything in readiness to deliver electricity as soon as it can be generated. The line will be of the most substantial material, very heavy copper wire being carried on high steel towers. It will run in a nearly straight line, the distance to Butte being 120 miles. The power to be generated from the Rainbow falls will be about 38,000 horsepower.

Plans will be submitted at a meeting of the creditors of the Idaho Smelting and Refining Company in Spokane, on Aug. 15 for the reorganization of the corporation. If present plans work out, all the factions will be included in the deal, and the plant at Sandpoint on Lake Pend Oreille will again be in operation. It is given out that Greenough Brothers, J. Herbert Anderson and prominent men in the Fidelity National Bank will coöperate in the new organization, thus bringing to a close the Greenough-Anderson controversy.

Salt Lake City

Aug. 6—It is persistently rumored that the Cole-Ryan interests have under way important negotiations in the Bingham district. The proposition is said to include the acquiring of the Ohio Copper, the Mascotte tunnel and the Boston Consolidated. If the deal goes through, it is probable that the Mascotte tunnel will be continued into Boston Consolidated territory, opening up an enormous tonnage of ore. It is known that Cole-Ryan agents have approached the several interests concerned, but just how far negotiations have progressed is not known. Samuel Newhouse expressed no surprise when the matter was mentioned to him, but would make no definite statement regarding the same.

Another suit has been filed in the Federal court against the Colorado Mining Company by Joseph L. Wilson and W. Y. Croxall. The suit is brought to recover several thousand shares of stock in the company, which are alleged to have been taken from them through fraud. The complaint also asks that the judgment of $4500 rendered in Wilson's favor in November, 1907, be set aside. The suit seems to have little effect on the market value of the stock. The stock market has been dull and listless during the past week, with the activity confined to but few stocks. Few of the old-time leaders have shown any strength, while new strikes and dividends seem to have no elevating influence.

In connection with the proposed consolidations in Park City, it is now a settled fact that the West Quincy and the Thompson Mining companies are to be merged. The shareholders of each company have voted on the subject, and all that now remains is to work out the details of transfer of the old companies to the Quincy-Thompson Consolidated Mining Company, which is the name of the new organization. The new holding company is to have a capital of $1,250,000, in $1 shares. The West Quincy is to receive 400,000 shares for its holdings, the Thompson company 333,000 shares, and the Daly-West and Ontario companies, for drainage and operating easements, 200,000, while the remaining 317,000 shares will go into the treasury to provide a working capital.

Goldfield

Aug. 3—In a statement recently issued to stockholders by the Goldfield Consolidated Company, the accompanying figures were given as to tonnage, earnings, and mining and milling costs, for the quarter ended June 30, 1909. The decrease shown in the net earnings is attributed to the new policy of the company to mine all the ore in the stopes of a payable grade, and thereby save any secondary expense in again opening the stopes and mining the lower grade ores. The estimated production for July is $531,000 gross, with a net profit of approximately $390,000, recovered from the treatment of 18,620 tons of ore.

GOLDFIELD QUARTERLY REPORT.

	April.	May.	June.
Tons mined	19,417	21,631	19,542
Tons milled	19,274	21,174	19,542
Tons shipped	384	156	.....
Earnings	$926,652	$762,748	$529,714
Expenses	129,006	155,988	147,334
Profits	797,646	606,760	382,380
Cost per Ton.			
Mining	$3.92	$3.70	$3.80
Transportation	0.133	0.111	0.112
Milling (both mills)	2.440	2.306	2.267
Total per ton.....	6.493	6.117	6.179

The closing of the affairs of the subsidiary companies will be completed on Aug. 20, 1909. At a meeting of the directors in May, a proposition to purchase the outstanding stock of the subsidiary companies was formulated and accepted on July 1, 1909. Deeds and bills of sale of the stock and holdings of the respective companies were filed for record the next day and a final dividend declared.

The entire matter will be ratified by the stockholders on Aug. 20. At the time the Goldfield Consolidated company was formed it owned 97.716 per cent. of the stock of the Mohawk, 99.666 per cent. of Red Top, 99.191 per cent. of the Jumbo, 99.276 per cent. of Laguna, and 99.08 per cent. of the stock of the Goldfield Mining Company. Thus far it has been necessary to keep each of the above corporations alive, but upon the ratification of the above transaction they will be dissolved.

The Goldfield Consolidated Milling and Transportation Company has been formed with $400,000 capital, par $100, to acquire and operate the Consolidated mill, Combination mill and Consolidated railroad. President Wingfield, of the Goldfield Consolidated Mines Company, is also president of the new concern. The Consolidated exhibit for the American Mining Congress consists of two blocks of quartz, each weighing, approximately, 500 pounds and worth about $20 per pound.

Cobalt

Aug. 6—On its Lawson property, the La Rose company has opened a new 8- to 12-in. vein, which for silver content is said to be fully equal to the famous "silver sidewalk." An important feature of the discovery is that the vein is in a different part of the Lawson territory from that portion where the other veins have been found, being near the western side line and in the conglomerate. The ore is smaltite carrying native silver. This makes seven surface veins that have been found on the Lawson, and the probability is that underground development will show up more as this has been the experience of practically every mine in the camp. Development on this property is at present limited on account of the small capacity of the compressor but the power companies expect to be in a position to deliver air before long, and when they are, development will be conducted on a much larger scale.

The latest addition to the list of concentrators under contemplation is for the Silver Cliff, where there are considerable bodies of low-grade ore. The Northern Customs concentrator has practically completed milling the dump of the Silver Queen mine, about 125 tons of concentrates having been obtained. There is much activity in Munroe township where there are many gold properties. One of the most promising of these belongs to the Painkiller Lake Gold Mining Company. A shaft down 25 ft. has a 4-ft. vein in the bottom. As a rule, however, the veins in this section are narrow and rich.

The directors of the Kerr Lake have declared the regular quarterly dividend of 6 per cent for the third quarter of 1909. On July 30, the cash on hand amounted to $367,832 and the value of ore on hand and in transit was $306,291. The Coniagas mine will erect a shaft house in the center of the town to develop the eastern part of its property.

A case that has attracted much attention, and which is generally spoken of as the Temiskaming & Hudson Bay bribery case, culminated recently in the arrest of Angus Mackelvie, vice-president of the company. Several years ago a man named John Piche, staked a number of claims for the Temiskaming & Hudson Bay Company, and subsequently several persons made application to the attorney general to have the claims of the company set aside, stating that Piche did not have a legitimate discovery when the properties were staked. When the case came up, Piche, who was the principal witness, had disappeared and it was claimed that he had accepted a number of shares of stock and a certain sum of money to leave the country, so that his evidence would not be given, and it was further claimed that Mr. Mackelvie had given this money on behalf of the company. Piche disappeared for 3 years and was arrested a short time ago on his return to New Liskeard. The evidence at the preliminary hearing tended to show that the money that passed between the two men was in settlement of a personal matter, and had nothing to do with the company's affairs. The case will come up at the assizes next September. Many people think that it is largely a matter of politics, Mr. Mackelvie having been the Liberal candidate for the Provincial House at the last election.

Toronto

Aug. 7—The Ontario government announces that the Provincial mine in the Gillies timber limit, embracing an area of 30 acres, together with other portions

of the limit amounting to about 350 acres, and divided into about 20 lots, will be offered for sale under competitive tender, to close Sept. 13. The conditions include the payment of a 10 per cent. royalty on the output. The Provincial mine has two shafts. One is down 140 ft., with levels at 65 and 125 ft. On the first level about 870 ft. of drifting has been done. East of the shaft are several crosscuts, and a raise has been put through to the surface. Considerable stoping has also been done. At the 125-ft. level drifts have been carried easterly for 310 ft. with crosscutting north and south of the vein. The second shaft, 70 ft. deep, near the eastern boundary of the property is on another vein, and diamond drilling from this shaft recently encountered ore at a vertical depth of 125 ft.; other veins have been found by crosscutting. The mine has a boiler and compressor plant, and has shipped two carloads of cobalt ore and one of silver ore, the value of which has not been made public. Deputy Minister Gibson, of the department of mines, is preparing an official prospectus, showing the condition of the mine and the results obtained, for the guidance of bidders.

Sydney, Nova Scotia

Aug. 7—The situation at the mines of the Dominion Coal Company at Glace Bay presents little change. The operators claim that the backbone of the strike is broken and continue to refuse terms to the United Mine Workers. This organization, on the other hand, still claims that it will be successful. Meanwhile the mines are being operated by the members of the Provincial Workingmen's Association. The mines are now producing about 10,000 tons per day, according to the claims of the operators.

At the mines of the Nova Scotia company at North Sydney and Sydney Mines a feeling of unrest is manifest among the men, but there have been no definite signs that a strike will be declared. It is thought that the men are awaiting the outcome of the strike at the Dominion company, and will only strike if that is successful.

Great interest is attached to the visit paid to Sydney last week by Charles M. Schwab, of the Bethlehem Steel Company. Mr. Schwab inspected the plant of the Dominion Iron and Steel Company and pronounced it one of the most modern and best equipped steel works in Canada or the States.

Mexico

Aug. 5—The severe earthquake shocks which visited the City of Mexico and the whole southern part of the republic in the last week of July caused alarm and terror to the large foreign population engaged in mining in the region affected. Very little damage was done by the recent phenomena, but the effect on the nerves of the whole population was, in itself, a serious matter, and the fear of still greater disaster from the many sleeping volcanoes of the region is an ever present fact in the lives of the people of the earthquake zone. A recently issued bulletin of the Mexican Institute of Geology, contains an interesting catalog of the *temblores* (earthquakes) which have been recorded in Mexico during the years 1904 and 1908. The list contains nearly 500 records, most of which, of course, represent only slight shocks, not perceptible except to the delicate instruments of the recently established seismological section of the institute.

It is announced that the Interoceanic railway has secured a lease on the Mexican Southern covering the remainder of the period of the concession. The Interoceanic is an English-owned company, which is under lease to the National Railways of Mexico, the Merger system, and these new developments in the railway situation extend the control of the Merger system over the important Mexican Southern line and defeats the plan of the Mexican Railway to secure control of the road. The Mexican Railway which operates between Mexican City and Veracruz is a strong independent line, and has been in negotiation for the Mexican Southern for some time. The Mexican Railway had planned important extensions of the Mexican Southern to the southward to connect with the Tehuantepec line. It is thought that the new control of the Southern will defeat these proposed extensions, although there exists good commercial reasons for this mileage. The matter is not officially announced and considerable interest awaits the outcome. The Mexican Southern railway extends from Puebla to Oaxaca, a distance of 284 miles, and controls the branch line to Taviche and another extension from Oaxaca. It is owned by an English company, and has not been very profitable.

The negotiations for La Blanca mine in Pachuca have been an interesting feature in Mexican mining circles for some days. La Blanca has twice in the past year been under option to J. B. Farish, but the options reverted. As recently noted, an option was given to parties supposed to represent the English interests owning the Camp Bird mine in Colorado. An examination of the La Blanca was made by the engineering firm of Spurr & Cox, Inc., and a number of prominent engineers, including R. J. Frecheville, John Hays Hammond and others, arrived to conclude the investigations and negotiations. About the time of the arrival of these engineers it became known that the Santa Gertrudis was under negotiation, as well as La Blanca; both these mines are on the same vein and are owned by separate Mexican companies.

The Santa Gertrudis has not been under option before, but covert negotiations for its purchase have been under way for several months. The company last month contracted for a 300-ton cyanide mill, and it is presumed that this act was an indication of the failure of all negotiations. However, papers are drawn up for option on the property for a sum said to be 9,250,000 pesos. It is expected that the contracts will be closed. The La Blanca sale is still pending over negotiations as to terms and prices. The announced price is 6,000,000 pesos. It is likely that both of these sales will be concluded, and that these mines will pass into strong hands. There is much interest in the deal, partly because it means extensive operation of the properties, but chiefly because it is an expression of confidence in the future price of silver on the part of men who are in a position to know about the subject.

Johannesburg

July 1—The developments being prosecuted on the eastern extension of the Witwatersrand have a vital bearing on the future of the country, generally. Of this area, which is about twice as large as the rest of the Witwatersrand, little is known as to the value of the ore. The pioneer Geduld is opening up good ore now. The Cloverfield has just reached the reef in their shaft and although not so good as the bore-hole results led one to expect, the content is satisfactory. A sampling of the reef in 16 sections all around the shaft gave an average width of 10.5 in. and a content of 22.3 dwt., equivalent to 6.5 dwt. over a stoping width of 36 inches.

The result of the last bore hole at the Modder B.—reef width, 11.5 ft.; content, 1.6 dwt.—has caused disappointment here, but is really of no consequence in view of the excellent results obtained in other parts of the property. All the Witwatersrand mines contain unpayable areas. The Van Ryn Deep has just encountered the reef in its shaft which has not yet passed through it, so that the content of the ore will not be known for some days.

Another big amalgamation of producing mines has now been definitely planned. This comprises the four producing subsidiary companies of the Randfontein estates, together with the non-producing Stubbs-Randfontein and 123 reef claims on the dip of the Porges-Randfontein and the South-Randfontein companies.

The capital of the new company, which is to be styled the Randfontein-South Gold Mining Company, Ltd., will be £2,250,000, of which 250,000 shares will be held in reserve. The shares in the new company are apportioned as follows: To Porges-Randfontein, 500,000 shares; North-Randfontein, 495,000; Robinson-Randfontein, 330,000; Stubbs-Randfontein, 174,000, and to the Randfontein Estates Company for 123 undeveloped reef claims, 200,000 shares.

Mining News from All Parts of the World

New Enterprises, Installations of New Machinery, Development of Mines and Transfers of Property Reported by Special Correspondents

THE CURRENT HISTORY OF MINING

Alabama

Tennessee Coal, Iron and Railroad Company—Alice furnace at Birmingham has been blown in and an additional furnace at Ensley; also a large number of coke ovens.

Dr. M. J. Shields, of Scranton, Penn., has finished the organization of a first-aid corps in each of the coal mines of the Tennessee company. These corps are divided in seven districts, Pratt No. 1, Pratt No. 2, Bloss, Blue Creek, Blocton, Henry Ellen in Alabama, and Whitwell district in Tennessee. Each corps has elected its own officers, consisting of a president, vice-president, secretary and medical directors. The corps are to meet monthly for practice and instruction by the medical director.

Arizona

COCHISE COUNTY

Superior & Pittsburg—The Calumet & Arizona smelter at Douglas, treating the ores of these two companies, recently adopted the policy of showing the proportion of copper contributed by each company. For the past five months the average monthly output of the Superior & Pittsburg has been slightly over 2,000,000 pounds.

Copper Queen—The copper output for July was 8,600,000 lb., being a decrease of about 400,000 lb. from the June production.

Shattuck-Arizona—Development of the orebodies on the 600 level continues with favorable results. Raise No. 21 put up to the fifth level showed an orebody 55 ft. thick. All ore taken out in this development has been of smelting grade.

GILA COUNTY

Inspiration—The shaft in the sulphide orebody at a depth of 345 ft. was in ore averaging 2.03 per cent. copper. The shaft has been in commercial ore for 255 ft., and it is estimated this body will average 2% per cent. copper.

Superior & Boston—The Great Eastern shaft of the company has reached a depth of about 670 ft., where lateral work has disclosed the lode wider than in the workings above.

United Globe—From the 14th level of the Old Dominion shaft ore has been encountered in the Gladiator claim. This is thought to be the same orebody already opened on the 10th and 12th levels.

Old Dominion—The West orebody encountered on the 16th level has now been crosscut and found to be 110 ft. wide. The copper production during July was 2,700,000 lb., which is below the normal output. The production for the first seven months of 1909, however, was 21,490,000 lb., as against 21,290,000 lb. for the corresponding period of 1908. Four furnaces were in operation.

Arizona-Colorado—The shaft has now reached a depth of 900 ft. and a station is to be cut for the pumps.

Cactus Development—Favorable showings continue in the development of the high-grade copper orebody encountered recently in the Hamilton shaft.

GRAHAM COUNTY

Arizona Copper—The production of this company for the half year, as finally adjusted, was 16,482,000 lb., a yield of 11.91 per cent. copper for the material smelted, or 2.22 per cent. on the raw ore treated. A briquetting machine with conveyer belt and drying tunnel has recently been installed.

PIMA COUNTY

Southern Arizona Smelting Company—This operating company of the Imperial Copper Company is now producing about 1,000,000 lb. of copper per month. Two blast furnaces and one converter stand are being operated, about 700 tons per day being smelted; this production is mainly from the Mammoth and Union mines. Meade Goodloe, Sasco, Ariz., is superintendent.

YAVAPAI COUNTY

May—Work will be resumed on this property, near Mayer, under the direction of H. C. Heffelman.

Rosalie—George C. Meese, of Joplin, Mo., recently visited this property, and states that the company is preparing to increase the work as soon as connections can be made with the Arizona Power Company's lines. A new hoist and air compressor have been ordered.

California

AMADOR COUNTY

Bunker Hill—The property at Amador City, E. H. Harrington, superintendent, yielded during the last six months 10,844 tons of ore averaging $6 per ton, and seven dividends, aggregating $42,000, have been paid.

BUTTE COUNTY

John Morris—This quartz mine at Wyandotte has been bonded to F. H. Bell, of San Francisco.

CALAVERAS COUNTY

Mechanic's Mining Company—The company is now sole owner of the Ritter mine near San Andreas, and operations will shortly be resumed.

Reiner—Work has been started at this gravel mine by John C. Benson, of Stockton. The mine has the largest gravel mill in the State.

Heckendorn—Bernardo Curti, of Angels, is erecting a 10-stamp mill for the mine at West Point.

FRESNO COUNTY

Delilah Mining Company—This company has been organized to work the Delilah group, comprising 140 acres at Sampson's flat. W. A. Macdonald, W. G. Melton and H. N. Norris, of Coalinga, are interested.

NEVADA COUNTY

Yuba—In the mine above Washington, good ore is being taken from the 400 level. T. M. Chase, manager.

Birchville—At the mine at Graniteville, 25 men are at work under the superintendence of Fred Medlin; the mill continues to work on excellent ore. There are now 100 men at work on claims in and about Graniteville.

PLACER COUNTY

McGeachin Mining Company—The company has added to its possessions the Morning Star drift mine on the Iowa Hill divide; also the Iowa Hill canal and reservoir. The water is to be used for power for mining.

PLUMAS COUNTY

Crescent Hill Gold Mines Company—Two tunnels are being run to develop the ore deposits in this mine; one is in 800 and the other 400 ft. Ore sufficient to keep a mill running two years is to be blocked out before erecting a mill.

SAN BERNARDINO COUNTY

Gold Mountain—The machinery for 60 additional stamps has been purchased by Captain Delamar for this mine at Gold Mountain camp.

SHASTA COUNTY

Oun Copper Company—This company has been organized at Redding to work the Spread Eagle group of claims near Copley and Coram. The ore will be smelted at Coram. The president of the company is Alfred Onn.

SIERRA COUNTY

Twenty-One—High-grade ore is being taken from the tunnel of this mine at Alleghany, F. M. Phelps, manager. The tunnel is about 1000 ft. below the apex of the vein and is regarded as a proof of the continuance of the veins in the Alleghany district. The tunnel is 1000 ft. south of the Tightner mine.

Colorado

CLEAR CREEK COUNTY

Columbia & Eureka—In the Silver mountain section, a strike of high-grade gold-copper ore has been made in these old workings. E. J. Butts, manager, Georgetown.

Bezant—The old Quartz Hill mine in Leavenworth gulch is shipping regularly, and additional machinery will probably be installed and the shaft deepened.

Concrete—Three cars of ore are being shipped daily from this property and a mill may be erected for the treatment of the low-grade rock. E. S. Moulton, Central City, is interested.

LAPLATA COUNTY

Tomahawk—The Trails End property in the Laplata district, on which a rich strike was made, has recently been purchased by this company and will be actively developed.

LAKE COUNTY—LEADVILLE

Highland Mary—The shaft is now down 70 ft. and is still in ore. A station will be cut and a crosscut started southward to determine the width of the orebody in this direction. The Weston fault is south of the recent strike—about 150 ft., as placed by Emmons. Two-hundred tons of ore have been taken from the shaft in sinking to the present depth and 150 tons of it were sent to the smelters. An electrict hoist will be installed.

Robert E. Lee—On the 250-ft. level of this old producer, leasers have opened a large body of zinc carbonate ore, the shoot now being 35 ft. wide. It was discovered in virgin territory and carries from 25 to 30 per cent. zinc. Leasers in the upper workings are obtaining a fair grade of iron ore.

SAN JUAN COUNTY

New Gold King Mines—Under this title, the property of the old Gold King Consolidated will resume operations as soon as the surface improvements are completed. In addition to the tramway and shaft house, additions are being made in the mill, including new Wilfley tables, classifiers and other minor improvements, which will be completed about Sept. 1. Victor E. Kerr, Silverton, Colo., is in charge.

SAN MIGUEL COUNTY

Vanadium Alloys—After a tedious period of experimentation, this company's plant at Newmire is now said to be making a satisfactory saving on the vanadium ore.

Tomboy—Reports from London state that during July the mill ran 29 days, yielding bullion valued at $48,000 and concentrates, worth $17,000. The working expenses were, approximately, $40,000, leaving $25,700 profit.

SUMMIT COUNTY

Elk Mountain Mining and Leasing Company—This new company will begin development of property in this county at an early date. John T. Milliken, of St. Louis, president of the Golden Cycle Mining Company, and L. A. Van Tilborg and other Cripple Creek men are interested.

TELLER COUNTY

Empire State—A 6-ft. vein, carrying streaks of sylvanite, has been encountered on the 900 level.

Acacia—Returns, averaging over $60 per ton, have been obtained from the last 3 cars shipped by Hastain & Johnson, leasing on the Burns claim.

Lucky Corner—This leasing company is shipping a car per day of ore of milling grade from the Lucky Corner mine owned by the Doctor Jackpot Mining Company. A new shaft is being sunk beyond the line of the recent cave and connects with the first level.

Idaho

BOISE COUNTY

Columbia—Machinery for the 15-stamp mill has arrived at Quartzburg. Electric power will be used. I. H. Friar, manager.

BONNER COUNTY

Idaho Power and Concentrating—Ralph Reinerston and G. H. Hipke, of Sandpoint, and associates have incorporated this company for the purpose of developing water power on Trestle creek between Sandpoint and Hope. The company will also erect a custom concentrating plant on the lake shore east of Sandpoint.

SHOSHONE COUNTY

Snowstorm—At the annual meeting, it was decided to close the mine at the termination of the present smelting contract, the reason given being the unsatisfactory railroad rates to Anaconda, Mont.

Sampson Mining and Developing—High-grade lead ore has been encountered in the lower tunnel of this property on Eagle creek, 5½ miles from Murray. A. J. Brainard, manager.

Black Bear—A body of milling ore, 8 ft. in width, has been cut at the property, near Gem, and a tunnel is being driven to catch the orebody.

Kansas

CHEROKEE COUNTY

Waterhouse & Co.—Construction work is in progress on a 300-ton mill on the Maggie Taylor tract in the heart of Galena. It is expected the plant will be in operation Oct. 1. A second plant will be built later and in addition to working old dumps, deeper runs of zinc and lead ores will be opened.

Clermont Mining and Milling—Manager Joseph Fallenback has purchased a 150-ton mill in Missouri for immediate removal to the property south of Galena, where the company owns 300 acres in fee and has leases on 200 acres.

M. K. & T.—The property south of Baxter Springs has been acquired by Charles Nusbaum, of Cincinnati, and John M. Daugherty, of Omaha. The capacity of the mill will be increased to 500 tons at once.

Good Luck—The company is now producing 60 per cent. zinc ore from its mine south of Baxter Springs, the improvement coming with the development of the lower ore run.

Louisiana

During the month of July there were 27 new wells bottomed, of which only 12 were oil producers. There were 25 new wells in progress at the end of the month. Oil production for July was 265,300 bbl., a decrease of 20,900 bbl. from June. Shipments by rail were 225,432 bbl.; by pipe line, 36,000; total, 262,032 bbl., an increase of nearly 100,000 bbl. over June.

Michigan

COPPER

New Arcadian—A contract has been let for a large amount of diamond drilling, and operations are to start at once from the bottom of the exploratory shaft, previously sunk to a depth of about 200 ft, on the eastern portion of the tract. The company has about 3200 acres of land in the mineral zone. Robert H. Shield, of Houghton, is president.

Ojibway—Drifting between the two shafts at the 800-ft. level on what is known as the west bed of the Kearsarge lode continues, and both breasts of the drift are showing a good grade of stamping rock. Sinking is going forward at both shafts; No. 1 is down to about 1100 ft., and No. 2 to 1150 feet.

Copper Range—The betterment in the mineralization that was noted several months ago in the lower workings at the Trimountain tract continues. The south drifts from "E" shaft are nearing the point where the proposed new, or "F," shaft will be put down. The drifts are in good ground.

Mayflower—The company has let a contract for about 10,000 ft. of diamond-drill work to be done on the eastern portion of the land. Considerable exploratory work has been done on the western portion, both by drilling and underground openings, without revealing anything of importance. Work was suspended in 1906.

LaSalle—The stock pile that has accumulated during the opening of the shaft on the Tecumseh tract is to be stamped at one of the heads in the Calumet & Hecla mill. Openings on the Kearsarge lode at this property are encouraging, and it is also planned to open the Osceola lode from this shaft.

Franklin—The company has made a contract with the Calumet & Hecla for the smelting of its mineral, its contract with the Quincy company having expired.

Indiana—This company, which originally organized in 1862, and owned about 1200 acres of land adjoining the North Lake property, has been acquired by a new company headed by Steven R Dow, of Boston, and R. M. Edwards, of Houghton. The new company is capitalized at 100,000 shares, par value $25; 60,000 shares are to be given in exchange for the property and 20,000 shares are to be sold at $8 per share to provide development funds, 20,000 shares remaining in the treasury. Exploratory operations will start at once. The results being obtained at the Lake and North Lake properties strengthens the company's position.

Lake—The shaft is attomed at a depth of 750 ft. and 1. [illegible] this point the fifth level will be established. The shaft is in the foot-wall and it will be necessary to drive a crosscut about 20 ft. to enter the lode. At the fourth level, crosscutting has been resumed. The crosscut was extended about 40 ft. into the formation and then suspended while a drill core was driven to test its width and copper content; this core revealed copper of commercial quantity for an additional 47 ft. Diamond drilling is being carried on from various points underground to fully determine the width and mineral content of the lode.

IRON—MENOMINEE RANGE

Erickson—Diamond drilling is in progress and the results so far have been encouraging. It is in the Iron River district, in section 20, 34-43, and is owned by the Cleveland Cliffs Iron Company.

Porter-Carpenter—Diamond drills are at work on this tract in the Crystal Falls district. An orebody has been found, but its extent is not yet determined.

Schiebler—A diamond drill has been placed on this tract in the Iron river district by the St. Clair company, of Duluth.

Minnesota

IRON—MESABI RANGE

Hudson—McArthur Brothers, of Duluth, have taken a contract to strip this mine at Aurora, which is controlled by Pickands, Mather & Co., of Cleveland, Ohio.

Franklin—The lease of this mine, near Hibbing, the fee of which is owned by the State, was recently bought by Pickands, Mather & Co. It will be worked as an underground mine, and a contract has been let to the Foundation Company, of New York, to sink a shaft, which will be lined with concrete.

Virginia—This mine, between Virginia and Eveleth, has been worked to some extent underground. It is now to be stripped and worked as an open-pit mine.

Missouri

JOPLIN—ZINC-LEAD DISTRICT

With the tariff bugaboo out of the way and zinc ores at $45, this mining district is showing signs of a period of unusual activity. New companies are being organized and nearly all the mines shut down through the recent hard times are starting again. For the first time in two years labor for the mines is unusually scarce and wages have been raised in all the camps. Development work has brought to the front the old Galena section, which bids fair to reach its old place; the Neck City camp, Gordon hollow, south of Joplin, the west Joplin sheet-ground district, the Spring City district and the Sarcoxie section are all showing renewed activity.

Carnation—The company has started production from its 40-acre lease in the sheet-ground district, on the Cosgrove land, near Porto Rico.

Porto Rico—During the latter part of July, the Highland mill of 500 tons capacity, the Trinity of 700 tons and the Lincoln of 300 tons, were started in the Duenweg camp.

United Zinc—The company has bought 160 acres of undeveloped land, south of Spring City. It has also taken under option a 40-acre tract in the Riceville district of Galena.

Texhoma—This company, of Carthage, is unwatering the Waddell mine and will enlarge the mill to 300 tons capacity.

Montana

JEFFERSON COUNTY

Calumet & Corbin—James W. Wilcox, president of the company, has been in Corbin several days inspecting the company's property, and has given orders to sink the shaft an additional 150 feet.

MADISON COUNTY

Apex—Parkinson, Stranahan and Taylor have taken an option on this mine and have a force of men cleaning out the tunnel from the Alder gulch side of the mountain.

Nevada

CHURCHILL COUNTY—FAIRVIEW

Nevada Eagles—Several promising oreshoots have recently been opened. Experiments are now being conducted to see if the ore can be concentrated and a small plant may be erected.

Nevada Hills—The directors have decided to coöperate with the Nevada-Wonder Mining Company, of Wonder, in securing electric power from a plant to be built at Fallon, 40 miles distant. Upon the consummation of the negotiations, the Nevada Hills company will consider the matter of constructing a mill and exploiting the mine at greater depth. W. H. Webber, manager.

ESMERALDA COUNTY—GOLDFIELD

Cherokee Lease—At a depth of 540 ft., while sinking, copper ore carrying fair gold and silver content has been encountered in the Atlanta.

Golden Daisy—This lease on the Goldfield Daisy ground is producing about one car per week of high-grade ore.

C.O.D. Consolidated—It is the intention of the company to sink the Victor shaft to 500 feet.

ESMERALDA COUNTY—GOLD MOUNTAIN

Bonnie Clare—The mill has started 10 stamps, and the other 10 will soon be started for custom milling. The ore being treated at present comes from the Rattlesnake mine.

ESMERALDA COUNTY—LUCKY BOY

Mitchell, Fairfield & Collins Lease—A 100-h.p. compressor and machine drills have been installed and the shaft is now about 300 ft. deep. John F. Mitchell, manager.

Silver Moon Leasing Company—J. R. Woodbridge and J. J. McCarthy have secured a lease on a portion of the Mountain King and Mountain Queen claims. The block will be equipped immediately with a 25-h.p. gasolene hoist and a 40-h.p. compressor.

ESMERALDA COUNTY—RAWHIDE

St. Ives—The lease on the Queen estate is now sinking a shaft and has ordered an air compressor, 40-h.p. engine, machine drills, etc. It is the intention to sink to the 1000-ft. level.

Gordon Coalition—On the Coalition estate this lease has opened a rich vein of sulphides on the 150-ft. level.

NYE COUNTY—TONOPAH

Montana-Tonopah—The 40-stamp mill is treating an average of 950 tons of ore per week, the recovery being between 90 and 92 per cent. Two new veins have been recently discovered.

Tonopah Mining—The Mizpah shaft has now reached a depth of 1466 ft., and the bottom is still in the rhyolite-dacite. The mill is treating about 3300 tons of ore per week of an average value of $20 per ton, from which a saving of about 90 per cent. is being made.

WHITE PINE COUNTY—ELY

Boston Ely—The shaft on the Emma claim is now down nearly 900 ft. Ore was recently encountered. E. W. Ralph, manager.

Nevada Consolidated—The copper production for the quarter, ended June 30, 1909, was 9,721,873 lb. The quarterly report, just issued, shows:

Net earnings from operations	$514,945
Interest, rentals and miscellaneous earnings	2,309
Dividends received and estimated dividends accrued	121,990
Total income	$639,244
Interest on bonds outstanding	44,325
Net surplus to profit and loss	$594,919

The metals on hand and in transit are credited at $1,781,971, and there was $606,089 cash on hand.

Oklahoma

Petroleum production in July is reported by the *Oil Investors' Journal* at 3,561,092 bbl. Deliveries were 2,865,530 bbl., leaving 695,562 bbl. to be added to stocks, which amounted on July 31 to 56,535,000 bbl. In the Mid-continent field in July 214 wells were completed, of which 196 were oil producers, three gas producers and 15 dry. There were 208 wells in progress at the end of the month.

Pennsylvania

Anthracite Coal

Kingston Coal Company—It is claimed that Breaker No. 2 of this company has established a record for the anthracite region. In July the breaker ran 24 full working days, or 216 hours, and shipped 91,000 long tons of coal. The record for one day was 5200 tons. The greatest number of mine cars dumped in one day was 1641, over a single, old-fashioned car dump, the only old part retained in the remodeling of this breaker. During the past six months this breaker has been entirely rebuilt without a single day's stopping of the machinery. All the revolving screens have been replaced by the Parrish spring-board shakers, and it is also equipped with the latest mechanical slate pickers, which eliminate the picker boys, not a person under 16 years being employed. F. F. Zerbey, of Wilkes-Barre, is general manager in charge.

Lehigh Valley Coal Company—The school for this company's employees, which was established last year at Lost Creek, has closed its first session. A large number of the men attended for all or part of the session, and the work has been so successful that the company has decided to start other schools at convenient points

Bituminous Coal

Isabella-Connellsville Coke Company—Two shafts have been started on the new coal property on the Monongahela river, near Brownsville. As soon as the shafts are well advanced, 500 coke ovens will be built.

Pittsburg Coal Company—The financial statement for the half-year ended June 30, is as follows:

	1908.	1909.	Changes.
Net earnings	$ 868,069	$ 964,684	I. $ 96,615
Charges	1,261,699	1,230,680	D. 31,019
Net loss	$ 393,630	$ 265,996	D. $ 127,634

Charges were made up this year as follows: Depletion of coal lands, $257,034; depreciation of plant, $464,014; interest on bonds, $509,632. The charges were increased this year by the adjustment of affairs in relation to the surrender of the leases of the Pittsburg Terminal Railroad and Coal Company.

Vesta Coal Company—This company has bought a tract of 5500 acres of coal land, known as the Jones land, for which it is reported to have paid $1,650,000. This tract adjoins the Liedenburg tract on Tenmile run, on which the company recently made a new entry, known as No. 5, and is near the well known Marianna mine of the Pittsburg-Buffalo Coal Company. The coal will be held in reserve by the company, but will eventually be mined through No. 5 entry. The coal will make an excellent grade of blast furnace coke. The field is tapped by the Monongahela & Western branch of the Pennsylvania railroad, and it is proposed to carry the coal either by rail or river to the coking plant at Hazlewood. The Vesta company is owned by the Jones & Laughlin Steel Company.

Utah

Beaver County

Cedar-Talisman—P. B. McKeon, a large stockholder, reports that a body of fine ore has been encountered on the 400-ft. level. The management will shortly install power drills and prosecute development work vigorously.

Indian Queen—L. N. Morrison, acting manager, states that the tunnel is in over 3200 ft., and the face is showing strong mineralization.

King David—The shaft has attained a depth of about 500 ft. The new machinery is working smoothly and good progress is being made.

Juab County

May Day—A strike of much promise has lately been made on the 1000-ft. level, showing a good body of ore.

Summit County

Daly-Judge—The extension of the Ontario-Daly fissure has been cut on the 1200 level; at this time there is a face of from 10 to 12 ft. of ore, the greater part being of excellent milling grade, while on the footwall is a streak of rich sulphides.

Silver King Consolidated—A second exposure of rich ore has been made within 60 ft. of the point where ore was recently encountered.

Liberty—Work is to be resumed shortly on a large scale in the development of this property, owned by Thomas Kearns, David Keith and other big operators of the district. The ground comprises over 400 acres in the neighborhood of the big mines.

Tooele County

Old Glory—Manager A. J. Bruneau states that regular shipments will now be sent to the Salt Lake market. The vein is 4½ ft. wide and is all of shipping grade.

Millard County

Ibex—On the 200-ft. level, a 4-ft. vein of high-grade copper ore, carrying gold and silver, has been opened. Jesse Knight, of Provo, is interested.

Washington County

Silver Reef—A shipment of high-grade silver ore was recently made to the Salt Lake market by leasers. The peculiar feature in connection with this property is the fact that the metal occurs in sandstone, either in the pure state or as chlorides.

Canada

Alberta—Blairmore

Hillcrest Coal and Coke—The dispute regarding differentials in pillar work in the Hillcrest mine having been settled by arbitration, the miners have returned to work. All coal mines in eastern British Columbia and western Alberta affected by the miners' strike early in April are now operating again.

British Columbia—East Kootenay

Sullivan Group Mining Company—The mining and smelting property of this company has been sold by the sheriff and a new company has been organized. Work is to be resumed with James Finlay, Cranbrook, as manager.

British Columbia—Phoenix

Granby Consolidated—It is reported that much more extensive development work is to be done this year, with a view to increasing the future possibilities of the property.

British Columbia—Portland Canal

Portland Canal Mining Company—An aërial tramway is being constructed from the mine on Glacier creek to Bear river, near the head of the canal. A silver-lead concentrating plant has been arranged for. C. H. Dickie, of Duncans, Vancouver island, is in charge of the property.

British Columbia—Trail

Consolidated Mining and Smelting—The total value of gold, silver, copper and lead produced during the fiscal year ended June 30, 1909, was $5,500,000, of which about $2,700,000 was of products from electrolytic lead refinery. The tonnage of

ore smelted was 347,000 tons as against 305,956 for the year preceding.

NOVA SCOTIA

Dominion Coal Company—Shipments of coal for July were 203,982 tons, of which 136,000 tons were from the mines and the remainder from the banks. The strike situation continues practically unchanged.

ONTARIO—COBALT

Ore Shipments—During the week ended July 31, there was shipped a total of 17 cars containing 519.79 tons, as follows: La Rose, 260,000 lb.; Nipissing, 187,280; Right of Way, 123,330; McKinley-Darragh, 57,300; Chambers-Ferland, 60,430; Kerr Lake, 50,500; Coniagas, 62,520; Crown Reserve, 63,000; O'Brien, 64,030; Silver Cliff, 60,820; Cobalt Central, 40,180; total, 1,030,500 pounds.

Cobalt Central—The No. 4 vein, which for some time has been a mere stringer, has widened to from 3 to 8 in. of high-grade ore. The shaft is to be sunk an additional 50 feet.

Foster—A vein, varying from 2 to 5 in. in width and having high silver content, was discovered a few feet from the Lawson boundary. It has been stripped for a distance of over 40 feet.

Union Pacific—The new machinery is now in place and the shaft will be sunk to a depth of 140 ft., at which point crosscutting will be started.

Mexico

CHIHUAHUA

The F. S. Pearson Syndicate, through the Mexico Northwestern Railway, has acquired the Rio Grande, Sierra Madre and Pacific Railroad Company and has also become the sole owner of the Sierra Madre Lumber Company, both of which were formerly the property of Col. William C. Greene.

Batopilas—It is stated that Pres. Lyndon H. Stevens, of New York, while abroad, will endeavor to secure the co-operation of English shareholders in the formation of a new company to explore and develop the unworked territory controlled by this company.

Hoods Consolidated—The company's new concentrating mill at Santa Barbara is now in satisfactory operation. Otto F. Slinack is in charge.

Palmer—This company has resumed operations on a large scale at its mines in the Parral district.

Tangyan Company—It is reported that this St. Louis company is to resume development work on its property in the Cuchillo district. R. Rains is general manager.

[illegible]

Consolidated Coal Mine—[illegible] Cananea Copper Company, [illegible] Germania. Frank P. McDermott, of New York, was appointed receiver for this company, the property of which consists of about 50 pertinencias, near La Luz, and a 100-stamp mill and cyanide plant. Efforts are being made to have the receivership order vacated, and it is expected that operations will be resumed. The company was one of the Albert J. Adams concerns, and the Adams estate is a creditor to the extent of $450,000. The balance of the debts of the company brings the total up to about $650,000.

HIDALGO

Santa Gertrudis—The mine at Pachuca has contracted for a 300-ton cyanide plant. It will be modelled on the general lines of the successful San Rafael mill in the same district. E. Girault, manager of the San Rafael, will be the consulting engineer for the new mill. The mill will be built at once irrespective of the outcome of sale negotiations. Moore filters, Pachuca tanks, Dorr thickeners and Dorr classifiers will be used.

SONORA

Calumet & Sonora—The property of the South Cananea company, consisting of four groups of mines covering nearly 600 hectares, has passed to the control of this company, headed by J. E. Cooley, of Duluth. The properties included are the Gladys, Last Chance, Collins and Homestake groups, about 2 miles south of Cananea.

Greene-Cananea—The output for July is given as 3,508,000 lb. of copper, 69,975 oz. of silver and 438 oz. gold. This production is a slight decrease in copper, as compared with the previous month, and an increase in gold and silver.

Willey-Cananea—A large body of good copper ore is reported to have been encountered in the old Ortega mine.

Mina Blanca—This group in the Moctezuma district has been acquired by W. P. Belding and associates of Nacozari and Los Angeles. Sinking to the 100-ft. level below the Antigua tunnel is being pushed by hand pending the arrival of machinery, and a gradual widening of the surface ore shoot from about 8 in. to over 3 ft. is reported.

Moctezuma-Duluth Development Company—The shaft on the Monte Cristo mine has reached the 200-ft. level where the station is now being cut. Ore running high in silver taken out in development work is being sent to the smelters via Nacozari. The ore contains much tetrahedrite, showing ruby silver. C. H. Jones, of Moctezuma, is manager.

South America

CHILI

Braden Copper Company—William Braden, vice-president, has recently returned to New York to supervise the plans for the extension to the reduction works and power plant. The concentrating capacity is to be increased to 2000 tons, including an extension to the present 250-ton mill, which is to be increased to 400 tons capacity. Corresponding smelting and converting capacity will also be provided. The concentrates now produced are handled in part by the small smelting plant at the property and the balance shipped to Perth Amboy, N. J. The smelting problems have been worked out at the local plant consisting of six sintering pots and two blast furnaces. The sintering pots are worked by the natives on contract, and only the coarse product is accepted for the blast furnaces. Additional water-power development is to be undertaken, rights for 30,000 h.p. having been secured on the Cachapoal river, midway between Rancagua and the mine. Grading has been completed for the construction of the railway between Rancagua and the mine, a distance of 43 miles, and rails have been laid for about one-fifth of this distance.

The mining claims comprise about 1200 acres in the province of O'Higgins. The Fortuna group is in a fractured diorite formation around an old volcanic vent 2½ miles in diameter. The Teniente mine is a high-grade antigua on a contact of porphyry and tuff, though the adit being driven to this property is passing through ore similar to that of the Fortuna section. The mines are being developed through four main adits. The lowest adit, 725 ft. below the main working adit, No. 3, has just encountered commercial ore. The company has recently authorized a bond issue of $4,000,000 to provide for the proposed improvements, and the estimates of ore reserves are 4,520,000 tons averaging 2.7 per cent. copper. Of this amount, 1,750,000 tons are considered "in sight," and 2,770,000 tons as "partly developed." Frank Langford is now general manager, with offices at Graneros, though the principal office will be removed to Rancagua upon the completion of the railroad.

PERU

Cerro de Pasco—It is reported that since the completion of the McDougall roasting furnaces and the installation of the screening plant at the mines, this company is now producing at the rate of 40,000,000 lb. of copper per annum. The capacity of the blast furnaces has been increased markedly by the coarse charge provided by the screening plant. At the reduction works the company is operating four blast furnaces, 30x180 in., ten 18-ft. McDougall roasters, five reverberatory furnaces and six stalls of converters. F. W. Mackenzie is superintendent of the mines, and the smelters at La Fundicion is in charge of S. J. Gormly. The general direction of the company's affairs in Peru is in the hands of R. H. Channing, Jr., president and general manager, with headquarters at Lima.

Metal, Mineral, Coal and Stock Markets

Current Prices, Market Conditions and Commercial Statistics of the Metals, Minerals and Mining Stocks

QUOTATIONS FROM IMPORTANT CENTERS

Coal Trade Review

New York, Aug. 11—The bituminous coal trade in the East shows some improvement and there is a better tone to the market, based on some actual gain in business and the confident anticipation of a better trade.

The anthracite trade is quiet for the present. The July production, as given below, was the smallest for a number of months, many collieries having been run on short time. Very few are still running full, but a better showing will probably be made later in the month. The dry weather is beginning to be felt in a shortage of water at some of the collieries.

In the West there are few changes to be noted. Factories and dealers at the large centers are beginning to lay in stocks, and a heavier movement of coal is apparent. Shipments in excess of demand are still troubling the trade, and competition for orders is pretty sharp.

A feature of the present year has been the disposition to secure control of undeveloped coal lands by steel makers and other large manufacturing companies.

Ohio Freight Rates—The coal operators of the No. 8 and Ohio-Pittsburg districts last week argued on their application to the Ohio Railroad Commission for a reduction in the freight rates from the mines in southeastern Ohio to Lake ports. The substance of their claims is in the statement presented that while the average rate on No. 8 district coal is 0.548c. per ton-mile, the railroads carry coal to Lake Erie on average rates of 0.405c. per ton-mile from Fairmont, W. Va.; 0.274c. from the Kanawha district in West Virginia, and 0.198c. from the Marrowbone district in Kentucky.

Central Pennsylvania Wage Settlement—A district convention was held at Clearfield, Penn., Aug. 7, when the operators presented a second proposition in which they ask that the miners appoint a committee of three men and the operators a similar committee, the six to select an umpire for the purpose of arbitrating the wage question. The operators say that there must be a reduction of wages, or they cannot compete with West Virginia coal in the market.

Coal Traffic Notes

The Victor Fuel Company, of Colorado, reports its coal and coke production for the fiscal year ended June 30, as follows:

	1907-8.	1908-9.	Changes.
Coal mined	1,649,722	1,394,033	D. 255,689
Coke made	76,592	93,382	I. 16,790

The coal mined for 1908-9 was also less than the output of 1906-7 by 379,270 tons.

Tonnage originating on Pennsylvania railroad lines east of Pittsburg and Erie, years to July 31, short tons:

	1908.	1909.	Changes.
Anthracite	3,022,542	2,870,341	D. 152,201
Bituminous	18,827,072	20,609,195	I. 1,782,123
Coke	3,930,328	5,867,774	I. 1,937,446
Total	25,779,942	29,347,310	I. 3,567,368

The total increase this year to date was 13.8 per cent.

Coal passing through the Sault Ste. Marie canals, season to Aug. 1, short tons:

	1908.	1909.	Changes.
Anthracite	643,633	638,981	D. 4,652
Bituminous	3,125,680	3,316,236	I. 190,556
Total	3,769,313	3,955,217	I. 185,904

The shipments, both anthracite and bituminous, in July were lighter than was expected. The total increase for the season was 4.9 per cent.

Anthracite shipments in July were 4,020,765 long tons, being 884,093 tons less than in June, and 540,741 tons less than in July, 1908. For the seven months ended July 31, the shipments were, in long tons:

	1908.	1909.	Changes.
Reading	6,954,684	6,779,385	D. 174,299
Lehigh Valley	6,325,815	5,968,862	D. 356,953
N. J. Central	4,892,898	4,509,519	D. 383,379
Lackawanna	5,925,177	5,479,357	D. 445,820
Del. & Hudson	3,733,067	3,809,122	I. 76,055
Pennsylvania	3,428,595	3,346,379	D. 82,216
Erie	4,274,367	4,477,348	I. 202,981
N. Y., Ont. & West.	1,676,345	1,602,523	D. 73,822
Total	37,209,948	35,972,495	D. 1,237,453

The total decrease this year was 3.3 per cent. Only two companies show gains this year—the Erie and the Delaware & Hudson.

New York

Anthracite

Aug. 11—Business is dull, but no one expects to do much in August. The coal offices are looking forward to a good trade with the opening of September. At present there is nothing but the usual current business.

Schedule prices for prepared sizes are now $4.65 for lump, and $4.90 for egg, stove and chestnut, f.o.b., New York harbor. For steam sizes quotations are: Pea, $3.15@3.25; buckwheat, $2.35@2.50; No. 2 buckwheat or rice, $1.70@2; barley, $1.35@1.50, all f.o.b., New York harbor. Occasional lots that are a little off quality can be had for less.

Bituminous

A more hopeful feeling is evident in the trade. The actual increase of business is not great, but inquiries are coming in, and everyone is looking forward to a much better business next month. The expected increase will probably be in the volume of sales only; prices are not likely to advance much as long as there are so many idle mines ready to take business when offered. Then too, the West Virginia competition is always in evidence.

The Far East is buying a little more coal and inquiring for big lots. The Sound is also looking up and showing a tendency to stock up. All-rail trade is steady. New York harbor is still irregular and bunchy. Prices continue as they have been for some time. Good Miller vein steam coal can be had at a delivered price which nets $1.30@1.35 at mines, while lower grades bring 90@95c. per ton at mines, and gas coal can be had at 60@65c. per ton at mine for run-of-mine.

Transportation is very good, coal coming through quickly; in some cases a day or two ahead of schedule time. Car supply is good, but it is now and then difficult to get special cars; for instance, the small cars which have to be used for consignments over some New England roads.

In the coastwise trade there is no change and will be none so long as vessels are in abundant supply as at present. Rates are 60c. from Philadelphia to Boston; 60c. from New York to around the Cape and 30@40c. to Providence and the Sound. All are shaded 5c. or so occasionally to get good cargoes.

Birmingham

Aug. 9—Alabama coal mines are starting up on all sides and the production is steadily improving. Before October, it is estimated, more than three-fourths of the mines in the State will be in full operation. The railroads are placing contracts for their fuel and as their business improves are using more, and the other large consumers are looking after supplies. There is a plentiful supply of labor so far.

Coke making is on the increase also, 1000 ovens having been put at work in the last two weeks. The Tennessee Coal, Iron and Railroad Company is putting in shape all the coke ovens it has near idle coal mines.

Chicago

Aug. 9—Strength continues in the coal market, and no kind of Western coal can be said to be weak, for lump, run of mine and screenings there is fair and steady

demand. Shipments to this market are now well balanced, so that forced sales to escape demurrage are few. Prices do not change notably on Illinois and Indiana coal, the chief steam supply, though the usual summer weakness of lump has disappeared, owing to the very large demand for the harvesting trade. In consequence of the large crops, railroad requirements are heavy.

For Illinois and Indiana the same car prices as last week, in general, obtain, lump and egg being sold at $1.75@2.35; run-of-mine at $1.60@1.75, and screenings at $1.10@1.60 per ton.

Eastern coals are steady, with receipts of smokeless not so plentiful, but demurrage sales occasionally on run-of-mine at 10 or 15c. less than the quotations of $2.95@3.05. Smokeless lump is less variable at $3.20@3.50. Hocking remains at $3@3.15, with little need of demurrage sales. Youghiogheny is $3.15 for ¾-in. gas and Pittsburg No. 8 is $2.55.

Anthracite continues in light demand, the country trade improving slightly. Considerable coal is in evidence at 10 and even 25c. under standard August prices.

Cleveland

Aug. 10—Local trade is improving on an increase of buying for fall stocks. It is still rather quiet, however, and supplies are plentiful. Slack is rather easier. Middle-district coal sells at $1.85@2 for lump, $1.65@1.75 for run-of-mine, and $1.15@1.20 for slack. No. 8 district is 1.90@2.05 for lump, $1.70@1.80 for run-of-mine and $1.30 for slack. Pittsburg coal sells at $2.15@2.25 for lump and $2@2.05 for run-of-mine; Pocahontas at $2.80 and $2.35 for the two grades. Massillon lump for domestic use is $2.70, Cleveland.

Indianapolis

Aug. 9—There has been little change in the mining situation. While there has been no great rush of orders operators say they have been enabled to operate their mines from three to four days, and, in some instances, five days during the past week. The railroads have removed a large number of idle cars from the sidings and sent them to the shops for needed repairs. Other preparations are being made to mine and handle the coal rapidly when the anticipated rush comes this fall.

The Dolton Coal Company, of Gary, has filed articles of incorporation, with large capital, to do a wholesale shipping business and a retail trade at Gary. The company may also acquire coal land and open up mines. The directors are William A. Dolton, J. J. Newbold and John McCloud, all of Gary.

Pittsburg

Aug. 10—There has been no change in the market, demand continuing fair, with prices some of them irregular. Nominal prices are $1.20 to retail dealers and $1.10 to manufacturers, for mine-run, and 65c. for slack, at mine, but these prices are shaded 5 or 10c. a ton in many cases.

Connellsville Coke—There is a slightly better demand for coke for prompt shipment, and some contracts are being figured on for furnace coke. The practice of exchanging a given number of tons of coke for one ton of pig iron continues, but of late some contracts have been made on a scale basis, referable to the ascertained monthly average selling price of basic or bessemer pig iron. Standard Connellsville coke is quotable at $1.65@1.70 for prompt furnace, and $1.75@1.80 on contract, with 72-hour foundry at $1.85@1.90 for prompt and $2@2.40 for contract.

The *Courier* reports the production in the Connellsville and lower Connellsville region in the week ending July 31 at 385,817 tons, a gain of about 400 tons from the previous week. The production seems to have reached a regular gait of about 385,000 tons a week, which compares with 400,000 to 430,000 tons per week made in 1907. Shipments in the week are reported at 4407 cars to Pittsburg, 7432 cars to points west of Pittsburg and 747 cars to points east of Connellsville, a total of 12,586 cars for the week, which is a gain of 500 cars.

Foreign Coal Trade

Nova Scotia Coal—Shipments of coal from Nova Scotia mines, six months ended June 30, long tons:

Companies.	1908.	1909.	Changes.
Dominion	1,570,258	1,209,991	D. 360,267
Nova Scotia Steel	287,595	274,556	D. 13,039
Cumberland	198,279	178,316	D. 19,963
Acadia	162,618	124,199	D. 38,449
Inverness	128,291	97,487	D. 30,804
Intercolonial	134,523	110,124	D. 24,399
Total	2,481,594	1,994,673	D. 486,921

The total decrease this year was 19.6 per cent., most of the loss being due to the strike of the miners.

German Coal Production—Coal production of the German Empire, six months ended June 30, metric tons:

	1908.	1909.	Changes.
Coal	72,695,452	71,905,114	D. 790,338
Brown coal	32,047,323	32,422,221	I. 374,898
Total mined	104,742,775	104,327,335	I. 415,440
Coke made	10,029,140	10,268,742	I. 244,598
Briquets made	8,765,938	8,901,267	I. 135,959

The larger part of the briquets reported is made of brown coal, or lignite.

British Coal Prices—Messrs. Hull, Blyth & Co., London and Cardiff, report current prices of coal as follows, on July 31: Best Welsh steam, $4.20@4.26, seconds, $4.08; dirtier, $3.96; dry coals, $4.08; best Monmouthshire, $3.60; seconds, $3.48; best small steam, $2.90; seconds, $2.40. All per long ton, f.o.b. shipping port. This is an advance of 12c. on nearly all varieties.

Iron Trade Review

New York, Aug. 11—The rush of business in the iron and steel markets has subsided a little and matters are rather quieter than they have been for a few weeks past. The quantity of business done has been so large that this was rather to be expected and was, perhaps, not unwelcome to some manufacturers.

The selling of pig iron in the Central West continues on a large scale, and the merchant furnaces are still gathering in contracts. In Eastern territory business is quieter, especially as regards basic pig. For foundry iron there are still a good many customers whose necessities are not provided for beyond the present quarter. Inquiries for next year are coming in, but not very much business has been done beyond 1909. Many furnaces have got their ideas for next year's prices up so high that buyers are unwilling to close, believing that they will be able to do so later on to better advantage.

In finished material structural steel is quieter and the business done has been mainly in smaller lots. For other material, such as plates, sheets and general merchant steel, trade continues good, though not at the highest point. Quite a number of orders for standard rails are coming to the mills, though they are not generally for large quantities. A good business is being done in rails in electric railroads, both for repairs and for new work.

In the strike of the Amalgamated Association there are no new developments, and it begins to look as if the American Sheet and Tin Plate Company would carry its point.

Pig Iron Production—The reports of the blast furnaces on Aug 1., as collected by the *Iron Age*, show 259 coke and anthracite furnaces in blast, with an aggregate weekly capacity of 488,750 tons of pig iron; an increase of 20 stacks and 25,750 tons over the July report. About one-quarter of this gain was from the merchant furnaces, the rest being from the steel companies' stacks. The increase in the latter class of furnaces in July was 13, of which 11 belonged to the Steel Corporation. Making allowance for the charcoal furnaces, the total production of pig iron in July was 2,120,000 tons; for the seven months ended July 31 it was 13,142,000 tons.

Birmingham

Aug. 9—A steady line of inquiries is being received by Southern pig iron manufacturers and some of them ask about 1910 deliveries. No business is yet being sought for next year by the manufacturers, the quotations for that period being uncertain. No iron in this section of the country is selling under $13.50 per ton. No. 2, foundry, for delivery either during the balance of the third quarter

or for the last quarter of the year. The make is being increased right along in the Southern territory, three furnaces starting in this month already and two others being in shape for operation. An increase of more than 5000 tons of iron was noted in July as compared to the output in June. The shipments are steady and accumulated iron is being sent out in quantity.

Conservative iron men look for $14 per ton, No. 2 foundry, iron within another week.

The cast-iron pipe trade is active. The plant of the Sheffield Pipe and Foundry Company has resumed operations. The Tennessee company is working the steel-rail mill at Ensley on double turn as well as the rolling mills at Bessemer.

The Tennessee company has started work on the spike and bolt works at Bessemer. The Southern Iron and Steel Company has started the work on the foundations for the new mills at Gadsden

Baltimore

Aug. 10—Imports for the week included 6600 tons manganese ore from India; 17,750 tons iron ore from Cuba and 5400 tons iron ore from Nicolaieff, Russia. Exports included 568,741 lb. scrap tin to Rotterdam; 1,103,700 lb. steel billets to Glasgow

Chicago

Aug. 9—The iron market continues firm, with steady sales for last quarter and first-half supplies well distributed. Tonnage of the individual order is still somewhat light, but is increasing and the occasional large order swells the total. For 1910 delivery sales agents are maintaining prices firmly, some holding Northern iron especially high for ordinary-sized contracts. The tone of sellers is confident and buyers are apparently settling into the conviction that general requirements may now be contracted for with confidence.

Northern brings $16.50@17 on last-quarter business; Southern, $13@13.50, Birmingham ($17.35@17.85, Chicago). The tendency upward is stronger in the case of Northern than of Southern and users of Northern are consequently more willing than agents of Northern furnaces to contract at prevailing prices, on 1910 deliveries.

Tariff certainty has not, to any large extent, affected the market for iron and steel products, which continues good in practically every line. Coke is quiet at $4.70, Chicago, for the best Connellsville.

Cleveland

Aug. 10—Few sales of iron ore are reported. A number of furnaces are expected to come into the market soon, as they are not provided yet Prices are unchanged.

Pig Iron—Small sales for early delivery continue. Inquiries are coming in for next year, but furnaces are not anxious for contracts. Current prices are $16@16.25 for No 2 foundry; $15.50@15.75 for gray forge.

Finished Materials—Prices are generally better, with good demand for almost all kinds. Contracts have been let for another freight boat, which will require about 2000 tons of plates. Quotations are 1.35@1.40c. for bars; 1.40@1.45c. for plates and structural steel, Pittsburg basis. There is some delay in deliveries.

Philadelphia

Aug. 11—Notwithstanding recent large purchases of pig iron prior to last week, buyers have been obliged to increase their orders outside of this territory. Negotiations are pending and by the close of the week some very large supplemental orders will have been placed, which will cover the needs of manufacturers for the present. Several concerns are figuring on winter needs for basic on account of the developing tendencies to stronger prices. More furnaces are going in blast. There is only moderate activity in other kinds of pig iron, buyers not caring to yield to the stronger terms named by makers for winter delivery. Pipe iron is hardening under the constant demand. The activity of the bar mills is keeping forge going and the asking price this week is $16. No. 2X foundry has also improved and the asking price today is $17.25 for some brands, though others sell at $16.75.

Steel Billets—Billets are notably higher this week and stocks are rapidly disappearing.

Scrap—A large business has been done in scrap. Railroad scrap is scarce and will be held by the companies at present prices at least. Dealers are securing control of considerable scrap which they will probably hold

Pittsburg

Aug. 10—The general tone of the iron and steel market has shown a further improvement. In pig iron the developments have produced a decidedly enthusiastic feeling. In finished steel the feeling is also favorable, but the enthusiasm is tempered with conservatism. Steel manufacturers would probably be satisfied to see the market worked up to the basis of 1.40c. for bars and 1.50c for plates and shapes These prices would compare with 1.60 and 1.70c., respectively, in 1907, and 1.05 and 1.10c. at the bottom last spring.

Bookings of specifications on old contracts and of new orders from the smaller buyers continue excellent, the total since July 1 having exceeded expectations In bars, plates and shapes the mills are now decidedly behind in deliveries, the usual promises being from 6 to 12 weeks on new orders or specifications. In shapes deliveries could be gotten two months ago in about three weeks, while 8 to 10 weeks are required now.

The Pennsylvania steel-car orders, for the lines east of Pittsburg, have been finally placed, and make a total of 8000 cars, including the orders lately placed.

Pig Iron—There has been a heavy movement in bessemer pig, sales including 10,000 tons to the Youngstown Sheet and Tube Company for delivery September to December, inclusive, by the Bessemer Furnace Association, 15,000 tons to the Republic Iron and Steel Company, for delivery from now to Dec. 1, by W. P Snyder & Co., all at $16, Valley, equal to $16.90, Pittsburg. The Jones & Laughlin company also took 10,000 tons of basic for delivery to the end of the year at $15.25, Valley, and is negotiating for 15,000 to 25,000 tons bessemer. There is some additional inquiry in the market, the largest tonnage being 100,000 tons for next year's delivery to the Standard Steel Car Company, which has decided to build a steel plant at its Butler site containing six 60-ton basic open-hearth furnaces. Associated with the steel plant will be a plant for making rolled-steel wheels, and there will also be blooming and finishing mills to make a portion of the rolled steel consumed in the company's car plant. The market is very firm at $16, Valley, for bessemer, and $15.25, Valley, for basic, for delivery this year, but predictions are freely made that it will soon work up to a higher level, and even $18 is spoken of for bessemer. Sales of foundry iron have been rather light, $15.25 and $15.50, Valley, being done for this year, and $15.75, Valley, for first half of next year. Some furnaces quote much higher figures. Forge is quotable at $14.50@14.75, Valley. Sales of about 200,000 tons of bessemer ores are reported in the past 10 days, to western Pennsylvania furnace interests, which were supposed to have entirely covered for the season.

Steel—Billets and sheet-bars are firm, but transactions have been light. Bessemer billets are at a minimum of $24, Pittsburg, open-hearth being $25, while sheet bars are $25.50@26, all f.o.b. Pittsburg, with freight to destination added Plates are well established at 1.40c., Pittsburg, 1.45c being quoted on small orders

Sheets—Demand continues to improve slowly. Prices are now well maintained at 2.20c. for black and 3.25c for galvanized, 28 gage

Ferromanganese—The market has absorbed almost the full reduction in the duty, which was from $4 to $2.50 per ton, being quotable firm at $41, Baltimore, for early delivery, against $42.50 under the old duty Fourth-quarter delivery is quotable at $41.50@42, and next year at $42@42.50, freight to Pittsburg being $1.05 per ton

Metal Markets

New York, Aug. 11—The metal markets show a fair degree of activity, but without much change in prices. Some of the business is of a speculative nature.

Gold, Silver and Platinum

UNITED STATES GOLD AND SILVER MOVEMENT

Metal.	Exports.	Imports	Excess.
Gold:			
June 1909..	$ 8,846,446	$ 2,417,735	Exp. $ 5,928,711
" 1908..	8,626,718	3,449,673	Exp. 5,177,045
Year 1909..	63,834,337	20,185,592	Exp. 43,648,745
" 1908..	53,517,975	21,141,348	Exp. 32,376,627
Silver			
June 1909..	5,504,437	4,339,275	Exp. 1,165,162
" 1908..	4,437,360	3,453,198	" 984,162
Year 1909..	29,359,066	22,872,028	" 6,487,038
" 1908..	25,514,545	21,141,348	" 4,373,197

Exports from the port of New York, week ended Aug. 7: Gold, $1,000,000, to Argentina; silver, $986,583, chiefly to London. Imports: Gold, $112,645; silver, $64,940, both from Central and South America.

Foreign exchange in New York continues at a high level, as it has been for some time past. This, and the superabundance of currency, make gold exports still probable.

Gold production of the Transvaal in July is cabled as 620,494 oz. fine. This makes the total for the seven months ended with July 4,257,152 oz., or $87,995,532 in value.

Gold—Prices on the open market in London are unchanged at 77s. 9d. per oz. for bars and 76s. 4d. per oz. for American coin. Gold arriving was pretty well distributed, most of it going to the Bank of England. No gold exports are noted in New York this week.

Platinum—Prices continue about $21@22.50 per oz., for refined platinum; $26 per oz. for hard metal, and $17@18 for good scrap. Sales are small.

Silver—The market has remained steady at 23½d. in London without special incident, except firmness on buying by the Indian bazars.

SILVER AND STERLING EXCHANGE

Aug.	5	6	7	9	10	11
New York..	50⅞	50⅞	50⅞	50⅞	50⅞	51
London....	23½	23½	23½	23½	23½	23½
Sterling Ex.	4.8665	4.8665	4.8660	4.8660	4.8660	4.8660

New York quotations, cents per ounce troy fine silver. London, pence per ounce sterling silver 0.925 fine.

Exports of silver from London to the East, Jan. 1 to July 29, as reported by Messrs. Pixley & Abell:

	1908.	1909.	Changes.
India	£ 4,997,493	£3,736,300	D. £1,261,193
China	516,400	1,214,500	I. 698,300
Straits	89,510	82,800	D. 6,710
Total...	£ 5,604,403	£5,033,800	D. £ 570,603

Imports for the week, £1000 from New Zealand, £1000 from Mexico, £1000 from the West Indies and £5,000 from New South Wales. Exports, £10,000 to China and £12,500 to India, £32,500 to

Copper, Tin, Lead and Zinc

Aug.	Copper. Lake, Cts. per lb.	Copper. Electrolytic, Cts. per lb.	Copper. London, £ per ton.	Tin. Cts. per lb.	Lead. New York, Cts. per lb.	Lead. St. Louis, Cts. per lb.	Zinc. St. Louis, Cts. per lb.
5	13¼ @13⅜	12⅞ @13	58⅞	29⅜	4.27½ @4.30	4.15 @4.17½	5.45 @5.45
6	13¼ @13⅜	12⅞ @13	58¾	29⅜	4.27½ @4.30	4.15 @4.17½	5.45 @5.50
7	13¼ @13⅜	12⅞ @13	....	29⅜	4.27½ @4.30	4.15 @4.17½	5.47½ @5.52½
9	13¼ @13½	12⅞ @13	58¾	29½	4.30 @4.32½	4.15 @4.20	5.52½ @5.57½
10	13¼ @13½	12⅞ @13½	59	29½	4.30 @4.35	4.17½ @4.20	5.55 @5.60
11	13¼ @13½	13 @13¼	60¼	29¾	4.32½ @4.35	4.17½ @4.20	5.57½ @5.62½

London quotations are per long ton (2240 lb.) standard copper. The New York quotations for electrolytic copper are for cakes, ingots and wirebars, and represent the bulk of the transactions made with consumers, basis, New York, cash. The price of cathodes is usually 0.125c. below that of electrolytic. The quotations for lead represent wholesale transactions in the open market. The quotations on spelter are for ordinary Western brands; special brands command a premium.

Through a typographical error the price of electrolytic copper in New York, Aug. 2, was given in our table at 12⅞@13c.; the correct quotation was 12¾@13c. The price was 12⅞@13c. on Aug. 3, the following day.

Copper—The character of the market remained entirely unchanged until Tuesday, Aug. 10, when the statistics were published, which showed a decrease in the stocks in this country of about 32,000,000 lb., which figure is far in excess of what was expected by the most optimistic. The inquiry from all sources thereupon became very heavy, which was supplemented the following day by very excited buying from European sources at advancing prices. The close is firm and higher at 13¼@13½c. for Lake, and 13@13¼c. for electrolytic copper in cakes, wirebars or ingots. The average of the week for casting copper has been 12¾@13 cents.

Copper sheets are 17@18c., base for large lots. Full extras are charged, and higher prices for small quantities. Copper wire is 15c. base, carload lots at mill.

The standard market in London fluctuated within narrow limits, until the publication of the American statistics resulted in a veritable bear panic, which drove prices up by leaps and bounds on Wednesday morning when spot reached £60 12s. 6d., and three months £61 10s. At this level demand was freely met, whereupon a reaction set in at the second exchange, the close being cabled at £60 5s. for spot, and £61 2s. 6d. for three months.

Refined and manufactured sorts we quote English tough, £63 10s., best selected, £62 10s.@£63 10s.; strong sheets, £74 10s.@£76 10s.

Copper Producers' Association.—The report of the Copper Producers Association covers the following figures for July and the seven months ended July 31, in pounds.

	July.	Seven Mos.
Stocks, Jan. and July 1	154,858,061	122,357,266
Refined in U. S.	118,277,603	799,670,212
Total supplies	273,135,664	922,027,478
Deliveries, domestic	75,320,083	389,133,240
Deliveries, for export	75,018,974	410,297,631
Total deliveries	150,539,057	799,430,871
Stocks, Aug. 1	122,596,607	122,596,607
Inc. or dec. in stocks	D. 32,261,454	I. 239,341

Production includes all copper refined and put in marketable form in the United States, whether from domestic or imported material. The July production was 1,710,110 lb. more than in June, and 78,443 lb. less than in May.

Tin.—The market has a semblance of activity, due to purchases from speculative quarters, who appear to be willing to anticipate an advance, and to more active buying on the part of consumers, in sympathy with strength shown in other metals. Consumers, however, have been holding back and their purchases are limited to immediate requirements. Nevertheless, the market, stimulated by higher prices from London, closes firm at 29¾c. in New York, and at £135 for spot and £136 10s. for three months in London.

Lead—Consumers showed a much more lively interest during the week under review than for a long time past, and the orders which were placed have absorbed the floating supply of second-hand lead and the offerings from Missouri. The close is firm and higher at 4.17½@4.20c. St. Louis, 4.32½@4.35c. New York.

The London market has been neglected and closes somewhat lower at £12 7s. 6d. for Spanish, and £12 10s. for English lead.

Spelter—The inquiry continues urgent, and the demand from consumers can only be satisfied at advancing prices, as smelters are chary about sales owing to the advancing market for ore and the inability to secure adequate supplies of the same. The market closes at the highest prices reached so far on this movement, 5.57½@5.62½c. St. Louis, and 5.72½@5.77½c. New York.

The New York quotation for spelter Aug. 5 was 5.57½@5.60c.; Aug. 6, 5.60@5.65c.; Aug. 7, 5.62½@5.67½c.; Aug. 9, 5.67½@5.72½c.; Aug. 10, 5.70@5.75c.; Aug. 11, 5.72½@5.77½ cents.

Base price of sheet zinc is now 7¼c. per lb., f.o.b. La Salle, Peru, Ill., less 8 per cent. discount.

The London market is unchanged at £22 for good ordinaries, and £22 5s. for specials.

Silesian Spelter Market—Paul Speier writes from Breslau, Germany, under date of July 28, that prices of spelter are unchanged at 41.75 marks per 100 lb., f.o.b. works in Silesia, which is equivalent to 4.83c. per lb. For zinc sheets the base

price is 53@58 marks per 100 lb., the average being equal to 6c. per lb. Zinc dust, in 10-ton lots, is 42 marks per 100 kg., or 4.5c. per lb., delivered at Stettin.

Other Metals

Antimony—The market is unsettled and uncertain; it has not yet adjusted itself to the new tariff. Business has been small, chiefly on this account. Prices generally quoted are 8½c. per lb. for Cookson's; 8¼c. for Hallett's; 8c. for U. S., and 7¾c. for outside brands.

Aluminum—No. 1 ingots can be had at 20@23c. per lb. for large lots. The higher price is that asked by the American maker.

Quicksilver—New York prices are unchanged at $43.50@44 per flask of 75 lb. San Francisco, $43@43.50 for domestic business, and $2 less for export orders. The London price is £8 5s. per flask, with £8 2s. 6d. quoted from second hands.

Nickel—Large lots, contract business, 40@45c. per lb. Retail, spot, from 50c. for 2000-lb. lots, up to 55c. for 500-lb. lots. The price for electrolytic is 5c. higher.

Magnesium—Quotations for this metal are $1.25 per lb., New York, in 100-lb. lots; for 5-lb. lots, $1.40 per pound.

Cadmium—Current quotations are 75c. per lb. in 100-lb. lots at Cleveland, Ohio. In Germany 450@475 marks per 100 kg., at factory in Silesia.

Spanish Metal Exports

Exports of metals and minerals from Spain, four months ended April 30; reported by *Revista Minera*, in metric tons:

Metals.	1908.	1909.	Changes.
Pig and manuf. iron	6,769	19,419	I. 12,650
Copper	3,816	5,949	I. 2,133
Copper precipitate	8,245	5,811	D. 2,434
Lead	61,848	51,752	D. 10,096
Zinc	404	813	I. 409
Quicksilver	848	631	D. 216
Minerals.			
Iron ore	2,769,930	2,488,033	D. 281,897
Manganese ore	9,501	1,650	D. 7,851
Copper ore	405,153	380,936	D. 24,217
Lead ore	1,221	975	D. 246
Zinc ore	36,594	40,431	I. 3,837
Pyrites	498,971	431,0 1	D. 67,960
Salt	220,116	190,878	D. 19,238

Imports of phosphate rock, 31,133 tons in 1908, and 33,995 in 1909; increase, 2862 tons.

Zinc and Lead Ore Markets

Joplin, Mo., Aug. 7—The highest price paid for zinc ore was $48 per ton, the base price jumping to $44 low and $46 high for sulphide ore assaying 60 per cent. zinc. Silicate of zinc sold on a base price of $22@23 per ton of 40 per cent. zinc. The average price, all grades, was $30.76 per ton, the shipment of 1000 tons of silicate from Granby causing a lowering of the average. The highest price paid for lead ore was $57, all grades averaging $55.78 per ton.

The zinc shipment was 1000 tons greater than any previous week of the year. It was 2147 tons larger than the previous week. A number of weeks have reported a much larger shipment of lead, but the combined value of the two minerals was $57,000 ahead of the best previous week this year. The market closed stronger than at any other period, with several smelters very short on filling orders.

SHIPMENTS, WEEK ENDED AUG. 7.

	Zinc, lb.	Lead, lb.	Value.
Webb City-Carterville	4,351,350	1,026,310	$125,556
Joplin	2,360,250	292,510	60,923
Granby	2,247,970	11,400	26,295
Oronogo	845,970	216,850	22,179
Duenweg	880,260	142,880	22,059
Galena	705,300	53,360	16,826
Miami	460,820	248,830	15,490
Jackson	405,220	1,000	9,144
Zincite	381,510	11,560	9,097
Carthage	404,390	.....	8,689
Spurgeon	210,360	164,510	8,324
Aurora	533,300	.....	8,093
Alba-Neck	351,710	.....	8,089
Quapaw	302,410	.....	6,204
Badger	141,620	.....	3,717
Sarcoxie	117,990	.....	2,594
Prosperity	89,390	.....	2,208
Saginaw-Shoalsburg	136,050	.....	2,139
Stott City	63,360	.....	1,393
Totals	15,009,230	2,169,210	$359,018
32 weeks	361,398,380	54,420,790	$8,267,680

Zinc value, the week, $298,509; 32 weeks, $6,801,211
Lead value, the week, 60,509; 32 weeks, 1,466,469

MONTHLY AVERAGE PRICES.

Month.	Zinc Ore. Base Price.		Zinc Ore. All Ores.		Lead Ore. All Ores.	
	1908.	1909.	1908.	1909.	1908.	1909.
January	$37 60	$41.25	$35.56	$38 46	$46 88	$52 17
February	36.63	36.94	34.92	34.37	49 72	50.50
March	36.19	37 40	34 19	34 71	49.90	50 82
April	35.40	38.63	34.08	37.01	52.47	55.63
May	34.19	40.06	33 39	37.42	56.05	56 59
June	33.06	44 15	32 07	40.35	60.48	57.52
July	34.55	43.06	31.67	41.11	59 90	53.74
August	36.53	.....	33 42	.....	60.34	.....
September	37 63	.....	34.44	.....	54 59	.....
October	35 95	.....	33 28	.....	52.63	.....
November	39.13	.....	35.02	.....	54.53	.....
December	42.75	.....	39 63	.....	49.68	.....
Year	$36.63	.....	$34.31	.....	$53.93	.....

NOTE Under zinc ore the first two columns give base prices for 60 per cent. zinc ore; the second two the average for all ores sold. Lead ore prices are the average for all ores sold.

Platteville, Wis., Aug. 7—The base and highest price paid for 60 per cent. zinc ore was $44 per ton. The highest price paid for lead ore was $56 per ton.

SHIPMENTS WEEK ENDED AUG. 7.

Camps.	Zinc ore, lb.	Lead ore, lb.	Sulphur ore, lb.
Highland	634,250	.....	.....
Hazel Green	419,950	.....	.....
Cuba City	392,500	342,455	64,995
Platteville	378,150	.....	167,600
Days Siding	352,000	.....	.....
Benton	287,080	170,720	.....
Rewey	152,600	.....	.....
Harker	124,340	.....	
Linden	118,500	.....	
Galena	88,000	.....	.....
Livingston	80,000	.....	.....
Strawbridge	66,000	.....	
Dodgeville	60,000	.....	.....
Total	3,153,460	513,175	232,595
Year to Aug. 7	78,650,409	4,410,880	6,580,945

There was shipped from Highland last week, not then reported, 650,000 lb. zinc ore. In addition to the above there was shipped to the American Zinc Ore Separating Company, 402,000 lb. and to the Joplin Separator Works, 63,200 lb. zinc ore.

Chemicals

New York, Aug. 11—Summer dullness is over the market as far as spot sales are concerned. Contract deliveries are fair.

Copper Sulphate—Business is quiet and prices unchanged at 4.22½c. per 100 lb. for carload lots and 4.32½@4.47½c. for smaller parcels, according to deliveries.

Arsenic—The market is still rather uncertain. White arsenic can be had at 3@3½c. per lb., New York.

Nitrate of Soda—Business is good and quotations unchanged at 2.12½c. for both spot and futures. The position of nitrate in the United States on Aug. 1 is stated as below, in long tons, by Messrs. Mortimer & Wisner, New York:

	1908.	1909.	Changes.
Stocks, Jan. 1	5,900	9,140	I. 3,240
Imports 7 months	142,450	187,900	I. 45,450
Total Supplies	148,350	197,040	I. 48,690
Deliveries 7 months	134,850	187,740	I. 52,890
Stocks, Aug. 1	13,500	9,300	D. 4,200
Afloat for U. S.	85,000	79,300	D. 5,700

Quantities afloat include all cargoes due to arrive at United States ports before Nov. 15 next.

Mining Stocks

New York, Aug. 11—On the Stock Exchange this week the upward movement reached a turning point, and the latter days of the week were marked by a number of recessions in price. A few stocks retained their high quotations, notable among them being Steel common. The market has been largely professional throughout the week and the bull movement has not brought in outsiders to the extent that was anticipated.

On the Curb the copper stocks were quiet, but hardly dull. Changes in price were not large nor important, and business in most of the stocks traded in was on a moderate scale. In the gold stocks and in the Cobalts a fair business was done, but in both there was more or less scaling in prices. The only industrial active was Southern Iron and Steel, which was quite a feature during the week with large sales at advancing prices.

Boston, Aug. 10—A remarkably strong and active market has been witnessed the greater part of the week. Resting spells have been frequent, but prices in the meantime held about steady. The Lake Superior issues have been the leaders in speculation and new high records have been made in a number of cases. Those bearing the so-called Calumet & Hecla tag have been the most buoyant. Lake Copper has led all in popularity, and made a high record at $31.87½ per share, which represents an advance of $5.37½ in the week. North Lake has been a close second and

touched $11.87½ Monday, an advance from $10.25 during the week.

The July report of the Copper Producers' Association today fell flat as a market factor, its purport having been discounted in a measure. North Butte lost ground during the week to the extent of $3.62½ by touching $55.12½. This was due to the uncertainty of the dividend, action on which is expected to be taken shortly. In general, the present $4 rate is expected to be maintained and some recovery followed. Superior Copper touched $62 again on periodical activity, which is within a fraction of its record. U. S. Smelting and U. S. Coal and Oil show strengthening signs along with activity. Both are at their high of the year. Amalgamated is up to $87 per share, an advance of over $2. The short interest in this specialty is reported as of large proportions.

Curb trading has been characterized by strength and activity. Davis-Daly and First National have been both strong and active. Corbin Copper had a sharp advance from of over $1 to $9, and Cactus rose $1.50 to $4.62½. Gila touched $9, an advance of $1. Rhode Island Coal has been active, but with slight price change. Two new promotions are announced, that of the Indiana Mining Company, which has traces of the so-called Lake lode and the South Lake Mining Company, which is the old Aztec, both in Michigan. Eventually both will go into a larger combination which will likely include Lake and North Lake.

STOCK QUOTATIONS

NEW YORK Aug. 11	
Name of Comp.	Clg.
Alaska Mine	‡.11
Amalgamated	86⅞
Anaconda	49⅞
Balaklala	‡2⅛
British Col. Cop.	7¼
Buffalo Mines	3½
Butte Coalition	26⅛
Colonial Silver	⅝
Cum. Ely Mining	7⅝
Davis-Daly	7⅛
Dominion Cop.	7
Douglas Copper	1½
El Rayo	2½
Florence	2⅝
Foster Cobalt	‡.32
Furnace Creek	‡.05
Giroux	10⅛
Gold Hill	½
Goldfield Con.	6¾
Granby	104½
Greene Gold	‡½
Greene G. & S.	‡9
Guanajuato	1⅝
Guggen. Exp.	216
Hanapah	‡15
Kerr Lake	7[illegible]
McKinley-Dar.	[illegible]
Miami Copper	16¾
Micmac	¾
Mines Co. of Am.	[illegible]
Montezuma of C. R.	6
Mont. Sho. C.	2
Nev. Utah M. & S.	2
Newhouse M. & S.	5¼
Nipissing Mines	10¾
Old Hundred	½
Silver Queen	‡.45
Stewart	[illegible]
Tennessee Copper	40¼
Tri-Bullion	[illegible]
Union Copper	9¾
Utah Apex	6¼
Utah Copper	51¼
Yukon Gold	[illegible]

‡Last quotation.

BOSTON Aug. 11	
Name of Comp.	Clg.
Adventure	7
Allouez	47¼
Am. Zinc	32
Arcadian	4¼
Arizona Com	44
Atlantic	10½
Boston Con	16
Calumet & Ariz	108
Calumet & Hecla	677
Centennial	35
Copper Range	83¼
Daly West	9½
East Butte	12½
Franklin	17½
Greene—Can	10⅛
Hancock	11
Isle Royal	28½
Keweenaw	3⅝
La Salle	15¼
Mass	8¼
Michigan	10
Mohawk	64½
Nevada	24¼
North Butte	56¼
Ojibway	11½
Old Colony	60
Old Dominion	58
Osceola	146
Parrot	33
Quincy	92
Rhode Island	3¼
Shannon	16¼
Superior	60½
Superior & Bost	15½
Superior & Pitts.	17
Tamarack	71
Trinity	14
U S Smg & Ref	55⅛
U S Sm. & Re. pd	52
Utah Con	45
Victoria	4½
Winona	6⅛
Wolverine	157
Wyandotte	¾

‡Last quotation.

N. Y. INDUSTRIAL	
Am. Agri. Chem	18⅜
Am. Smelt. & Ref.	102½
Am. Sm. & Ref., pf	116½
Colo. Fuel & Iron.	47
Federal M. & S., pf.	93
National Lead	92
National Lead, pf.	113¼
Pittsburg Coal	15
Republic I. & S	38½
Republic I. & S., pf.	107
Sloss-Sheffield	86½
Standard Oil	‡685
U. S. Steel	77⅞
U. S. Steel, pf.	126⅜
Va. Car. Chem.	51

BOSTON CURB	Low.
Ahmeek	195
Chemung	17
Chino	6¾
Corbin	8⅜
Globe Con	4
Gila	9
Ray Central	2⅞
Ray Con	19½
San Antonio	9½

Furnished by Hornblower & Weeks, N. Y.

ST. LOUIS Aug. 7		
N. of Com.	High.	Low
Adams	.40	.30
Am. Nettie	.09	.07
Center Cr'k	1.80	1.70
Cent. C. & C.	83.00	81.00
C. C. & C. pf.	82.00	80.00
Cent. Oil	110.00	100.00
Columbia	9.00	7.00
Con. Coal	19.00	18.00
Doe Run	115.00	105.00
Gra. Bimet.	30	23
St. Joe	12.00	11.00

LONDON Aug. 11	
Name of Com.	Clg.
Dolores	£1 5s 0d
Stratton's Ind.	0 3 3
Camp Bird	1 6 0
Esperanza	2 16 3
Tomboy	1 1 3
El Oro	1 5 9
Oroville	0 12 3

Cabled through Wm P. Bonbright & Co., N. Y.

NEVADA STOCKS. Aug. 11.

Furnished by Weir Bros. & Co., New York.

Name of Comp.	Clg.
COMSTOCK STOCKS	
Belcher	.72
Best & Belcher	.49
Caledonia	.30
Chollar	.21
Comstock	.26
Con. Cal. & Va.	.80
Crown Point	.75
Exchequer	.25
Gould & Curry	.17
Hale & Norcross	.36
Mexican	.95
Ophir	1.22½
Overman	.30
Potosi	.40
Savage	.48
Sierra Nevada	.38
Union	.45
Utah	.05
Yellow Jacket	.98
TONOPAH STOCKS	
Belmont	.85
Extension	.49
Golden Anchor	...
Jim Butler	.09
MacNamara	.28
Midway	.20
Montana	.75
North Star	.02
Tono'h Mine of N.	6.87½
West End Con	.27
GOLDFI'D STOCKS	
Adams	.01
Atlanta	.13
Blue Bell	.03
Booth	.09
C.O.D. Con	.11
Columbia Mt.	.10
Comb. Frac	.64
Con. Red Top	
Cracker Jack	.01
Dia'dfield B. B. C.	.03
Goldfield Belmont	.04
Goldfield Daisy	.23½
Great Bend	.06
Jumbo Extension	.17
Kendall	.03
Lone Star	.02
May Queen	.04
Oro	.06
Red Hill	.06
Sandstorm	.07

Name of Comp.	Clg.
Silver Pick	.10
St. Ives	.05
Triangle	.01
BULLFROG STOCKS	
Gibraltar	.02
Homestake King	...
Mont. Shoshone C.	2.00
Tramp Cons	.04
MISCELLANEOUS	
Cumberland Ely	7.31
Giroux	10.00
Greenwa'r Copper	.04
Nevada Con	24.25
Nevada Hills	.70
Nevada Smelting	.87½
Nevada Wonder	.45
Nevada-Utah	1.93¾
Penn-Wyoming	...
Pittsburgh S. Pk.	.45
Ray Central	2.81¼
Ray Con	21.00
Round Mt. Sphinx	.40

COLO. SPRINGS Aug. 6	
Name of Comp.	Clg.
Acacia	‡.07¾
C. C. Con	.03⅛
Dante	.06½
Doctor	‡.10⅛
Elkton	.74
El Paso	.65⅞
Findlay	.12
Gold Dollar	.14¾
Gold Sovereign	.03⅝
Isabella	.24⅛
Jack Pot	‡.09
Jennie Sample	‡.08
Jerry Johnson	.06¾
Lexington	‡.02
Mary McKinney	.45
Pharmacist	.03¼
Portland	.80
U. G. M.	.05⅞
Vindicator	.66
Work	.06½

Assessments

Company.	Delinq.	Sale.	Amt
Arcadian, Mich.	Sept. 1	Sept. 31	$0.50
Belcher, Nev	July 20	Aug. 10	0.10
Black Jack Con., Utah	Aug. 16	Sept. 2	0.01
Caledonia, Nev	July 23	Aug. 13	0.05
Columbus Ext., Utah	Aug. 14	Sept. 4	0.01
Con. Virginia, Nev	Aug. 16	Sept. 7	0.25
Crown Point, Nev	Aug. 21	Sept. 17	0.10
Ely Con. Copper, Nev	July 16	Aug. 28	0.03
Exchequer, Nev	Aug. 16	Sept. 13	0.05
Gold Mt. Champion, Utah	July 26	Aug. 10	[illegible]
Massasoit, Utah	Aug. 21	Sept. 14	[illegible]
Pittsburg Con., Utah	Aug. 20	Sept. 17	0.01
Savage, Nev	July 28	Aug. 18	0.10
Seven Troughs Mon., Nev	Aug. 18	Sept. 8	0.40
Scottish Chief, Utah	Aug. 4	Aug. 25	0.01
Silver Bell, Utah	June 30	Aug. 20	0.01
Tarbox, Idaho	July 29	Aug. 24	0.003
Tombstone Grand C., Utah	July 19	Aug. 19	[illegible]
Wasatch Utah, Utah	July 19	Aug. 16	0.01
Yellow Jacket, Nev	July 13	Aug. 17	0.28
Yerington Gold, Utah	Aug. 5	Aug. 23	0.01

Monthly Average Prices of Metals

SILVER

Month.	New York.		London.	
	1908.	1909.	1908.	1909.
January	55.678	51.750	25.738	23.834
February	56.000	51.472	25.855	23.706
March	55.365	50.468	25.570	23.227
April	55.505	51.428	25.133	23.708
May	52.795	52.905	24.377	24.343
June	53.663	52.538	24.760	24.166
July	53.115	51.043	24.514	23.519
August	51.683	.....	23.858	.....
September	51.720	.....	23.877	.....
October	51.431	.....	23.725	
November	49.647	.....	22.933	.....
December	48.766	.....	22.493	
Total	52.864	.....	24.402	.

New York, cents per fine ounce; London, pence per standard ounce.

COPPER

	NEW YORK.				LONDON.	
	Electrolytic		Lake.			
	1908.	1909.	1908.	1909.	1908.	1909.
January	13.726	13.893	13.901	14.280	62.386	57.688
February	12.905	12.949	13.098	13.295	58.786	61.198
March	12.704	12.387	12.875	12.826	58.761	56.231
April	12.743	12.56¼	12.928	12.93¾	58.331	57.363
May	12.598	12.893	12.788	13.238	57.387	59.338
June	12.675	13.214	12.877	13.548	57.842	59.627
July	12.702	12.880	12.933	13.363	57.989	58.556
August	13.462	.....	13.639	.....	60.500	...
September	13.388	.....	13.600	.....	60.338	.....
October	13.354	.....	13.646	.....	60.139	.....
November	14.130	.....	14.386	.....	63.417	.....
December	14.111	.....	14.411	.....	62.943	...
Year	13.208	.....	13.424	.....	[illegible]	.....

New York, cents per pound. Electrolytic is for cakes, ingots or wirebars. London, pounds sterling, per long ton, standard copper.

TIN AT NEW YORK

Month.	1908.	1909.	Month.	1908.	1909.
January	27.380	28.060	July	29.207	29.125
February	28.978	28.290	August	29.942	
March	30.577	28.727	September	28.815	...
April	31.702	29.445	October	29.444	.....
May	30.015	29.225	November	30.348	....
June	28.024	29.322	December	29.154	...
			Av. Year	29.465	.....

Prices are in cents per pound.

LEAD

Month.	New York.		St. Louis	London.	
	1908.	1909.	1909.	1908.	1909.
January	3.691	4.175	4.025	14.469	13.118
February	3.725	4.018	3.868	14.250	13.313
March	3.838	3.986	3.835	13.975	13.438
April	3.993	4.168	4.061	13.469	13.297
May	4.253	4.287	4.214	12.938	13.225
June	4.466	4.350	4.291	12.600	13.031
July	4.744	4.321	4.188	13.000	12.563
August	4.580	.....	.....	13.375	.....
September	4.515	.....	.....	13.125	.....
October	4.351	.....	.....	13.375	.....
November	4.330	.....	.....	13.538	.....
December	4.213	.....	.....	13.156	.....
Year	4.200	.....	.....	13.439	.....

New York and St. Louis, cents per pound. London, pounds sterling per long ton.

SPELTER

Month.	New York		St. Louis.		London.	
	1908.	1909.	1908.	1909.	1908.	1909.
January	4.513	5.141	4.363	4.991	20.563	21.425
February	4.788	4.889	4.638	4.739	20.875	21.563
March	4.665	4.757	4.527	4.607	21.075	21.438
April	4.645	4.965	4.495	4.815	21.344	21.531
May	4.608	5.124	4.458	4.974	19.906	21.975
June	4.543	5.402	4.393	5.252	19.000	22.000
July	4.485	5.402	4.338	5.252	19.031	21.969
August	4.702	...	4.556	...	19.350	...
September	4.769	...	4.619	...	19.563	....
October	4.801	...	4.651	...	19.750	....
November	5.059	...	4.909	...	20.875	....
December	5.137	.....	4.987	.....	20.625	.....
Year	4.726	...	4.578	.....	20.163	.....

New York and St. Louis, cents per pound. London, pounds sterling per long ton.

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Operating Companies of Birmingham District

Total Annual Pig Iron Capacity of 27 Furnaces in District nearly 2,000,000 Tons. Steel Corporation Controls Half of Entire Output

BY JOHN LEGGETT PULTZ*

There are 27 furnaces within the limits of the Birmingham district proper. Although the combined annual capacities of these furnaces exceed 2,000,000 tons, the largest production of pig iron for Alabama amounted to 1,651,533 tons in 1907, while owing to the recent depressed condition of the iron market, it was reduced in 1908 to 1,397,014 long tons. There are eight furnaces located in Birmingham, six at Ensley, five at Bessemer, three at Thomas, three at Woodward, and two at Oxmoor, while the Southern Iron and Steel Company, and the Central Iron and Coal Company have furnaces just outside the district at Trussville and Holt respectively.

The principal steel- and iron-producing operations of the district are those of the United States Steel Corporation, the Republic Iron and Steel Company, the Sloss-Sheffield Steel and Iron Company, the Woodward Iron Company, the Birmingham Coal and Iron Company, and the Southern Iron and Steel Company. Owing to the depressed condition of the iron market and the strike in 1908, I give the outputs of the different operations for 1907 as being more nearly characteristic of their actual capacities.

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The United States Steel Corporation

In 1907, the United States Steel Corporation acquired the Tennessee Coal, Iron and Railroad Company, comprising extensive holdings of coal and iron lands in Alabama, Tennessee, and Georgia and a number of furnace, steel and coke operations in the Birmingham district. The company owned 327,784 acres of coal territory in Alabama and Tennessee. This large acreage is equivalent to over 500 square miles and is more than double the acreage of coal properties held by the Steel Corporation in the northern fields. Of this acreage, there are approximately 100,000 acres owned in the Warrior coalfield in the vicinity of Birmingham and Bessemer, while large tracts are located on the Southern and Frisco systems some distance northeast of Birmingham. It owns a large acreage of red-hematite property located near Birmingham and Bessemer, operates extensive brown-ore deposits in the vicinity of Woodstock, and several limestone quarries near its numerous furnace plants.

The blast furnaces of the Steel Corporation in the Birmingham district have an annual capacity of more than 1,000,000 tons of pig iron which is 50 per cent. of the total output of the district. The steel capacity of the corporation was increased 500,000 tons by the purchase of the Tennessee company, the output of which amounted in 1908, to 3.2 per cent. of the total production of pig iron in the United States, 4.4 per cent. of the country's production of open-hearth steel, and 2.5 per cent. of the entire production of open-hearth and bessemer-steel ingots. The company produced 1,576,757 tons of ore from its red and brown ore mines in Alabama in 1907 and 1,533,402 tons in 1908.

The red-hematite properties are situated on Red mountain. They consist of the Muscoda group of five active and one inactive mine openings, the Fossil group of four active mine openings, the Ishkooda group of four active mines, and one inactive mine at Green Springs. The company owns, jointly with the Republic Iron and Steel Company, the red ore of the Potter estate. The greater portion of the ore supplying the furnaces of the corporation comes from these mines. Extensive improvements in the development of new mines were made last year, among them the opening and equipping of the No. 7 and No. 9 slopes of the Fossil group, and the No. 13 and No. 14 slopes of the Ishkooda group.

The brown ore deposits occur at Greely about 30 miles southwest of Birmingham,

TENNESSEE COAL, IRON AND RAILROAD COMPANY'S TIPPLE AND POWER HOUSE ON ROUND MOUNTAIN, NEAR BESSEMER, ALABAMA

where there are three active mines in the Greely group and one active mine in the Champion group, the latter opened during 1908. The mines at Greely produced 132,088 tons of brown ore during 1907. Brown-ore pockets are also owned in Georgia.

The coal properties comprise a very large acreage in the Warrior and Cahaba coalfields, and in Tennessee, but those in the Warrior coalfield are the only ones lying within the limits of the Birmingham district. In 1907, the Alabama mines of the Tennessee Coal, Iron and Railroad Company produced 3,362,649 short tons of coal or over 23 per cent. of the entire output of the State for that year. This tonnage comprised the combined outputs of twenty-two mines. Four of these mines are located in the Cahaba field and their production amounted to 393,689 short tons. The greater part of this coal was sold in the open market for domestic and steam purposes. Thirteen mines worked the Pratt seam and produced 1,918,446 short tons of run-of-mine; three mines on the Blue Creek seam produced 690,486 short tons, while the Henry Ellen and Gamble mines produced 38,997 and 80,931 short tons from the Mammoth and Big seams respectively. Of the thirteen mines working the Pratt seam, one is a shaft opening, eight are opened by slopes, and four are drift mines. In seven of these mines the average thickness of the seam is 48 in., while it runs from 36 to 46 in. in the other mines. The Blossburg mines consist of two drifts and one slope. In the slope mines working the Blue Creek seam, the coal is about 9 ft. in thickness.

The company has 3304 coke ovens in Alabama including 240 Semet-Solvay ovens at the Ensley plant and produced 852,788 tons of coke in 1907. The 1907 output of coke amounted to over 30 per cent. of the total production of the State and was chiefly made from Pratt seam coal.

The furnace plants and steel operations belonging to the Steel Corporation are located at Birmingham, Bessemer, Ensley and Oxmoor. The output of these plants consists of foundry pig, forge, mill, basic, ferromanganese, spiegeleisen and numerous steel products. The total annual capacity of the steel plants is estimated at 670,000 long tons of open hearth steel ingots, about 10,000 tons of steel castings, 600,000 tons of steel rails, and 60,000 tons of finished iron and steel products.

Furnace and Steel Plants of the Steel Corporation

The Alice furnace plant is located at Birmingham. It consists of one stack 75x18 ft. and has Whitwell stoves. The furnace is run on a mixture of red and brown ore and Pratt coke and has a capacity of over 70,000 tons of foundry and forge pig iron.

The plant at Bessemer has five stacks and a capacity of about 288,000 tons of foundry and forge pig iron. Two stacks are 75x16 with eight stoves, two 75x17 with eight stoves, and one 60x12. The stoves are all of the Whitwell type. The plant has a plate mill producing light and heavy plates up to 65 in. and two mills producing merchant bar, hoop and cotton ties. Light rails are also turned out. The annual capacity of the plant is rated at 60,000 tons.

The Ensley operation is the largest in the South. It has six blast furnaces with a capacity approximately of 600,000 tons. There are four stacks 80x20, one 85x20, and one 86½x20¾. Furnaces No. 1 and 2 have each four Gordon-Whitwell-Cowper stoves; Nos. 3, 4 and 5 have four Massicks and Crooke stoves, and No. 6 furnace has four Kennedy two-pass stoves. The casting department of the Ensley plant was constructed in 1900 and has a capacity of about 10,000 tons. It has one basic open-hearth steel furnace of 15 gross ton capacity. Car couplers, gears, rolls, engine parts and other steel castings are turned out.

The steel-works division at Ensley secures its metal from the furnaces in connection with the plant. The equipment comprises eleven basic open-hearth furnaces of 50 gross tons each, one coal reheating furnace, five 4-hole soaking pits, one blooming mill, and one rail train with a roughing mill. The rail mill was remodeled in 1907. Two bessemer converters are operated in conjunction with the open-hearth steel departments and are used for desiliconizing and decarburizing molten iron for the open-hearth furnaces. The company expended $1,441,335 in 1908 in connection with the installation of a new open-hearth steel plant, the improvements of the blooming and rail mill, and the erection of two new 60-ton open-hearth furnaces, all of which construction work was started in 1907.

The Oxmoor furnace plant consists of two alternate stacks 75x17 and is rated as having a capacity of 120,000 tons per annum.

By the purchase of the Tennessee Coal, Iron and Railroad Company, the Steel Corporation more than doubled its acreage of coal territory held in the northern fields and added greatly to its iron resources, its capacity of pig iron was increased by 1,000,000 tons annually, equivalent to 63¾ per cent. of its present total capacity of pig iron. In the past, the extensive acreage of undeveloped mineral land held by the Tennessee company necessitated high fixed charges and prohibited the attainment of as high an economic efficiency as is possible with furnace operations having a reserve tonnage of raw materials based on the probable life of the plant. This condition could only be relieved by an increase in production which, in turn, required the expenditure of large sums for the development of new mines and the construction of additional furnace equipment. After the Steel Corporation acquired the southern properties, the improvements necessary to increase the production were immediately commenced. During 1908 $3,460,933 was expended in connection with the Tennessee company and was distributed as follows: Manufacturing plants, $2,399,266.83; ore, coal, and limestone properties, $831,474.41; Birmingham Southern Railway, $139,737.57; sundry real estate, $90,514.19; total, $3,460,993. It is probable that this amount will be increased in the future, owing to the fact that an increased production means a proportional reduction in the fixed charges per ton of pig iron.

The coal reserves undoubtedly exceed the actual fuel requirements necessary for the treatment of the large tonnage of ore reserves. It is therefore to be supposed that the open coal markets will be entered on a larger scale than in the past.

The purchase of the Tennessee company by the Steel Corporation will be a great advantage to the Birmingham district. The fact that such a large acreage of mineral lands had been held in an undeveloped state, naturally retarded the rapid growth of the region. The necessity for further development has been demonstrated and the large expenditures necessary for these improvements can only be accomplished by a company having adequate financial resources. With the increased production will come the necessary extension of the now somewhat limited market for Birmingham products. This in itself can only be undertaken by an efficient organization with a systematic and far reaching sales department for the marketing of its output.

In the past, American coal, iron and steel were only exported during periods of extreme depression in the home markets. This intermittent process was not conducive to securing the confidence of foreign consumers. Within the last few years, however, the Steel Corporation has endeavored to establish a permanent export trade; in 1908 it amounted to 12.4 per cent. of the entire shipments of rolled and other finished steel products of that company. An important factor in maintaining a successful position in highly competitive markets is having advantageous transportational facilities. In the North the policy of the Steel Corporation has been to own its own roads for the transportation of raw materials. The Birmingham district has the advantage of the low water transportation to the Gulf. The initial cost and the maintenance of this river service will be moderate compared to the construction, equipment and operating costs of one of the Steel Corporation's ore roads in the North. It has already been shown, in my previous article on "Economic Features of the Birming-

ham District," that low ocean rates on pig iron should be had from the Gulf and Atlantic coasts to foreign ports, and there is good reason to believe that the Birmingham district will become a powerful factor in this trade.

The active interests which the Steel Corporation has assumed in the South will mean much for the future development of the Birmingham district. In 1908, the Steel Corporation expended $18,733,841 on its Gary, Ind., plant, while the total expenditure made by the subsidiary companies during the year for additional property, construction and improvements, including outlays for account of the Gary plant and for the Tennessee Coal, Iron and Railroad Company, amounted to over $60,000,000. It is probable that in the future a substantial amount of the funds set aside for these expenditures will be directed toward the southern properties. The general policy of the Steel Corporation with respect to the Birmingham district, appears to be aimed more at the development of the present resources than at the absorption of new operations, a policy which if carried into effect should stimulate the wholesome and widespread development of the district and create a more far reaching market for Birmingham products.

The Sloss-Sheffield Steel and Iron Company

The holdings of raw materials comprise a large acreage of ore, coal and limestone properties in Alabama. The total annual capacity of the seven furnaces owned by the company is 435,000 tons of foundry and forge pig iron, which is divided about equally between the furnace plants located at Birmingham and at Sheffield in the extreme northern portion of the State, in conjunction with which the company operates the Russellville brown-ore deposits.

The Birmingham plant consists of four stacks, furnaces Nos. 1 and 2 are 82½x18; No. 3 is 73x17½; and No. 4 is 8½x17½. There are twenty stoves, thirteen being of the Whitwell-Cowper types. Recently the No. 3 is 73x17½; and No. 4 is 82½x17½. repairs and improvements, including the erection of three new stoves, etc. Additions were also made to the No. 4 furnace.

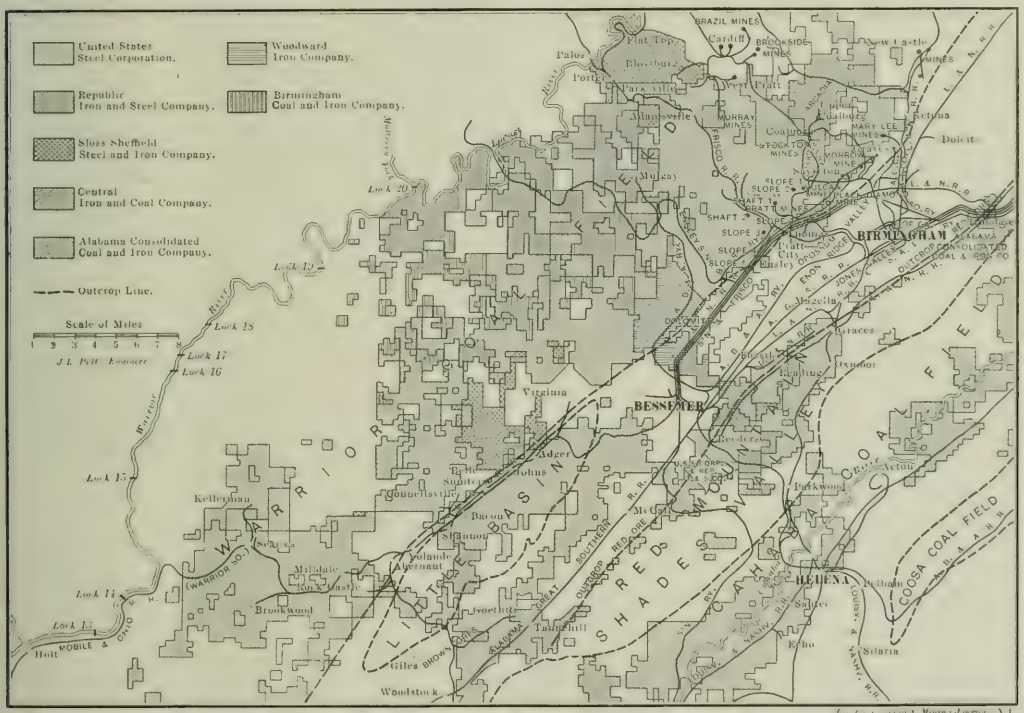
The red ore mines are on Red mountain near Irondale. The company also owns a large acreage on the Big seam, on Red mountain opposite Bessemer. In 1908, a new slope was opened on the Irondale seam and should become an important producer.

The coal properties are in the Warrior field in Jefferson and Walker counties. They have been developed by 23 mines, the outputs of which are tributary to the Southern and Frisco railroads. The 1907 coal production of the twelve working mines amounted to 1,237,499 short tons of run-of-mine. Of this tonnage 679,620 tons was produced from the three mines working the Big seam, 470,059 tons from the eight openings on the Pratt seam, and 97,220 tons from the mine on the America seam. The Big seam averages 9 ft. in thickness, the Pratt seam ranges from 3 to 4 ft., and the America seam where it is worked averages 4 ft. The coking plants consist of 1438 ovens and the output of coke for 1907, amounted to 503,705 tons; the company ranked third in the production of coal and second in the production of coke for the entire region.

The Republic Iron and Steel Company

The red- and brown-ore properties of this company include four slopes known as the Alfretta group, three on the Raimund group, and also mines at Houston, Tannehill and Spaulding. A half interest in the Potter Ore Company is held jointly with the Tennessee Coal, Iron and Railroad Company.

The limestone quarries are operated



SKETCH-MAP OF THE BIRMINGHAM DISTRICT, SHOWING SOME OF THE MINERAL LANDS HELD BY THE PRINCIPAL COMPANIES

near Birmingham, the lands being owned in fee simple.

The coal properties are in the Warrior and Cahaba coalfields. The output of the mines operated by the company amounted to 759,865 short tons in 1907, which was the fourth largest output in the State. The mines are at Warner, Sayreton and Thompson in the Warrior field. The Warner operation consists of one slope and six drifts. The seam worked is the Pratt and averages 4 ft. in thickness. This mine produced 405,847 short tons in 1907, of which 10,475 tons were nut and steam coal. The Pratt seam is also mined by a single drift opening at Thompson, where it has about the same thickness. In 1907 the output of this mine was 48,241 short tons. The Mary Lee seam has been opened by a slope at Sayreton. The seam is about 84 in. in thickness and produced 305,782 tons in 1907. The Warner and Thompson mines are situated on the Southern and the Birmingham Southern railroads respectively, while the Sayreton workings are reached by the company's private railroad. There are 1010 coke ovens of the beehive type, 910 of which are located at Thomas and 100 at Warner. The capacity of these ovens is 606,000 tons per annum.

The furnace equipment includes three stacks 90x18½ each, with twelve Massicks and Crooke stoves. The capacity of the plant is 250,000 tons of pig iron which is equivalent to about 28 per cent. of the total production of the Republic company. The company ranks among the leading iron-producing operations of the Birmingham district. At the Gate City works bars, bands, hoops, rails, angles and light channels are turned out. This plant has an annual capacity of 24,000 tons. The Birmingham mill has an output of approximately 70,000 tons. It produces iron and open-hearth steel bars, plates, sheets, angles, fish plates, railroad spikes, light rails, etc.

The Southern Iron and Steel Company

The furnace operations of this company are at Chattanooga, Gadsden, Rising Fawn and Trussville. It has an annual capacity of 320,000 tons of pig iron. The only furnace operation in the Birmingham district is at Trussville, about 19 miles northeast of Birmingham. The company operates a mill at Ensley. The annual capacity of this plant is about 100,000 tons of rods, 130,000 tons of wire, and 1,000,000 kegs of wire nails. The operation was acquired from the Alabama Steel and Iron Company.

The Birmingham Coal and Iron Company

The Birmingham Coal and Iron Company has one 75x134 stack at Birmingham and one 85x20 stack at Bessemer. The latter stack has four Whitwell stoves. The annual capacity of the operation is 134,000 tons. The company owns red-ore property on Red mountain and a large acreage of coal lands in the Warrior field. At Mulgay, about seven miles northwest of Ensley, a shaft has been sunk and the Pratt seam is being developed on an extensive scale.

Alabama Consolidated Coal and Iron Company

The Alabama Consolidated Coal and Iron Company has extensive holdings of coal lands in the Warrior field. Its red-ore properties are on Red mountain near Irondale, and in the northern portion of the State. The company has an annual pig-iron capacity of about 300,000 tons. The furnaces are situated at Ironton and Gadsden. It is one of the largest producers of coal, coke and iron in the State. Its coal mines are located at Cordova, Mary Lee, Brookwood and Searles, and in 1907 the company produced 688,048 tons from the Brookwood, Milldale and Mary Lee seams.

The Woodward Iron Company

The Woodward Iron Company, considered with respect to its furnace plant and raw-material resources, has probably the best situation in the country. Its ore properties are situated on Red mountain just north of Bessemer, and the holdings of the company extend in an unbroken chain across the valley to its coal territory in the southeastern edge of the Warrior field. The distance in an air line from the outcrop of the Big seam on Red mountain to the coal measures is about 4½ miles. The furnace plant is located in about the center of the valley and is connected with the sources of supply of raw materials by the company's own railroad. The distance by rail from the furnaces to the ore and coal is not greatly in excess of three miles. The proximity of the furnace to the raw materials and the favorable mining conditions, together with the character of the ore, has enabled this operation to attain a very high economic efficiency.

The furnace plant has three stacks. No. 1 stack has four Whitwell stoves; No. 2, one Whitwell and four Foote stoves; and No. 3, five Whitwell stoves. The capacity of the operation is 250,000 tons of basic, foundry, and forge pig iron. Transportation facilities are afforded by the Louisville & Nashville, Alabama, Great Southern, Southern, and Frisco lines.

In 1907, the company mined 424,032 tons from its two slope openings on the Pratt seam, which at one of these workings is about 52 in. thick. The battery of 674 beehive ovens produced 213,201 tons in the same year.

Prospects of the Region

In anticipating the future development of the Birmingham district, the fact that the reserve tonnage of coal is far in excess of the reserve tonnage of red hematite, is an important consideration. It has has estimated (Ernest F. Burchard, *Bulletin* 340, U. S. Geological Survey) that the red-ore reserves in the district, workable under present conditions, amount to over 380,000,000 short tons and that this tonnage is probably 90 per cent. of the workable red ore of the State. On the basis of the present output of red ore, Mr. Burchard estimates the reserves will last for 75 to 100 years. The production of pig iron will probably be increased to some extent, principally by the larger output which conditions appear to show the United States Steel Corporation will attain. The Warrior coalfield has a known area of 3000 square miles and is capable of furnishing many times its present output for centuries to come. The Cahaba field has also a large reserve tonnage and will have a constantly increasing production. The reserves of iron ore are comparatively small considering the estimated life of the workable coal seams. Consequently it appears that the future development of the natural resources, within the limitations of the Birmingham district, will be most actively carried on in the coalfields.

The coals mined on an extensive scale in the Warrior and Cahaba fields are excellent domestic, steam, and furnace fuels. The low initial cost of transportation to the Gulf and South Atlantic ports must necessarily make these fuels strong competitors in a market which promises an outlet for a constantly increasing production.

It seems to be settled that the War Department is powerless to stop work on the big débris-settling basin being built at Hammonton, Cal., on the Yuba river, though the farmers are making a determined protest against it. Nothing short of new legislation by both State and Federal governments can prevent the California Débis Commission from going on with the work now under way. The money was appropriated by the State and Federal governments jointly. The engineers consider that the objections brought against the plan are frivolous and not based on any proper understanding of the subject.

While the United States company's lead smeltery at Bingham Junction, Utah, is running at nearly full capacity, little smoke is emitted from the large stack and the noxious fumes are practically eliminated. The farmers of the district who annually carried their crop of damage suits to the United States courts are no longer able to reap their former harvest from this source. The baghouse system is making a commercial saving of products which were formerly carried away.

The Theory of Blasting with High Explosives

Important to Ascertain Grain of Rock; Greatest Efficiency by Placing Bore Holes Parallel to Fracture Planes; Underhand Stopes Preferable

BY H. MUSSON THOMAS*

Until the fundamental principles of efficient breaking are ascertained, I do not think much progress will be noticeable in breaking ground by first determining the burden, length and diameter of hole, and quantity of dynamite for a particular stope width. The real crux of efficient breaking is to discover the tendency of the conglomerates and the country rock to break more easily in one direction than in any other; in other words (expressed in miners' phraseology), to find the grain of the rock. Although the illustrations show benches for machines, the principles apply with equal force to hammer benches. They also apply more particularly to stopes in which the dip is less than 40 deg. A very common question is: Should a particular stope face be laid out for overhand, underhand, or breast stoping, or a combination? I aim to answer this query.

It is generally accepted that the direction of the face should facilitate shoveling, and this point is allowed to weigh so heavily in the mind of the overseer, that it not infrequently happens that the direction is determined entirely on that consideration. The full significance of the local occurrence of fracture planes is not generally appreciated and has not, to my knowledge, been thoroughly investigated in any of our mines.

The tightness of rock or the resistance to breaking is due to the following causes, in their order of importance: (1) Drilling across fracture planes or lines of weakness; (2) Rolls or irregularities in the footwall and hanging-wall; (3) A tight or frosted hanging and footwall; (4) The toughness of some rock as opposed to the brittleness of other rock.

Drilling across Fracture Planes or Lines of Weakness

It will be found on examination in mines on the Rand that there is a series of vertical parallel planes which cut right through the reef and waste, but do not throw the reef, and run more or less north and south, at right angles to the strike of the strata. For terms of reference, these planes might be called "fracture planes." The conglomerates have not been tilted up uniformly throughout the Rand. The tilting varies from a vertical dip to a very low dip. These lines consequently having been subjected to unequal upheaval forces, cracks or fracture planes have been formed. Lines of weakness are well pronounced after blasting, and they naturally run parallel to the fracture planes. I have also noted two other series of planes which strike at approximately 45 deg. to the fracture plane on either side of this plane, but, fortunately, they are not so well defined nor so universal as the fracture planes. Faulting planes which throw the reef, but do not necessarily run parallel with each other, must not be confused with fracture planes.

In rock breaking these fracture planes may be used to produce increased efficiency. Not taking them into consideration, their existence will undoubtedly hinder efficiency.

In a stope, of the six sides of a bench, four are bound and the other two are free. The section at right angles to the direction of the holes, which produces the greatest line of resistance, is at the base of the bench, where the whole of one side and the part of two sides have to be sheared, and part of one side has to be rended. Consequently the greatest force is required at the bottom of a hole. If the bench could be so arranged that the fracture plane coincided with the base of the bench, this plane would thus be made to help blasting to the greatest extent. Fig. 1 shows bench a arranged in the ideal way. Unfortunately there are two non-existent conditions which are essential for the successful carrying out of this

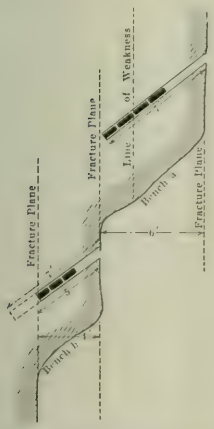


FIG. 1. CONDITIONS UNDER WHICH MAXIMUM BREAKING WOULD OCCUR IF LOCAL CONDITIONS WERE GOOD

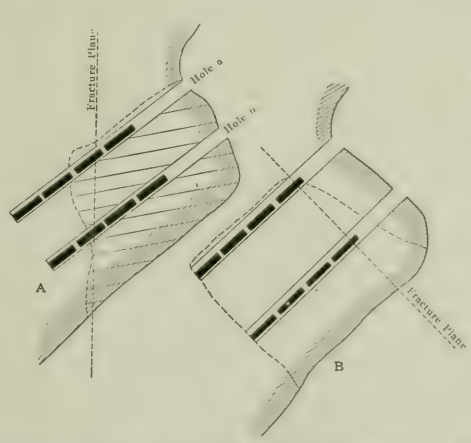


FIG. 2. HOLES DRILLED ACROSS FRACTURE PLANES BREAK INEFFICIENTLY

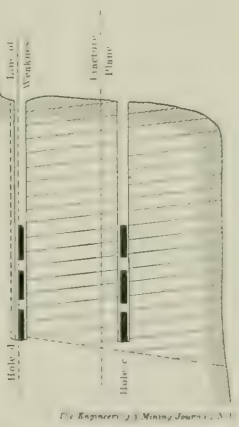


FIG. 3. HOLES DRILLED PARALLEL TO LINE OF FRACTURE GIVE BEST RESULTS

NOTE—Abstract of paper published in Journ. Chem., Met. and Min. Soc. of South Africa, December, 1908, under discussion of E. M. Weston's paper of the same title. Although this paper deals with operations on the Rand the principles evolved will be found to apply in many other mining districts.

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principle. The first essential is that the rock should have a massive structure. It should be like putty, with no cleavages at all, but just one homogeneous mass. On the other hand, our rock is, apart from bastard slips, intersected with invisible lines of weakness, which, although not so definitely cracked as fracture planes, are still cracked to a smaller degree to such an extent that if microscopically examined

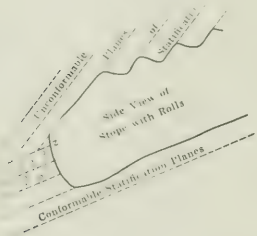

FIG. 4. NORMAL HANGING-WALL *z z*

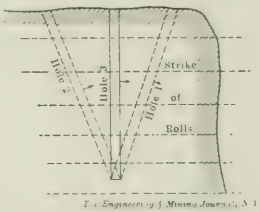

FIG. 5. ARRANGEMENT OF HOLES

they would show a distinct cleavage. The resultant action, when under the influence of an explosive charge, would be similar to that of the fracture plane. If one of these lines were located as shown in Fig. 1, bench *a*, cutting through just above the bottom cartridge, the base of the hole would undoubtedly be held up.

The second essential is that, besides the rock being a homogeneous mass, the lines of cleavage should be spaced at equal distances, say, 6 ft. apart. This condition is also non-existent, with the result that although the hole could be put in the correct distance of, say, 7 ft. in bench *a* there would be a greater chance of the fracture plane on the next bench appearing as in bench *b*, when either the last 2 ft. of the hole would be lost or this hole would only be able to be put in to a distance of 5 ft., which would at once spoil the system of the benches. I consequently consider that these planes should be made use of as in Fig. 1, which would appear to produce the greatest efficiency.

Before explaining Fig. 2, I shall demonstrate how inefficient breaking will result if these planes are not taken into consideration.

The holes in Fig. 2 run in one case diagonally across the fracture plane and in the other case at right angles. In Fig. 2, *A*, practical knowledge will agree that holes *a* and *b* will be held up at their base, the reason being that as the fracture plane intersects the second cartridge in the hole it breaks up the total effect of the explosion into the largest force above the plane and the smallest below the plane. The dynamite above the plane has to perform two duties. It has to rend out the rock above the plane, and also to help the explosive force of the dynamite below the plane by exerting a pull on that portion of the rock. There is, therefore, no beneficial pull produced by the excessive dynamite above the plane on the rock below the plane, since a cleavage destroys the action, and the one and a half cartridges have not sufficient force to push out the burden on the bottom of the hole by their own agency. Similarly with hole *a*. The resultant bench would be represented by the dashed line. In Fig. 2, *B*, there is a line of fracture near the collar, which produces an easy "let-go," and there would probably be a line of weakness near the bottom of the holes, so that the resultant bench would be as shown by the dashed line, and the collar would be left intact, causing a bull-ring.

In Fig. 3, hole *c* is put in parallel to a fracture plane, and there would likely be a line of weakness running parallel with the fracture plane in or near hole *d*. In this case the direction of the hole and fracture plan being similar, it follows that there is an equal cohesion of the rock all along the length of the hole, which produces a constant burden and assures that equal quantities of explosive will bear similar burdens on all benches so placed.

If a hole is put in along the fracture the explosive does not have to rend the rock along the plane, since the rend has been produced by the fracture, and therefore it might be assumed that a certain amount of dynamite would be saved. It has been proved that gelatin creates a pressure on explosion of about 20,000 lb. per sq. in. and it is not hard to contemplate that with this huge pressure there would be a leakage of force along the crack although the sludge in a wet hole would act as tamping. Another objection is that the fracture would cause the chisel bit to fichet. I see no reason why three cartridges should not only break as much as the four in Fig. 2, but more, since the broken bench would be represented by the dashed line, and the bench would approximate the much desired square instead of the narrow rectangle.

Hole *d* shows no fracture plane before it is broken, but if the hole is put in parallel to the direction of the visible fracture plane it will be found, as a rule, that there is a line of weakness which, after breaking, looks similar to the fracture plane. It follows, when a fracture plane cannot be found, look for a line of weakness on the broken bench and they will be found to be more numerous than fracture planes. I do not mean to infer that, even if the above suggestions are minutely carried out, every bench so drilled will break efficiently. Besides these planes there are bastard slips running in no particular direction, but which nevertheless can be seen on benches which show well defined fracture planes. These bastard slips must also be taken into consideration, and if more pronounced than the fracture planes, would naturally be followed in the place of the above-mentioned planes.

I think the reason why it has been found necessary to give a lift on the bottom of holes, i.e., to have less burden on the bottom of a hole than at the collar, will be explained by Fig. 2, *a*, and that if the hole is directed as in Fig. 3,

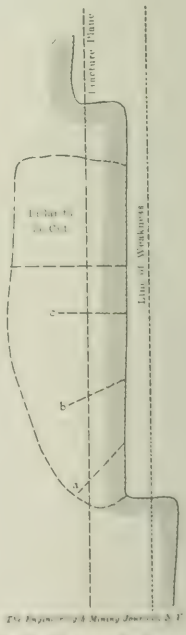

FIG. 6. WRONG METHOD OF UNDERCUTTING PILLAR

a lift will be unnecessary, and an equal burden can be placed on the bottom and the collar. I, also, do not think it will be found necessary to drill the two back holes, say 6 in. deeper than the two front holes. It would appear that the necessity of the extra 6 in. being drilled comes from drilling across the fracture planes, as shown in Fig. 2, *a*. Stoping, according to Fig. 3, will also produce fewer misfires

and accidents, as not so many bottoms of holes will be held up.

As to whether a stope should be run, in an overhand, underhand or breast direction the answer is to make the bench faces parallel to the fracture planes, or in a few cases to the bastard slips, and the stope faces will shape themselves accordingly. It is obvious that if the stope is run in an underhand instead of an overhand direction the shoveling costs will be increased. Let us assume that this system produces an increase in the shoveling costs of 25 per cent., and a decrease in the stoping costs of a similar amount. If 1s. 6d. per ton is taken as a fair charge for shoveling and tramming the proportionate shoveling cost will be about 1s. Four shillings and six pence might be cited as a fair cost for stoping. There would thus be a net gain of 10½d. per ton, by underhand stoping which on a 200-stamp basis, mining 40,000 tons per month, represents £1750. The desired end to be attained is the maximum duty in the minimum stope width. Experience teaches us that when a miner drills in the same direction as the dip of the stope there is less likelihood of the bottom of the holes being projected into the hanging or foot. This fact is generally proved when undercutting a pillar when, as a rule, the foot is ploughed up. Since the fracture planes and lines of weakness run north and south the direction of drill holes will be south, or in the same direction as the dip, which will produce the minimum stope width.

It is interesting to note how fracture planes help in development work. The average drive is extended in a direction which is at right angles to these planes, so I am afraid that no benefit can be derived from them in drives running east and west. In raising, sinking winzes, and incline sinking, they are, however, of distinct advantage (Fig. 8). Since they run north and south, a winze should be started on a well defined fracture plane, provided this plane can be found at approximately the desired point. The winze would be arranged so that the plane coincided with the east face in order to not cramp the hammer boy, which would be the case if the west face and the plane coincided. This plane, if there were a well defined foot, would fulfill the functions of two sides of a cut; and the starting hole would be drilled at an angle to the planes so that its base would just touch, or nearly reach the planes. Similar remarks apply to a raise.

Since most of the inclines are sunk at an angle to the dip it is more difficult to use them, but it will be conceded that if, say, an 8-ft. winze were always kept ahead of the main face of a 26-ft. incline by small machines, and the other 18 ft. were benched out parallel to these planes, an increased footage would be obtained.

Rolls or Irregularities in the Foot- and Hanging-Walls

In Fig. 4 the dashed line *Z Z* represents the normal hanging, but the wall has been broken up by unconformable rolls. Fig. 5 represents a plan of these rolls showing their strikes. If hole No. 1 were divided as shown, there would be a tight end and it would not break efficiently. Holes 2 and 3 would not form wedges at their bottoms and would break more easily. Hole 2 would perhaps give the greatest efficiency. The fracture planes on the Rand generally run at right angles to the rolls, the latter of which strike east and west. Therefore, hole 3 would suit both the fracture planes and the rolls.

Tight or Frosted Hanging-Wall or Tough Rock

In the case of a stope with a tight or frosted hanging, as opposed to a loose let go, and also when the rock is tough, as opposed to *brittle*, for breaking purposes, I do not know of any method of producing greater efficiency by altering the system of breaking ground. Knotted ground also hampers breaking; it appears to have a spherical structure. I might illustrate this by directing attention to those lumps of ground which prove so difficult to break by the native wielding a 12-lb. hammer at the grizzley of a main orebox. These are three natural conditions of tightness which we always have to contend with, but the other two conditions can be made to help the breaking of ground.

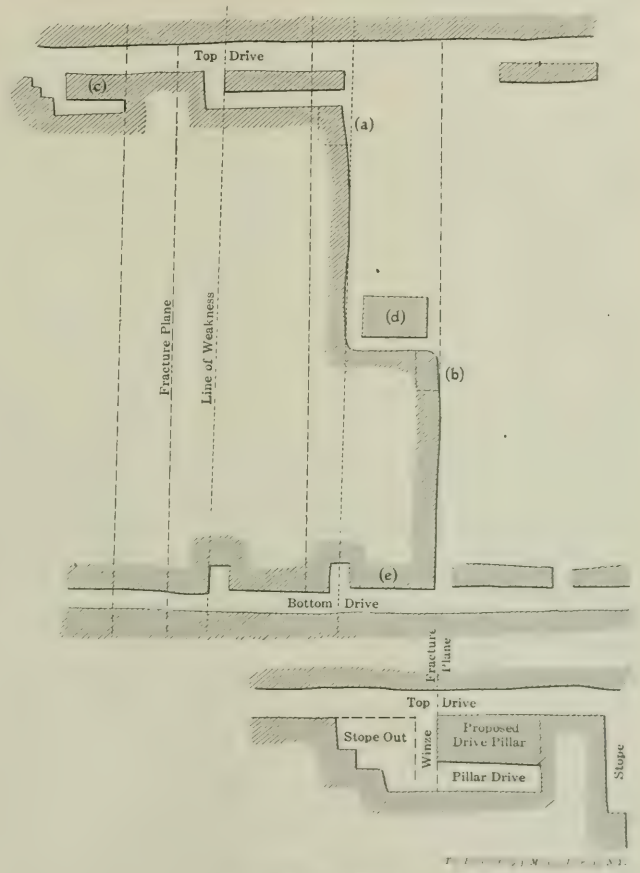

Fig. 7. Top Drive Pillar

Summary

There are machine drills on the Rand which may justly be termed foolproof in their mechanism, and with increased air pressures, single shift working, clay tamping cartridges, and by sharpening drills underground, there is only one other factor to be made foolproof as far as possible, and that is, the actual breaking of the rock. It is natural that, if a miner

who is learning to break rock were instructed to put his holes in one direction only, and that direction was parallel to the fracture planes and the lines of weakness, he would soon be able to judge the least amount of explosives for the largest burden. But if he is called upon to cut a pillar he will have to put in the holes across the planes which are running north and south, and he will be surprised that his holes have not broken efficiently in bench *a*, Fig. 6. His confidence in himself will begin to waver, and by the time the pillar is undercut all confidence in his ideas on burden will have departed. Then again the stoping machines are supposed to be used for stoping only, therefore they should not be called upon to do what might be called development work in cutting pillars and boxholes, where such are necessary instead of waste packs.

It is now essential to find some method

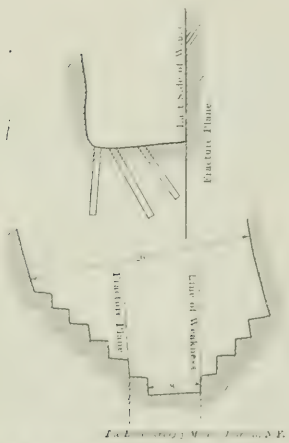

FIG. 8. WINZE AND INCLINE HAMMER WORK

of obtaining a uniform direction of hole, and also to keep the machines continually stoping. Fig. 7 represents the method which I would recommend wherever possible.

The fracture planes and lines of weakness are striking north and south. In order to keep the machines continually stoping, and to enable the machines to always put their holes in parallel to the fracture planes, it is necessary to cut pillars and boxholes by some outside agency. The top drive pillar should be sunk through and cut under by hammer boys. The stope pillar should be undercut by hammers and sunk through by a machine, as hammer boys would take too long to sink through the pillar series, thereby hanging up too much broken rock. The bottom drive pillar would be raised through by a sub-contract machine or by hammer boys. The top pillar series and the bottom pillar raises would be put up in advance of at least one pillar ahead. As soon as the hammer boys had undercut the top drive pillar and the stope pillar, the stoping machine would break into it and start drilling benches *a* and *b*, and no holes would thus be put in at an angle to the fracture planes. I would suggest that where a bench face is not parallel to the grain, burden should be sacrificed on the front holes, and they should at once be directed parallel to the grain and not wait to procure the grain direction by gradually beating back, say, half a dozen benches. Consequently, if the learner is only asked to do elementary breaking of rock in one direction, I maintain that breaking rock is also reduced to such a simple process as to merit the distinction of being called foolproof, as well.

It might be said that there is an increased cost in undercutting the two pillars by hammers, but if the increased efficiency of the machines be taken into account, I feel satisfied that, when the system is working satisfactorily, a fair proportion of the stoping machines might be stopped, to produce the same amount of ground, and if such be the case, the gain of shutting down such machines will far outweigh the extra cost of undercutting pillars—if there be any. This system has now been in operation for about two months, and in every case where the miner has been able to follow the principle, a marked advance has been registered in breaking footage. I can consequently claim that these contentions have been removed from the realms of theory and have been fully demonstrated in actual practice.

In conclusion, I would refer back to a statement in the earlier pages that, until the grain of the rock, which will assist or retard breaking in a particular direction, has been ascertained, it is useless to make experiments to prove what the length of hole, diameter of hole, quantity of explosive, burden, etc., should be.

The Proposed Meldrum Tunnel in Colorado

SPECIAL CORRESPONDENCE.

Colorado reports state that negotiations are under way in New York, having in view the raising of capital for the purpose of building what is known as the Meldrum tunnel, between the Telluride district of San Miguel county, and Ironton, in the Red mountain district, of Ouray county. As the project is one of considerable magnitude, a description of the proposed work may be of interest. The tunnel has an almost east and west course and would be from 4½ to 5 miles in length, about 8000 ft. having already been driven at each end. The elevation is about 10,000 ft. above tidewater. The chief series of veins which it will intersect are those which have their outcrops and workings in Savage basin, on the San Miguel side, at elevations of 12,000 to 12,500 feet.

These will be intersected in the following order: First, the vein on which are the Columbia, Pay Rock, Champion and others, owned by the Mines Finance Company, of which John B. Farish is managing director; next, the lode on which are the Cincinnati, Argentine, Red Cloud and others, owned by the Tomboy company, of London, David Herron, manager; then the Flora, Japan, Climax, I X L and others, owned, it is believed, by the Mines Selection Company, of London, of which A. G. Brownlee, Denver, is resident manager; next, the Tomboy vein proper; then the Barstow vein in Commodore gulch; and the vein on which is located the Camp Bird mine; as this mine is about 2½ miles north of the line of tunnel, it is extremely problematical whether the vein extends that distance—probably not.

The only one of the group then that is paying dividends is the Tomboy company, and while nearly all of the Savage Basin mines have been rich on the surface, it remains to be proved whether or not the deposits persist to the depth of the tunnel level, say 1500 to 2000 ft. But as these claims are all patented, and, therefore, owned by their respective companies, as deep as human ingenuity can work them, the only revenue for the tunnel therefrom would be as a drainage and transportation enterprise, and whether the revenues from this source would pay a dividend on the outlay is what has to be figured on.

In any event, the first thing to be secured from the companies on the surface would be contracts for drainage and haulage. But where mines are fully equipped on the surface with hoisting and pumping plants, and mills to treat their ore, it is always a question whether they will care to first sink their shafts to great depths to the tunnel level, then perhaps have to drive long laterals to connect; and then abandon their surface workings and move their mills to the tunnel portal, where they would have to acquire ground by purchase for their plants, even supposing such ground to be suitable for the purpose, which is not always the case. A company working along comfortably from the surface and paying dividends, would require very large inducements in the way of decreased cost of production to warrant them in making such a change; and a company not paying a profit could hardly afford to. The history of transportation and drainage tunnels throughout the State is well known, and is not an encouraging one, as most of them have been a loss to the original investors.

The Alaska-Yukon-Pacific Exposition

Mineral Exhibits from the Northwestern States, Alaska and Canada. Work of United States Geological Survey Plays Prominent Part

BY E. JACOBS

The minerals on exhibition at the Alaska-Yukon-Pacific Exposition, at Seattle, Washington, serve to convey an idea of the increasing value of the mining industry of the northwestern portion of North America.

The following notes will convey a fair idea of the mineral exhibits as a whole. They should be premised with a word of praise to the Federal Government for its contribution to the success of the exposition, in giving mining prominence among its large and valuable exhibits. Through the U. S. Geological Survey, and in small measure in other ways, the value of the mining industry is being demonstrated in keeping with its importance. The shortcomings of others in this direction are thus largely offset and the industry worthily presented to the public.

United States Geological Survey

The exhibits of the United States Geological Survey form, one of the chief features in the mineral department of the exposition. From an educational point of view they are decidedly of greatest importance, though from a spectacular standpoint the Alaskan placer-gold exhibit attracts more public notice. There are two exhibits, the larger being in the Government building, and the smaller in the Alaska building. Special attention is given to investigations of the mineral and water resources of the United States and Alaska; to test work in the laboratory; to mine rescue work, and to disseminating useful information relative to the operations of and results obtained by the Survey.

Mineral Resources of the United States

The distribution of the mineral resources of the United States, especially of coal, oil and gas, is indicated on a wall map 12x16 ft. It also shows the important mining districts throughout the United States, Alaska, Cuba, Porto Rico and the Philippines

Large show cases contain samples of coals and other fuels, and ores, the distribution of which is illustrated on the map. The 70 samples of coal exhibited

UNITED STATES GOVERNMENT BUILDING AND THE COURT OF HONOR

range from lignite of lowest grade, to the best steam and coking coal, with anthracite samples containing fixed carbon up to 87.23 per cent. Coke, coal briquets and crude petroleum are given an important place. Samples of rocks and minerals of economic value fill several cases. Other exhibits in this section are rocks used in making cement; also samples of concrete in connection with experiments to determine the compressive strength of cement, concrete, etc. Information is given relative to educational collections of rocks, each containing 156 specimens illustrating the various types of rocks, distributed by the Survey throughout the United States to universities and colleges.

Work of Survey

Illuminated transparencies show members of the Survey topographers, geologists, hydrographers, etc., at work in the field. A Hoe map printing press is in operation, printing maps for free distribution. In a testing laboratory, Walton Van Winkle gives demonstrations of physical and chemical tests, illustrates and explains to inquirers methods and results, and shows in operation a grinding machine for polishing rocks and preparing thin sections for microscopic study. Willard S. Robbins, who is in local charge of the Survey exhibit, is kept busy giving information relative to his department. A complete collection of the Survey publications is on exhibition and available for reference. A demonstration is made under Mr. Robbins' direction, of the way the Draeger apparatus, of the compressed oxygen type is used in mine rescue work, a tunnel having been constructed in the Mines building in which to produce noxious gases and illustrate the rescue of imprisoned victims. Two sets of the apparatus are shown to all interested, and the use of it is explained.

Special Features

Chief among these are, undoubtedly, the large and very effective panoramic views of (1) Crater lake, in southern Oregon, and (2) the cañon and falls in Yellowstone National Park, Wyoming. Both are impressive and attract much notice among visitors, most of whom are better informed as to the latter than the former. Crater lake, crater of an extinct volcano, is seven miles in diameter, its water is remarkably clear and its depth of 2000 ft. gives it a wonderful blue color; its banks are precipices rising 2000 ft. above the water.

There is also a wall map, illustrating the general geology of North America, prepared by the Survey with the coöperation of the Geological Surveys of Canada and Mexico; topographic maps, specially prepared for use in schools by being mounted on millboard under celluloid, being thus made sanitary as well as serviceable; and models showing, respectively, the complex geology of the Appalachian mountains, and the striking relief features of the Yosemite valley region, California.

The whole exhibit of the Survey reflects great credit on Prof. J. S. Diller, geologist in charge in Washington, D. C., under whose immediate direction it was prepared.

Exhibits in the Mines Building.

The most prominent exhibits in the Mines building are those connected with coal mining in the State of Washington, and the large display of ores, and models of mine surface works of the Cœur d'Alene mining district, Shoshone county, Idaho. Others, also creditable, but less pretentious, are those of the Tacoma smelter and of M. K. Rodgers, of Seattle. Incidentally, it may be mentioned that Mr. Rodgers is one of comparatively few individual mining men who went out of their way to make the mineral exhibits worthy of the occasion; he supplied three separate exhibits—one each to the Mines, Alaskan, and Canadian buildings.

A tall pyramid of cubes of coal exhibits the progress, in five-year periods, in coal production in the State of Washington, from 5474 tons in 1890 to 3,722,433 tons in 1907. There are also a number of large blocks of coal, the largest one from Roslyn mines, Kittitas county, Wash., weighing 17,000 lb. It is 7 ft. 5 in. long, 5 ft. 3 in. wide, and 4 ft. 6 in. high. Coal and coke are exhibited from other Washington mines; a model of the Carbon Hill Coal Company's mine at Carbonado, Wash., showing "longwall retreating and timbering after coal is taken," and another of the north workings of the Seattle Electric Company's coal mine at Renton, Wash., and numbers of photographs of coal-mining scenes are representative of the industry.

The Cœur d'Alene district's exhibit is in two parallel sections, each about 50x10 ft. At one end of each section there is a headframe with ores and mining tools arranged about it, and at the other is a model of a mine-tunnel portal with much ore about it. A number of large blocks of ore, and piles of smaller lumps, together make a comprehensive exhibit of ores, chiefly silver lead and zinc, from the Cœur d'Alene.

The Tacoma smelter exhibit includes ores from all the northwestern States, Alaska, British Columbia, Mexico, and South America; various smelter products, from flue dust and slag to bullion, from both copper and lead furnaces; briquets, fluxes, concentrates and slimes, and blacksmith coal from the smelter company's coal mine at Fairfax, Wash. There is

MINES BUILDING.

CALIFORNIA BUILDING.

also a large photograph of the Tacoma smelter.

Many mining camps in Washington and elsewhere are represented by varied and miscellaneous collections of ores. Other exhibits are iron ores and diamond-drill cores from Ishpeming, Mich.; magnetite concentrates and chromite from the sands of Cape Flattery, Wash.; a considerable quantity of molybdenite, from Lake Chelan, Wash.; bog-iron ores, from Snohomish county, Wash.; a model of the "Welcome" nugget of gold, found at Bakery hill, Ballarat East, Victoria, Australia, on June 11, 1858 (the discoverer of this nugget, Francis Webster, died recently at the Ballarat Benevolent asylum, whence he went three years ago, poor and friendless), and which weighed 2195 oz., and was valued at £8780; a model of a platinum nugget, weighing 21 lb., found in 1827 in the Ural mountains, Russia; talc from Skagit county; infusorial earth, from Adams county; mineral paint, clays, shales, limestones, silica and other economic nonmetalliferous minerals, from various parts of Washington; a block of pale-green, polished marble, from Stevens county; a slab of "natural flexible sandstone," 12 ft. 3 in. by 4 ft. 7 in. by 1 in., and a block of sandstone 10 ft. by 4 ft. 6 in. by 4 ft. 6 in., weight, 38,000 lb., both from Tenino, Wash.; a block of granite, 17 ft. by 24 in. by 24 in., weight, 11,000 lb., from Index, Snohomish county, and other products, metallic and nonmetallic, of the State.

Exhibits from California and Utah

California has on exhibition a varied display of minerals, but many of them are not conspicuous owing to being crowded together on shelves against a wall, while fruit and other food products fill more accessible floor space. At the main entrance to the building the contents of two fancy show cases, one filled with rich gold specimens, chiefly gold in quartz, from Siskiyou county, "the Gateway of the Californian Goldfields," and the other with stones, rough and polished, from San Diego, "the Gem City of California," are much admired.

California's ores are represented by numerous specimens, while building and other economic materials are also shown in considerable number and variety. Oils, too, are on exhibition, mostly crude. Several exhibits, for which floor space was not found, are outside the building. One of these is a stack of about 100 pigs of Heroult electric iron, smelted by electricity at Heroult, Shasta county, where iron is being turned out in commercial quantity. Especial interest attaches to this exhibit, since it is claimed that this product is from the first electric iron smelting enterprise established on the Pacific coast. Another exhibit is a 4-ft. cube of fuller's earth, from Santa Barbara, where, it is stated, this material occurs up to 6 ft. in thickness without a seam in it.

Utah's display of minerals, while not large, is an excellent one. All the chief metalliferous minerals are represented, some by large specimens, while coal and coke, rock salt, gypsum, onyx in various colors, a case of hydrocarbons from Uintah county, and others combine to make an attractive exhibit. Many photographs of mining scenes are also exhibited. In a rear room is a concentrating mill, part of the equipment of the Utah State School of Mines, Salt Lake City, shown in operation.

Philippine Mineral Exhibit

The exhibit of minerals from the Philippine islands is not large, but that country being a comparatively new possession of the United States, its natural resources are of interest. These include coal, gold, sulphur and salt, all of which are well represented, together with much valuable information regarding the deposits.

EXHIBIT OF THE UNITED STATES GEOLOGICAL SURVEY

United States Assay Office

The Seattle branch of the United States Assay office has an interesting exhibit in the Government building, where there is a daily demonstration of melting and assaying gold. There are two melting furnaces, one with a capacity of 1000 oz. and the other of 500 oz., but it is not customary to make bars of gold bullion of heavier weight than 1200 oz. The process of melting the gold and cleaning the bars prior to assaying is watched daily by as many people as can get near the caged compartment in which operations are conducted. The scales used for weighing the heavy bars of gold were made at the Philadelphia mint and are sensitive to 1/1000 of an ounce. There are two sets of assay balances used by the assayers. The Seattle office is equipped for melting $500,000 worth of gold a day, that is if the gold comes in the right sizes. C. E. Vilas is assayer in charge.

Miscellaneous Mining Exhibits

At the entrance to the Government building, the International Bureau of the American Republics has an exhibit in which there is a case of ores from Chile, Bolivia, Ecuador, Peru, Mexico and Santa Domingo. Elsewhere are to be seen mine timbers treated with creosote or other preservative preparation, after having been in use underground in coal mines for a number of years, and others not treated, for purposes of comparison. Many other exhibits connected with the mining industry are also to be found in one part or another of the exposition.

Exhibits from Foreign Countries

Canada is the only foreign country making a mineral exhibit of much importance. Japan has a small collection of rock and ore specimens sent by the Imperial Geological Survey of Japan. Each country has its own separate building and staff.

Canada's mineral display merits the praise it receives from most visitors. It is comprehensive, adequately illustrating the varied mineral resources of the Dominion; is well arranged, so that it can be conveniently examined, the individual exhibits are clearly labeled, showing the

main facts of the progress of the mining industry of the country. There are well-posted officials always in attendance while the building is open to visitors.

In assembling and arranging the Canadian exhibits, Col. W. M. Hutchinson, commissioner in charge of Canada's exhibition branch, has kept in view the desirability of giving prominence to western Canadian mineral products, the exposition being primarily to exploit the resources of the Pacific northwest. Thus it is that British Columbia occupies a leading position in the mineral department of the Canadian exhibit as a whole. Gold, silver, lead, copper and zinc ores, from British Columbia mines, and coal and coke from its collieries, are on exhibition in considerable quantity; also metallurgical products, from both copper and lead furnaces, shown by the Consolidated, Granby, British Columbia Copper, and Tyee companies.

Eastern Canada and Ontario are well represented, chiefly in cobalt-nickel arsenides and silver; nickel ores and manufactured products; corundum, with wheels made in different countries from same; mica, asbestos, graphite, hydromagnesite, and mineral pigments, all with manufactured products from these respective materials.

A metallurgical collection sent by Dr. Euugene Haanel, of Ottawa, director of the mines branch of the Department of Mines of Canada, includes samples of pig iron made from magnetite and pyrrhotite in an experimental furnace at Sault Ste. Marie, Ontario. Building stone, lime stone, cement and other materials applicable to common or decorative construction, are exhibited in great variety.

Altogether the Canadian mineral exhibit constitutes to mining men one of the attractions of the exposition. The western exhibits were collected by R. L. Broadbent, of the Geological Survey of Canada. He and W. D. Dalglish are in constant attendance to give information concerning Canada's minerals and the progress of its mining industry.

Dredge and Hydraulic Mining in California

SPECIAL CORRESPONDENCE

Inyo county, California, has just started its first hydraulic mine, though more or less placer mining has been going on there for the past 50 years. The claims are located at the Birch Creek and are six miles southeast of Big Pine, where other placer mining has carried on years ago with pans, sluices, etc. Coarse gold and some nuggets were found, but at a depth of about 50 ft. prospecting diggings gave poor results and had to be done by hand. J. A. Spaulding, J. B. Woods, A. N. Bell and C. A. Curl, the latter the superintendent, began work in that section early this year and have built a dam to store the waters of a lake at the head of Birch creek, with three miles of ditch and flume. This gives them about 1000 miners' inches of water with a fall of 250 ft. Only one giant is in use as yet. The mines cover about 300 acres. There is no débris question in that section and the tailings run where they may. The gravel mined runs from 20c. to $2 per cubic yard.

A. C. Fulton, of San Francisco, and Chas. Paulsen, of Redwood City, are about prospecting possible dredging ground near Gas Point, 17 miles from Cottonwood in Shasta county. The ground is the Shuffleton ranch on Cottonwood creek. The acreage in the tract is not large and it has been found impracticable to bond adjoining ranches where gold is found, because the owners prefer to continue to work them as ranches. It is intended, if dredging is carried on, to build a restraining dam to prevent the débris getting to the Sacramento river or the ranch lands below.

Certain claims located east from Hammonton, on the Yuba river, and between that place and Smartsville in Yuba county, have been bonded to Robert E. Cranston and associates, of Marysville, in order to determine their availability for dredging purposes. Included are the river claims of the Marysville Quartz Tunnel Company, the Archimedes Gold Dredging Company, and the Montclair Mining Company. Boring by Keystone drills will begin at once to determine values. The lands in question are in a favorable location for dredging work.

On Aug. 15 the Trinity River Mining Company will turn the waters of Trinity river through the new two-mile tunnel above Lewiston. This will leave about 1½ miles of the river channel bare for mining purposes. Electric machinery is being installed at the mouth of the tunnel, where 1800 h.p. will be generated. This power is to be used for operating electric cranes for removing any large boulders met with, and will also lift the gravel into the sluices. This is the largest river-bed mining scheme started in California in recent years.

BY PRODUCTS OF GOLD DREDGING

The new rock-crushing plant of the Natoma Consolidated Company between Folsom and Fair Oaks, Sacramento county, has been started up. The object of the plant is to crush the cobbles piled up by the stackers of the gold dredges of the company, during the mining operations. These cobble piles have caused much adverse comment on gold dredging enterprises owing to their unsightly appearance. Now they are being utilized by being crushed into several sizes and used for road building material. The old cobble-crushing plant at this point was capable of crushing about 10,000 tons monthly, but the new one will handle 50,000 tons. Large bunkers have been erected in which to store the crushed material. The stones are handled by steam shovels which deposit them in cars, which in turn carry them to the crushing plant. As fast as the cobbles are removed, the soil surface is being replanted with fruit trees, etc., so that the land can be again utilized. The crushed rock is a valuable by-product of gold-dredging operations, its profits lessening the cost per cubic yard of the mining operations. Moreover, it is sold so cheaply that excellent roads may be built at much less cost than formerly. The dredging companies are also utilizing this crushed rock in the manufacture of cement, etc., and will manufacture cement pipes at the plant.

Sulphur Deposits in the Transcaspian

The *Tifliser Zeitung* states that in the neighborhood of Kyrk-Tschulba in the Transcaspian district of Aschabad, near Schjich, there are ore deposits which are very rich in sulphur. These deposits could be very readily worked, as they form hills 90 to 125 ft. high and often one to two miles in circumference. The ores on the surface contain 58 to 62 per cent. sulphur. The amount of ore in these hills, on the surface, is estimated at several hundred million poods. (A pood is 36.07 lb.).

Attempts to work these sulphur deposits have been devoid of success, because, according to the correspondent of the paper in question, there has been a lack of proper means. At present, all these deposits have been bought by a company under the name of "Sulfur." The new company intends, in a short time, to work the deposits in a thorough manner.

The iron works at Hanyang, China, are situated near the city of Hankow, 600 miles up the Yang-tse-kiang, which is navigable to that point by vessels drawing nearly 20 ft. of water. The plant comprises three blast furnaces, with a combined daily capacity of about 500 tons of pig iron, four open-hearth furnaces, each of about 60 tons daily capacity; rolling mills for bars, rails, plates, etc.; bolt, nut and spike machines. Nearly 4000 Chinese laborers are employed, controlled by 20 foreign engineers, electricians and foremen. These works are being extended, and it is proposed to erect a new plant a few miles further down the river, just below Hankow, for the manufacture of steel bridge and structural material, and railway cars, trucks, and other equipment. It is also intended to put up a plant for making cement from the blast-furnace slag, which is now waste.

Reminiscences of the Early Rand*

By J. S. MacArthur†

After a stormy voyage to Capetown, a pleasant trip through Cape Colony to Kimberley, and a wearisome coach journey to Johannesburg, I arrived there in April, 1890. Happily I forget much of the unpleasantness of the journey associated with the good old coaching times. I do remember, however, that a coach which would have been well filled with six passengers had to carry a load of twelve. We had to "sit tight" and be good natured—or be thrown out. The monotony of tight sitting was varied by an occasional walk where the dust was too deep for seven pairs of horses to pull through, and when we came to a sluit the passengers jumped over and helped the horses.

Fares were high, about £8 to £12 for Kimberley-Johannesburg stage. In modern days the train carries baggage at a less rate than the human passenger, but the coach charged more per pound for luggage than for humanity. The coach was the first-class conveyance, used principally by those who traveled at the expense of others. Those who traveled on their own account generally bargained to be conveyed with "urgent" goods by fast mule wagon for a modest fee of, say £2, each passenger supplying himself with food, and co-operating with the transport riders in the toils and adventures of the trek. Probably these mule-wagon passengers had a pleasanter time than their coaching friends.

Johannesburg in the Early Days

At that time Johannesburg was certainly the premier gold camp, but the glamor of Barberton had not quite faded, and Klerksdorp was also the center of a gold industry, very promising if not very thriving. There were many who shook their heads wisely and said that Johannesburg was only a passing fashion, and time would show that Barberton was the place; others, with a knowing look and a grave whisper assured their acquaintances that they positively knew that Klerksdorp was the key to the situation.

I spent a few days at Klerksdorp and saw several batteries "just ready to start but"—there was no capital to develop the mine, or the mine manager had not arrived, or a barrel of lubricant had been lost on the way. There was always some good reason for the silence of the mill.

At Johannesburg some mills were going, but many were silent. The boom had passed and the blight had come. As the possibility and opportunity of speculation had dwindled, the crowd of irresponsibles who dubbed themselves brokers also dwindled till few were left. The whole mining industry was in a precarious state, the rich surface patches had been exhausted, the average grade of ore was falling, working expenses remained high, and the dread of the blue ground under the oxidized zone deterred fresh capital and discouraged new enterprise. At least one-third of the houses and stores were unoccupied and gloom was general. Families were leaving, offices were being closed, cheap sales of pianos and safes blocked the Market square.

The First Cyanide Plant

There were many processes in the air—fine crushing by wonderful machines was one type of the infallible cures, amalgamation, where contact was induced by mechanical and electrical agencies, was another; chlorination with pressure or without was another; and some inventions included all these, so that whatever gold escaped one trap would surely fall into the next. Two or three years before this period the cyanide process had, with labor and pain, been evolved into existence in Glasgow under the brothers Forrest and myself, and was being brought into world-wide use by the Cassel Gold Extraction Company, which controlled the patents. Late in 1889 this company sent an expedition of a few skilled men, under the leadership of Alfred James, to erect a cyanide plant, for demonstrating the applicability and commercial value of the process in South Africa. This pioneer of the huge cyanide plants now in existence on the Rand was erected in the Salisbury battery, and many little troubles were avoided and difficulties smoothed by the manager, R. A. Michell, who was truly hospitable in his kindness to the little band of enthusiasts who bothered him with their cranks. The directors of the Cassel company, recognizing the importance of the ordeal, decided to send the ringleader of the inventors to take command, and thus came about my first visit to the Transvaal. By the month of June, 1890, the cyanide plant was ready for work. It was composite, available for agitation and for percolation. It had a vacuum attachment for hastening filtration, and provided everything but a filter-press, a piece of plant already tried and found wanting in its then design. It is a very different appliance now.

After a little preliminary work on our own account we prepared for a demonstration of the process and consignment; on the challenge of a celebrated metallurgist, now almost forgotten, who jeered at the bare idea of cyanide being a commercially useful gold extractor, we decided to work on the Percy concentrates. These were ordinary underground pyritic concentrates containing 20 oz. gold per ton.

The Demonstration

The representatives of the gold industry were invited to check us at every point, and they came prepared to be very exacting, but when afternoon became evening and evening became night, refreshment, recreation and rest became necessary, so with most of them watching became whist and whist became sleep. One of them, however, Hennen Jennings, was not to be tempted; he attached himself to me like an old friend, and I am glad to say he has not shaken me off yet. He took nothing for granted, measured every vat and every pipe, sampled the water, the lime, the cyanide and the zinc to make sure there was no humbug. For two days and two nights the trial lasted until late on the third day, when a small ingot of gold was turned out of the little kerosene smelting furnace.

The industry is not now called on to deal with rich concentrates, in fact, the concentrates are not much in evidence since cyanide became dominant and this Percy lot was most exceptional; so in deference to the wishes of my colleague and other technical friends we used a 2 per cent. solution, though in our ordinary work in the laboratory we used solutions as weak as those now in general use. I must admit that my friends had good reason for their wish to use a comparatively strong solution, for cyanide was not in those days the pure salt of reliable composition that it is now. In the solid, its true cyanide contents were erratic; in solution, it was without sufficient reason, considered uncertain and cranky, and, after all, they said that the extra strength would not hurt if it did not help.

Probably W. A. Caldecott, who was our first South African assistant, remembers many of the incidents of this period; his scientific acumen was then as now, an invaluable guide in a new field of industry. The demonstration was over, the gold extracted to the extent of 98 per cent., but the industry was not convinced.

The Doubting Thomas

Those who knew most were perhaps incredulous but not contemptuous; those who knew least had to be contemptuous to maintain their dignity. One gentleman, who had been an expert telegraph operator and knew all about batteries, "chemicals and things," condemned it roundly as the result of his accumulated wisdom. Once, coming as an unknown passenger in the Pretoria coach, I heard the process discussed as "bound to be a failure," "all about it known long ago," "positively ridiculous," and myself as "an honest sort of fellow but knows nothing," and "all right in the laboratory but no good outside it." The temptation was too great, and to the consternation of the critics I disclosed myself in the last mile.

*Journ., Chem., Met. and Min. Soc. of South Africa, December, 1908. Discussion of M. H. Coombe's paper of same title.

†Metallurgist, 6 Broad Street place, London, E. C.

In these days the professions of journalist, mining engineer and metallurgist were frequently combined in the one person—generally it was an unhappy coalition. One of the gentlemen was shown over the works by me, everything was fully explained and understood, at least so I flattered myself, but as he was about to go he said, "now, my dear fellow, you really cannot fool me as you fooled the others, what is it you have up your sleeve?" I have always regretted the loss of this magnificent opportunity for telling some wonderful fairy tale.

Another type of man whom I dreaded was the "practical man," who reveled in shirt sleeves turned up to the elbows and concealed his ignorance in a fluent jargon of weird science and torrid profanity. Fortunately he is now relegated to his proper sphere and bosses the Kafirs, and well trained scientific young fellows have taken his place and discharge responsibilities the "practical man" never dreamt of. A type of man whom I admired then was the clerk, stockholder, sugar-planter or storeman who, by force of circumstances, found himself in charge of a mine. Many of these men, who started by knowing little or nothing of mining and metallurgy, quietly went on learning and working. In the end most of them had to give their place to better trained men, but they served their day and did their share in founding the industry.

Other Visits to the Rand

By 1891 the African Gold Recovery Syndicate, into whose hands the control of the MacArthur-Forrest patents have passed, had made some profit from the treatment of 10,000 tons of Robinson tailings and had arranged for the treatment of a similar parcel of tailings at Fever creek. As profits had actually been made, leaders of the industry were convinced that the process was good and, as the process was at the booming stage, I again visited the Rand in 1891. Everything was changed, every house was occupied, every store was filled, every merchant was busy, there was a distinct feeling of confidence in the future, fresh enterprises had been taken up and were being initiated every day, and the Rand industry, as it stands now, was clearly foreshadowed. Of course, wise men were at it again, and each wiseacre took credit to himself, saying he knew from the very beginning that there was something in that MacArthur-Forrest patent, and each one took credit for the encouragement that he had given to the industry.

By the introduction of cyanide the gold industry everywhere, but particularly on the Rand, became really an industry which, combined with good business management, has changed from a gamble speculation into a safe investment.

I was again on the Rand in 1895-96 at the time of the Jameson raid. My occupation was then the defence of the patents that protected the process which, next to the existence of the main reef series, was the most important factor in the development of the wealth of the South African Republic. Unfortunately, since that time I have had no interest calling me to the Transvaal, but I still regard Johannesburg and the many friends that I met there with affection, and the episodes of that period form a series of pictures in my mind, which I trust may never fade.

Iron Ores of Nova Scotia

By Phillips Thompson

A report just issued by the Mines Branch of the Dominion Department of Mines, and prepared by Dr. J. E. Woodman[1], gives a comprehensive survey of the iron ore resources of Nova Scotia, with full descriptions of the localities where iron ore deposits are known to occur, a history of such development as has taken place, analyses of ores, statistics as to output, and much other information calculated to aid the development of the Canadian iron industry. The geographic relations of the deposits are fully set forth. While the ores are widely distributed only a few really important bodies are known, the largest of which are within easy reach of transportation and sufficiently near fuel and limestone to make smelting possible under favorable conditions.

Commencing at the west detached small deposits are found along the south side of the Bay of Fundy, from Brier island to Cape Blomidon, and on the south shore of Cobequid bay toward Truro. Behind or south of this line of deposits are the more persistent and important ores of the Clementsport and Nictaux-Torbrook fields. On the north side of the Bay of Fundy are many small isolated occurrences and a persistent and probably connected line of ore bodies from the western part of the Cobequid mountains east into Pictou county. Detached deposits occur eastward through Pictou and Guysborough counties, north of the region occupied by the granites and gold bearing rocks. In Antigonish county is the large field of Arisaig, on the coast south of which are numerous small occurrences. In Cape Breton island the iron ores are found in widely separated localities and some deposits promise to be of commercial importance. The coalfields of the Province are numerous and so widely distributed as to supply fuel at a number of smelting centers, should it be required.

[1] Report on the Iron Ore Deposits of Nova Scotia. Part I. Canada. Department of Mines. Mines Branch. By J. E. Woodman. pp. 226, 91x64, in paper. Illustrated. Ottawa, Canada. 1909. Government Printing Bureau.

Future Prospects for the Industry

In view of the fact that so many of the iron ore deposits are small and scattered, with but few of considerable size, Dr. Woodman points out that if the question of additional centers for iron and steel manufacture arises, there are very few localities possessing the requisite qualifications, adequate supplies of suitable iron ore, flux and fuel, cheap transportation for these raw materials to the furnace, and shipping facilities. The cost of labor being even throughout the province it is not a factor in determining position. From this standpoint the following may be taken as a natural grouping (1) A western section in Digby and Annapolis counties with its industrial center at Annapolis; (2) a west-central section draining Kings, Colchester and Cumberland counties with Londonderry as its center; (3) an east-central section, embracing Pictou, Antigonish and Guysborough counties with a focus in or near the Pictou coalfield; (4) an eastern division including Cape Breton with its centers at Sydney and Sydney mines.

Dr. Woodman does not consider that there is any probability of Nova Scotia developing an iron industry from its own ores that will compete extensively with the American and Ontario products in their own markets. Its success must result from the comparative isolation of the Province, which diminishes the intensity of competition in the home market. So far as now known there are no deposits in Nova Scotia comparable in size, quality and low cost of treatment with those of Bell island, Newfoundland, or the Lake Superior ores. But there appears to be a possibility that the Province may be able with its own ores to supply eastern Canadian demand, as every ton of iron or steel that can be made to meet existing trade conditions can be sold. A characteristic of many of the ores is that they are highly silicious, phosphorus being also a common constituent. They are usually comparatively free from sulphur. So far no deposits of importance of uniformly bessemer grade have been discovered.

Dr. Woodman, in speaking of the policy to be pursued for the encouragement of exploitation, points out that the disposition to ask exorbitant prices by landowners, leaseholders or others concerned in booming iron ore properties has been a serious drawback to development. Large capitalists are not justifiable under existing conditions. Small deposits could advantageously be developed if the owners should work them and contract for the sale of the ore to the smelters, instead of holding them for sale at high prices. The bounty system, he urges, should be altered, the government paying the bounty direct to the mines upon raw iron ore at a sliding scale, according to quality, when that ore is accepted at the furnace and converted into pig iron.

Concrete Linings in Shaft Sinking

An Oklahoma Coal Company Put down a 9 ft. Circular Shaft, 330 ft. in Depth, with a 6 in. Concrete Lining, at a Cost of $27.56 per Foot

BY R. H. ROWLAND*

During the past few years the adoption of concrete in practically all industries has developed with wonderful rapidity, insofar that today almost every variety of structure designed by an engineer or architect consists, in part at least, of concrete, either reinforced or otherwise, and its use is constantly increasing.

As a structural material, where economy, durability and fire-resisting qualities are important factors, concrete construction is universally adopted and the great number of structures in which concrete has been successfully applied is conclusive proof of its safety, economy and permanence. Its fire-resisting qualities have been fully demonstrated on a large scale in many great and destructive fires.

Several large and uptodate coal- and metal-mining companies, recognizing the material advantages of reinforced concrete over lumber, adopted this construction in their entries and slopes for props, caps, etc., to maintain these roadways in condition; while the initial cost of this construction is higher than that of lumber, it is not necessary, as is often the case with lumber, to replace the material from time to time, owing to roof strain, rotting timbers, etc., and a permanent roadway is thus established. Consequently, while the initial cost of concrete is somewhat higher, its efficiency is much greater, its durability unequalled, and its permanence an established fact; it has, therefore, proved a justifiable and economical outlay in regard to the maintenance of permanent roadways in coal and other mines.

Another unsatisfactory condition mine operators have to contend with is the growing scarcity of lumber suitable for road timbering, the difficulty in procuring and transmitting, and the prohibitive price in many parts of the country.

One of the largest coal-mining companies operating in the Southwest decided to experiment by sinking an air and escape shaft 330 ft. in depth at one of their mines in the State of Oklahoma. The construction of this shaft was designed by me and the work carried out in the following manner:

The shaft was circular in shape, 9 ft. 6 in. in diameter and lined with a 6-in. lining of concrete. The thickness of the lining was not uniform owing to the nature of the excavation, the minimum being about 6 in. and the maximum about 10 in. Three rings, *A*, *B*, *C*, were made of ¼ in. steel plate in four quarter sections, each 3 ft. 6 in. in depth, making a total depth of 10 ft. 6 in.; to these rings upright supports were attached, consisting of 3x3x¼-in. angles, 3 ft. 6 in. high, as shown in Figs. 1 and 5.

These rings could have been constructed of either wood or steel. Although the steel rings are heavier to handle than wooden rings, they have proved more efficient in many respects, and little difficulty was experienced during the entire operations in detaching them from the concrete when set. Three wooden blocks 4x4 in. were used and bolted between angles, as shown in the illustration, these blocks being adopted for the purpose of detaching the steel rings from the concrete when hardened and set in place.

Owing to the fact that the strata sunk through in this particular district consisted principally of black shales, no reinforcement was considered necessary, although the platform supports shown in Figs. 2 and 3 essentially formed a reinforcement.

If reinforcement is considered necessary, perpendicular or circular bars of the desired cross section can be used in the process and inserted while the concreting is in progress. If bad ground is met with, the crib method adopted in brick-lined shaft-sinking can be applied, and the concrete lining could be accordingly increased in thickness.

At the bottom of each quarter section of these steel rings *A* and *B*, circular angles were riveted as shown on the diagram. These angles were tapered to a fine edge in order that they might be easily detached from the concrete when sufficiently set. Circular angles placed on the outside of the rings, so as not to enter the concrete at all, could be used and might serve the purpose, but it was found that angles embedded in the concrete with tapered edge proved more suitable, and no difficulty whatsoever was experienced in removing them from the concrete.

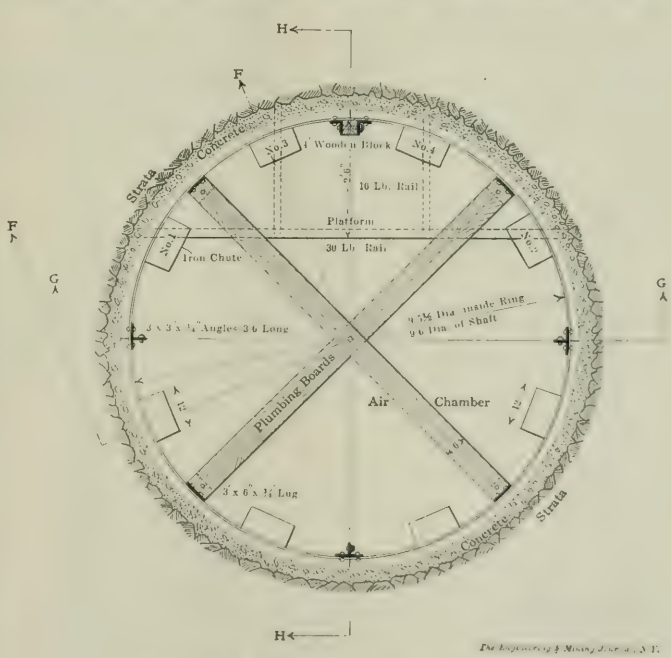

FIG. 1. PLAN E E SHOWING RINGS SET FOR CONCRETING

The Steel Supporting Rings

The weight of each ring with angles attached was approximately 1500 lb., and these rings were raised and lowered when necessary by an engine located on the sur

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face. Lifting lugs were provided of 4x4x4-in. Norway iron which were riveted centrally on each quarter section of the steel rings, as shown in Fig. 5. The construction of these rings is shown in Fig. 5.

Excavation was carried on for a depth of 10 ft. 6 in., the ground at this point leveled up and the steel ring *C* placed in position. From Fig. 5 it will be observed that there are two 12-in. openings in each quarter section of this ring, making a total of eight. These openings were intended for the use of flat iron plates 12x9x¼ in., which were inserted at an angle of 45 deg., and wedged in in the manner shown in the illustration, Fig. 4, in order to prevent the freshly applied concrete from running out.

After the ring *C* had been filled with concrete, ring *B* was placed immediately above and filled in the same manner; then ring *A* was placed immediately above ring *B*. The iron chutes shown on the ring *A*, Figs. 4 and 5, were constructed in exact relation to the openings of the ring *C*. This was done in order to facilitate the work of concreting, as will be seen on reference to the illustration. A wooden chute of suitable capacity was adopted for concreting, the opening of which was

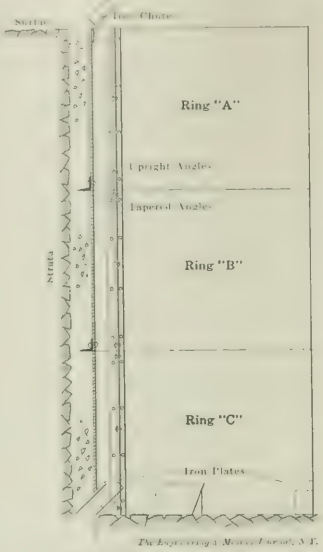


FIG. 4. SECTION F F SHOWING RINGS IN POSITION

plumbing boards, and were placed centrally on each quarter section, as shown in Fig. 5.

Platforms

The platforms shown in Figs. 2 and 3 were installed 10 ft. 6 in. apart, being constructed in the following manner: A 30-lb. rail was inserted (base upward) at the openings marked Nos. 1 and 2, and grouted in with pure cement. From this 30-lb. rail two 16-lb. rails were run at right angles and grouted in at the openings marked Nos. 3 and 4 in the same manner. The platform itself consisted of 1½-in. boards supported by the rails above mentioned and attached to same by means of bolts. The platforms could have been made of concrete also, and this would have made an absolutely fireproof shaft, but this construction necessitated more labor and conditions hardly justified such a project.

Openings were made in the platforms, as shown in Fig. 2, and perpendicular iron ladders were adopted, placed alternately at each opening and attached to the 30-lb. rail platform supports. The apertures in platforms were constructed to the dimensions shown in Fig. 2, in order to allow

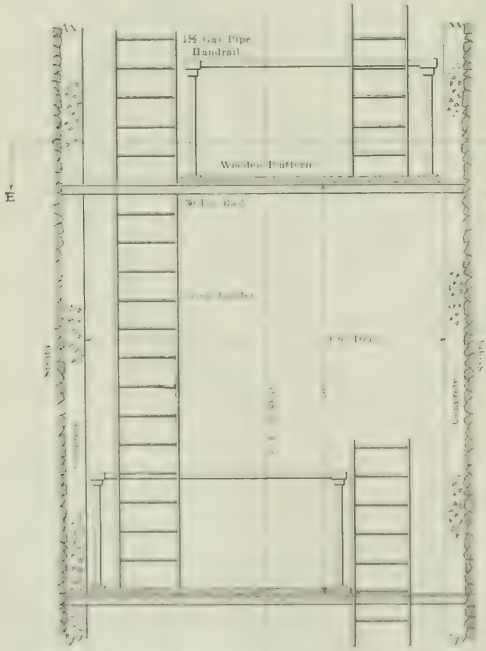


FIG. 2. SECTION G G SHOWING PLATFORMS AND LADDERWAY

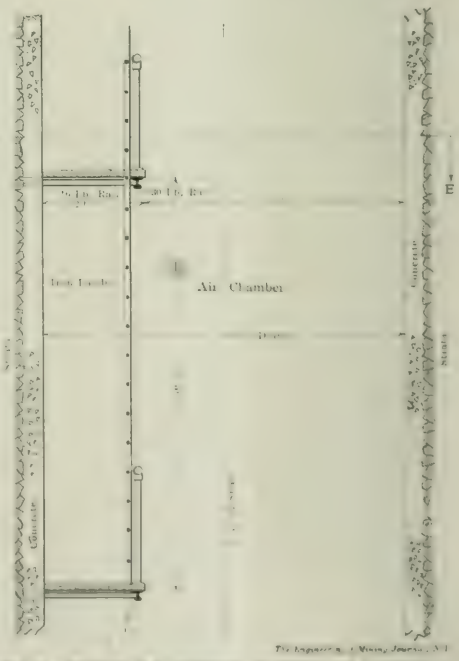


FIG. 3. SECTION H H SHOWING PLATFORM AND LADDERWAY

[illegible] 12 in. in width, in order to slide [illegible] the concrete in the aperture [illegible] referred to.

[illegible] perpendicular angles [illegible] in., [illegible] ft. 6 in. long) were used in order [illegible] the quarter sections of the rings in position, and also to act as strengthener. By adopting a 4 in. wooden block it was only necessary to release one quarter section each time, and the entire ring was then raised or lowered by the engine.

Iron lugs were provided for resting sufficient clearance as a manway. In this way danger from falling any great depth was eliminated, as it would thus be impossible for a person to fall down the shaft, or, in fact, to fall any greater distance than 10 ft. 6 in. to the platform

below. A gas-pipe handrail was provided to insure safety as a traveling way, and placed as indicated in the sectional view, Figs. 2 and 3. These ladders were placed alternately in order to facilitate the means of travel and also as stated previously, to insure greater safety.

A concrete mixer was used, and materially facilitated the progress of making concrete; the complete work of excavation, concreting and installing platforms and ladders, occupied about 90 working days of two 10-hour shifts. Owing to the small diameter of the shaft, only a limited number of men could be employed in sinking operations, consequently rapid progress was somewhat retarded. While the concrete was hardening in each section, and the rings were held in position, excavation was continued to the necessary depth, and the rings then removed and reinserted for the next operation.

The cost of operation per foot, worked out at the rate of $27.56, which cost included all labor and material in excavation, concreting, rails, platforms, ladders and steel rings, with an allowance for concrete mixer and hoisting engine on hand, and general superintendence, or a total expenditure of $9095 for sinking 330 ft. in depth.

At this time when many of us are estimating the quantity of available coal remaining unmined throughout the world, it may be interesting, if not satisfying, to recall that in the last report of a Royal Commission, appointed to examine the question, it was shown that the final and uptodate estimates of available coal gave a total world supply 12 per cent greater than was reported by a similar commission 30 years earlier.

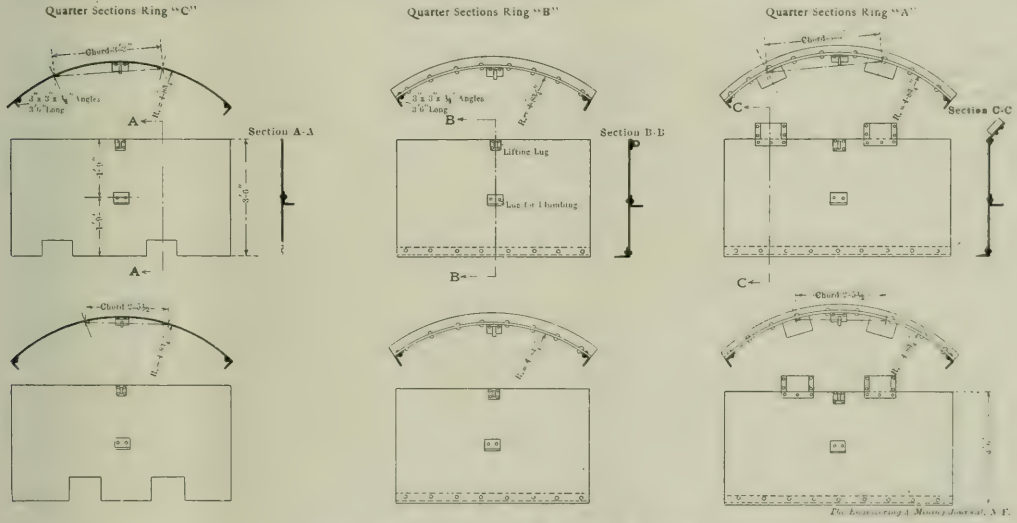


FIG. 5. DETAILS SHOWING CONSTRUCTION OF RINGS

Peat in Canada

SPECIAL CORRESPONDENCE

The Mines Branch of the Canadian Department of Mines is devoting much attention to the question of rendering available for fuel the extensive peat resources of the country. With the purpose of presenting all attainable information as regards the latest processes of peat manufacture successfully pursued abroad, the branch last year issued a comprehensive report on "Peat and Lignite, their Manufacture and Use in Europe." This has now been followed up by the present publication,[1] giving the results of an examination by experts of some of the bogs most favorably situated as regards transportation and market facilities. The investigation was conducted in a very thorough manner, the surface of the bogs being mapped out, lines run at intervals generally 1000 ft. apart, and drillings made in each of these lines at intervals of 500 ft., samples of the peat being collected at different depths. The following estimates of the amount of fuel contained in the bogs investigated will give some idea of the peat resources awaiting exploitation. The calculation of the amount available in each case is based on the assumption that 1 cu.yd. of drained bog will furnish 200 lb. of dry peat substance. The following table gives the results obtained from the investigation of several bogs, all of which are within reach of transportation.

Bog:	Area, Acres.	Peat, Cu.Yd.	Dry Peat, Tons.
Mer Bleu.....	6,004	38,442,494	3,844,250
Alfred.....	6,800	70,270,200	7,027,000
Welland	4,900	30,796,480	3,079,600
Newington.....	3,800	46,566,500	4,656,600
Perth.....	4,800	38,445,200	3,844,500
Victoria Road ..	67	402,440	40,250

From these few bogs examined, it is apparent that the quantity of peat available for use is very large.

PRESENT CONDITION OF THE INDUSTRY

The report also gives an account of the present status of the peat industry in Canada by which it appears that it is at a very low ebb. Only one small peat plant was in actual operation last season, that of Dr. J. McWilliam, at Dorchester, Ont., which made a few hundred tons of peat fuel. The large amount of dust is the principal defect with all the peat briquets so far produced, and up to the present time this difficulty has not been overcome. The report attributes this to the fact that the moisture in the peat collected from the bog is not uniform, and considers that the method pursued of collecting the raw material in thin horizontal layers is not in most cases as good as where the peat is dug vertically to the bottom of the bog and the different layers mixed. In most cases the companies that have erected plants have never produced any quantities of fuel worth mentioning. This is due principally to lack of knowledge of the properties of peat, which has led to the employment of impracticable methods or unsuitable bogs. Extensive experiments have been made by E. V. Moore at the Victoria Road peat bog, but the plant constructed was found to be too complicated in design and not practicable. Operations have recently been started at the Guelph peat plant by the Imperial Peat Company, Ltd., but no data are yet obtainable as to the results obtained.

[1] "Investigation of the Peat Bogs and Peat Industry of Canada during the Season 1908-9." Canada, Department of Mines, Mines Branch. *Bulletin* No. 1. By Erik Nystrom and S. A. Anrep. Pp. 25; 9½x6½ in. paper, with maps. Ottawa, 1909; Government Printing Bureau.

Rope Strains in Hoisting

By C. W. Beers*

The calculation of rope strains for hoisting purposes, on any pitch, for service in and about a coal mine, involves some features and methods that are not thoroughly understood by mine foremen and others who have to do with such problems. To place within the reach of such persons, a quick method of solving such problems for various rope strains, the accompanying curve has ben prepared. For practical purposes this curve will be found sufficiently accurate.

The quantities used in determining the curve are: L=weight in lb. of loaded car; 35=car friction in lb. per ton; 2000=lb. per ton; F=distance car travels; W= weight in lb. per ft. of rope. The pitch of haulage or hoist is ϕ deg. which may vary from 0 to 90 deg. The value of 35 lb. running car friction per ton is the average of experiments conducted on cars at a certain mine and is assumed to be fairly accurate for other mine cars. With the load on the pitch

$$L \sin. \phi = \text{load on rope due to } L,$$

$$\frac{\cos. \phi\, L}{2000} \times 35 =$$

load on rope due to running friction of load L.

$$L \sin. \phi + \frac{\cos. \phi\, L}{2000} \times 35 =$$

combined load on rope due to the above when load is at top of pitch.

Reference to a table of cast steel ropes, which are the kind commonly employed in the anthracite field, shows that the weight per foot of rope is equal to about one quarter the working load in tons, i.e., a rope designed for a working load of 10 tons would weigh about 2½ lb. per ft. Therefore, to obtain the average weight per foot of rope, reduce the above load to tons, and divide the result by four, or

$$\frac{L \sin. \phi + \frac{\cos. \phi\, L}{2000} \times 35}{2000} \div 4 = W =$$

weight per ft. of rope in lb

And if F = distance car travels on pitch of ϕ deg., then

$$\frac{\sin. \phi\, F\, (L \sin. \phi + \frac{\cos. \phi\, L}{2000} \times 35}{2000 \times 4} =$$

additional load due to rope.

Hence, when the car is at the bottom, the total load on the rope, neglecting rope friction, is:

$$(L \sin. \phi + \frac{\cos. \phi\, L}{2000} \times 35) + \sin. \phi\, F \left(\frac{L \sin. \phi}{8000} + \frac{\cos. \phi\, L}{57.2 \times 8000}\right) = \left(L + \frac{\sin. \phi\, L F}{8000}\right)\left(\sin. \phi + \frac{\cos. \phi}{57.2}\right)$$

When ϕ = 0 deg., or for a level road, the rope friction may be taken as 10 per cent. of the nominal pull on the rope, and, of course, as the pitch increases, this friction will vary as the cosine of the pitch. Hence

$$\frac{\cos. \phi}{10}\left(L \frac{\sin. \phi\, L F}{8000}\right)\left(\sin. \phi + \frac{\cos. \phi}{57.2}\right) =$$

rope friction,

and the

$$\text{total rope strain} = \left(L + \frac{\sin. \phi\, L F}{8000}\right)\left(\sin. \phi + \frac{\cos. \phi}{57.2}\right) + \frac{\cos. \phi}{10}\left(L + \frac{\sin. \phi\, L F}{8000}\right)\left(\sin. \phi + \frac{\cos. \phi}{57.2}\right) = \left[\left(L + \frac{\sin. \phi\, L F}{8000}\right)\right]\left(1 + \frac{\cos. \phi}{10}\right)\left(\sin. \phi + \frac{\cos. \phi}{57.2}\right).$$

Solving the expression

$$\left(1 + \frac{\cos. \phi}{10}\right)\left(\sin. \phi + \frac{\cos. \phi}{57.2}\right),$$

by substituting the value of the natural sines and cosines for each 10 deg. from 0 to 90 deg., the values shown in the accompanying table are obtained:

TABLE I. VALUES FOR EXPRESSION

$$\left(1 + \frac{\cos. \phi}{10}\right)\left(\sin. \phi + \frac{\cos. \phi}{57.2}\right).$$

Degrees	Result	Degrees	Result
0 . . .	= 0.01042	50	= 0.82720
10	= 0.20959	60	= 0.91853
20	= 0.29408	70	= 0.97804
30	= 0.37971	80	= 1.00195
40	= 0.50646	90	= 1.000000

Plotting the various values of the expression as above obtained, as abscissas, and the angles as ordinates, and connecting the points of intersection thus obtained, the curve reproduced herewith is obtained.

Practical Use of Table and Curve

To use the curve the procedure is as follows: Suppose the pitch of the slope is 30 deg., and the load L, is one loaded car = 8000 lb.; the distance the car moves is 500 ft.; speed on slope, 400 ft. per min. Here, L = 8000 lb., ϕ = 30 deg., $\sin.$ 30 deg. = 0.5, and F = 500 *ft.* Substituting the proper quantities in the formula

$$\left(L + \frac{\sin. \phi\, L F}{8000}\right),$$

the value 8250 lb. results. Then on the vertical line at left of curve find 30 deg., and follow a horizontal line across the figure till it cuts the curve, and at this point, drop a vertical line until it intersects the base line, which point will be 0.55971; then multiply the value 8250 by 0.55971, and the result, 4600 lb. is the required rope strain.

In case it is desired to use an air or steam engine to handle the load, the size of the same may be readily determined by reference to Table II., which gives the various sizes of engines and drums commonly used about the mines. Since the rope strain is 4600 lb., and the rope speed is 400 ft per min., by referring to the table, and looking under columns headed "Average Rope Strain" and "Average Rope Speed," it will be found that a 10x12 in. engine, with a 53 in. diameter by 42-in. face drum is listed to do the work.

The proper size of rope to use for any rope strain, may be easily determined by the aid of the table on "Rope Data."

TABLE II. SIZES OF VARIOUS SINGLE-DRUM HOISTING ENGINES ARRANGED ACCORDING TO ROPE STRAIN AND ROPE SPEED.

Usual Approximate Horsepower.	Diameter of Cylinder.	Stroke of Cylinder.	Diameter of Drum.	Face of Drum.	Feet per Coil.	Average Rope Speed.	Average Rope Strain, Lb.
3	5	6	8	10	56	65	600
6	5	6	10	12	69	65	1,000
4	5	8	10	15	82	130	1,000
6	6¼	8	10	15	67	130	1,500
12	6¼	8	23	22	200	250	1,500
8	5	8	14	14	85	135	1,650
10	7	10	12	16	71	140	2,000
20	7	10	29	23	225	275	2,000
12	6¼	8	14	15	77	150	2,500
15	8¼	10	14	18	80	150	3,000
30	8¼	10	41	39	440	350	3,000
30	8¼	10	27	30	249	500	3,000
30	8¼	10	34	30	314	500	3,000
20	7	10	14	19	85	157	3,500
35	8¼	12	34	30	314	450	3,500
35	8¼	12	42	38	464	450	3,500
40	8¼	12	47	42	500	375	4,000
50	10	12	53	42	550	400	4,500
50	10	12	37	38	425	600	4,500
50	10	12	42	38	374	600	4,500
50	10	12	48	42	474	600	4,500
50	10	12	54	42	494	600	4,500
20	8½	12	16	26	116	110	5,000
65	11	14	48	42	474	575	5,000
65	11	14	54	42	594	575	5,000
25	10	12	16	26	116	146	6,000
30	8¼	10	16	26	116	175	6,000
75	12¼	15	59	54	775	450	6,500
75	12¼	15	48	42	474	550	6,500
75	12¼	15	54	42	540	550	6,500
75	12¼	15	60	48	574	550	6,500
100	14	18	65	63	975	450	7,500
100	14	18	54	42	540	500	7,500
100	14	18	60	48	547	500	7,500
110	14	20	60	60	688	450	8,500
110	14	20	66	60	754	460	8,500
40	8¼	12	16	24	110	150	10,000
150	16	18	65	63	900	450	10,000
50	10	12	16	24	95	150	12,000
200	18	24	72	70	1,160	550	13,000

*Division Engineer, Lehigh Valley Coal Company, Wilkes-Barre, Pa.

given in the upper left hand corner of the chart. Suppose it is desired to find the proper size of cast steel rope to handle the above-determined rope strain of 4600 lb. Perform the operations suggested by the table; thus:

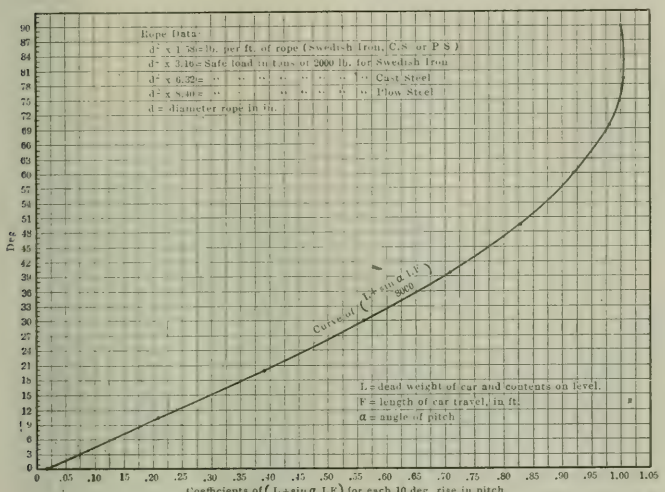
$$\frac{4600}{2000} = 2.35 \textit{ tons;}$$

and

$$\sqrt{\frac{2.35}{6.32}} = 0.61$$

which is the diameter in inches of the rope, or taking the nearest standard size, rope of ⅝ in. diameter would be used.

The attention of the reader is drawn to the peculiar shape of the curve between 75 deg. and 90 deg., due to rope friction, and showing that more power is required to handle a given load at 83 than at 90 deg. slope.



CURVE FOR USE IN CALCULATING ROPE STRESSES

Colliery Notes

Boiler tubes have been successfully used for air-crossings in underground mine ventilation.

Motor rooms in mines should be constructed of uninflammable material; they should be large and roomy, and should be separately ventilated by intake air.

Switches and controllers, although oil-immersed, should be designed so that dust cannot accumulate on the surface of the oil; they should also indicate, on inspection, whether the current be "on" or "off."

As compared with its population, the production of coal in the United Kingdom still surpasses that in the United States, amounting to 6 tons per head, as against 5 tons per head in the United States, 3¼ tons in Belgium, about 2¼ tons in Germany and less than one ton in France.

In order to minimize the dangers of electricity underground, the make and break in the case of the three-phase circuits should be under oil. It is also advisable to provide a ready means for making the whole or part of the apparatus dead, so that inspection and cleaning may be done in safety.

The modern tendency in the use of electricity underground is to construct "explosion-proof" rather than gastight joints. One authority says that the joints should be metal-to-metal, and the flanges not less than 1¼ in. wide. Boxes constructed on this principle have no rubber ring to get misplaced or broken.

By splitting the air current in a mine, and by maintaining airways of large sectional area, the volume of air circulating through the workings may be greatly increased, without increasing the ventilating power. However, splitting has its disadvantages, and loses its efficiency when carried beyond a definite limit.

Some engineers believe that falls of roof in mines are more frequent when the barometer shows a reduction in atmospheric pressure. One authority who doubts this relationship, says, if the assertion were true, roof falls in return airways would be more numerous than in intakes, because of the decreased pressure in the former.

In connection with the use of a three phase system underground, it may be mentioned that this electrical system permits the use of oil-immersed switches, controllers and even resistances; in other systems the circuit would have to be broken in air. This advantage of three-phase alone, is sufficient to justify the preference shown it.

If grid resistance boxes are installed in a motor room, a railing should be erected to keep unauthorized persons away. One authority recommends the use of wire with "slow-burning" insulation, asbestos covered, for resistance and controller connections. The same engineer suggests that resistances should never be placed within 1 ft. of combustible material.

A good type of modern safety lamp will burn when carried against a current of air traveling about 1000 ft. per min. When the air travels at a higher velocity than the figure named, the ventilation of the lamp is deranged; the force of the air prevents the easy escape of the products of combustion given off from the flame, and, as a consequence, the flame is extinguished.

Although it takes three parts in 100 of carbon monoxide to give the first indications of its presence on a safety lamp, one part in 500 is dangerous to life. It is, therefore, evident that 15 times as much carbon monoxide is required to show on a safety lamp, as is necessary to kill a man. For this reason the only simple and safe test for this gas is a mouse or bird, which is affected 20 times sooner than a man. If a mouse is used, it should be occasionally changed, as it is possible that the mouse will become seasoned to carbon monoxide.

It is not enough to know that a certain coal seam is clean and uniformly thick, nor that the fuel from this same seam shows an excellent analysis; such physical advantages may be present, and if the market is not at hand, and the fuel does not stand up well under transportation, the operations may prove a commercial failure. No matter how excellent a fuel may be at the mines, it must stand transportation well, and thus permit delivery without undue breakage. The quality of the coal from one of our Eastern fields cannot be surpassed anywhere in the world; however, this same product cannot be delivered at distant points in good shape.

At many collieries, the original installation of underground cables for carrying electric current is commenced with great care; it often occurs, however, that when the original system has to be extended the new work is frequently put in hastily and is erected only as a temporary arrangement. These temporary cables, which are sometimes unarmored, frequently become absorbed in the general system in this way lowering the general standard and adversely effecting the insulation resistance of the whole. Mine superintendents should always realize the importance of extending the underground cable work in a way so as to fully maintain the standard of the original installation.

The Vermont Copper Company

By Albert H. Fay

The property of the Vermont Copper Company is in Orange county, Vermont, 2 miles east of South Strafford, and 12 miles northwest from Pompanoosuc, a station on the Boston & Maine railway. A good wagon road connects the two places and only recently two preliminary surveys were made for the construction of a railroad to the mine.

History

The copper mines of this county are of historical interest inasmuch as they were the largest producers of copper prior to the opening of the Lake Superior mines. The first work done here was in 1793, when sulphide ores, pyrrhotite and some chalcopyrite were mined, roasted, and leached for copperas. Between 1820 and 1830 [illegible] were employed at the latter in the production of copperas, the finished product being hauled to Boston by wagon. At this time it became [illegible] and [illegible] years following [illegible] were worked for copper, the ore being roasted and then smelted. Since the [illegible] of the [illegible] [illegible] and [illegible] for paint.

Ore

The ore occurs in lenses in what appears to be a fissure vein. It consists largely of pyrrhotite in which is a small amount of chalcopyrite, finely disseminated through the orebody so that in previous concentration methods a large percentage was lost. The wallrock, both hanging and foot, is a micaceous schist. The strike of the vein is approximately north 20 deg. east with a dip varying from 70 to 50 deg. as depth is gained. An average analysis of the ore is as follows: Fe 40; Al_2O_3 6; Cu 2 to 3; CaO and MgO 2; and SiO_2 15 to 20 per cent.; 1/3 of the silica is free and 2/3 is combined. The problem of handling ore of this character is more of a metallurgical one than mining.

SMELTERY, VERMONT COPPER COMPANY

Development

The orebody is 10 to 25 ft. thick and the management estimates that about [illegible] tons of ore are now developed. During the last few months two diamond drills have been used in prospecting, the orebody has been encountered 200 ft. below the present working level at a number of places both north and south of the old workings as well as directly under [illegible]. The old work consists of a large [illegible] on the side of the hill as shown in the photograph, and an adit 1,100 ft. long which extends from the power house and taps the zone at a depth of about [illegible] ft. Work has been done along the [illegible] approximately 1800 ft. and above the drift level a large amount of ore has been removed. From the junction of the adit and the drift an inclined shaft is being worked which is in ore at a depth of 200 ft. below the adit.

Mine Equipment

The mine is furnished with power from a hydroelectric plant which was recently installed 10½ miles from the mine. The normal capacity of the plant is 800 h.p. which is transmitted at 6600 volts and is transformed to 550 volts before entering the power house motors. A 14-drill Sullivan compressor is operated by a 150 h.p. three-phase induction motor. The machine shop is equipped with pipe and thread cutters, emery wheels, lathes, drill presses and other machinery and is capable of handling any ordinary work connected with the mine. All of the ore is transported from the mine to the smelter by electric motors operated on 220 volts, direct current.

Smelter

A furnace 10 ft. by 44 in. was built last year. The building covering the furnace was constructed entirely of wood, and as a result the building caught fire soon after the furnace was started and was destroyed last February. The damage was not only confined to the building, but the 250 h.p. gasoline engine and blower were badly damaged. The blower has been repaired and will be

operated by two 100-h.p. induction motors connected in parallel. The motors and blowers are now inclosed in a fireproof steel building. The furnace itself will be inclosed in a steel building also. During this reconstruction the furnace has been altered so that it is now one-half its original size, that is, 8 ft. by 44 in. with 8 tuyeres on one side and six on the other. It is the intention to use the smaller furnace experimentally on pyritic smelting. In case this method of smelting is successful the furnace will be enlarged to its original capacity. No concentration of the ore will be attempted prior to smelting.

A flow sheet of the ore from the mine to the smeltery is as follows: By electric motor to a crusher; then by belt conveyer to a Vezin sampler; then to storage bin; then to car and tram about 1500 ft. to storage bin at the furnace; from these bins it is loaded into an automatic weighing car and charged direct to the furnace. In the early days a large amount of heap roasting was done and now there are many thousands of tons of ore in the old heaps which will be used eventually, although it has lost some of the copper content by leaching during the last few years. The mine is under the management of Charles Of, to whom I am indebted for much of the above information.

OPEN CUTS, POWER HOUSE AND SAMPLING WORKS, VERMONT COPPER COMPANY

The Los Angeles Oil Industry

By Percy E. Barbour*

When Los Angeles began producing crude petroleum in 1894, the total annual production of California amounted to only 600,000 bbl. In 1895 Los Angeles produced 729,695 bbl., which amounted to 60 per cent. of the total production of the State. Owing to the rapid development of other new fields in California which made it in 1907 the first oil-producing State in the Union (in 1908 it was forced to second place by Oklahoma), the Los Angeles district, although still showing steady and important increases in production, furnished only 8.7 per cent. of the State's total in 1907 and 11.4 per cent. in 1908.

BLAST FURNACE, VERMONT COPPER COMPANY

The Los Angeles oil industry is unique in several ways. The oil belt extends through one of the best portions of the residential part of the city. Here costly residences are confronted or surrounded by pumping wells, and, in some instances, the unsightly derricks stand on either side of the stately palm trees that embellish most of the lawns. The city of Los Angeles consumes almost the entire oil production of the Los Angeles district. There are very few pipe lines and these are unimportant. The local refining industry has grown to considerable proportions and is wholly in the hands of independents. The price of Los Angeles oil is, for reasons to appear, almost invariably far above the average price for the State's production.

Deposits of Brea

The existence of oil-bearing formation in or around Los Angeles was known to the early settlers. There are several places where the oil sands outcrop, and in these places the oil oozing out has had its more volatile constituents evaporated, thus leaving a residuum, mixed with more or less earthy impurities, which is known as "brea." This brea was used by old-time Mexican residents for fuel and for waterproofing the roofs of their adobe houses, and not inconsiderable amounts have been shipped away in former years. More recently some interesting discoveries of perfectly preserved remains of prehistoric animals, including the mammoth and the sabre-toothed tiger, have been made in these brea deposits. About four miles west of the city is the largest deposit of brea in the county, which gave the name of Rancho la Brea to the vicinity where are now the important wells of the so-called Salt Lake field, named from the first company operating therein.

Extent and History of the Los Angeles Oilfields

The Los Angeles fields are in an oil belt extending from Santa Barbara on the northwest, to Puente on the southeast, a distance of more than two miles, all of which is more or less productive and which is of growing importance in the California oil industry. The "geological formation is of Middle Eocene age and

*Consulting mining engineer, Salt Lake City, Utah.

It turns out that the Producers' Transportation Company, formed by the independent oil producers of the San Joaquin valley, had the backing of the Union Oil Company of California in securing the proposed new pipe line to the coast. The independent union has about one-half of the commercial oil produced in California. When the new pipe line is finished, a greater production will be made. The State is now yielding 160,000 bbl. per day, of which 30,000 are consumed by the railroads, and 30,000 by the refiners. The other 100,000 bbl. are for the open market.

as the form of a flat anticline, though somewhat broken."

Doheny and Cannon, who dug two wells with pick and shovel, are given credit for having discovered commercial crude oil within the city limits, in a well only 150 ft. deep. This was in 1892. It was not until 1894, however, that the oil excitement began. A well put down near Second street park in a residential section yielded a good quantity of oil and the boom was on. Other wells were rapidly drilled in the neighborhood, the total number in five years amounting to about 1500. Wildcatting was rife and picturesque, but, as usual, was confined more to stock selling than to wildcat drilling. This period passed, the industry settled down to healthy increasing production, amounting in 1908 to 5,138,853 bbl. of 42 gal. each. Of this, the so-called Salt Lake field produced 4,535,607 barrels.

Four Fields in the District

The Los Angeles oil district is commonly divided into four fields: three are in the city proper, and the fourth, by far the most important, is on the Brea ranch, just west of the city limits. The Central or Old field, including the first commercial wells, extends from Victor street on the east to Miramar and Bonnie Brae streets on the west, thus reaching a point almost opposite Westlake park. The exploitation of this field covered the years 1892 to 1895. The eastern extremity of this field is marked by a local fault, and quicksand and water seemed to have put a limite to development in this direction, but subsequent prospecting opened up an entirely new field extending from the Old field eastward almost to the Southern Pacific tracks. This is known as the Eastern field, and by the end of 1897 both these fields were thickly dotted with wells, sometimes not more than 30 ft. apart. In 1899 prospecting to the west of the Old or Central fields opened up what is known as the Western field, which extends from the Central field west to the city limits. These three fields cover a territory nearly 3 miles in length, and varying in width from 500 ft. to ¼ mile. In 1901 development of the oilfields of the Brea ranch was begun by the Salt Lake company, which gave its name to the fields, and since that time the development of this field has been most rapid, and it is now the most prospective part of the Los Angeles oil district. The storage capacity in this field is large, and there are several miles of pipe here, the largest of which extends 4 miles to the Southern Pacific tracks in the city. The oil is conveyed through these lines under a pressure head of 60 pounds.

Appliances and Machinery Used

The standard "California Rig" is almost wholly used in the district. This rig is the standard ordinary reel known as a "calf wheel," which is necessary to handle the casing required by the formation of this district and California oilfields in general. The derrick is 82 ft. high by 20 ft. square on the ground, and the rig complete contains about 17,000 ft. of lumber, and about 4 tons of ironwork, exclusive of the engine and boiler. The engine generally used is a plain slide-valve, link reversible engine with two eccentrics, of 12 to 30 h.p., and the customary boiler is of the tubular type, 15 to 40 h.p. The larger sizes of engine and boiler are, of course, for the deeper wells. The cost of drilling in Los Angeles averages about 63c. per ft. for 1000-ft. wells, and the total cost of a well, including machinery, rig, and surface appurtenances, varies from $3500 to $8000.

LOS ANGELES OIL PRODUCTION.(a)

Year.	Barrels.	Average Price, Los Angeles Oil, Cents per Bbl.	Average Price, California, Cents per Bbl.
1895	729,695		
1896	900,000		
1897	1,072,000		
1898	1,168,000		
1899	1,032,036		
1900	1,500,000		
1901	2,500,000		
1902	3,074,000		
1903	2,468,000		
1904	2,102,892	58.9	27.9
1905	3,469,433	26.8	24.5
1906	3,449,119	45.9	28.9
1907	3,477,235	50.3	37.0
1908	5,138,853		

(a) Figures compiled from bulletins of California State Mining Bureau and bulletins and Mineral Resources of U. S. Geological Survey.

LIST OF REFINERIES IN THE LOS ANGELES OILFIELDS.

Name.	Number of Stills.	Capacity in Bbl.
Southern Refining Co	2	100
	16	250
Densmore Stabler Refining Co	6	150
British California Oil Co	2	100
Union Consolidated Refining Co	1	200
	3	225
	2	250
Asphaltum and Oil Refining Co	1	35
	1	50
	2	150
	1	200
Hercules Oil Refining Co	2	600
	2	300
	1	120
Amalgamated Oil Co	3	250
	2	200
Chas. Victor Hall	3	100
	1	100
Jordan Oil Co	3	100 (a)

(a) Total capacity.

In the Western field productive wells may not be over 300 ft. deep, but in the Eastern field some are over 1500 ft. deep.

Pumping Machinery

All the wells in this district have to be pumped, although in the Salt Lake field most of the wells have produced some gas and some of the wells have come in as gushers, one having been reported as producing 18,000 barrels per day for a few days. The wells within the city limits have no gas.

Very few of the wells are pumped singly by a walking beam. The wells are so close together that they are pumped in groups of from 6 to 12 from a single power plant, which is generally a gasolene engine. Power from the engine is transmitted by belt to a shaft outside the power house, which, in turn, drives a short vertical shaft by means of bevel gearing. The top of the vertical shaft carries a bell crank revolving in a horizontal plane. The crank pin carries a horizontal disk to the periphery of which are attached, by means of clevises, the wire cables which reach to the jacks at the wells. When a larger number of wells are to be pumped, a large eccentric is added. This eccentric is placed on the shaft below the crank, and the pumping cables attached to the eccentric strap. If the location of the wells is such that the cables connecting them to the disks cannot be placed so as to approximately balance the load, a cable is run to a counterbalance jack loaded with rocks. Pumping is done at the rate of 12 to 17 strokes per minute. The oil is pumped to small storage tanks at or near the wells, and a large proportion of the total production is delivered by tank carts to the refineries and to consumers in the city, where crude oil is the common fuel.

The oil from all parts of this district is a heavy oil with an asphaltum base, and has an average density of 13 deg. B. Various tests have given the average fuel value of Los Angeles oil as 3½ bbl. of oil equal to 1 ton of soft coal. The average yield per well per day is 10 to 15 bbl. This low productive average is due probably to overcrowding the wells.

Production and Price of Los Angeles Oil.

Owing to the fact that this oil is actually produced in its own market, or within four miles at the farthest, transportation thus being largely eliminated, the price obtained for Los Angeles oil is almost always in excess of the average price obtained for the total California production. When oil was first produced in Los Angeles, it sold for $1.25 per bbl. Later when the price fell to $1, it was termed "ruinously low." In May, 1909, a Los Angeles municipal contract for crude oil for street sprinkling purposes was let at 70c. per bbl., and for asphaltum for road building at $1 per barrel.

The Los Angeles refining industry has grown to considerable proportions and is entirely in the hands of small independent refiners. The Standard Oil Company has no refinery here. The products of these refineries include gasolene, benzine, gasolene engine distillate, illuminating, neutral, lubricating and fuel oils, lubricating stock and asphaltum.

There are more than one hundred oil companies doing business in or from the city of Los Angeles.

Bulletin 32, California State Mining Bureau.

Report of the California State Mining Bureau.

Peroxidation of Iron in Blast Furnaces

By Antenor Rizo-Patron*

Although I see that very little attention, if any at all, is given to the possible formation of iron peroxides during the raw smelting of certain pyritic ores in blast furnaces, I have come through practical experience to duly appreciate the deleterious effect that the actual existence of that chemical condition during the process will produce on the running of the furnace. I attach so much importance to this condition in the blast furnace that I believe some negative results in pyritic smelting may be attributed to no other cause, and that the same phenomenon, in other cases, originates a large amount of trouble that is not satisfactorily explainable in any other way.

Unsatisfactory Working of Furnace

The liquation of sulphides will no doubt leave a more or less infusible matter inside the furnace on account of lack of the necessary FeO if, in the calculation of the charge, insufficient allowance was made for the replacement of the iron subtracted by the too low-grade matte formed. This, however, will be apparent to any one experienced in the smelting of ores, and the remedy of adding to the charge the necessary amount of extra fluxes required to make a good slag should be immediately applied. The same could be said about the amount of carbonaceous fuel used to obtain the required temperature in the furnace.

In any case, the experiment could be considered a failure both on account of the production of a too low-grade matte and the excessive consumption of coke, unless these factors could be adjusted later during the actual operation of the furnace. It might be possible to do this by regulating the volume of blast and the weight of charges, or by such other method as good practice might suggest in any particular instance.

But the case to be considered now is the one in which the furnace entirely fails to work in spite of the fact that all these apparent causes of failure had been removed. I have myself met with exactly this case in practice and the same seems to have occurred at a Canada smelter, working with Sudbury ores, as described by Mr. Beardsley, and so fully discussed by other metallurgists.

Running on Raw Sulphide Ores

In a certain instance I attempted to run a blast furnace on raw sulphide ores while the roasting plant of the works was still unfinished. The ores were a mixture of gray copper, chalcopyrite and pyrites, and a very little zinc blende in a silicious gangue. Their chemical composition is given by the following analysis: silica, 27.6 per cent.; iron, 25.75; zinc, 1.07; lime, 0.67; lead, 0.63; copper, 6.13; sulphur, 31.49; antimony, 6.34; total, 99.68. Although the furnace was making a matte containing only 15 to 20 per cent. Cu, and every combination of fluxes to form fluid silicates was tried yet it was impossible to obtain a single pot of fluid slag. The analysis of the thick mass, obtained as slag and showing magnetic properties to a greater or lesser extent, showed the relative properties of its elements to be as required to form a fusible and liquid slag if they had been present as the regular slag-forming silicates of the protoxide of iron and the other bases of the charge. However, it is hardly possible that this could have been the case to a great extent, and the true composition of the slag could better be described as a greatly peroxidized magma containing in addition to these compounds enough ferric silicates and magnetic oxide of iron, associated with calcium sulphide, to form a mass only partially fusible at the temperature of the furnace. Although the amounts of coke in the charge were varied from almost nil to 20 per cent., and the volume of blast from 350 to 470 cu.ft. of air per min. per sq.ft. of hearth area in the furnace, yet, on the assumption of Fe being present as FeO, it was impossible to secure a slag within the following limits: silica, from 34.9 to 43.5 per cent.; iron oxides, 46.8 to 35.3; lime, 12.5 to 21.2. The experiment was repeated seven times under different conditions at each trial, and it was never possible to keep the furnace hot for a longer period than 24 hours.

The same ores, partially roasted in kilns and in a mechanical furnace of the Edwards type, were smelted without difficulty, making mattes containing about 35 per cent. Cu and regular fluid slags, notwithstanding the fact that the roasted ore contained a heavy proportion of the magnetic oxide of iron. If the roasting was carried far enough most of the iron in the ore was converted into that oxide.

Upon calculating the amounts of S and Fe contained in a 20 per cent. copper matte, it was seen that only 3.87 lb. of S and 5.72 lb. of Fe for every 100 lb. of ore had escaped oxidation; i.e. 86.7 per cent. of the S and 77.6 per cent. of the Fe had been oxidized in the stack. This is without taking into consideration the Fe_3O_4 which goes into the matte, lowering its value beyond the point due to the unburned sulphur and causing in the furnace the cooling and hardening of the matte-tap.

Under these conditions it could not be properly said that the furnace failed to oxidize, notwithstanding the low grade of the matte. It did exactly the opposite in a certain respect, for it oxidized too much of the iron in the charge. This excess of oxidation, however, did not seem to be caused by conditions in the furnace, at least by conditions under the immediate control of the metallurgist during the experiment, as no difference could be observed with varying proportions of coke and blast, with heavier or lighter charges, nor with different hights of the ore column (from 2 or 3 ft. to 12 ft. above the tuyeres). Everything must have depended upon the nature of the ore, and this assumption would be confirmed by its property, not common to all natural sulphides of iron, of being easily converted into Fe_3O_4, even at the low temperature of roasting.

It may be noted that the results obtained in this case were almost identical with those of the Canadian smelter, although no nickel or Al_2O_3 in appreciable quantity was present. The ore to be treated and the fluxes at hand were especially clean, thus making any difficulty in the technical treatment of the ore entirely unexpected.

Similar Results with Concentrates

Although I made these observations about the time the articles on "Negative Results in Pyritic Smelting" came to my hand and thought at that time that something similar could have occurred with the Sudbury ores, yet I did not consider the matter any further until recently, at another place, I observed very much the same phenomena while treating ores of a somewhat more complicated composition. I had been running a blast furnace for several years on high-grade copper ores which were treated at the highest profit by roasting in mechanical furnaces and making mattes of over 60 per cent. copper in one operation. Later, the principal supply of ore to the smelter became a very silicious silver ore containing but little copper. These ores were concentrated by water to free them of the excess of silica, and the raw concentrates were mixed with the wasted copper ores. The mixture was briquetted and smelted. The composition of the concentrates is shown in the accompanying table, corresponding to different grades of the original concentrating ore.

ANALYSES OF CONCENTRATES.

	Per Cent.	Per Cent.
Silica	30.52	21.80
$BaSO_4$	10.16	5.26
Iron	14.70	13.40
Zinc	8.00	12.40
Alumina	1.69	4.00
Lead	11.61	20.30
Arsenic and antimony	1.25	trace
Copper	3.72	0.50
Sulphur	18.20	22.95
	99.85	100.15

*Engineer, La Fundicion, Peru (Establecimiento Mineral de Huarauccaca).

Increasing Proportion of Concentrates

For commercial reasons it was desired to increase as far as possible the proportion of concentrates smelted, diminishing at the same time the amount of copper ore. Everything worked right until the ratio of raw concentrates to roasted copper ore became about 4 to 1. As soon as this ratio was exceeded, the furnace began to work poorly; the slags becoming thick and cold, the capacity of the furnace diminishing from 3½ to 2½ or less tons of charge smelted per square foot of hearth area, and freeze-ups occurring after exceedingly short runs sometimes most suddenly. Any change in the composition of the charge between the limits already known as forming good slags, did not give results in the direction of improving the condition of the furnace, even though the analyses of the slags showed almost the same proportions of the elements as when the furnace worked well with the same amounts of fuel and blast. The slags were more or less magnetic and refused to flow. The question of the formation of iron peroxides inside the furnace had no doubt newly arisen.

Slags

The accompanying analyses give the composition of some of these magnetic slags which caused the furnace to work poorly and finally to freeze. The iron is always considered as protoxide.

COMPOSITION OF MAGNETIC SLAGS.

	Per Cent.	Per Cent	Per Cent.
SiO_2 *a*	38 00	41 80	39 50
FeO and MnO	25 00	31 80	30 00
Al_2O_3	6 50	6 00	7 00
CaO	18 15	11 21	10 40
MgO	4 60	2 90	4 48
ZnO	7 20	3 60	6 30
PbO	1 20	1 10	0 50
Cu	0 30	0 40	0 30
Silica *b*	38 00	41 80	39 50
Iron oxides *b*	31 50	37 80	37 00
Lime *b*	18 15	11 21	10 40

a The weight of SiO_2 includes some $BaSO_4$. *b* Daily slag reports. The Al_2O_3 is included in the weight of iron oxide, no determination being made every day, for the other elements.

I quote these analyses to enable a comparison to be made with the following monthly averages of slags producing no trouble at all in the furnace:

Silica	38 07	39 17	39 14
Iron oxides	35 01	32 28	35 91
Lime	18 26	17 20	14 22
Copper	0 31	0 27	0 17

The mattes made with the above slags contained about 50 per cent Cu with a concentration of 12 to 1, corresponding to an oxidation of 80 per cent of the sulphur in the charge.

Crusts taken from inside the frozen furnace, analyses of which are shown in an accompanying table, were entirely magnetic. The iron is recorded as protoxide although it was not totally contained as such.

These slags do not differ from one another in their elementary composition to an extent that will explain their opposite behaviors in the furnace. Moreover, the thickest ores and those which look to be most infusible, will, if charged again into the furnace, flow perfectly fluid. From this it seems evident that the degree of oxidation in the one is quite different from that in the other. If the iron is contained as protoxide, the slags are fusible and fluid; if it is peroxidized to a greater or lesser extent they do not flow, as ferric silicates are almost as infusible as the silicates of alumina. If the peroxidized materials are again charged into the furnace, a rapid reduction takes place and the qualities of infusibility and thickness disappear.

ANALYSES OF CRUSTS TAKEN FROM INSIDE OF FURNACE.

	Per Cent.	Per Cent.
SiO_2	27 50	35.70
FeO	26.20	20 50
MnO	2.10	2 70
Al_2O_3	5.00	6.00
ZnO	8 00	5.00
CaO	16.90	25 00
MgO	2.20	3 10
PbO	0.60	trace
Cu...	3 40	0.20
S...	2.45	0 00
$BaSO_4$	1 60	1.60
	97 95	99 80

Characteristics of Slags and Crusts

All these slags and crusts, like the other ones with which I have had to deal, will, if pulverized and strongly calcined in the muffle furnace, take the appearance of earthy matter and become strongly magnetic, if they were not so originally. Is it a decomposition the silicates undergo in this operation? They also increase in weight more than could be attributed to the peroxidation of the iron contained, and afford at the same time a certain amount of sulphates, soluble in dilute acids. The calcination being carried on at a high enough temperature to decompose any sulphate of the heavy metals ($PbSO_4$ being disregarded as contained in too small proportion), the extra increase of weight cannot be ascribed to any cause other than the conversion into sulphates of the calcium (and magnesium) sulphides contained in the slag. A certain relation seems to exist between the proportions of Fe_3O_4 and CaS contained in the slags, as the originally magnetic ones increase the more in weight through calcination, and afford at the same time a greater amount of sulphates.

Formation of Magnetic Oxide

From all the observations stated in the preceding paragraphs, it can be deduced that the iron of certain pyritic ores is very easily converted into the magnetic oxide, Fe_3O_4, especially under the blast pressure of a cupola furnace in pyritic smelting. Such a conversion taking place low down in the stack, where a powerful oxidizing atmosphere prevails, there is no chance for the reduction of the Fe_3O_4 to the ferrous oxide which easily forms slag by combining with the silica of the charge. At the same time and under the conditions prevailing, Fe_2O_3 is undoubtedly formed, too, this peroxide being capable of forming only infusible ferric silicates. Calcium sulphide, another infusible substance, does its share to make matters worse by associating with the magnetic oxide of iron to form those crusts which adhere to the bottom and sides of the furnace and block it up more or less rapidly, very much as cadmias would do in the upper parts of the furnace when treating ores containing much zinc.

Effect of Ores on Furnace

If these reactions operate energetically, as seems to be the case with certain ores, the furnace will quickly fill with refractory materials incapable of subsequently reacting with one another. Consequently a block-up must necessarily take place in a short time, and the alterations in the charge or in other factors of operating which are made to regulate the run of the furnace under normal conditions, will be of no avail as the evil remains untouched.

When this kind of ore is fed into the furnace partially roasted, the peroxides already existing are subject to the reductive action of the upper parts of the furnace, and, furthermore, the reaction of the sulphates and oxides, formed in the roasting, on the remaining sulphides, has a chance to be accomplished early in the process. The subsistence of any peroxidized iron is very difficult under these new conditions. The same result will be attained if such ores are treated by mixing them with others, already roasted, whose oxides may react with the sulphides at the right moment to prevent their conversion into Fe_3O_4. This, to my mind, is a natural explanation of observed facts, as the preliminary roasting does away with all such trouble.

Conclusions

We should reach the conclusion, therefore, that certain pyritic ores, whose iron sulphides possess the property of being converted in a great degree into Fe_3O_4 through the action of oxidizing agents, cannot be raw smelted in blast furnaces, for the reason that to succeed in this operation it would be necessary to produce at the same time and in the same place (inside the furnace), two opposite actions: oxidizing, the one, to burn the sulphur and oxidize the iron; and reducing, the other, to convert into protoxides the peroxides formed.

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*Illustrated.

Coal Imports and the Duty on Coal

Some of our contemporaries appear to be very much exercised about the probable result of the reduction of 22c. per ton in the duty on bituminous coal made by the new tariff. One or two of them have gone so far as to predict heavy imports with a corresponding reduction in the trade of our own mines. It seems to us that this alarm is altogether needless, and that the lower duty is not likely to have any considerable effect upon the general coal trade. It is possible, of course, that in the East there may be a slight increase in the imports of Nova Scotia coal into New England territory, where it can be delivered by sea at a very low freight rate. The quantity of coal so imported, however, is not at all likely to be a serious menace to our own mines. The total present capacity of the Nova Scotia mines is very small in comparison with those of a single region in Pennsylvania—such as the Clearfield, for instance—which is now engaged in supplying Eastern territory. Moreover, the quality of most of the Nova Scotia coal is not such as to make it a formidable competitor of such coal as Cumberland, New River, Pocahontas or Clearfield. The probability is that the great majority of manufacturers will prefer one of these coals to Nova Scotia, even if offered at a lower price. Moreover, if the reduction in duty is to be considered as a limitation in price, its effect would be very much less in that direction than is the present competition between West Virginia and Pennsylvania coals. We do not expect to see any marked increase in coal imports on the Atlantic seaboard.

On the Pacific Coast, especially in California, the greater part of the demand for coal is already supplied from British Columbia and Australia. The reduction in duty is not sufficient to stimulate these imports to any great degree beyond the amount which they have already reached, and which is established by the existing demand and the absence of any strong competition from domestic coal. In recent years, in fact, the limiting agent in the consumption of foreign coal in California has not been the competition of domestic coal, but the use of fuel oil.

The only part of the country where the reduction in duty is liable to make any important difference is in the northwestern States of Montana and Idaho; where the lower duty will probably help the consumption of the excellent coal from the Crow's Nest Pass district, a very considerable quantity of which already finds it way to this side of the line. This trade is of growing importance, but, after all, it owes its increase rather to the comparatively short haul and lower freight rates than to any tariff considerations.

The duty still charged of 45c. per ton will give domestic coal a certain advantage; but quality and freight rates will still remain the principal consideration, as heretofore, both in the East and the West.

Silver Prices and Silver Shipments to the East

We have, heretofore, noted the prevailing low prices of silver, which have now continued for considerably over a year. In 1908 prices were not high, the maximum monthly average for that year being reached in February when it was 56c. in New York, and 25.855d. in London. From that point the fall was almost unchecked, although gradual, until the metal reached its lowest point in December with a monthly average of 48.766c. in New York, and 22.493d. in London. From this low point there was a slight reaction, bringing up the average price in January about 1¼d. in London over that of December. Since then the price has remained remarkably even and steady. The lowest monthly averages for the present year have been 50.468c in New York and 23.227d. in London in March, while the highest were 55.905c. and 24.343d. in May. The average for the six months ending with June was 54.834c in New York and 25.230d. in London in 1908; 51.760c. and 23.831d., respectively, this year.

For quite a number of years past, as is generally known, the controlling factor in the price of silver has been the demand from the Far East, where silver constitutes not only the currency, but the main medium for hoarding by the people. For a series of years the East has absorbed about two-thirds of the yearly silver production of the world, a sufficient quantity to make its takings the dominating influence in price. India and China are the great absorbers of silver, and of these two countries India itself produces none of the metal. China does produce some, although the quantity is very difficult to

ascertain. The Malay Peninsula, which formerly took a very considerable quantity in exchange for its tin, has practically passed out of the line of silver buyers in the last three years, owing to the changes in its currency under British rule. Japan, also, ceased to be a taker of silver five or six years ago when it adopted the gold standard. India and China, therefore, are the mainstays of the silver market.

Owing to short crops for two or three years Indian buying has been comparatively small in quantity. China took less from the general market for three or four years, owing partly to the disturbance in trade due to domestic difficulties, and later to the heavy special disbursements made during the Japanese war, which were made mainly in silver and which were provided from other sources. With the revival of trade, however, Chinese buying has considerably increased.

For the first half of the present year, including the shipments from London—which remains the chief market where the East does its buying—and those from San Francisco direct to China, which are comparatively small, and reducing the values to their approximate equivalent in metal, the exports of silver to the East were as follows, in ounces:

	1908	1909.	Changes.
India	40,400,000	31,743,000	D. 8,657,000
China	9,613,000	17,125,000	I. 7,512,000
Total	50,013,000	48,868,000	D. 1,145,000

It will be seen that the total decrease in the quantity of silver sold was comparatively small, only 2.3 per cent. Its direction, however, showed important changes. The decrease in shipments to India was 21 per cent., while this year China took 78 per cent. more than the comparatively small quantity which was purchased in the first half of 1908. These relative quantities furnish some explanation of the lower price on the comparatively small change in demand. Indian purchases are usually made at the going rate, and are influenced more by the ability of the buyer than by the price, so long as the latter does not rise to an extraordinary level. Chinese bankers, on the other hand, are very shrewd buyers and well understand how to manipulate the market in their own interests, as has been notably shown during the present year.

No great change appears probable in the near future, although the tendency in price is to advance rather than recede. In addition to the actual shipments it is generally believed that the Chinese banks control considerable reserve stocks in London, which might be utilized to make matters very interesting for speculators in the metal. This fact, or belief, has done very much to restrain London operators during recent weeks.

Black Sand Mining in California

Another attempt at saving gold from the black sand of the beaches is to be made in California. This time the effort is to be made on the beach sands of the Big Lagoon on the ocean shore in Humboldt county. The tract on which the sand occurs is owned by Robert D. Johnson, and has been leased by him to C. W. Fox, of San Francisco, and associates. The exact process to be used has not been described, but it is understood that the sands are to be concentrated before washing them for gold. Gold was discovered at this place as long ago as 1851, and ever since that time more or less work has been done trying to make the sands profitable. Numerous gold-saving machines have been tried there, and once a dredge was installed and operated on the lagoon, which is a lake of brackish water about 3½ miles long by 2 miles wide, separated from the ocean by a sandbar.

Unlike most of the beach sands of the California coast, there is very little iron sand in this vicinity. There is, however, a large amount of low grade auriferous sand, but the gold in it is very finely divided and difficult to save. It remains to be seen whether the present attempt will be more successful than its predecessors.

This black sand mining has always been attractive to men of little experience in mining affairs or mining machinery. All sorts of experimental machines have been tried on the beaches along the Pacific in California, but generally with indifferent success. Speaking generally, there is no profit in the business. At certain times of the year, after storms have caused the waves to effect a rough concentration of the sands, day wages may be made at the work, but at other times the beaches will not even pay "Chinese wages." Where the attempt has been made to work on a large scale, failure has been the usual result. Probably the Big Lagoon—at any rate the Humboldt county beaches—has been the scene of more experiments in this direction than any other place in California. The result may be summed up in the statement that usually there is not gold enough in the sand to pay a profit, or even pay expenses where machinery is used.

A Labor Condition in Montana

We have from time to time had occasion to remark respecting the extraordinary demands of the unionized artisans of Montana, whose greediness has led to frequent strikes and much exasperation. Consequently it was with no surprise that we noted recently in *The Evening Post* the following despatch:

"*Great Falls, Mont., July* 30—Because he was rich enough to buy an automobile and then used it to convey himself to and from his work, Otto Klessig, a journeyman plumber, got into trouble with his union and was arrested today for trying to whip the secretary of the local branch. After the purchase of the automobile Klessig was fined $25 for using it to ride to and from work in alleged violation of the union rules."

A plumber in Great Falls or Butte ought, undoubtedly, to be able to ride in an automobile, but to use it in going to and from his work is certainly a thing to be severely penalized. The plumber counts his time from leaving his shop to return thereto. Of course, no automobile can be geared down sufficiently slow to preserve any plausibility of the usual charges for "time." Then what should the plumber of good standing do when he makes his daily discovery that he has forgotten his Stilson wrench and must go back to the shop for it on customer's time? The union is quite right to forbid its members from using their automobiles in connection with business.

The United States Steel Corporation does not seem to be quite keeping pace with the independent producers, if we can judge by the production of pig iron from its furnaces. In 1907 it made 44.3 per cent. of the total pig iron, in 1908 its proportion dropped to 43.5, and in the first half of the current year to 42.4 per cent. If we take the production of pig for use by the steel-making companies, the drop is larger. From 71 per cent. in 1907, the corporation's total fell to 68.3 in 1908, and 66.3 in the first half of 1909. These reductions, it must be observed, took place notwithstanding the operation for some months this year of a part of the great plant at Gary.

The Murex Magnetic Concentration Process

SPECIAL CORRESPONDENCE

At the general meeting of the Murex Magnetic Company held recently in London the chairman gave information as to the steps that had been taken to protect the invention by patents and as to the tests and trials that had been carried out at the experimental station. As pointed out in my letter published in the JOURNAL, May 22, the process has been introduced to the public in a rather mysterious manner. The official circular, in which the advantages of the process were set forth, failed to describe it in scientific language. It is true that an explanation was given that the foundation of the invention consisted in adding magnetite to the ore to be concentrated, which magnetite was made to attach itself to the valuable mineral, leaving the gangue alone. But the only explanation given as to the method of attaching the magnetite to the mineral was that it was effected by treating the ore with a magnetic solution—an unfortunate expression, more suitable for a quack medicine vendor than for a professional chemist or metallurgist. It is now made clear by the chairman of the company that oil, or some substance of a like nature, and magnetite are the main ingredients of the magnetic solution, because weight is placed on the advantage for smelting purposes that is secured by the mixture of iron and oil with the concentrates.

The use of oil in the process opens the question whether it infringes other patents for ore-concentration, especially that of the Elmore company. The advisers of the Murex company on the patent position are, however, confident that the new process cannot be attacked. Whether the patents will be questioned by rival ore-concentrating companies remains to be seen; but, having regard to the amount of litigation that has already taken place on the subject of ore flotation, it will be surprising if the Murex company does not have to defend the validity of its process in the courts.

As regards the operation of the process on a commercial scale it was announced that a contract had been entered into with the Van Roy Company in British Columbia for the erection of a plant. By arrangement with the Van Roy, this plant will be available for demonstration purposes so that managers and engineers in British Columbia will have an opportunity of seeing the process in actual work.

Several tests have been made on Broken Hill ores, both on the raw ore and on the tailings from wet-concentration mills, with satisfactory results, and a contract has been entered into with the Broken Hill Block 14 Company to treat their ore.

The process is also to be put to work at the Cordova mine in Spain. Tests made in London, according to the chairman's statement, showed a recovery of 89.3 per cent. of the copper from an ore averaging 2.8 per cent. The concentrates averaged 9.8 per cent. and the tailings 0.35 per cent. copper. Particulars were given of many other tests in London, that is, the assays of the original ore, of the concentrates and of the tailings; but the weights of the various products are, for some unexplained reason, omitted. A weak point in the statement was the omission of all figures of the cost of working, which are required in order to make comparison with other processes of concentration.

Recent Events on the Mother Lode in Amador County

SPECIAL CORRESPONDENCE

It has often been said that the career of a mine is much like that of an individual. It has its vicissitudes, its periods of prosperity and of poverty; days of opulence and times of ignoble non-production; finally, like the individual, it passes away and may soon be forgotten, or not, according to the magnitude of its influence during its life-time. Few mines illustrate the vagaries of life more completely than has the South Eureka, which is situated about a mile from the town of Sutter Creek, California.

The mine was opened in 1889 for the South Eureka Mining Company by the late James F. Parks, who at that time was also superintendent of the noted Kennedy mine. To the north, but a few yards away, lay the Eureka with a great record of production; to the southward, the Argonaut, Kennedy and Oneida, all of which were important producers.

With a large territory between, which was but little developed and almost unknown, Mr. Parks and his friends considered the probability of finding a mine in the South Eureka ground an exceedingly good gamble—for gamble it assuredly was. The surface was largely covered by the wash of an ancient river channel. Boulders and cobbles of andesite, which had been washed down the ancient stream from the distant Sierra Nevada, covered all the original rock outcrops in this section.

In his uncertainty as to the best place at which to sink a shaft, Mr. Parks had a survey of the neighboring mines made, projecting the lines of outcrop of the Kennedy northward and that of the Eureka southward. These lines passed each other in the South Eureka about 300 ft. apart and nearly parallel. Midway between these lines, the inclined shaft was started and sunk rapidly. When bedrock was reached at the bottom of the gravel, the shaft entered black clay slate, which at that point showed little sign of mineralization. Neither quartz nor gouge was present, but it was believed that the fissure could not be far distant, so the shaft was continued downward in the slate and crosscuts run at intervals of a few hundred feet.

To the eastward, some distance from the shaft, a fissure was encountered and at the depth of 900 ft., a vein of good ore was found. A narrow strip along the footwall side of the vein was heavy with auriferous sulphides worth several hundred dollars per ton. A mill was built and for a time the South Eureka was a profitable mine, paying several consecutive monthly dividends. The little ore shoot was worked out and the workings were extended north and south in search of more ore. The shaft was sent down to the depth of half a mile or more and thousands of feet of prospecting work done in the search for ore. Occasionally an orebody was encountered, which would contribute something to the support of the mine, but assessments, not dividends, were the order of things through those long, tedious years of *borrasca*. For about 18 years, the South Eureka continued to operate, often on a greatly curtailed basis, it is true, for the management was obliged to conduct business with a view to available means.

This condition prevailed up to the latter part of 1908. Many old-time stockholders, tired of the continued drain, with slender promise of reward, had disposed of their stock, the price gradually sinking until it was but a few cents a share. At this time, it was decided to drive a crosscut into the west country for the purpose of exploring for a vein, which some contended lay out in that direction. The work was conducted leisurely, with no great hope of success, but at last about 200 ft. west of the shaft, quartz was found that prospected encouragingly and the crosscut was continued through it for 30 ft. Since then crosscuts have been run at four other levels, and other work is under way. The general result of this recent work is the development of a mass of typical Mother Lode rock from 4 to 30 ft. wide, averaging about 20 ft. which pulls $10 a ton or better. This shoot is opened for a length of 300 ft. and a height of 400 ft. or more.

In addition, to the southward of the large oreshoot, a small vein 2 to 4 ft. wide, which has been opened for a distance of 250 ft., carries ore assaying from $80 to over $100 a ton and in places it runs into the thousands. Some of the ore carries a large amount of visible gold. A fair idea of the general value of the ore now being mined in the South Eureka is suggested by the clean-up for June, which was nearly $45,000, the output of 40 stamps during 30 days, and no particular

effort made to run the better grade of ore. The ore averaged about $10 per ton. Extensive improvements are contemplated at the South Eureka and its success has given a stimulus to mining for miles along the Mother Lode.

Immediately south of the South Eureka is the Oneida, which a few years ago was operated by the London Exploration interests and finally closed. The company has sold some of its surface equipment, and, it is reported, intends to sell it all. Recently, a leaser has been mining and shipping high-grade ore from a vein discovered in cutting a railroad grade a few hundred feet south of the old shaft of the Oneida. This shaft is down about 2250 ft. and the mine has been extensively worked in years gone by. The new find is in a promising location, and the fissure is 3 ft. wide at present.

At the Keystone, in Amador City, the stamp mill is being overhauled. This mill contains 60 stamps, 20 of which are of modern type, the others being light and nearly worn out, the mill having been built in 1895. The battery frame and mortar blocks were found badly rotted and these are being repaired as rapidly as possible. This, however, is only a makeshift, as it is the intention as soon as possible to add 80 heavy stamps and make such other improvements as may be necessary to provide the Keystone with a first-class uptodate mill. There is an abundance of low-grade ore in the mine, but it will not pay with the present old, light and much worn metallurgical equipment. A large quantity of sulphides are shipped monthly to the Selby smeltery. The Keystone is one of the properties recently acquired by the California Consolidated Mines Company.

The Original Amador is building a mill just north of the Keystone. The general impression is that this company is opening a valuable mine. The main vertical shaft of the Kennedy, near Jackson, has now reached a depth of 3400 ft., the lowest level being 3150, and at that depth a large amount of good ore is being developed. The shaft is now 2100 ft. below the level of the sea. This great mine shows no sign of impoverishment in depth, a fact which stimulates the managers of other mining companies in Amador to greater effort, with confidence in the successful result of deep mining here. The South Kennedy company (formerly Amelia), adjoining the Kennedy mine on the south, is clearing out and retimbering an 800-ft. inclined shaft, with the intention of exploring the vein known to be in the east country on the old Muldoon property.

The iron mines on the river Tayeh in China now have an output of 1500 tons daily. The ore is of high grade, about 60 per cent. iron. It is carried by boats down the Tayeh and Yang-tse-kiang rivers to Hankow.

New Dredging Fields in California

Special Correspondence

The newest dredging field in California is that in the Pozo basin in San Luis Obispo county, where tests of the gravel have been made, which have proved satisfactory to those interested. The field begins within half a mile of Pozo, which is 18 miles from Santa Margarita, and runs east to the foothills and a few miles up Adams cañon, covering about 11 square miles in all. Work will commence in the bed of the headwaters of the Salinas river. J. W. Adams, of Pozo, is one of the promoters and W. H. Wright represents the interests of the San Francisco men who have invested. Some placer mining in a small way has been done in this section, but it has never been known as a mining field of any importance.

Dredging men are also taking options on land along the Yuba river, both above and below Hammonton, where several dredges have been at work for some time. The lands bonded are to be tested with drills before final purchase. The Natomas Consolidated Company has secured options on certain large tracts of tule land in the Tule basin of Sutter county, which are to be reclaimed and possibly some dredging will be done. The Bear river section in the same county is also being bonded by other parties. At Trinity Center, Trinity county, and that vicinity, Mr. Cranston and some others, formerly dredging at Folsom, in Sacramento county, are testing ground with a view to purchase. The tests are being made on the wooded flats of the Sykes hydraulic properties, the ranch ground of a hotel man named Ellery, and the low portion of the Larsen property. This latter ground was at one time drifted. The Payne ranch near by has also been prospected, but the ground in the direction of the Coffee creek section is too heavy for dredging purposes, according to those who have examined it in the river bottoms above the Payne ranch.

Iron in the Transvaal

Special Correspondence

In connection with the contemplated government assistance to establish an iron industry in the Transvaal, the government mining engineer has prepared a useful memorandum. After reviewing the accessible deposits, he concludes that were blast furnaces established, the bulk of the ore would be drawn from the magnetite beds of the Timeball range near Pretoria. Over considerable distances, the deposit averages between 30 and 45 per cent. iron, though some portions of the seams run up to 55 per cent., and higher. It may be remarked that the district in the Midlands which claims to produce pig iron at the cheapest rate in Great Britain uses iron ore containing about the same percentages as the beds of the Timeball range.

The great difficulty to be encountered is the apparent absence of good coking coal in the country. The market for iron produced locally is put at about £800,000, but the government mining engineer does not consider that a local industry could figure on capturing enough trade to absorb the whole of the output, and he remarks that it would have to look to the South African market for its profits and to rely upon an external market without profit for disposing of a portion of the pig iron which it would have to produce in order to keep down costs by working on a sufficiently large scale.

From the many systems which have been tried for fostering infant industries he selects the bounty system as having experience in its favor and as being less burdensome on consumers than rival methods. In Canada the bounties are so arranged as to become automatically extinguished within a given period, yet under their nurturing influence the output rose from 37,829 tons in 1895 to 541,957 in 1906. The memorandum suggests that the bounty might commence at 15s. per ton produced, and be diminished by 1s. 6d. per ton per year, so as to extinguish the bounty in 10 years.

It is further suggested that 5 per cent. be guaranteed on the capital involved for five years. Such an industry should, it is also suggested, be insured a monopoly at the start, as there is no room for a competitor in this limited market. It is also recommended that the export of scrap iron and steel, which form valuable raw materials for working up into steel in the electrical furnace, should be prevented by the imposition of a prohibitive export duty or railway rate.

An example of large profits from a small blast furnace is given in an interesting history of Jefferson furnace in the Hanging Rock region of Ohio, which is given in the Cleveland *Iron Trade Review*. Jefferson was a charcoal furnace with a capacity of 10 tons daily. It was built in 1854, and run by the original company till 1871. During that time it paid a total of $636,625 on $34,500 capital stock, or 1845 per cent. In two years, 1870 and 1872, the dividends were 200 per cent. The furnace was sold after 1891 to other parties, and was run for a few years. It is still standing, but it is now practically abandoned.

According to the *Queensland Government Min. Journ.*, May 15, 1909, the amount of gold retained on a plate in the form of amalgam scale is a variable factor, depending largely on the capacity of the millman and the discretion of the manager.

New Publications

TABLES OF STRESSES IN ROOF TRUSSES, INCLUDING TABLES OF COMPRESSION AND TENSION MEMBERS, AND EXTRACTS FROM THE BUILDING LAWS OF VARIOUS CITIES. By H. C. Hearne. Pp. 235. 7½x10¼ in.; cloth, $4. New York, 1909: Hill Publishing Company.

This book covers, very thoroughly and systematically, a field that has been somewhat neglected heretofore, and it will be a useful addition to the library of every active engineer, architect and builder. It is often necessary for engineers, architects and builders to know the amount of material, wood or steel, that certain trusses require, yet they cannot afford the time necessary to design them. With this book at hand they can refer to the tables of the stresses in the various members without going into the theory of the subject.

If the trusses are built of wood, knowing the stress, they can tell the size necessary for the members immediately, as they generally know the allowable stress per square inch for the kind of wood used. If the trusses are of steel, they can pick out the sizes of the various members from the information in the tables for tension and compression members in the latter part of the book.

The tables of stresses in the different trusses cover the entire field of trusses thoroughly, from the smallest to the largest loads per square foot, for spans and distances of center to center of trusses that are generally used.

Another large field for the book will be in the designing and detailing offices of manufacturers and fabricators of steel, where time is so valuable that the theory of design is not studied except in special cases. In ordinary work reference is made to tables, which one or more men are likely to have, some of which are questionable and very few complete. If they are complete the owners are careful that they are not published. Many men, who are capable and have had years of experience detailing steel work, cannot design a tension member or a compression member of the simplest kind, but a good set of tables in their hands makes them very efficient men.

Mill buildings, and sometimes office buildings, are purchased by competitive designs, which are made by the steel fabricators, and the designs must be made accurately, in the shortest possible time, and in the most economical way. Tables of values of tension and compression members are absolutely necessary. Tables of angles for various radii of gyration for the different lengths in this book are arranged very nicely for engineers in this branch of the science.

The same tables can be used in the design of plate and angle columns, and angle and lattice columns. If the trusses, columns, ties and struts of mill buildings are designed without the use of such tables it requires very competent men and it is very tedious and likely to cause error. With the present book at hand the design of the trusses can be made in the least time and with little actual knowledge of the subject.

The salient points of the various city building laws, as to steel design, are written with such a mass of information foreign to that subject that it is often impossible to find just the information wanted. Mr. Hearne's book contains the most important points of the building laws for the larger cities in handy form. C. J. McG.

THE MINERAL INDUSTRY: ITS STATISTICS, TECHNOLOGY AND TRADE DURING 1908. Founded by Richard P. Rothwell. Edited by Walter Renton Ingalls. Vol. XVII, supplementing Vols. I to XVI. Pp. 1073, illustrated. 9x8¼ in.; cloth, $10. New York; published by THE ENGINEERING AND MINING JOURNAL. McGraw-Hill Book Company, selling agents.

Contents: Aluminum Sulphate and Aluminum. Alundum. Ammonia and Ammonium Sulphate. Antimony. Arsenic. Asbestos. Asphaltum. Barytes. Bauxite. Bismuth. Borax. Bromine. Cadmium. Calcium. Calcium Carbide and Acetylene. Calcium Chloride. Calcium Cyanamid and Nitrate. Carborundum. Cement. Chromium and Chrome Ore. Coal and Coke. Copper, Copperas, Corundum and Emery. Cryolite. Feldspar. Fluorspar. Fullers' Earth. Garnet. Glass. Gold and Silver. Graphite. Gypsum. Iodine. Iron and Steel. Lead. Lithia. Magnesite. Magnesium. Manganese. Mica. Mineral Wool. Molybdenum. Monazite. Natural Gas. Nickel and Cobalt. Petroleum. Phosphate Rock. Phosphorus. Platinum. Potassium Salts. Precious Stones. Quicksilver. Salt. Silica. Silicon. Silundum. Sodium and Sodium Salts. Sulphur and Pyrite. Talc and Soapstone. Tantalum. Tin. Titanium. Tungsten. Vanadium. Zinc. Zirconium. A review of the literature on Ore Deposits in 1908. Notes on Practice in Mining. Index to the literature of the Action of Noxious Gases on Vegetation. Progress in Ore Dressing and Coal Washing during 1908. Sampling and Assaying. Mineral Statistics of the United States and Foreign countries.

This volume deserves the descriptive qualification on its title-page, "Supplementing Volumes I to XVI." But it deserves much higher praise, as a wonderful summary of the latest details of progress, not less than an epitome of its results and a picture of its present condition. I have reviewed, in times past, a good many volumes of this series, but I never felt more keenly the difficulty of criticism in the presence of my profound admiration.

One of the most striking features of the book is the evidence which it furnishes of a new era in the dealing of the States of the Union with their physical structure and mineral resources. At the present time, there are 33 State surveys, not to mention such bureaus as that of the State mineralogist of California, the chief of the Department of Mines, Pennsylvania, etc. Practically every State which possesses mines is engaged in measuring, studying and making known its treasures. And Mr. Ingalls has succeeded in getting from nearly all the chief State geologists or inspectors of mines contributions to this annual cyclopedia. It is an amazing symposium, exhibiting our national resources not only in minerals, but in men. A few years ago, it would have been scarcely possible to find either the material or the authors for such a presentation of such a theme.

Our multiplied technical schools also are represented by important chapters from leading American instructors. Professor Kemp presents his usual annual summary and review of the literature on ore deposits, in which, by the way, Americans seem to be still holding the advance. At least, the recent publications of the U. S. Geological Survey, the American Institute of Mining Engineers, "Economic Geology," etc., give much novel and suggestive material. Prof. Henry Lloyd Smith furnishes notes on mining practice, concerning especially the questions of dealing with coal dust in collieries, and the use of air-hammer drills in stoping. Prof. Robert H. Richards and Charles E. Locke furnish about 50 pages on the progress of ore dressing and coal washing in 1908; Prof. H. O. Hofman treats of recent improvements in lead smelting; Prof. L. S. Austin, of the Michigan College of Mines, gives a summary of the literature of 1908 on copper metallurgy; Professor Baskerville, of the College of the City of New York, writes on the metals titanium and zirconium; Professor Walker, of Columbia, describes recent progress in the electrolytic refining of copper bullion; Professor Peters, of Harvard, states, "Some Future Problems in the Metallurgy of Copper," and Prof. Henry M. Howe discusses the shape of the iron blast furnace. To these authors are added many distinguished practicing mining engineers and metallurgists, and the able staff of THE ENGINEERING AND MINING JOURNAL, headed by Mr. Ingalls himself, who contributes special articles on gold production and commodity prices; the cost of silver-lead smelting; and the mining, metallurgy and commercial relations of zinc.

The foregoing statement does not half exhaust the multifarious topics or the list of distinguished contributors represented in this volume. The extraordinary promptness of its appearance (the editorial work having been completed at the end of May, and the last proofreading in June) is an additional claim upon the admiration of the reader.

R. W. RAYMOND

Details of Practical Mining

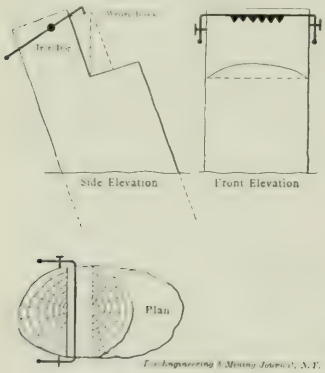
Notes of Interest to the Operators of Small Mines as Well as of Large Mines. The Things That Have to Be Done in Everyday Mining

REPORTS FROM EXPERIENCE

Readers of the JOURNAL are invited to contribute to this department. Articles should be brief, thoroughly practical, and preferably illustrated by drawings or sketches. Our draftsmen will prepare properly any kind of a pencil sketch that is intelligible. Something that is an old story in one district may be quite unknown in another. Articles accepted and published are suitably paid for.

Chopping Wedges

When chopping wedges with a broad-axe the device shown in the accompanying illustration will be found useful. Set a block deep enough in the ground to insure solidity and at an angle from the perpendicular equal to the desired taper of the wedge. The iron dog holds the wedge block and one blow of the broad-axe should complete the wedge.



DEVICE FOR CHOPPING WEDGES

Distribution of Charges over Long Holes

"I am glad to find the author advocating the distribution of charges over long holes," writes J. Monck Phillips in discussing L. M. Weston's paper on "The Theory of Blasting with High Explosives."

"It was some time prior to the war that this idea occurred to me in consequence of my long holes having a tendency to 'bull-ring.' I was working on machines at the time, stoping. I started off with inserting 3 in. of tamping in the center of the charge and, as I fancied this gave better results, I split the charge up into three portions as follows: (1) Two cartridges; (2) 3 in. tamping; (3) one cartridge; (4) 3 in. tamping; (5) two cartridges.

"I soon found that at times the bottom portion of the charge remained unexploded, so I reverted to my first experiment, gradually increasing the length of tamping to 4 in. At that time I was working on the idea prevalent among our miners today, that as gelatin is the strongest explosive, so also it must be the quickest. After some time came the thought that if loose ground requires the quickest explosive, why is dynamite used in preference to gelatin?

"I then began to make inquiries concerning the manufacture and uses of high explosives, and found that the characteristic feature of dynamite is its intense rapidity of explosion, and that in big blasts, dynamite is often inserted along or among the charge to insure its perfect detonation.

"Working along these lines, I found that a charge composed of four cartridges of gelatin and one of dynamite gave equal results to one composed of five cartridges of gelatin only. I then distributed my charge as follows: (1) Two gelatin; (2) 4 in. tamping; (3) one dynamite; (4) 3 in. to 4 in. tamping; (5) two gelatin.

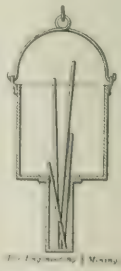
"This method distributed my charge over from 3 ft. 11 in. to 4 ft. of the length of the hole, thus leaving only 2 ft. on top of the charge. As I had a 3-ft. burden, I found that 18 in. of the hole was sometimes left, so eventually I distributed my charge as follows: (1) Two gelatin; (2) 4 in. tamping; (3) one dynamite; (4) 3 in. tamping; (5) one and one half gelatin; (6) half dynamite for primer. This method gave me the best results, both as regards costs and quantity of rock broken.

"These experiments extended over an interrupted period of more than two years, and as no dynamite was issued to machine men, and what was obtainable was only in the form of the ordinary 8 in. cartridge, I had to manufacture an 8x1 in. cartridge out of what I could beg, borrow or steal. I did not distribute the charges, but simply mixed the explosives by replacing a given quantity (weight) of gelatin by a like quantity of dynamite. The results I obtained were apparently equal to that of a full charge of gelatin, but with the advantage of being cheaper by the difference of the price between dynamite and gelatin.

"I have not been able to continue these experiments, but to those who have opportunities I can conscientiously recommend a trial of the method. I am of the firm conviction that the reason why we do not get higher results from the charges we use is because of imperfect detonation, and that the insertion of dynamite in the center of the charge, and as a primer—replacing a like quantity of gelatin—will give the best results. The insertion of a primer and detonator in each portion of the charge will not overcome the problem of exploding the entire charge simultaneously unless exploded by electric fuses or 'volley' fuses. I have experimented with the ordinary safety fuses and find that with three fuses cut of exactly the same length and fired simultaneously, no two of them will explode their detonator simultaneously, and this under ideal circumstances."

Bucket for Hoisting and Lowering Drill Steel

The accompanying illustration, which shows a form of bucket used in the Joplin district for hoisting and lowering drill steel, is self-explanatory. The bucket is of ordinary size, the only difference being the bottom extension as shown.



DRILL STEEL BUCKET WITH EXTENSION BOTTOM

A Method of Mining in Heavy Ground

By W. L. Fleming*

This method is used extensively in the soft slates and serpentines of California. It is also useful in running through caved stopes and slide rock on mountain sides.

Timbers are framed in the usual manner, but instead of being kept at a distance from the working face, each set is put in place as soon as room has been made for it. If blasting is necessary at all, the holes are drilled by hand and the light charge of powder required does little or no injury to the timber. Split lagging is mostly used though sawed plank is better if obtainable at a reasonable price. An assortment of widths from 3 in. to 8 in. is necessary. It is rare that face boards are needed to prevent running of the ground, but when occasion to use them arises, they are held in place by sprags from any available support, usually the nearest set.

Tunneling

The ground will usually sustain itself until the drive is several feet under roof. Then the first two sets are placed and lagged as closely as is necessary, the lagging resting directly upon the collar set and upon a bridge on the breast set. Sets are placed 4 ft. center to center, and lagging 4 ft. 6 in. to 5 ft. in length is used.

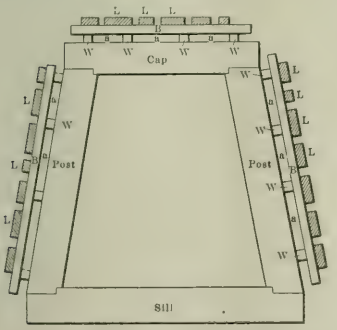


FIG. 1. DRIFT TIMBERING IN RUNNING GROUND

Sills are not used as frequently as they should be and the result is seen in the uneven appearance of many tunnels and the frequent repairs necessary.

Fig. 1 shows a set at a breast with the lagging *L*, resting on the bridge *B*, which is a piece of lagging or plank held from the timbers by the wedges *W*. In the spaces *a a*, the lagging for the next set is inserted and driven forward as the breast is advanced. Referring to Fig. 2, which is a vertical section lengthways through the center of the tunnel, the operation is as follows. Suppose set *A* is in place with the breast at *M N*. Lagging *L L*, is pushed under the bridges on posts and cap of set *A* and driven up to breast *M N*. The breast is worked forward by pick or drill and each piece of lagging is driven forward as the ground in front of it is taken out. When the breast has reached *X Y*, a false set *C*, of light, roughly framed timber, is set in place to guide and support the lagging as it is driven forward. When the breast reaches *O P*, the set *B* is placed and the bridges put on. Then *C* is removed allowing the driven lagging to rest on the bridges of *B*. The wedges sustaining the bridges on *A* are next withdrawn, allowing the lagging of the previous set to press the bridge evenly against the forward lagging which rests directly on *A*. New lagging is now driven under bridges on *B* to the breast *O P*, and the operation repeated.

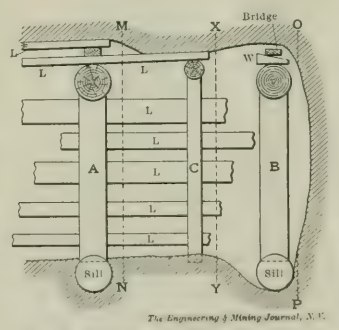


FIG. 2. SECTION ALONG DRIFT SHOWING METHOD OF PLACING SETS

Raising

To start a raise, as much lagging is removed from the top of the drift as the ground will permit without running. A hole is made through this opening with a bar as high as convenient, and a face board (any piece of plank or lagging) is pushed up to the bottom of the hole and secured by a sprag from any support. More lagging is then removed and the hole is widened and lengthened until it will accommodate the first set of raise timbers, additional face boards being placed as needed. The raise should correspond to the size of the tunnel and spacing of tunnel sets so the first raise set may rest directly on the tunnel timbers. The first raise set is put in place as soon as room has been made for it, and lagging is started upward around the outside. Then the face boards are worked up, false set placed, and the operation continued as in tunneling. The procedure in sinking is the same as in raising except that face boards are not needed.

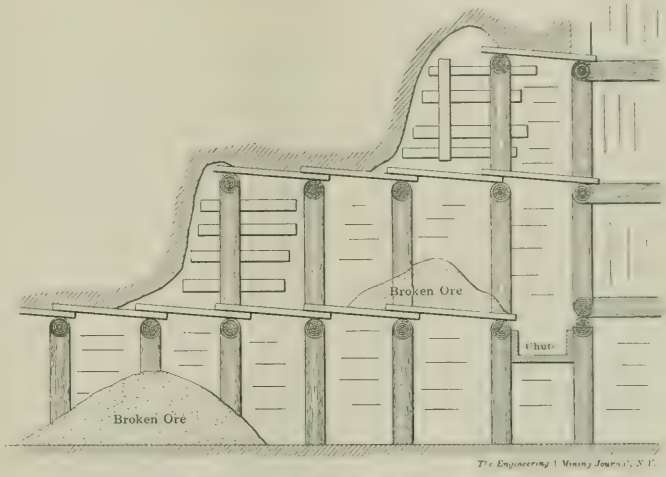


FIG. 3. TIMBERING IN OVERCAST STOPES

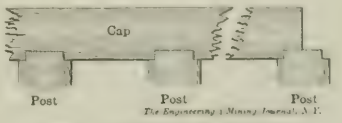


FIG. 4. METHOD OF JOINING CAPS AND BOLTS

Stoping

In drifting through a vertical or very steeply inclined orebody where stoping operations are probable, caps are framed in the tops of the caps of the drift sets to accommodate the posts of the stoping sets. Thus each cap becomes also the sill of the set above. Otherwise stoping

*Mining engineer, Room 717, 93 Nassau street, New York, N. Y.

sets are the same as drift sets with no batter to the posts. A raise is put up in the ore at any point selected and in this raise the sets are spaced as far apart as possible, usually from 5 to 6 ft. cap to cap, the aim being to allow ample working room for each stoping cut. Starting from the raise (see Fig. 3) the first cut over the drift is worked down into the drift through spaces made by driving the lagging forward horizontally behind the raise posts. By keeping the back of the stope in a V-shape, the miner is generally able to avoid having to drive lagging overhead and has merely to lay them in position after the set is placed. The false set then becomes an upright piece held in place by light sprags. When the first cut has been taken out to the limit of the ore shoot or has advanced sufficiently far to allow another cut to be started, chutes are built in the drift, and the stopes worked up by successive horizontal cuts. The ore can seldom be advantageously sorted from the waste but all goes to the mill together.

Veins dipping more than 45 deg. from the vertical are stoped by working upward at right angles to the drift instead of parallel to it, and each cut has a width (lengthways to the stope) of 16 to 20 ft. Lagging is required only on the hanging-wall and at the ends of the stope. Space is worked out beside the drift to allow the placing of a long cap timber parallel to the drift supported by the drift sets and posts. Over this cap the lagging is driven. The false set consists of a long cap or stringer supported on sprags and the stoping sets are the same except they are supported at regular intervals by posts fitting in notches in the caps and are secured by hitches cut in the footwall. The method of placing this cap is shown in Fig. 4. Veins up to 25 ft. in thickness are worked by this method, it being often possible to sort the ore and use the bulk of the waste mined for filling.

A Three-deck Man-cage

The hoisting of men consumes a large amount of time and hence reduces the amount of ore that may be hoisted daily. Witherbee, Sherman & Co. recently constructed a three-deck cage for hoisting men from the mine. The capacity is 30 men per trip. The framework consists of channel and angle iron, while the sides are inclosed with [illegible] wire screen, 2-in. mesh. The front of the cage is inclosed by means of sliding screen doors. The cage is to be operated in an inclined shaft and for this reason is mounted upon wheels. It is built so that the floor of the cage is horizontal while the sides conform to the slope of the shaft. When the cage is cut in so it will be removed from the shaft by means of a block and pulley which operates on an I beam track. The cage will thus be carried to one side of the shaft house and entirely out of the way. The time required for making the change from the ore skip to the man skip is small. The present skip will hoist only 10 men so that with this new cage the men will be hoisted in one-third of the usual time.

Timbering Wide Stopes

H. L. Hancock, general manager of the Wallaroo & Moonta Mining and Smelting Company, of Broken Hill, South Australia, recently visited the principal mining centers of the United States in search of information which his company might profitably utilize in the mining and smelting of copper ore. In his report Mr. Hancock stated that, in his opinion, he observed no methods of mining at any mine visited which could be substituted to advantage at the Wallaroo mines.

The "stye" and filling system used at the Wallaroo mines is illustrated in the accompanying sketches. This method is

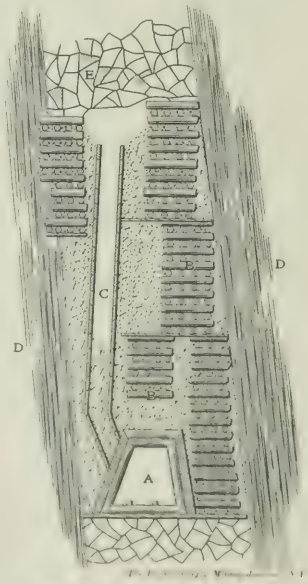


FIG. 1. END VIEW OF STOPE

A, main drive; *B*, pillars of firewood; *C*, "mill" or "pass;" *D D*, walls of lode; *E*, top of excavation in the quartz.

old, and is used in securing treacherous ground in wide stoping widths. Some of the old mines at Clunes and Edgerton, where some of the stopes were as wide as 100 ft., use firewood, as shown in Fig. 1, in building what are called "horses," when made of timber only, and "pigstyes" when an outer frame of timbers is filled with waste. The last kind of support is, of necessity, much used where mining timber is scarce.

Fig. 2 shows the system used in timber-

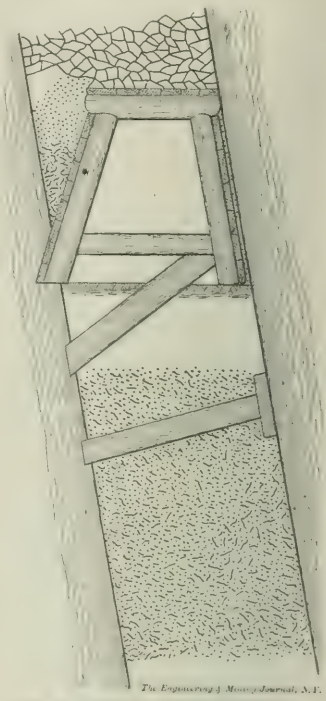


FIG. 2. TIMBERING NARROW STOPES IN TREACHEROUS GROUND

ing narrow stopes in treacherous ground, when approaching a level. The endeavor is made to dispense with "horses" or "styes" as much as possible where it is practicable to use filling.

Waste mined as such in the Cripple Creek district is seldom hoisted to the surface, but is dumped into worked-out stopes. All the ore is sorted by hand and the waste is washed before being thrown away. Many of the mines ship their waste out by railroad, but it is stored as far as possible in the hope that sometime it may be treated at a profit. The Portland elevates its waste by inclined conveyer to a bin from which it is drawn into electrically operated self-dumping cars which take it to the waste dump. Stratton's Independence loads the waste into ordinary tram cars which are then elevated by power to the top of the waste dump and trammed from there and dumped by hand. The Findley hauls a small car of waste up an incline by cable and electric hoist. The car dumps automatically at the top of the slope and forms a conical heap. The Last Dollar uses a vertical bucket elevator discharging into a chute from which the waste is trammed by hand.

Personal

Mining and metallurgical engineers are invited to keep THE ENGINEERING AND MINING JOURNAL informed of their movements and appointments.

S. A. Worcester has returned to Victor, Colorado.

C. D. Wilkinson, of Goldfield, Nev., is in New York on business.

James MacNaughton, general manager of the Calumet & Hecla, is in the East for a brief visit.

Quincy A. Shaw has returned to Boston after a brief visit to the mines of the Lake Superior district.

Alton T. Dickerman, of New York, has inspected a number of mining properties at Gowganda, Ontario.

Selwyn Goldstein has opened an office as mining engineer in the Edificio Olivarez, Culle de Tacuba, in the City of Mexico.

W. Spencer Hutchinson, consulting engineer for the Vulture Mines Company, is at the mine, near Wickenburg, Arizona.

Cyrus Robinson has returned to New York after two months spent in England, investigating new processes and mining machinery.

A. J. McMillan, managing director of Le Roi Mining Company, has returned to Rossland, B. C., after an absence of four months in England.

J. Cuthbert Welch has returned to Spokane, Wash., after an extended examination of mining claims in the San Poil district in Washington.

H. C. Cutler, of the firm of Cutler & Wilkinson, has returned to Goldfield, Nev., after examining mines in Grass Valley and Alleghany, California.

The Michigan board of geological survey has appointed Prof. Allen, of the State University at Ann Arbor, State geologist, in place of Albert C. Lane, resigned.

S. C. Hazelton has recently returned from Peru to resume charge as general superintendent of the United States Smelting Company's plant at Bingham Junction, Utah.

F. Colomer, of Paris, consulting engineer to the Canadian-American Coal and Coke Company, is at Frank, Alberta, inspecting the company's coal mine and plant.

T. W. Guthrie, president of the Republic Iron and Steel Company, has just returned to Pittsburg, from Birmingham, Ala., where he has been in the interests of his company.

Norman Carmichael, who for the past 2½ years has held the position of assistant general manager of the Arizona Copper Company, of Clifton, Arizona, has been appointed general manager.

A. H. Meuche, for some years past assistant State geologist of Michigan, has resigned and has accepted a position as representative of Longyear & Hodge, diamond-drill contractors, in the Michigan copper country.

Francis L. Bosqui, of San Francisco, has accepted an engagement on the consulting staff of Wernher, Beit & Co., of London and Johannesburg, and will sail from New York, Aug. 28, for London, on his way to South Africa.

Rush T. Sill, chief engineer for the Great Northern iron ore lands, has resigned, to take up consulting work in Mexico. A. C. Oberg, formerly assistant chief, has been promoted to chief engineer. Basil F. Fitch is now assistant chief engineer.

Frank W. Morris, of Anniston, Ala., general superintendent of coal mines for the Woodstock Iron and Steel Corporation, has resigned to take effect Sept. 1, to accept a similar position with the Republic Iron and Steel Company, Southern district, with headquarters at Sayreton, Ala., succeeding H. M. Geismer, who, as previously announced, goes with the Southern Iron and Steel Company.

David H. Ladd, assistant superintendent of the Michigan smelter, has resigned to accept a position as metallurgist for the Wallaroo & Moonta Mining and Smelting Company, of South Australia. Mr. Ladd will leave Houghton, Mich., Sept. 15, and will spend two months visiting various Western mines and smelters before starting for Australia. Mr. Ladd has been employed with the Michigan company since the starting of the plant and at the conclusion of his work at the Michigan College of Mines.

Obituary

J. C. Beebe, superintendent of the Island Creek Coal Company, in Logan county, W. Va., died at Geneva, N. Y., Aug. 7. He had taken a prominent part in the development of the Logan county coalfield, in which he spent a number of years.

George Frazier was killed in Eureka Mine No. 2, near Montgomery, W. Va., Aug. 7, the motor on which he was riding having jumped the track. He was 55 years old and had been active in the Kanawha coalfield for many years. He was manager of the Eureka mine.

Robert Womack, a Colorado prospector who was the first man to find gold at Cripple Creek, died at Colorado Springs, Aug. 10, aged 66 years. He failed to make any use of his discovery, and claims were taken up by others. He was born in Kentucky, but had been a prospector and miner in Colorado for 50 years.

Truman Schenk died in Salt Lake City, Utah, Aug. 1, aged 63 years. He was born in Ohio, and went to Utah in 1877 in the employ of the Union Pacific. Some years later he resigned and engaged in mining at Park City and Eureka. He was for several years connected with the MacIntosh sampler at Park City, and he also built one of the first ore-sampling plants at Butte, Montana.

Andrew Summer Braznell, of Pittsburg, died at Philadelphia, Aug. 10, aged 53 years. He was a son of Benjamin Braznell, one of the pioneer coal operators of the Pittsburg district. Andrew Braznell was active in the coal and coke industries all his business life. He was largely interested in the Stockdale Coal and Coke Company, Braznell Gas Coal Company, Dunkirk Coal Company, Allen Coal Company, Braznell Coal Company and East Connellsville Coke Company. He was also interested in many business institutions in and around Pittsburg, and had many mineral holdings in the West.

Dr. Joseph F. Whiteaves, prominent as a palæontologist and for many years assistant director of the Geological Survey of Canada, died at Ottawa, Aug. 8, aged 74 years. He was born and educated at Oxford, England, and came to Canada in 1862. Shortly afterward he conducted deep-sea dredgings for purposes of scientific research in the Gulf of St. Lawrence. In 1875 he joined the staff of the Geological Survey department. He received the presidency of the geology and geography section of the American Association for the Advancement of Science in 1899, and in 1907 was awarded the Lyell medal by the Geological Society of London. Dr. Whiteaves was a member of a number of scientific societies and an extensive contributor to scientific literature.

Andrew Colville, who died on July 15, at Nanaimo, Vancouver island, was born in Blairtown, near Peterborough, Ont. For several years he was a teacher in that province. Leaving Canada in 1886, he proceeded to North Dakota, where he engaged in farming and railroad construction. In 1889, at Lethbridge, Alberta, he commenced coal mining, working there as a miner for four years. In 1897 he was appointed superintendent for the Electric Peak Coal Company, at Hoar, Mont. During 1898-9 he was in charge of the outside operations of the Diamond Coal Company, Diamondville, Wyo., and in 1900 of those of the Carbon Coal Company, Carbonado, Mont. In 1901 he went to the Crow's Nest Pass coalfield, in British Columbia, where he was made superintendent of the Crow's Nest Pass Coal Company's Coal Creek colliery. He filled that position satisfactorily for four years, when he resigned and went to eastern Canada for six months. In July, 1908, he returned west, going to Nanaimo, but ill health kept him from taking up active work.

Societies and Technical Schools

American Mining Congress.—Official notice has been issued of the twelfth annual session, to be held at Goldfield, Nevada, Sept. 27 to Oct. 1 next. Details of the program will be given later.

Special Correspondence from Mining Centers

News of the Industry Reported by Special Representatives at Butte, Denver, Salt Lake City, Goldfield, Cobalt and London

REVIEWS OF IMPORTANT EVENTS

San Francisco

Aug. 11.—On the farm of Clarey, Payne & Keenan, a few miles above Trinity Center, Trinity county, on the Trinity river, a Keystone drill has lately been used in boring prospect holes to test the ground. The investigations have been so satisfactory that a Boston company has decided to take the property and work it on royalty. A small dredge had been used on the place for a year or two but the machine was not successful, as dredging to bedrock was not possible. A large dredge is now to be built.

The chairman of the recent dredge-mining convention at Sacramento, has appointed the following committee to investigate dredge-mining conditions in the Sacramento valley: William Beckman, Sacramento, Sacramento county; F. B. Edson, Knights Landing, Yolo county; Jesse Poundstone, Grimes, Colusa county; Dr. B. Caldwell, Biggs, Butte county; Louis Tarkey, Sutter City, Sutter county; and H. S. Dunning, Marysville, Yuba county. This committee is authorized by the convention to investigate dredge-mining methods and to "expostulate" if harmful methods are discovered and where this fails, to report to the Anti-Débris Association or to the California Débris Commission—neither of which bodies has any authority whatever in dredge affairs. The committee cannot report back to the body which created it, since that body adjourned *sine die*. It is not expected that the report of the committee will have much weight one way or another. None of the members are authorities on dredging affairs though some of them have given more or less attention to river conditions in an amateur way.

With the change in ownership of the Loon Lake Water and Power Company, El Dorado county—formerly the California Water and Power Company—C. M. Fitzgerald gives way to Herman D. Jerrett, of Georgetown, as general manager. The new company, controlled by W. P. Hammon, expects to make many changes in the water system of the Georgetown divide.

Mason W. Mather, for 14 years president and manager of the Crœsus Gold Mining Company, operating the Plumbago mine at Allegheny, Sierra county, has resigned the management and C. M. McMeekin has been placed in the position. Colonel Mather retains the vice-presidency of the company. The mine has been a producer for some years and is [illegible]. The plant is excellent and the mine is worked mainly through long adits, the lowest one being in 4000 ft. Colonel Mather is still manager of the Oriental mine in the same vicinity and will give most of his time to that mine.

Oil indications have been found in Shasta county, not far from Kennett, the smelting town. Seepages of oil have been found and some prospecting is to be started. At several places in the county oil indications have been found but no producing wells have thus far resulted. Most oil men consider that Shasta is too far north to be a good producing region.

It is expected that before long a consolidation will be brought about between the Standard Consolidated Mining Company and the Southern Mining Company at Bodie, Mono county. The former owns a number of claims and the latter has 14, including the Noonday, Red Cloud and Adanda, all opened to from 500 to 800 ft. A good many of the claims have not been worked for years, although those of the Standard company have been dividend payers for a very long period. This consolidation of interests and the resumption of work on a large scale is expected to cause a revival of interest in the old and famous camp of Bodie.

It was recently noted that an automobile service had displaced the stage line between Redding, Shasta county and Weaverville, Trinity county. Now an automobile service has been inaugurated between Sierra City, Sierra county, and Nevada City, Nevada county, passing through North San Juan, Camptonville, Mountain House, Forest City, Allegheny and Goodyear Bar. All of these are old-time mining centers and some of them are experiencing a revival.

Denver

Aug. 13.—At Breckenridge, in Summit county, the Reiling dredge of the French Gulch Dredging Company has been formerly worked more or less successfully by the Evans elevator system. During the past winter, a dredge was moved from Clear Creek, near Golden, where it had been a failure, and put in the old pit situated in what is known to be the richest portion of the Breckenridge ground. This ground is owned by William Lennox, of Colorado Springs, and Mark Evans and H. J. Reiling, of Denver, the latter of whom supplied the dredge. It has been working about four months under the direction of Mr. Reiling, and it is reported that the profits of operation covered the cost of installation and cleared $25,000 besides. About 2000 yards per diem were handled. This is the richest portion of the district and nuggets up to ¾ of an inch in diameter have been saved.

A story of a discovery and shipment of 100 sacks of ore to Denver, for which the owner received a check for $21,000, has just come in, and that the owner was offered $250,000 for a part of his one-third of the mine is also stated in the daily press. The claims are said to be in North park, on the Colorado-Wyoming boundary line, but as the statements as to location are very conflicting, the whole thing at this writing looks somewhat "fishy." At least, time and further details will be required to determine the value of the discovery.

In the Cripple Creek district the Mary McKinney Mining Company held its annual stockholders' meeting on Aug. 9, and the report for the year, ended June 30, shows receipts from ore sales and other revenue of nearly $407,000, profit about $68,000, as the mine is worked on the leasing system, and the leasers got about one-half of the entire receipts from ore sales. The cash balance on hand is $68,821—altogether a very healthy state of affairs. The total production of the company's mine to date is given as nearly $0,000,000. The Strong mine at Victor, which has paid about $3,000,000 in dividends, has, it is said, discovered new and rich orebodies, above the water level, and is shipping from 7 to 10 cars per week.

The United Gold Mines Company's property on Ironclad and Bull hills, now being worked under the leasing system, is making a greatly increased production, and last month shipped 1200 tons of good grade of ore. The School Section Leasing Company, operating near Cameron, shipped approximately 900 tons of ore in July. The Gaylord mill, on Ironclad hill, sent to the Denver mint a gold bar worth $5500, the result of the July cleanup from operations on the low-grade ore of the Jerry Johnson mine. In addition to this, it is stated that 32 cars of low-grade ore were shipped to a Colorado City mill.

"Bob" Womack, the discoverer of Cripple Creek, died in Colorado Springs a few days since, having lived in poverty for over 10 years, thus repeating the history of so many of the discoverers of great mining districts. It does seem as though there was something wrong in the laws of compensation when a man whose discovery has resulted in giving to the world

about $150,000,000 in gold, should die in poverty.

A portion of the Denver mint has been closed, it is alleged, owing to shortage of bullion, and 100 men in the coining department are thrown out of employment.

Butte

Aug. 12—George H. Casey has instituted action in the district court in Butte against Joseph A. Coram to recover $7000 for a 5/32 interest in the Thomas quartz claim sold to Coram. In the complaint it is alleged that Casey agreed with Coram to sell him the interest in the claim in consideration of 560 shares of stock in what afterwards became the Davis-Daly Estates Copper Company, and that Coram represented that the corporation would have $2,000,000 in its treasury, on which basis the stock was valued at $12.50 per share. It is alleged that Casey delivered the deed and received the stock but was deceived as to its value and that the consideration for the transfer therefore failed. Plaintiff asks for a vendor's lien upon the 5/32 interest in the claim and includes the Davis-Daly Estates Copper Company and the Davis-Daly Copper Company as defendants in the action, alleging that they claim some interest in the Thomas claim.

At the recent drilling contest in Butte, the first prize of $1000 was won by Pickens and Page, of Globe, Ariz., who drilled 43⅞ in. during the allotted 15 min. McNicholas and Ross, of Butte, were a very close second, having 43 27/32 in. to their credit. Carter and McLean, of Butte, won the third prize with 40 13/16 in. Other contestants were: Bradshaw and Frethey, Butte, 39 11/16 in.; Sodea and Sebla, Rossland, B. C., 38 13/16 in.; Rondo and Malerich, Butte, 35¼ in.; Duncan Brothers, Virginia City, 33⅜ in.; Roberts Brothers, Butte, 32⅛ inches.

At a meeting of creditors of the Kimberly Gold Mining Company, M. J. Walsh was selected as trustee in bankruptcy and his bond fixed in the sum of $100,000. Creditors representing claims aggregating in excess of $300,000 were present at the meeting.

The monthly report of the Butte Mining Exchange shows that 113,005 shares of stock were traded in during July. Alameda had the greatest number of sales with 37,000 shares, and North Franklin was second with 22,950. The estimated production of the Butte camp for the month of July was 26,580,820 lb. of copper, an increase of over a million pounds as compared with the output for June. The production for the first seven months of 1909 is approximately 183,000,000 lb., which is about 40 per cent. greater than last year's production for this period.

At the annual meeting of the La France Copper Company, held last week, the following were elected directors: W. A. Kidney, R. A. Carnochan, David Gilbert and E. M. Brennan of Butte, and J. T. Williams of New York. No definite date for the resumption of operations at the company's Lexington mine was decided upon. The affairs of the Garnet Gold Mining Company of Madison county were placed in the hands of a receiver by Judge Hunt, last week. This proceeding was taken on the application of the holders of the company's bonds, payment upon which is in default. Charles E. Morris was appointed receiver.

John Stepan has instituted action against the Butte Northern Copper Company, *et al.*, for the purpose of having the Minnesota and Stepan No. 2 quartz claims restored to him. It is alleged in the complaint that the deeds for the claims were to have been put in escrow, but that without the knowledge of plaintiff the deeds were recorded and no money was ever paid for the same.

Helena, Montana

Aug. 6—For the last seven weeks much interest has been manifested in the suit of the St. Louis Mining and Milling Company against the Montana Mining Company, Ltd., which operated the Drumlummon mine. This is the third time of trial of the suit in which the St. Louis company claims that, by virtue of its denouncement of the apex, or part of the apex of the Drumlummon lode, the Montana Company, Ltd., has mined and profited from ore which was rightfully the property of the St. Louis company. The value of the ore in former suits was estimated at about $500,000. In the present trial the St. Louis company is anxious to amend its complaint by fixing the limit of recovery for ore extracted at the 268-ft. plane instead of the south end line of the St. Louis claim. On Aug. 3, Judge Hunt gave the company permission to make the amendment and to change the complaint that it may conform with the views expressed in the decision of the Supreme Court of the United States, as interpreted by the attorneys of the St Louis company. By reason of the vast quantity of expert evidence, given by leading engineers, on the geology of the district and the formation of the famous ore deposit, the case has throughout held the interest of the mining community.

[Later—Despatches of Aug. 11 announce that the court has awarded damages of $203,192 to the St Louis Mining and Milling Company.]

The following are the shipments of bullion from the various counties to the Helena assay office during the month of July: Fergus, $58,556; Chouteau, $45,325; Madison, $28,725; Granite, $2118; Jefferson, $704; Lewis and Clark, $57,38; Missoula, $1054; Meagher, $225; Powell, $4470; Ravalli, $960; Silver Bow, $744. A small amount was also turned in by Broadwater county.

Although nothing unusual has been met in the development of the reopened mines of the Corbin district, the activity in promoting new companies and in working the older properties continues. The Boston & Corbin company has installed new equipment at the Bertha shaft, and is pushing work on the 700-ft. level. The old Alta mine, close to the Bertha, which has lain idle for 14 years, is to be reopened by a new company.

The old silver-lead mining camps show signs of settling down to work on a quiet, conservative basis. The Radersburg, Clancy and Ophir districts are attracting careful investors by their shipments of fair-grade ore. The August mine in the Little Rockies, which shipped recently eight carloads of ore of unusual value, has been optioned for $3,000,000. The price paid for the property some time ago was, it is said, about one-hundredth of this sum.

Salt Lake City

Aug. 13—Business in local mining circles has been exceedingly inactive during the Grand Army encampment which was held in this city last week. The attendance at the stock exchange has been light and the trading has been similarly affected. During the parade Wednesday all the mining offices closed their doors and little business was done throughout the entire week. The inactivity has been general throughout the State and no startling developments have been made in any locality. A number of mines closed during the week to allow employees to attend the encampment and excursions were run from all the mining camps to Salt Lake on the day of the parade. As a number of important matters are pending, next week is expected to be a notably active period in mining circles.

E. P. Mathewson, who is in general charge of the new plant of the International Smelting Company was in Salt Lake last week and states that the preliminary work for the power house and roaster building has been almost completed and the structures will be started at once. The steel work for the warehouse and office buildings is complete and the laying of brick has begun. The stack of the new plant will be 350 ft. high, 5[illegible] ft higher than the stack of the Washoe smeltery at Anaconda.

The Iron Blossom of the Tintic district passed its monthly dividend for August and much discussion has followed. The company has advanced several reasons and local mining men are anxiously awaiting further developments. The Colorado posted the usual 8c per share and the Sioux Consolidated its 7c. dividend, the former company checking out $80,000 and the latter disbursing $52,457. The orebody recently opened on the 2000-ft level of the Grand Central mine at Tintic has been tapped on the 2100-ft level. Gen-

eral Manager C. E. Loose gave out no other particulars concerning the strike other than that it was looking good. The information comes from unofficial sources that in addition to carrying a fair copper content, the ore went high in gold. The stock market gave unmistakable evidence that something unusual had happened at the Grand Central.

A large drain tunnel has been projected in the Park City district to pass through the Bonanza Flat section into the Mountain Lake region and a meeting of the stockholders of the Daly-Judge company has been called to ratify the proposition to convey certain claims to a new company, in which Jesse Knight and associates are interested and which proposes to construct this tunnel. Full drainage and working rights are to be reserved by the Daly-Judge company; its ground will be tapped at a depth of 2000 feet.

Cobalt

Aug. 13—The headframe over the main shaft of the Savage mine was destroyed by fire on Aug. 7. The fire also got down into the timbers of the shaft, destroying them for a considerable distance, and as all the ore was hoisted from this shaft, it will delay operations for a short time. Several months ago a new shaft was started to connect with the 75-ft. level of the main working. When the crosscut from the bottom is in another 30 ft. these workings will be connected and hoisting can be resumed.

The remainder of the mining lands of the Gillies Limit, amounting to 393 acres, which were not disposed of at the previous auctions, are again offered for sale. The Provincial mine is also offered for sale, although it has not much to recommend it except a diamond-drill core showing a new vein found recently. It is thought that the lots now offered will bring higher prices than were bid formerly on account of the good finds made on the Waldman and Young & O'Brien lots. It is understood that the Provincial mine is to be pumped out, so that those who are considering putting in a bid for the property may be able to make an examination.

The business of the smeltery at Thorold, for treating the high-grade ore from Cobalt, has increased so largely of late that the company has decided to increase the capacity. The smeltery is owned by the Coniagas Mines Company. George [illegible] who [illegible] the Chamberlain and Lake Rose mines in the Larder Lake district, has interested some English capitalists in the Harry Caswell, which is located in the same district. Considerable work has been done and the property is shaping up well.

The draft on the [illegible] of the Lake Shore and Algoma [illegible] has been [illegible] the Lumsden [illegible] and it has been [illegible] to [illegible] the [illegible] [illegible]

ues to be of good grade. This same vein is being worked on the O'Brien property, and has been one of the company's best producers, notwithstanding the fact that it has been in the Keewatin all the way.

Further exploration in the new Lawson find shows that toward the north and south ends the vein splits at each place into two stringers making a total of about 12 in. of high-grade ore. It is important to note that this vein was found in the Keewatin. One of the stringers from the Lawson vein has been uncovered to within 50 ft. of the Foster line and is heading straight for it. The development of the Lawson has given a great impetus to the work being carried on at the Foster and adjacent properties.

One of the best discoveries in the Elk Lake district was made a few days ago at the Silver Alliance property. It was encountered at a depth of 25 ft. in the shaft, at which point the vein widened from a mere stringer to between 6 and 8 in. of high-grade ore. The Silver Alliance is a Montreal company, and the property is situated in Tudhope township about four miles from Elk lake. There have been two other promising finds made in this district lately. One was on the Haentschel claim in the township of Farr, where an 8-in. vein of calcite, carrying native silver, was found. The other discovery was made on the York claim, situated about ¼ mile from the Otisse Currie. The vein is about 6 in. in width and carries smaltite, niccolite and native silver.

Toronto

Aug. 14—For the past two seasons experts engaged by the Ontario department of mines have been examining the geological conditions of the area known as the Gillies Timber Limit, south of the Cobalt camp, with the view of ascertaining how far the mineralized portion extends. The sales hitherto made and immediately in prospect, including the Provincial mine, only embrace 600 acres in all at the extreme apex, whereas the entire limit covers an area of 64,000 acres. As a result of the investigations so far made the officials have reason to believe that the mineral deposits are more extensive than has been supposed, and a thorough exploration of the whole territory will be undertaken. Operations will be begun almost immediately under the direction of Prof. Willet G. Miller, provincial geologist. The exploration will require some time, as the limit is largely under timber. One strong reason why the government altered its policy in regard to the Provincial mine and decided to sell it instead of operating it was that Prof. Miller and other officials might be free to undertake the exploration. It is understood that the government has not as yet decided as to its future course, should the long power to have such silver deposits but the opinion of the mining officials is generally in favor of selling the land by public competition, subject to royalty and working conditions, rather than of direct operation by the government or through a commission. It is probable that before any decision is arrived at the question will be submitted to the legislature.

Important gold discoveries are reported from Night Hawk lake near Matheson station on the Temiskaming & Northern Ontario railway. A. J. McGee, secretary of the commission, states that that body has been notified as to the discoveries, but can make no official statement as to their character or extent.

Johannesburg

July 19—The results of the development in the Brakpan Mines, Ltd., now published for the first time, are encouraging to those who are interested in the huge reef-bearing areas of the eastern extension of the Witwatersrand. This development has been done at a depth of from 3500 to 4000 ft. Of the ore blocked out, 78 per cent. is reckoned to be payable, and this amounts to 449,000 tons averaging 6.4 dwt. in gold. Assuming 12½ per cent sorting, this is equivalent to about 390,000 milling tons having a gold content of 7.3 dwt. or, with 93 per cent. extraction, a recovery value of about $7 per ton.

The indicated stoping width is 45 inches in the No. 1 shaft section, and 55½ inches in the No. 2 shaft section. It was originally intended to equip this property with a 100-stamp mill, but it is now proposed to erect a plant to treat 60,000 tons per month. There are only two companies on the Witwatersrand at present crushing that amount, namely, the East Rand Proprietary and the Simmer & Jack mines.

If one assumes the working cost to be $4.25 per ton and the working profit $2.80 —which is the average of the whole Witwatersrand for the past six months—after allowing for the profit tax, etc., the present development indicates a net working profit of $2.43 per ton. On the milling capacity contemplated this would be approximately $1,750,000 per year.

The famous Robinson Deep has lately shown a serious falling off in grade, though still remaining one of the premier mines of the Witwatersrand. Their profit for June was £30,000 compared with an average of £40,500 last year. According to the consulting engineer's report the value of the ore reserves is 7.25 dwt.—a drop of 1 dwt. The average recovery for the last 18 months has been about $8 and a fall of 1 dwt. would imply a yield of approximately $7; with 57,300 tons put through in March, the working costs were $3.84 per ton. The policy now proposed is to lower the grade of ore to the mill and increase the tonnage to the limit of 60,000 tons per month, if labor conditions will permit. Some reduction in working costs may follow the increase of tonnage.

Mining News from All Parts of the World

New Enterprises, Installations of New Machinery, Development of Mines and Transfers of Property Reported by Special Correspondents

THE CURRENT HISTORY OF MINING

Alaska

A despatch from Washington states that evidence has been obtained of extensive fraudulent entries of coal lands, involving over 100,000 acres. It is expected that hearings will be held in Seattle, next month.

Copper River & Northwestern—About 95 miles of this railroad is now in operation, and a force of between 3000 and 4000 men are employed on construction work. At present the road extends from Cordova to Copper river, and on the other side almost to the mouth of the Tasnuna river. Ferries convey supplies and passengers across the Copper river, but an 1800-ft. cantilever bridge is being constructed.

Ketchikan—The It mine is shipping 800 tons of copper-gold ore per month, which nets $20 per ton. The ore contains bornite and chalcopyrite and carries $2 to $3 gold per ton. A gravity tram and railroad have been constructed from the Goodroe mine to the harbor at Karta bay. M. D. Ickes and W. L. Polson are developing a vein of lead-copper-gold ore at Mallard bay. A crosscut at a depth of 35 ft. has cut a 7-ft. vein of good shipping ore. The Victor Copper Mining Company, operating 12 miles southeast of Ketchikan, is driving an 1100-ft. crosscut adit, which is now in 600 ft. Three veins have been intersected. Patrick Heany is in charge of the work.

Arizona

Cochise County

Copper Queen—The precipitation tower, near the Czar shaft, collapsed recently and is being rebuilt, this reconstruction having been in contemplation for some time.

Courtland—Since the completion of the Mexico & Colorado and the Arizona & Colorado railroads to this place, much lumber and machinery have been received. The Great Western company will begin shipments of copper ore as soon as the Mexican & Colorado railroad completes the spur to the dump at the Mary and Humboldt shafts. The ore will be sent to the El Paso smeltery instead of to the Copper Queen plant, as had been anticipated. It is not known when the Calumet & Arizona will begin the shipment of ore from their properties in this camp, but the company has ore on three dumps and can ship at any time.

Tombstone Consolidated—A large air compressor has been purchased and it is planned to use power from same for unwatering the lower levels of the mine.

Gila County

Arizona Commercial—The pump station being cut at the 600 level should be completed before the end of the present month. The breast of the east drift on this level is now over 450 ft. from the Eureka shaft and continues in ore, much of which is of smelting grade.

Barney—This group of 28 claims in the Miami section of the Globe district has been purchased by P. J. Reardon, H. E. Hingston and other Boston men. Extensive development will be started next month.

Globe District—Early in September it is expected that the Miami section will have direct railroad connection with Globe. This branch will facilitate operations for four large properties, the Miami, Inspiration, Gibson and Warrior groups. As soon as the railroad is completed, material for the new Miami mill will be sent in and construction work begun in earnest. Among other properties which are developing orebodies in this section and which will be benefited by the extension of the railroad to the Miami terminal are the Live Oak, Cordova and Keystone. As soon as this line is completed, the Gila Valley, Globe and Northern Railway Company is expected to begin construction on a four-mile branch to the Copper Hill district, which will afford an outlet for the ores developed in the Superior & Boston and the Arizona Commercial properties. Other outlying properties in this section are the Iron Cap of the National Mining and Exploration Company, the Superior & Globe and the Centennial.

Graham County

Arizona Copper—Production for the month of July was 2,400,000 pounds.

Detroit—The caving system of mining has been adopted in certain portions of this company's property at Morenci. The square-set system of timbering, however, is still in use in places where the caving system is not considered feasible.

Pinal County

Ray Central—The company has exercised its option on the Carrie Nation Wedge group and also on the Juares Adventure group. The shaft on the Calumet claim is now down about 100 feet.

Ray Consolidated—President Sherwood Aldrich is quoted as saying that actual work on the 5000-ton concentrating mill will commence Sept. 1. The mill will be built on the unit system and will have six 800-ton units, though it is expected that the nominal capacity of the plant will be exceeded in actual operation. The directors have also decided to build a smeltery with a capacity of 1000 tons per day, the work on this plant to be started soon enough to permit of its operating when the mill commences. The company expects to start production early in 1911. A small amount of concentrate has accumulated from the experimental work in the old mill already on the property.

Yavapai County

Rigby Mining and Reduction Company—The company is considering the installation of a lead furnace and blower to be operated from the power plant of the present works, near Mayer. The Bodie mine will be relied upon for the main ore supply.

Yuma County

New Planet Copper Mining Company—This company has been formed to operate the recently acquired group in the Harcuvar district. The new company is capitalized for $4,000,000, divided into 800,000 shares, of which 240,000 will be exchanged for outstanding shares in the old company, and the remaining 560,000 shares will be held under option by the General Development Company. The officers are: Charles S. Barton, of Worcester, Mass., president; William G. Nickerson, Boston, vice-president; J. H. Sussman, New York, treasurer; O. J. Ashman, New York, secretary. The work at the property is in charge of Superintendent W. E. Upham, Planet, Arizona.

California

Amador County

Original Amador Mines Company—Since the new company commenced work under management of J. J. McSorley on this mine at Amador City, hoisting machinery has been installed, necessary buildings erected, and the grading for a 20-stamp mill has been finished. The mill will be running in about two months.

Inyo County

Golden Siren—At this group of eight claims, north of Bishop, high-grade ore is being taken out.

Casa Diablo—A new generator, air compressor, and other machinery have arrived, for installation by this company.

LASSEN COUNTY

Walpeed District—There are signs of considerable activity in this district; Streik & McKechney have made a valuable strike and several other claims are showing up well.

PLACER COUNTY

Ophicum—At this mine at Ophir, Charles Peach, superintendent, a mill is being erected and will be run by electric power.

SACRAMENTO COUNTY

Channel—At this mine a mile east of Folsom, 90 men are now employed taking out gravel.

SHASTA COUNTY

Balaklala—Copper production, this year, at the Coram smeltery has amounted to 5,735,849 lb. distributed as follows: Jan., 342,028 lb.; Feb., 794,746; March, 1,263,667; April, 784,000; May, 820,193; June, 648,586; July, 1,082,629 lb. copper, 1844 oz. gold, and 49,670 oz. silver. The excess production in March was due to accumulation of matte from the two previous months.

Texas—The mine at Old Diggings, once a large producer but idle for some years, has again become productive and is shipping ore to the smeltery at Coram.

SIERRA COUNTY

Eastern Cross—The latest strike in Alleghany is in this mine owned by Bovee Brothers. The ledge was found in the tunnel after a shaft had been abandoned.

Twenty-One—The new plan of development in this Alleghany property includes the unwatering of the old shaft and its deepening. F. M. Phelps is manager.

Rainbow Extension—Men are at work clearing out the old tunnels at Alleghany to resume development. O. A. Harlan, of San Jose, is manager.

Boulder—The group of claims at Downieville has passed to H. T. Bragdon, J. R. Dorsch and M. I. Ish, of Goldfield. There are five quartz claims and three placers in the group.

Pacific—The gravel mine near Howland Flat is under bond to George Wingfield and associates of Goldfield, Nevada.

Kate Hardy—At the mine at Forest, rich ore is being taken out and it is intended to erect a new mill.

SISKIYOU COUNTY

Gardner & Elwood—In this hydraulic mine, near Fort Jones, while piping the bank, a number of slabs of high-grade quartz were washed out, and search is being made for the ledge.

McCloud—The mine at Callahan is now being operated by 18 lessees and the mill and cyanide plant are kept busy on the ore they are extracting.

Colorado

CLEAR CREEK COUNTY

Spur Daisy—Vincent & Moore, of Central City, leasing on this group in the Eureka district, have opened a body of milling ore about 50 ft. from the surface.

Rockford—Lowe & Harris have let a contract for a new shaft house on this property adjoining the old Topeka group. Development work has disclosed both milling and smelting ore.

GILPIN COUNTY

Golden Glory Tunnel Mining Company—The company has under consideration the construction of a 600-horsepower hydroelectric plant on Clear creek, three miles below Georgetown.

Griffith Mines—Work has started on the construction of the new mill for this property. The Malm process will be used.

Crescent—The remodeled mill of this company has been placed in commission, the ore supply coming from the New Boston workings. G. D. Parks, Georgetown, manager.

LAKE COUNTY—LEADVILLE

Hibschle—At a distance of 200 ft. from the 450-ft. level a large stope of good iron ore has been opened in the western part of the property, from which 25 tons daily are being shipped; in the south drift, a good body of lead sand carbonate has been opened from which shipments are going out regularly. Harris & Bennett are leasing the property, as well as the Coronado, and have connected both properties by a drift. Ore is also being hoisted from the 450-ft. level of the Coronado.

Yak Tunnel—The breast of the tunnel is now nearing Resurrection No. 2 shaft and is in about four miles. At the three-mile mark a lateral has been started toward the New Monarch and will be driven 1000 feet.

Cleveland—With average and high-grade ore, this property in South Evans gulch is shipping 1500 tons monthly.

Iron Silver—The aerial tramway at the Tucson shaft is in working order and the output from this property is in the neighborhood of 300 tons daily. Prospecting in the Cambrian quartzite at a depth of 1300 feet is being carried on.

PUEBLO COUNTY

United States Zinc Company—This zinc smeltery of the American Smelting and Refining Company, near Pueblo, was closed two days last week as a result of a strike of the furnacemen who demanded the restoration of the scale of 1907. The company is at present running three of the four furnaces.

SUMMIT COUNTY

Breckenridge—Dredging is in progress in this section by a number of companies. The Reiling dredge of the French Gulch company is operating this season and is said to have already cleaned up more than enough to pay for the dredge. The Colorado Gold Dredging Company is operating two dredges in Swan valley and in the Blue river near the mouth of the Swan. The Reliance company's dredge which has been equipped with a new bucket line is operating in French gulch in good ground.

TELLER COUNTY

El Paso Consolidated—A raise has been started at a depth of 740 ft. on block No. 22 of the Beacon Hill-Ajax claim. This raise will be carried to the surface and will later become the El Paso No. 2 shaft. John Nichols, superintendent.

Star of Bethlehem—J. L. Martin and H. C. Warmuth, leasing on this Stratton Estate property on Bull hill, have opened a body of smelting ore at a depth of about 40 ft. from the surface.

Drainage Tunnel—The bore has now been driven approximately 10,400 ft. and the breast of the tunnel is at a point near Arequa gulch, between Grouse mountain and Beacon hill.

Georgia

HALL COUNTY

Glade—A dredge is to be placed on this property which was recently acquired by J. H. Hunt, of Gainesville.

Idaho

ADA COUNTY

Spofford—This group of gold claims, covering 470 acres at the head of Cottonwood creek, 8 miles east of Boise, is reported to be under option to an English syndicate. A cyanide plant is contemplated. Judson Spofford, Boise, is manager.

Idaho—The company has in contemplation the erection of a stamp mill and cyanide plant on the property between Idaho City and Banner.

Indiana

FOUNTAIN COUNTY

There is a prospect that the coal mines near Kingman will soon be opened and a large number of men employed. The Kelley people have a large tract of land near Kingman leased, and others have been in the field looking after leases. It is the intention to open up mines on these leases as soon as switches can be built for the transportation of the product. The Kelley Coal Mining Company of Kingman is the most active and will sink the first shaft.

GREENE COUNTY

August 10 was payday at all the mines in the Jasonville district and the miners received the largest payroll for several years. Three of the mines had worked every day, and the rest averaged five days a week.

Kansas

CHEROKEE COUNTY

Childress & Hornaday—The mine on the Baker land is now a steady producer of average-grade zinc ore. The ground is being worked at a lower level than heretofore.

Hartford Zinc—Arrangements have been made for a supply of water from the city, the minimum expense being $80 weekly. Present prices will make the working of a run of 3 per cent. zinc ore profitable.

Mascot—The company has installed new hoisting machinery at its mine on the Redeagle land. Drill records, now being verified by development, showed an extensive run of high-grade zinc ore at the 80-foot level.

Southside—The second electrical pump of 1300 gal. capacity has been installed on this famous tract, which has paid approximately $1,000,000 in royalties. The pumps now in use will be sufficient to drain the 40-acre tract to the 140-ft. level. The company has placed a premium on deeper work in the form of lower royalty.

Ihlseng—Shaft sinking by this company on the Robertson and Ping tracts in new territory north of Galena is progressing at a rapid rate. It is a line shaft, 5x15 ft. in the clear, and of three compartments. The cribbing will be of 2x4-in. lumber and concrete. Three eight-hour shifts are employed, and the shaft will be sunk to 300 ft. Later two 250-ton capacity mills will be erected. The zinc ore found here is of exceptionally high grade. A. O. Ihlseng, Joplin, Mo., is manager.

Michigan

COPPER

Quincy—The company has worked out a plan for remodeling the concentrating part of its mill, to take care of the increased tonnage of the stamping end brought about by the enlarging of its single heads, equipping them with 24-in. cylinders, which gave them a capacity of from 700 to 800 tons. The present changes are designed to further reduce the tailing losses and include the installation of four units of Woodbury jigs of 250 tons capacity each, rolls and mills for fine grinding. A head with its rolls, as planned by Superintendent Shields, will have four receiving screens, two oversize jigs, four classifying jigs, four concentrating jigs and eight middling jigs, all of the Woodbury type and capable of handling a product of about 1000 tons in 24 hours.

Winona—The stamp mill that is being erected by this and the King Philip company is to be equipped with two heads, one of the steeple compound type, and the other single with 24-in. cylinders, the same as used at the Quincy. The relative merits of the two heads can then be determined on this rock and the results will be of much interest.

Atlantic—The company continues sinking its Section 16 shaft; it is planned to put this shaft down to a depth of 2500 ft., and then crosscut toward the Superior company's boundary, a distance of about 600 ft. In starting the lateral opening at the 16th level, favorable looking ground was broken, but it has not been opened sufficiently to determine its extent.

Lake—The diamond drill to locate the site of the second shaft has been started. Developments underground at this property are continuing exceptionally fine; there are seven drifts extending from the shaft, all of them in fine ground with the lode averaging about 60 ft. in width.

Allouez—The company produced 643,650 lb. of mineral during the month of July, a yield of 30.36 lb. of mineral to the ton of rock, as against 24.26 lb. for the month of June, indicating a betterment as depth is being obtained. No. 2 shaft will soon be able to materially increase the production.

OAKLAND COUNTY

Detroit Salt Company—It is expected that salt production will be started during September from the new mine at Oakwood.

Missouri

JOPLIN—ZINC-LEAD DISTRICT

Continental Zinc—The Little Pearl lease, west of Joplin, has just completed a shaft into rich ore, confirming a churn-drill strike. J. C. McDowell is president.

Fortune Teller—The company at Granby made a record-breaking shipment of silicate ore, consisting of 14 carloads, which brought an average of $27 per ton.

Gallemore—A rich lead orebody has been passed through by a drill hole on this land near Seneca. Ore was struck at 21 ft. and continued for 38 ft. This camp is a southern extension of the Spring City district.

United Zinc—At Peacock, a rich strike has been made in the Cincinnati mine.

Old Judge—This mine, 300-ton mill and 40-acre lease have been sold for $55,000 to Stover & Wonn, of Chicago.

Bull Frog—This large producer, west of Joplin, has sunk its shaft deeper and is now taking up a 10-ft. stope, insuring the life of the mine for a much longer period.

Montana

BUTTE DISTRICT

Amalgamated Copper—The Boston & Montana company's Mountain View mine has been practically shut down for the past week owing to the breaking of the main driving shaft of the hoisting engine. A small amount of ore is being hoisted through another shaft on the property. It is expected that operations will be resumed within a week. At the Badger State mine of the same company a station is being cut on the 1300 ft. level and when this is finished sinking will be resumed.

Butte & Superior—The shaft is now down 1525 ft. Drifting west is in progress on the 1200- and 1400-ft. levels. The management states that sinking will be continued to 1600 ft. when a station will be cut, and an electric pump installed to lift the water to the 1200 station, at which point an electric pump, already in place, will take the water to the surface. The company plans to erect a mill for the treatment of zinc ores on the property.

East Butte—During the first week of this month the production at the Pittsmont smelter was 21,000 lb. of copper per day, or on a basis of over 600,000 lb. per month, which is much in excess of any previous record.

Tuolumne—It is expected that the company will begin shipping ore during September. High-grade ore has been opened in the lower levels, in addition to the body encountered some time ago in the drift from the 1000-ft. level.

CASCADE COUNTY

Barker—This mine, near Monarch, was recently inspected by George E. Gunn, of Salt Lake, and developments will be continued under the direction of Henry Tegtmeier.

CUSTER COUNTY

New Crystal, Ltd.—This silver-lead mine, near Miles City, has been acquired by French interests, and will be developed under the direction of Capt. John Gray.

JEFFERSON COUNTY

Boston & Corbin—The compressors and hoists at this property will be operated by electric power about Sept. 1, or as soon as the pole line from Helena is completed. The company is developing at present the Bertha, the Bertha No. 2, and the Daphne No. 2. H. E. Emmerson, general superintendent.

Boston & Alta—Work of making room for the new machinery was begun at the Alta mine last week. The property has been closed down for 14 years. It is the intention to sink two vertical shafts and to rebuild the old concentrator. Electric power will be supplied by the Prickly Pear power plant, which belongs to the Boston & Alta company. C. E. Titus, Corbin, Mont., is in charge.

Nevada

ESMERALDA COUNTY—GOLDFIELD

Grizzly Bear Lease—Since the installation of new hoisting equipment, sinking has been carried forward in an energetic manner. The shaft is now over 600 ft. in depth and is to be sunk to a depth of 1000 feet.

American Mining Congress—Exhibits are now being received from Goldfield and other districts and an elaborate dis-

play of Nevada products is expected for the forthcoming session to be held here, Sept. 27 to Oct. 4. James J. Hill and John Hays Hammond are among the speakers invited.

ESMERALDA COUNTY—LUCKY BOY

Chicago Exploration—This company, operating the Hubbard lease on the Mountain King property, ceased operations on Aug. 7, the lease having expired. During the life of the lease, the company produced a gross amount of $900,000 and paid $180,000 in dividends.

McCormack Lease—High-grade silver ore has been discovered in a winze from the 100-ft. level.

ESMERALDA COUNTY—RAWHIDE

King-Heisner—The amalgamation department of the new custom mill has been started and the cyanide portion of the mill will soon be ready.

Howard Consolidated Mines Company—A 25-h.p. Fairbanks-Morse hoisting engine is *en route* for the development of this group, 18 miles south of Rawhide. The owners are George Graham Rice and associates.

NYE COUNTY—ROSE'S WELL

Diamond Queen—Leasers on this property are doing well; ore of smelting grade is being shipped.

HUMBOLDT COUNTY

Imlay—The new mill of this company has been completed and will shortly begin the treatment of the ore on a commercial basis. J. R. Turner, superintendent.

NYE COUNTY—RHYOLITE

Montgomery-Shoshone—Manager John G. Kirchen is quoted as stating that the company is now outputting about 6000 tons per month.

Crystal-Bullfrog—The small mill which the company has been erecting at "Mill junction," will shortly be ready for operation. Amalgamation, concentration and cyanidation departments have been provided.

WHITE PINE COUNTY—ELY

Giroux Consolidated—Developments by churn drills are said to have outlined ore bodies suitable for mining with steam shovels. It is again reported that the concentrating and smelting of the Giroux ore is to be done in the Robinson district, or at some point in close proximity.

Nevada Consolidated—In July, the company produced about 3,520,000 lb. of copper, and it is expected that the August production will be the largest the company has yet made.

New Mexico

The Cole Ryan interests have acquired several groups of gold claims in the Cooney District and will consolidate them into a new company to be known as the Sierra Mining Company.

GRANT COUNTY

Chino Copper—Ore developed in this property is estimated by A. Chester Beatty at 4,000,000 tons, and "partially developed" ore is given at 5,000,000 tons. Prospecting by churn drills is increasing the ore reserves at a rapid rate. At the recent meeting, the permanent board of directors was elected as follows: D. C. Jackling, A. Chester Beatty, Charles MacNeill, Spencer Penrose, Charles Hayden, Sherwood Aldrich, W. Hinkle Smith, J. G. Hopkins, Henry M. Whitney, Eugene N. Foss, B. Hochschild and Samuel Sloan. The first six are directors of the Utah Copper Company.

QUAY COUNTY

A rush has taken many prospectors to the arroyas of the Canadian river, about five miles from Logan, a station on the Rock Island railroad.

New York

ST. LAWRENCE COUNTY

Ontario Talc Company—On account of extended dry weather, the mill is not running at full capacity, it being dependent on water power. A new shaft is being sunk and is now about 135 ft. deep. The hoisting equipment from shaft No. 1 is being installed at the second shaft, and will be ready for operation within two weeks.

SARATOGA COUNTY

Empire Graphite Company—The plant at Porter Corners was destroyed by fire Aug. 13. It included a four-story mill for manufacturing graphite into various forms, besides a concentrating mill and some smaller buildings.

North Carolina

LINCOLN COUNTY

Piedmont Tin Mining Company—Diamond drill operations have been started on this property near Lincolnton to prospect the orebody.

Oregon

LANE COUNTY

Kelso—The company has spent about $10,000 in additional equipment for the mill. W. P. Ely, manager, Bohemia.

West Coast—Superintendent Ryan states that the 30-stamp mill on this property will soon be started.

Pennsylvania

BITUMINOUS COAL

Youngstown Steel Company—This company, of Youngstown, Ohio, has bought from I. V. Thompson of Uniontown, a tract of [illegible] acres of coal land located in the Dunkard creek section of Greene county, the price being $550 per acre, including the surface. The Youngstown concern also controls the Brier Hill Coal and Coke Company, which has 470 ovens at Brier Hill. The coal has been tested for coking and proves good, but as there is no railroad, the development will be deferred some time.

ALLEGHENY COUNTY

American Vanadium Company—President James A. Flannery, of Pittsburg, before departing for the mines in Peru announced that the reduction works at Bridgeville, Penn., would be tripled in size.

Utah

BEAVER COUNTY

Newhouse—Preliminary steps have been taken in the foreclosure of the mortgage, held by the Trust Company of America, as a part of the reorganization plans for resuming work on this property.

Majestic Mines—The Beaver River Power Company expects to have its pole line completed to the Harrington-Hickory mine by Sept. 1, after which electric power will be used exclusively. Development continues on the large orebody at the bottom of the incline shaft. A drift is being run from the 500-ft. level of the vertical shaft to cut this orebody. A. D. Moffat, superintendent, Milford, Utah.

SALT LAKE COUNTY

Utah Coalition—The tunnel at Alta, now in about 1000 ft., has encountered a body of silver-lead ore. Capt. Duncan McVichie is interested.

Prince of Wales—This company in the Alta district has increased its capital from $10,000 to $300,000. The new company will operate its lease on one-half of the old Prince of Wales mine and also develop six adjoining claims. Fred Schrott, president, 15 Wilfley apartments, Salt Lake.

SUMMIT COUNTY

Ore Shipments—The shipments from Park City during the past week were: Silver King, 1,333,740 lb.; Daly-West, 1,244,300; Daly-Judge, 549,000; Daly-Judge (zinc), 957,270; American Flag, 224,000 pounds.

Washington

KITTITAS COUNTY

Ellensburg—In the sands of the Yakima river near here, O. O. Felkner has obtained high pannings and is installing sluice boxes.

West Virginia

State Mine Inspector John Laing has announced the appointment and assignment of district inspectors as follows: First district, Karl F. Schoew, Bluefield; headquarters, Fairmont. Second, Frank

E. Parsons, Clarksburg. Third, L. D. Vaughan, Elk Garden; headquarters, Independence. Fifth, Earl A. Henry, Clifton. Sixth, Bonner H. Hill, Chelyan. Eighth, Robert Y. Muir, Gentry; headquarters, Thurmont. Ninth, Lane B. Holliday, Maybeury; headquarters, Beckley. Tenth, Arthur Mitchell, Stanford; headquarters, Bluefield. Eleventh, William Nicholson, Bluefield. Office and field assistant to chief, A. J. King, Rush Run; headquarters, Charleston.

The inspectors for the fourth, seventh and twelfth district will be named later.

Wisconsin

ZINC-LEAD DISTRICT

Big Dad—The Wisconsin Zinc Company has acquired and will reopen this mine, and commence milling. The Big Tom and Illinois are again active.

Benton—The Lucky Twelve company has purchased and will remove the Pine Tree mill.

Hazel Green—The Cleveland Mining Company has acquired the Scrabble creek and Murphy mines and will continue development under one management.

Pittsburg-Benton—Operations were resumed at this mine by the Wisconsin Zinc Company, which has taken it under release. The Drumm lease will also be developed.

Vinegar Hill—The company has started its mill at the Calvert mine.

Wyoming

CARBON COUNTY

United Smelters, Railway and Copper Company—Some changes have been made in the directorate of this company as a result of the entrance of some new interests. The directorate now comprises: I. N. Pennock, Cleveland, Ohio; Warner Moore, Richmond, Va.; W. E. White, Parkersburg, W. Va.; F. A. Baldwin, Grand Rapids, Mich.; Willard Pennock, Minerva, Ohio; A. L. Hawse, Clarksburg, W. Va.; Andrew S. Upson, Cleveland, Ohio; J. E. Haskell, Bradford, Penn.; E. M. Cobb, Chicago. The latter has been succeeded by I. N. Pennock as president. The company controls the Penn-Wyoming Copper Company and affiliated enterprises in the vicinity of Encampment.

Canada

BRITISH COLUMBIA—PHOENIX

New Dominion Copper Company—This company, which has succeeded the Dominion Copper Company, has been organized with a capital of $1,250,000 (par value of shares $5) and $500,000 in 10-year, 6 per cent. bonds. The new directors are: H. Cook, J. H. Susmann, Judge Warren W. Foster, John A. Sleicher, W. J. Cull, N. Bruce McKelvie and H. H. Melville. Operations are to be resumed at the property as soon as the engineers have completed their examination. As the General Development Company has a considerable stock interest in this company, and also in the British Columbia Copper Company, it is not improbable that the two properties may be consolidated.

BRITISH COLUMBIA—SOUTHEAST KOOTENAY

Crow's Nest Pass Coal Company—Official announcement has been made of suspension of dividends, owing to reduction in output of coal, consequent upon the caving of approaches to some of the mine workings. A change in mining methods is necessary to place the mines on as productive a basis as in the past, and attendant expenditure will temporarily absorb the profits of the company's other mines and coke ovens.

ONTARIO—COBALT

Ore Shipments—Shipments for the week ending, Aug. 7, were as follows: Buffalo, 42,250 lb.; Chambers-Ferland, 60,940; Coniagas, 91,790; Crown Reserve, 181,700; La Rose, 258,400; Nipissing, 128,690; O'Brien, 83,200; Silver Queen, 175,710; Silver Cliff, 63,000; Trethewey, 128,860, Temiskaming & Hudson Bay 64,000; total, 1,278,540 pounds.

Gifford—Contract work has been nearly completed, the main shaft being down 190 ft., and the shaft timbered for 172 ft. A station will be cut at the 200-ft. level and crosscutting commenced to tap surrounding veins. A plant has been installed and air leased from the Temiskaming to operate the drills.

Silver Lode—At this mine on the north side of Cross lake, native silver has been found in the calcite vein at the bottom of the 90-ft. shaft.

Nipissing—The company reports striking a new vein 3 in. wide, assaying high in silver. The vein has been named No. 128.

ONTARIO—DELORO

Deloro Mining and Reduction—On Aug. 11, fire destroyed the sluices and bullion rooms of the company. The cobalt plant was saved by great exertions.

ONTARIO—GOWGANDA

Morrison—The discovery is reported of a vein, 12 in. wide, which has been uncovered for 50 ft. on these claims.

NOVA SCOTIA

Spring Hill Coal Mines—The miners belonging to the United Mine Workers went out on strike Aug. 10. About 1200 men are affected. The principal question at issue is the recognition of the union, but other demands include a change in wage schedules amounting to an advance of about 10 per cent. The Cumberland Railway and Coal Company, which operates the mines, has decided to close them down indefinitely. H. R. Drummond, the president, states that the mines have been operated at a loss for the last three years. The average daily output was about 2000 tons. Hon. Mackenzie King, minister of labor, states that as a board of conciliation has already been appointed which, after investigation, sustained the position of the company, the department will not interfere further in the matter.

Mexico

CHIHUAHUA

Palmilla Milling Company—James I. Long, general manager, Parral, has received telegraphic instructions to proceed at once with plans for the first 250-ton unit of the new mill.

Cherokee Goldfields, Ltd.—The company has completed the construction of its mill at San Julian. The manager, Gerald Hopkins, is at present in London.

Compania Metalurgica de Torreon—The company has acquired the lease and bond held by Charles M. Dobson on Las Cuadras mine in the Santa Barbara district. The ores of the mine are silicious and daily shipments of about 25 tons are sent to the Torreon smeltery.

COAHUILA

Monterey Iron and Steel—The company has acquired about 1000 acres of iron land in the Hercules district.

DURANGO

Lustre Mining & Smelting—Owing to pressure from Mexican creditors, with claims amounting to about $139,000, it is expected that this company will be reorganized. The company owns the Magistral mine, stamp and concentration mills, and a 6-furnace copper smeltery near Santa Maria del Oro. The company is controlled by Pittsburg, Penn., capital.

MEXICO

Mexico Mines of El Oro, Ltd.—During July, the mill ran 29 days crushing 11,761 tons of ore, yielding bullion valued at $106,110. Regular working expenses were $37,620 and development expenditure was $8700, leaving a profit of $59,790, a net return of $4800 was obtained from 43 tons, shipped during the month, but not included in the above milling operations.

SONORA

Virginia Development—Ore has recently been encountered in this property 30 miles south of Douglas, Ariz. The property comprises 10 pertenencias and a two-compartment shaft has been started under the direction of S. Grose.

Cananea & Sonora—A 250-ton mill from the Joplin, Mo., district has been purchased and will be removed to Cananea to handle the sphalerite ores of this property. James W. Norton, manager.

Metal, Mineral, Coal and Stock Markets

Current Prices, Market Conditions and Commercial Statistics of the Metals, Minerals and Mining Stocks

QUOTATIONS FROM IMPORTANT CENTERS

Coal Trade Review

New York, Aug. 18—The bituminous coal trade in the East is improving. Demand is better and consumers are showing a disposition to put in winter stocks of fair amount. There is a prospect of some improvement in competitive conditions. It is understood that the New River producers, who have been heavy shippers and have been selling at extremely low prices, are making an effort to get together and see if something cannot be done to improve matters as to prices. This, of course, will involve some restriction of shipments.

The anthracite trade continues its usual course without change and without incident. The heavy rains of the present week mean better water supply and a consequent improvement in working conditions in a good many of the collieries.

Coal trade in the West continues its steady improvement. Demand for steam coal is better and dealers in the large cities and towns are beginning to take thought of their winter supplies, with a consequent improvement in orders. There is the usual tendency to over-shipment, which helps to keep quotations down. There is, indeed, not likely to be much increase in prices as long as the shipping capacity of mines is so much above their actual sales.

Central Pennsylvania Mine Wages—The miners of the Central Pennsylvania district, in a special convention called for the purpose, have voted to reject the proposal of the operators to reduce the mining rate from 60 to 55c. per ton; also to reject a second proposal to arbitrate the question. They will adhere to the existing contract, which runs to April 1, 1910. The operators claim that this refusal will make it necessary to close a number of mines.

Alaska Coal Locations—Under direction of the Secretary of the Interior, the General Land office in Washington has suspended a large number of claims entered on coal lands in Alaska. Charges of fraudulent entries are the reason given for this action. The suspension will be continued until the charges are fully investigated.

Coal Traffic Notes

Coal receipts at St. Louis, six months ended June 30, were 3,113,227 short tons in 1908 and 1,009,828 in 1909, decrease, 2,103,399.

Coal passing Dunkirk, Ashtabula and Conneaut docks, lake ports of Ohio, six months ended June 30, was 1,590,055 short tons in 1908, and 2,341,195 in 1909; increase, 744,540 tons.

Coal passing through the locks on the Monongahela river, six months ended June 30, was 4,136,820 short tons in 1908, and 4,864,000 in 1909; increase, 727,180 tons.

Coal shipments from Tacoma and Seattle, six months ended June 30, were 309,958 short tons in 1908, and 253,280 in 1909; decrease, 56,678 tons. These shipments are mainly to California and Alaska ports.

Receipts of domestic coal at San Francisco, six months ended June 30, were 147,757 short tons in 1908, and 236,762 in 1909; increase, 89,005 tons.

Tonnage originating on Pennsylvania railroad lines east of Pittsburg and Erie, years to Aug. 7, short tons:

	1908.	1909.	Changes.
Anthracite	3,085,670	2,948,460	D. 137,210
Bituminous	19,462,584	21,311,086	I. 1,848,502
Coke	4,061,666	6,094,385	I. 2,032,719
Total	26,609,920	30,353,931	I. 3,744,011

The total increase this year to date was 14.1 per cent.

Bituminous coal and coke shipments, Pennsylvania and West Virginia, six months ended June 30, short tons:

	Coal.	Coke.	Total.
Balt. & Ohio	10,160,035	2,033,888	12,193,923
Buff., Roch. & Pitts.	2,938,538	227,916	3,166,454
Buff. & Susquehanna	702,231	162,615	864,846
Penn. lines, N. Y. C.	3,524,298	46,896	3,571,194
Pitts. & L. Erie	3,853,767	2,160,892	6,014,659
Norfolk & Western	6,247,892	1,211,619	7,459,511
Ches. & Ohio	5,032,509	195,911	5,228,420
Total	32,459,180	6,039,737	38,498,917
Total, 1908	27,709,677	3,816,890	31,526,567

The total increase this year was 6,972,350 tons, or 22.1 per cent. Chesapeake & Ohio figures are for five months only, as the June report has not been received. In addition to the above, the Baltimore & Ohio carried 397,056 tons anthracite in 1908, and 418,024 in 1909; an increase of 21,268 tons.

Coal tonnage of railroads in Ohio Coal Traffic Association, six months ended June 30, short tons:

	1908.	1909.	Changes.
Hocking Valley	1,103,190	1,278,385	I. 175,195
Toledo & Ohio Cent.	498,056	540,994	I. 42,938
Baltimore & Ohio	668,101	602,098	D. 66,003
Wheeling & L. Erie	1,243,275	1,395,246	I. 151,971
Cleve., Lorain & Wh.	1,129,777	1,054,152	D. 75,625
Zanesville & Western	485,121	503,122	I. 18,001
Toledo Div., Pen. Co.	759,686	837,617	I. 86,931
L. Erie, Alliance & Wh.	440,272	458,918	I. 18,646
Marietta, Col. & Cleve.	25,111	35,474	I. 10,363
Wabash Pitts. Term.		8,097	I. 8,097
Total	6,353,589	6,714,103	I. 360,514

The total increase in tonnage this year was 5.8 per cent. Only the Ohio lines of the Baltimore & Ohio are included above; the main line is given elsewhere.

Coastwise shipments of coal from chief Atlantic ports, six months ended June 30, long tons:

	Anthracite.	Bitum.	Total.	PerCt.
New York	7,764,227	5,077,040	12,841,267	63.0
Philadelphia	1,093,632	2,139,635	3,233,267	15.9
Baltimore	129,212	1,643,812	1,773,024	8.7
Newp't News	.....	1,602,206	1,602,206	7.9
Norfolk	.....	922,914	922,914	4.5
Total	8,987,071	11,385,607	20,372,678	100.0
Total, 1908.	9,209,947	10,843,392	20,053,339	.....

Total increase this year, 319,339 tons, or 1.6 per cent. Shipments include bunker coal furnished steamships in domestic trade. New York includes all the harbor shipping points.

Coal receipts at Boston, seven months ended July 31, reported by Chamber of Commerce.

	1908.	1909.	Changes.
Anthracite	1,025,279	983,572	D. 41,707
Bituminous	1,838,791	1,933,731	I. 94,940
Total domestic	2,864,070	2,917,303	I. 53,233
Foreign	247,550	152,504	D. 95,046
Total	3,111,620	3,069,807	D. 41,813

The foreign coal reported comes chiefly from Nova Scotia.

New York

Anthracite

Aug. 18—The anthracite market continues very quiet and steady with only the usual current business forward.

Schedule prices for prepared sizes are now $4.05 for lump, and $4.00 for egg, stove and chestnut, f.o.b., New York harbor. For steam sizes quotations are: Pea, $3.15@3.25; buckwheat, $2.35@2.50; No. 2 buckwheat or rice, $1.70@2; barley, $1.35@1.50; all f.o.b., New York harbor.

Bituminous

There is an actual improvement this week in the bituminous trade. Business for some time past has been coming in bunches; at the present writing there is quite a flush which dealers hope will continue. More orders are coming in, although prices are not improving simply for the reason that there is so much reserve capacity at the mines. The far East has been busying itself and sending in pretty good orders. The Sound is lagging a little still, but is doing fairly well. New York harbor is the quietest of all. All rail trade is very good.

The improvement is in amount of business, not in quotations. Prices continue as they have been for some time. Good Miller vein steam coal can be had at a delivered price which nets $1.30@1.35 at mines, while lower grades bring 90@95c per ton at mines, and gas coal can be had at 60@65c per ton at mine for run-of-mine.

Transportation from the mines is good, coal coming through about on time and sometimes a day or so ahead. Car supply is good, with limitation noted last week, that it is sometimes difficult to get special cars; that is, cars of special sizes which are required on some roads, chiefly in New England.

The attempt of the New River producers to come to some agreement is noted elsewhere. The Interstate Commerce Commission has supported the complaint made by the George's Creek operators, and has ordered that the differential of about 20c. in freights between George's Creek and Clearfield coal to tidewater must be done away. The railroads are given until Sept. 15 to adjust their rates. The commission held that the service from the two districts was about equivalent, and that the railroads were not justified in making a higher charge on George's Creek coal because of its better quality. This will not improve the temper of the Clearfield people, who have also failed this week to secure a reduction in the mining wage rate.

In the coastwise trade vessels continue in abundant supply and rates are unchanged. They are 60c. from Philadelphia to Boston; 60c. from New York to around the Cape and 30@40c. to Providence and the Sound. All are shaded 5c. or so occasionally to get good cargoes. Captains and vesselowners are looking forward hopefully to a rush for charters to the shoalwater ports a little later.

Birmingham

Aug. 16—There is a steady improvement in coal production and trade in Alabama. Some good contracts are being let in this section for fall and winter use, with some of the product being requested to be delivered at once. The railroads are furnishing all the cars needed for prompt handling of the coal and it will be some time yet before there is likely to be a scarcity of cars reported.

The coke production is increasing, as more ovens are put into operation. The Tennessee Coal, Iron and Railroad Company will soon construct a large number of ovens in this district. This company has recently been taking up options on a large tract of land in Jefferson county, on which development will take place, including the construction of a number of coke ovens. Good prices prevail for coke and the demand is strong.

Chicago

Aug. 16—The coal market grows stronger with the continuation of restricted shipments, so that waves of depression due to too great receipts on track are kept out. Lump coal especially is in better condition; run-of-mine has a firmer tone and screenings no longer lead the bituminous market. Everywhere the wholesale trade appears confident of constantly increasing business for the last half of the month despite summer conditions. In part the betterment seems due to general improvement in manufacturing conditions; in part it is caused by the extraordinarily heavy harvesting trade, and something of it is to be accounted for by the tendency of retailers to lay in domestic stocks early. Except for smokeless, there is hardly any demurrage coal on the market. Shipments of smokeless run-of-mine still incline to bunch, with the result that prices are occasionally sacrificed to move the coal.

Illinois and Indiana lump brings $1.75@2.35; run-of-mine $1.60@1.75 and screenings $1.30@1.60. Smokeless holds up well on lump to $3.40@3.50; on run-of-mine to $2.95@3.05, these being list prices for Pocahontas and New River, with lower-grade smokeless 10 or 15c. less. Hocking coal is in very good demand and firm at $3@3.15. Youghiogheny is steady and in light sale at $3.15 for ¾-in. gas.

Anthracite shows no noteworthy change, with a fair sprinkling of sales in small quantities distributed among the city and country trade.

Cleveland

Aug. 17—Although the season is advancing, the Lake trade continues slow. Local demand is strong and steady; manufacturers are buying and dealers are stocking up. Prices are unchanged. Middle district coal sells at $1.85@2 for lump, $1.65@1.75 for run-of-mine, and $1.15@1.20 for slack. No. 8 district is $1.90@2.05 for lump, $1.70@1.80 for run-of-mine and $1.30 for slack. Pittsburg coal sells at $2.15@2.25 for lump and $2@2.05 for run-of-mine; Pocahontas at $2.80 and $2.35 for the two grades. Massillon lump for domestic use is $2.70, Cleveland.

Indianapolis

Aug. 16—Improvement in coal mining is more manifest than for any period during the summer. The payrolls at the mines in several districts were the largest for two years. Orders have not been as heavy as the operators are accustomed to booking in August, but they have been steady and numerous. The large consumers are a little conservative, but they have shown a disposition to place their orders soon.

Thomas L. Lewis, president of the United Mine Workers of America, sat as umpire in a two days' hearing of the dispute between miners and operators, growing out of differences regarding the removal of slate and leaving pillars of coal, which occasioned a strike in the eleventh district. The first thing the international president did was to order the men back to work pending the hearing and his decision, which is to be announced in a few days. Both sides agreed to leave the decision with Mr Lewis and abide by his ruling.

Pittsburg

Aug. 17—The coal market presents no change, demand being fair, with prices only fairly firm and active competition for what business is going. Nominal prices remain at $1.20 to retail dealers and $1.10 to manufacturers, for mine-run and 65c. for slack, at mines, these prices being generally shaded 5 or 10c. per ton, and sometimes a trifle more.

Connellsville Coke—The market has been relatively quiet as to new sales, but prices have firmed up further, particularly on foundry coke. The Connellsville region is suffering considerably from a scarcity of labor. Since the slump in operations late in 1907, common labor has been attracted to the region more than once on false reports of great activity in prospect, and the late genuine revival has not brought as many men as needed, as they had become suspicious. Standard Connellsville furnace coke is quoted at $1.65@1.75 for prompt and $1.75@1.85 for contracts running through the balance of the year; while 72-hour foundry coke is quotable at $2@2.25 for either prompt or contract.

The *Courier* reports the production in the Connellsville and lower Connellsville regions in the week ending Aug. 7, at 295,664 tons, a gain of 10,000 tons. Shipments are reported at 4310 cars to Pittsburg, 7424 cars to points west of Pittsburg and 852 cars to points east of Connellsville, a total of 12,586 cars, no change from the preceding week.

Foreign Coal Trade

Spanish Fuel Imports—Imports of coal into Spain five months ended May 31 were 934,908 metric tons, an increase of 135,974 tons over 1908. Imports of coke, 123,059 tons, a decrease of 14,036 tons. These imports are chiefly from Great Britain.

Austrian Coal Production—Coal production in Austria-Hungary, six months ended June 30, metric tons:

	1908.	1909.	Changes.
Coal	7,006,003	6,818,446	D. 187,557
Brown coal	13,430,226	12,606,998	D. 823,228
Total mined	20,436,229	19,425,444	D. 1,010,785
Coke made	946,153	905,128	D. 41,025
Briquets made	72,416	86,217	I. 13,802

The increase in briquets is due to the larger use of brown coal, or lignite, in that form.

French Coal Production—Coal production in the Nord and the Pas-de-Calais, the two principal coal districts in France, for the six months ended June 30 was, in metric tons:

	1908.	1909.	Changes.
Nord	3,441,125	3,486,674	I. 75,549
Pas-de-Calais	8,942,823	9,355,127	I. 420,304
Total coal	12,345,948	12,841,801	I. 495,853
Coke made	878,987	915,688	I. 36,701
Briquets made	692,261	722,514	I. 30,252

During the six months France exported

to Belgium 266,215 tons coal, 15,506 tons coke and 391 tons briquets; but imported from Belgium much larger quantities, 1,889,280 tons coal, 199,552 tons coke and 138,507 tons briquets.

British Coal Prices—Messrs. Hull, Blyth & Co., London and Cardiff, report current prices of coal as follows, on Aug. 7: Best Welsh steam, $4.20@4.26; seconds, $4.08; thirds, $3.96; dry coals, $4.08; best Monmouthshire, $3.60; seconds, $3.48; best small steam, $2.40; seconds, $2.10. All per long ton, f.o.b. shipping port.

Iron Trade Review

New York, Aug. 18—The iron and steel markets generally continue to show steady demand, though possibly less rush of business, as buying by manufacturers and first consumers has largely satisfied their requirements for some months to come. There are quite a number of inquiries from large consumers for the first quarter of 1910 which have not as yet resulted in much business, partly because producers are inclined to advance prices for such deliveries to a point above that which purchasers are willing to pay.

In pig iron the market in Eastern territory shows fewer large contracts, but a considerable run of small orders, both for foundry and basic iron; while the pipemakers are taking some forge and a good deal of lower-grade foundry. Prices are firm with a general tendency to ask advances wherever possible. Not much business is being done beyond next quarter, buyers being unwilling to pay more while there are still a number of merchant furnaces out of blast. In the Central West, pig iron is more active than in the East. Foundry and basic are being taken and there is some call for bessemer pig from the steelmakers.

In finished material conditions remain good. The absence of large contracts in structural steel is made up by a number of small orders. The demand for nails and other material which enters into general building is strong, indicating a good business condition. Plates, bars and shapes have been stimulated by the large orders for equipment which are coming in.

The railroads are coming into the market with quite a rush of orders for new equipment, and the number of cars for which contracts have been placed is large. Orders for locomotives are on the increase, though more slowly. The present year, apparently, will go out with only a moderate tonnage in rails, but a number of companies are now figuring on rail orders for next delivery, and it looks as if a considerable business of this kind would be placed. Light rails and trolley rails are active as they have been for some weeks past.

Lake Shipments Five Out—Shipments of iron ore from the Lake Superior region for the month of Aug. 1 are reported by the Cleveland *Iron Trade Review* as below, in long tons:

	1908.	1909.	Changes.
Escanaba	754,283	2,016,505	I. 1,262,212
Marquette	345,789	870,961	I. 525,172
Ashland	592,939	1,061,187	I. 468,248
Superior	1,111,887	2,576,110	I. 1,464,223
Duluth	2,819,934	5,434,135	I. 2,614,201
Two Harbors	1,610,439	3,436,452	I. 1,826,013
Total	7,235,281	15,395,350	I. 8,160,069

Notwithstanding cloudbursts and washouts on the ranges which crippled Duluth and Ashland for a week in July, the ore shipments of that month were 6,693,025 tons, which is the second largest shipment of any month in the history of the trade. Shipments to Aug. 1 show an increase of 112.5 per cent. over last year, and are within 2,139,391 tons of the record shipments of 1907.

Baltimore

Aug. 17—Exports for the week included 983 tons steel rails and 532 tons rail joints to Mexico; 3,378,000 lb. steel billets to Liverpool; 847,565 lb. tin scrap to Rotterdam. Imports included 1681 tons manganese ore from Germany; 6000 tons manganese ore from Brazil; 15,990 tons iron ore from Cuba.

Birmingham

Aug. 16—Southern pig-iron manufacturers are holding firmly to $13.50 per ton for No. 2 foundry, and do not appear to be willing to sell much at that price save to regular customers whose needs will be cared for right along. The production is being kept up; the estimate is made that the output in August will show as large an increase as compared to July as did the output in July over the month of June.

Much iron that has been stacked in furnace yards in this section, belonging to others than the producers, is beginning to be moved off. Reports have it that there will be a large percentage of the iron in the yards here shipped out in the next few weeks. The make is equal to the present demand, with the furnace companies not anxious to handle much future business. The larger companies, the Tennessee Coal, Iron and Railroad Company and the Republic Iron and Steel Company are practically out of the market for the balance of the year. The Sloss-Sheffield Steel and Iron Company, which has five furnaces in operation, is selling only to regular customers, or holding such trade as might become regular business in this district.

The Southern cast-iron and soil-pipe trade is still active. The smaller pipe companies are securing much business from municipalities where a few thousand tons of pipe at a time are needed. This is aggregating well, and is a profitable business.

The minor iron users throughout Southern territory are requiring more and more iron right along.

Chicago

Aug. 16—Sales of pig iron continue good in the aggregate, with the average melter taking lots up to 500 or 600 tons and the exceptional buyer going up to 1000 tons on last-quarter and 1910 business. The wide distribution of sales and the increase of inquiries for heavy tonnage point to increasing firmness. The upward tone, indeed, is apparent in many features of the market. Furnace agents hold out strongly for higher prices on 1910 deliveries, with good prospects of bringing the buying side of the market to their requirements. On last-quarter business Southern is quoted at $13@13.50 Birmingham ($17.35@17.85 Chicago) and Northern at $17@17.50. A little iron sells at the lower prices for 1910 first-half delivery, but in general selling interests continue to get the higher. For Northern furnaces the situation is good because of the relatively high price of Southern and sales of Northern are increasing. The activity in demand for Northern for special purposes is notable.

Conditions of the market for iron and steel products are promising for continuation of the heavy demand that exists now in practically every line. Railroad and structural shapes are especially active. Coke is in good demand and steady at $4.70 for the best Connellsville.

Cleveland

Aug. 17—The demand for merchant ore has increased so much that some of the selling agencies report that Old Range bessemer is almost cleaned out, while Mesabi bessemer is not abundant.

Pig Iron—Sales for the week have been moderate locally, but inquiries so numerous that furnaces are asking 25c. more for fourth-quarter iron. Bessemer is quoted $16.50@17; No. 2 foundry, $16.25 @16.50, Cleveland.

Finished Material—Plates are doing well, and more contracts for structural steel are coming in from this territory. Bars are also in good demand, and there is more call for sheets.

Philadelphia

Aug. 18—The continued demand for basic, in most cases for more remote delivery, continues to be the feature of the market. Requirements now the subject of negotiation will probably be covered and followed by a quiet market for some time to come. Prices are 25c. per ton higher and makers figure out a further advance. The rush of work calling for basic continues. Today's quotations are $16.75@17 per ton.

Some additional business has been done in Southern No. 2 foundry at $17. Northern No. 2 standard makes are quoted at $17.50. Sales of gray forge have been made at $16. Some inquiries this week

are from consumers who are well supplied for 60 days. The tone of the market is strong throughout and there is a general disposition to look ahead. Bar-iron manufacturers are seeking options in some cases for iron at present selling prices for early winter delivery.

Steel Billets—On the surface nothing has been done in the closing of business owing to the higher prices asked by manufacturers. Buyers are fairly well supplied for the present.

Bars—Reports from mill offices show a further increase in distribution, generally made up of small orders. Manufacturers have knowledge of September requirements. Quantities and terms have not been considered but it is understood that less than current quotations will be agreed upon on account of the size of the expected orders.

Sheets—The week has been quiet so far as large mill orders are concerned. Manufacturers report a general increase in consumption.

Pipes and Tubes—This territory has absorbed its full share of pipes and tubes. All the smaller industries are active.

Plates—The rush of new business continues and mills are practically sold up. On large orders quotations are kept low. Railroad equipment orders are bringing considerable business to the plate mills.

Structural Material—The structural mill people give glowing reports of business in hand and in sight. It will soon be a matter of meeting demands for early delivery. Car builders' requirements are very heavy and general construction work has more than doubled its demands on the mills.

Steel Rails—Some overflow business from Western mills has reached eastern Pennsylvania mills. The calls for small lots of light sections are numerous.

Scrap—Demand for heavy steel scrap has again subsided and yardmen report very little business.

Pittsburg

Aug. 17—Prices of iron and steel products continue to advance by a very gradual, but well-sustained movement. The gain each week is slight, but there are no retrogressions. This week's news includes an advance of $1 per ton in steel bars, an advance of 5c. per keg in cut nails and a firming up in iron bars in the Pittsburg market of about $1 per ton.

Production continues to increase. The United States Steel Corporation made a new month's record in pig-iron production in July, which is the more remarkable from the fact that July and August are poor months for furnace operations on account of the humidity. The same furnaces would make a considerably larger tonnage in March or October. The corporation is not running as large a percentage of its blast-furnace capacity as when the June record was made, as it has blown in some new furnaces. Neville island furnace will be blown in early next week, to be followed within a fortnight by Edith. These furnaces are in the Pittsburg district and were formerly owned by the American Steel and Wire Company, but some time ago were transferred to the Carnegie Steel Company. As soon as the sheet and tinplate labor matter is settled and the corporation gets up to its usual tonnage of sheets and tinplates the Columbus blast furnaces and steel works will be started. The prospect is that by October the Steel Corporation will be making a much larger tonnage than ever before in its history.

It is definitely given out that the American Sheet and Tin Plate Company will not sell any tinplate for next year at less than a 15c. advance over the current market, which is $3.40 for 100-lb. cokes, and an advance in sheets is likely also. Meanwhile some of the independents are advancing prices, one independent, producing both sheets and tinplates, having made a general advance of 25c. per 100 lb. last Friday. Other independents are quoting 15 to 25c. advance on tinplate to buyers other than their regular customers.

Pig Iron—Pig iron has been relatively quiet. The tone of the market has possibly improved slightly in the week, but not at the rate of the preceding fortnight. In some quarters the failure of foundry iron to score an absolute advance is blamed for the halt. No. 2 foundry can still be had on the basis of $15.25, Valley, for this year's delivery. There have been several sellers on this basis, including one Valley interest which is about to go in after a year's idleness, and a couple of detached furnaces in western Pennsylvania. It is a fact, however, that some sales of foundry iron have been made at higher than $15.25, and sales at $15.75, or higher, have been reported for next year. Bessemer iron has been quiet since the sales reported last week, aggregating about 25,000 tons to the Republic Iron and Steel Company and Youngstown Sheet and Tube Company, the market being firm at $16, Valley, for large lots, while one lot of 200 tons for fourth-quarter is reported to have gone at $16.50. Basic remains at $15.25, Valley, and is firm at that price. A sale of 2500 tons for prompt shipment has been made during the week.

Ferromanganese—Sales in the past fortnight have been fairly large, for early delivery. While sales have been made in the past 10 days of a few carloads at $40.75, Baltimore, more recent sales have brought $41, and the market is quotable firm at that price, the freight to Pittsburg being $1.05. An advance is generally asked for next year.

Steel—The market has been quiet, but prices are stronger, and it is difficult to secure any tonnage at the level lately prevailing, $24 for bessemer billets, $25 for open-hearth billets and $25.50@26 for sheet bars, all f.o.b., Pittsburg, plus freight to destination.

Sheets—The market is very strong, and some mills are quoting a premium over the regular prices, particularly on specialties. Regular prices remain at 2.20c. for black and 3.25c. for galvanized, with corrugated roofing at $1.55 per square for painted and $2.80 for galvanized. Some mills have refused to sell for delivery beyond Nov. 1 at these prices.

Sault Ste. Marie Canal Traffic

Freight passing through the Sault Ste. Marie canals for the season to Aug. 1 was, in short tons:

	1908.	1909.	Changes.
East-bound	8,759,790	16,213,999	I. 7,454,209
West-bound	4,330,684	4,610,034	I. 279,350
Total	13,090,474	20,824,033	I. 7,733,559

The total increase this year was 59.1 per cent. The mineral freights included in the totals were as follows, in short tons except salt, which is given in barrels:

	1908.	1909.	Changes.
Coal	3,869,451	3,945,217	I. 75,766
Iron ore	7,106,322	14,540,764	I. 7,434,442
Pig and man. iron	121,055	209,811	I. 88,756
Copper	35,960	51,945	I. 15,985
Building stone	577	980	I. 403
Salt, bbl	261,978	364,142	I. 102,164

The total freight in July was 8,799,666 tons, which is the largest ever reported for a single month, with the exception of June, 1907, when the total was 8,865,442 tons. For this season iron ore was 69.8 and coal 18.9 per cent. of the total freight.

Foreign Iron

British Blast Furnaces—The average number of furnaces in blast and making pig iron in Great Britain for the second quarter of 1909 was 310; while there were 200 furnaces idle.

Metal Markets

New York, Aug. 18—The metal markets show some activity, and in some directions prices have advanced, while in others there are slight declines.

Gold, Silver and Platinum

UNITED STATES GOLD AND SILVER MOVEMENT

Metal.	Exports	Imports	Excess
Gold			
July 1909	$16,661,782	$ 3,169,885	Exp. $13,491,897
" 1908	4,845,272	2,989,172	Exp. 1,856,093
Year 1909	80,496,119	16,496,477	Exp. 57,699,642
" 1908	58,663,098	29,657,055	Exp. 29,006,172
Silver			
July 1909	5,049,366	3,926,117	Exp. 1,123,249
" 1908	4,930,746	3,038,581	" 1,892,165
Year 1909	31,409,032	26,398,145	" 5,010,887
" 1908	30,145,291	24,180,629	" 6,264,662

Exports from the port of New York week ended Aug. 14: Gold, $12,580; silver, $5,705. Imports: To London and Paris: Imports Gold, $169,158, chiefly from the West Indies and Central America; silver, $115,560, from Mexico and South America.

Foreign commerce of the United States, seven months ended July 31, as valued by the Bureau of Statistics, Department of Commerce and Labor

Merchandise:	1908.	1909
Exports	$ 980,997,089	$ 897,425,504
Imports	604,886,648	830,287,488
Excess, exports	$ 372,110,441	$ 67,138,016
Add excess of exports, silver		7,610,887
Add excess of exports, gold		57,090,642
Total export balance		$ 131,839,545

The gold and silver movement in detail will be found in the table at the head of this column.

Gold—There was no special demand for gold on the open market in London this week and prices continued at the standard, 77s. 9d. per oz. for bars and 76s. 4d. per oz. for American coin. The Bank of England continues the policy of strengthening its reserve and took the greater part of the gold arriving.

In New York the only actual exports during the week were $200,000 to Canada. Arrangements were made for $3,000,000 gold for Japan, but it will not be shipped until September.

Platinum—There is little change in the market, demand continuing light. No change is expected before next month. Prices continue about $21@22.50 for refined platinum; $26 per oz. for hard metal; and $17@18 for good scrap.

Our special correspondent reports from St. Petersburg, under date of Aug. 5, that nominal quotations both at Ekaterinburg and in St. Petersburg remain unchanged but on the whole the tendency has been toward lower prices. Crude platinum, 83 per cent. metal, is quoted at Ekaterinburg at 4.50 rubles per zolotnik; in St. Petersburg at 17,500@18,250 rubles per pood. These prices are equivalent on an average to $16.02 and $17.52 per oz., respectively.

Silver—The market has continued quiet and steady, without special features, closing at 23⅛d. bid in London.

SILVER AND STERLING EXCHANGE

Aug.	12	13	14	16	17	18
New York	51	51⅛	51⅛	51⅛	51⅛	51
London	23⅛	23⅛	23⅛	23⅛	23⅛	23⅛
Sterling Ex.	4.8660	4.8645	4.8650	4.8650	4.8655	4.8660

New York quotations cents per ounce troy, fine silver. London, pence per ounce sterling silver 0.925 fine.

Export of silver from London to the East, Jan. 1 to Aug. 5, as reported by Messrs. Pixley & Abell:

	1908	1909	Changes
India	£ [illegible]	£ [illegible]	D. £ [illegible]
China	516,400	1,165,700	I. 949,300
Straits	[illegible]	82,900	D. 7,510
Total	£ 5,782,403	£5,329,100	D. £ 453,303

Receipts for the week, £[illegible] from Mexico and £[illegible] from New York, total £[illegible]. Exports, £[illegible] to China and £[illegible] to India, £[illegible] in all.

Copper, Tin, Lead and Zinc

Aug.	Copper. Lake, Cts. per lb.	Copper. Electrolytic, Cts. per lb.	Copper. London, £ per ton.	Tin. Cts. per lb.	Lead. New York, Cts. per lb.	Lead. St. Louis, Cts. per lb.	Zinc. St. Louis, Cts. per lb.
12	13¼@13½	13@13¼	60¼	29⅝@29¾	4.35@4.40	4.20@4.25	5.55@5.60
13	13¼@13½	13@13¼	59⅞	29¾@29⅞	4.37½@4.42½	4.25@4.27½	5.57½@5.62½
14	13¼@13½	13@13¼	....	29¾@29⅞	4.37½@4.42½	4.25@4.27½	5.60@5.65
16	13¼@13½	13@13¼	59⅞@30	29⅞@30	4.37½@4.42½	4.25@4.27½	5.62½@5.67½
17	13¼@13½	13@13⅛	59⅞@30	29⅞@30	4.37½@4.42½	4.25@4.27½	5.62½@5.67½
18	13¼@13½	13@13⅛	59⅞@30⅛	30@30⅛	4.37½@4.42½	4.25@4.27½	5.62½@5.67½

London quotations are per long ton (2240 lb.) standard copper. The New York quotations for electrolytic copper are for cakes, of the transactions made with consumers, ingots and wirebars, and represent the bulk basis, New York, cash. The price of cathodes is usually 0.125c. below that of electrolytic. The quotations for lead represent wholesale transactions in the open market. The quotations on spelter are for ordinary Western brands; special brands command a premium.

Copper—The market throughout the week has been relatively quiet. During the recent buying movement, consumers here and in Europe had supplied themselves liberally, and they are now disposed to await developments before entering into new commitments. The close is steady at 13¼@13½c. for Lake, 13@13⅛c. for electrolytic in cakes, wirebars or ingots, and the average for casting copper during the week is 12¾ to 13 cents.

Copper sheets are 17@18c., base for large lots. Full extras are charged, and higher prices for small quantities. Copper wire is 15c. base, carload lots at mill. Business is very fair.

After the excited buying of last week had been satisfied, the standard market in London settled down gradually, and closes lower at £59 12s. 6d. for spot, and £60 11s. 3d. for three months.

For refined and manufactured sorts we quote English tough, £63; best selected, £62@63; strong sheets, £74@76.

Statistics for the first half of August show an increase in the visible supply of 3000 tons.

Exports of copper from New York and Philadelphia for the week were 5239 long tons. Our special correspondent reports exports from Baltimore for the week at 1247 tons copper.

The Wolverine Mining Company reports the sale of 0,095,748 lb. of copper during the year ended June 30, 1909, at an average of 13.35c. The quotational average was 13.56c. for the same period.

Consumption of foreign copper in Germany, six months ended June 30, reported by Aron Hirsch & Sohn, Halberstadt: Imports, 84,001 tons; exports, 3913; apparent consumption, 76,148 tons, a decrease of 2042 tons.

Tin—Although consumers have continued in their policy not to cover beyond their near-by requirements, the bull faction in London has had no trouble in moving prices upward from day to day, and the market here has readily followed. At the close London stands £136 5s. for spot and £137 12s. 6d. for three months, while business locally is taking place at 30@30⅛ cents.

Visible stocks of tin on Aug. 1 are estimated by Ricard & Freiwald at 20,239 long tons, including 4953 tons in the United States. The total shows an increase over July 1 of 1850 tons.

Arrivals of Bolivian tin concentrates at Hamburg, Germany, in July are reported by Robertson & Bense as follows: Direct, 939 tons; by Liverpool, 352; other ports, 113; total, 1404 tons.

At the Banka auction in Amsterdam, July 29, about 2000 tons were sold at an average of 81 florins per pikul, equivalent to £134 17s. 6d. per long ton, or 29.3c. per pound.

Lead—The demand for this metal has increased from day to day and large transactions have taken place. The leading interests raised their price on Thursday last to 4.40c. New York, and outside sellers immediately followed suit. The close is firm at 4.25@4.27½c. St. Louis and 4.37½@4.42½c. New York.

In London prices have fluctuated erratically without showing any definite tendency. The close is undecided at £12 10s. for Spanish and £12 12s. 6d. for English lead.

Spelter—The market has again moved upward, under the same influences reported in previous weeks. The close is firm at 5.77½@5.82½c. New York and 5.62½@5.67½c. St. Louis.

New York quotations for spelter on Aug. 12 were 5.70@5.75c.; Aug. 13, 5.72½@5.77½c.; Aug. 14, 5.75@5.80c.; Aug. 16-18, inclusive, 5.77½@5.82½ cents.

The London market is unchanged at £22 for good ordinaries and £22 5s. for specials.

Base price of sheet zinc has been advanced ¼c., to 7½c. per lb., f.o.b. La Salle, Peru, Ill., less 8 per cent. discount.

Other Metals

Antimony—The market is gradually settling down, but business is rather of a retail character. Prices are a little unsettled still, but those generally quoted are 8½c. per lb. for Cookson's; 8¼c. for Hallett's, 8c. for U. S. and 7¾c. for outside brands.

Bismuth—No. 1 ingots can be had at 2.00@2.25 per lb. for large lots. The higher price is that asked by the American maker.

Quicksilver—New York prices are unchanged at $43.50@44 per flask of 75 lb. A fair business is being done in this

metal. San Francisco, $43@43.50 for domestic business, and $2 less for export orders. The London price is £8 5s. per flask, with £8 2s. 6d. quoted from second hands.

Nickel—Large lots, contract business, 40@45c. per lb. Retail, spot, from 50c. for 2000-lb. lots, up to 55c. for 500-lb. lots. The price for electrolytic is 5c. higher.

Magnesium—Quotations for this metal are $1.25 per lb., New York, in 100-lb. lots; for 5-lb. lots, $1.40 per pound.

Cadmium—Current quotations are 75c. per lb. in 100-lb. lots at Cleveland, Ohio. In Germany 450@475 marks per 100 kg., at factory in Silesia.

Zinc and Lead Ore Markets

Platteville, Wis., Aug. 14—The base price of 60 per cent. zinc ore was $45@48 per ton; no premium was paid. The base price of 80 per cent. lead ore was $56@57 per ton; the highest price paid was $58.50 per ton.

SHIPMENTS, WEEK ENDED AUG. 14.

Camps.	Zinc ore, lb.	Lead ore, lb.	Sulphur ore, lb.
Platteville	448,760	.....	333,770
Highland	445,890	.....	.....
Benton	370,760	80,500	.....
Hazel Green	240,000	80,000	.....
Harker	234,080	.....	.....
Linden	191,420	.....	.....
Cuba City	186,490	168,530	192,765
Rewey	119,500	.....	47,400
Galena	88,000	.....	.....
Mineral Point	85,000	.....	.....
Strawbridge	55,000	.....	.....
Total	2,462,810	329,030	573,935
Year to date	81,113,219	4,739,910	7,154,870

In addition to the above there was shipped to the American Zinc Ore Separating Company, 696,410 lb., and to the Joplin Separator Works, 197,300 lb. zinc ore.

Joplin, Mo., Aug. 14—The highest price paid for sulphide zinc ore was $52.50 per ton, the base ranging from $46 to $50.50 per ton of 60 per cent. zinc. Silicate zinc ore sold as high as $35 for 51 per cent. ore on a base of $27 per ton of 40 per cent. zinc, the base ranging down to $23. The average price, all grades, was $44.54. The highest price paid for lead ore was a base of $57 for 80 per cent. lead, with 83 per cent. lead selling at $60. The week-end demand was heavy at this figure, though most of the sales were made at prices ranging from $57 to $59. The average price, all grades, was $56.82 per ton.

Intense excitement prevailed in the zinc ore market. The fore part of the week was calm, and the storm broke slowly, beginning with an advance to a $48 base immediately after noon Thursday, reaching a $49.50 base by night, on 50c. advances, and Friday witnessed two more advances of 50c. each, the high base price at the week-end being $50.50, which was bid on a number of car-lots.

Zinc silicate prices reached a point where importations can be made at a profit compared with local prices, it is claimed by several smeltermen. It has touched a high point that is starting active prospecting in every silicate producing spot of the district, and in many of these locations it will be but a few weeks before the output of this ore can be increased a number of carloads each week.

As the price of zinc ore has inclined upward, mineowners who were previously selling lead and holding zinc, have reversed the order and all but two of the large bins of zinc ore have changed hands. Instead of a heavy stock of zinc, there is today perhaps the largest stock of lead ever held from the market. The week-end offerings have tended to transfer a large tonnage to the hands of the smelters, and this will be loaded out within the next two weeks.

SHIPMENTS, WEEK ENDED AUG. 14.

	Zinc, lb.	Lead, lb.	Value.
Webb City-Carterville	3,793,130	857,160	$113,566
Joplin	1,866,190	171,840	49,247
Duenweg	957,070	134,060	25,891
Miami	674,070	194,140	18,917
Galena	693,320	48,690	17,632
Prosperity	393,720	204,000	15,066
Badger	565,870	.....	13,298
Aurora	469,160	.....	8,067
Quapaw	253,490	52,040	7,034
Spurgeon	269,620	40,970	6,710
Jackson	149,370	86,000	6,142
Carthage	231,050	.....	5,776
Oronogo	256,930	34,500	5,730
Alba-Neck	226,020	.....	5,537
Granby	358,900	12,950	5,197
Sarcoxie	296,000	.....	4,440
Saginaw	134,170	.....	2,147
Cave Springs	82,790	.....	1,987
Zincite	82,260	.....	1,974
Stott City	70,380	.....	1,619
Peoria	60,390	.....	845
Totals	11,883,900	1,836,350	$316,822
33 weeks	373,282,280	56,257,140	$8,584,502

Zinc value, the week, $264,648; 33 weeks, $7,065,859
Lead value, the week, 52,174; 33 weeks, 1,518,643

MONTHLY AVERAGE PRICES.

Month.	Zinc Ore. Base Price. 1908.	1909.	Zinc Ore. All Ores. 1908.	1909.	Lead Ore. All Ores. 1908.	1909.
January	$37.60	$41.25	$35.56	$38.46	$46.88	$52.17
February	36.63	36.94	34.92	34.37	49.72	50.50
March	36.19	37.40	34.19	34.71	49.90	50.82
April	35.40	38.63	34.08	37.01	52.47	55.63
May	34.19	40.06	33.39	37.42	56.05	56.69
June	33.06	44.15	32.07	40.35	60.48	57.52
July	34.55	43.06	31.67	41.11	59.00	53.74
August	36.53	.....	33.42	.....	60.34	.....
September	37.63	.....	34.44	.....	54.59	.....
October	35.96	.....	33.28	.....	52.63	.....
November	39.13	.....	35.02	.....	54.53	.....
December	42.75	.....	39.63	.....	49.68	.....
Year	$36.52	.....	$34.31	.....	$53.93	.....

NOTE—Under zinc ore the first two columns give base prices for 60 per cent. zinc ore; the second two the average for all ores sold. Lead ore prices are the average for all ores sold.

Petroleum

June 16—Exports of mineral oils from the United States, seven months ended July 31, in gallons:

	1908.	1909.
Crude petroleum	55,498,746	71,302,786
Naphthas	20,545,914	42,620,966
Illuminating oils	657,171,537	595,991,394
Lubricating oils	82,240,088	81,429,108
Residuum	39,713,873	58,206,640
Total	855,170,158	850,150,888

Paraffin is included in lubricating oils.

The total decrease in exports this year was 5,019,270 gal., or 0.6 per cent.

Chemicals

New York, Aug. 18—Deliveries on contracts continue on a fair scale, and new business is looking up a little.

Copper Sulphate—Prices continue unchanged at $4.22½ per 100 lb. for carload lots and over; $4.32½@4.47½ per 100 lb. for smaller parcels. Business is not especially active.

Arsenic—The market has settled down to what may be considered a steady basis, the tariff agitation being over. Quotations are 2¾@2⅞c. per lb. for white arsenic, with good sales.

Nitrate of Soda—A good business is being done in nitrate at current prices which are unchanged at 2.12½c. per lb. for both spot and future positions.

Mining Stocks

New York, Aug. 18—The general stock market has been without any special tendency this week. It has been, if anything, inclined to reaction and to profit taking on small fluctuations. The fact seems to be that the recent advance failed to call in the outside public to any extent, and the market has remained largely in professional hands. Under these circumstances and the further condition that nothing really affecting stock values to any extent has occurred, some such situation was to be expected. It is not unlikely that matters may continue in a sort of suspended state for some little time.

On the Curb there was more activity, especially in the copper stocks, which were largely traded in, some of them at a fair advance. The motive or excuse for this was the large reduction in unsold stocks, shown by the July report of the Producers' Association.

The Nevada gold stocks on the Curb were moderately quiet, with only small fluctuations. Trading in these stocks seems to languish a little. The Cobalt stocks were fairly active. There seems to be a considerable bull interest in these stocks, and they are being pushed from several quarters.

The Standard Oil dividend for the third quarter of the year, declared this week, is $6, which is $3 less than the June payment, but is the same as in the third quarter of last year. The dividend declaration had no effect on the market.

Boston, Aug. 17—Mining stocks have had moderate reactions, although there is still a good degree of buoyancy manifest in certain specialties. The Lake group, particularly Lake Copper, continues in strong demand and the above mentioned is selling at its highest, $37.75, which represents an advantage of $5.25 in the week.

The present bugaboo in the mining-share

market is the continued accumulation of copper abroad. Money is easy in this city, 2½ per cent. being the call loan rate, and the public is disposed to take the long side of stocks. North Butte still acts peculiarly and has had a market range from $61 to $56.25, with the final tonight above $57. It is still believed that the stock is being accumulated by certain interests. Amalgamated, which touched $89, is off to $84.87½ tonight, following the New York list very closely. Superior touched $62 again, but is off to below $58. Utah Consolidated had a $3.50 rise to $48.50, but lost it, and Copper Range, after touching $85, fell back to $82.75: Parrot has been active up to $34.25 and U. S. Smelting common up to $57.12½, although both have had substantial reactions.

The news of the week included regular quarterly dividends of $1 each by the North Butte and the Quincy Mining Companies; assessments of $2 each by the Hancock and Michigan Mining companies and a $1 assessment by the Winona Copper Company. As a result of its ownership in Hancock, King Philip and Winona, the St. Mary's Mineral Land Company will be called upon to pay $124,747 assessment money during the next six months.

Curb trading has been animated and strong, while reactions have followed in the active stocks. Rhode Island Coal has risen over $2 to $9.50 on very active trading. New securities on the Curb are Yuma Copper, an Arizona proposition, and Champion Copper, also in Arizona.

STOCK QUOTATIONS

NEW YORK Aug. 18

Name of Comp.	Clg.
Alaska Mine	‡.11
Amalgamated	86⅛
Anaconda	49¼
Balaklala	‡2 1/16
British Col. Cop.	7¼
Buffalo Mines	3⅜
Butte Coalition	25⅞
Colonial Silver	5/16
Cum. Ely Mining	7¼
Davis-Daly	6 9/16
Dominion Cop.	7 1/16
Douglas Copper	2⅛
El Rayo	2¼
Florence	3 1/16
Foster Cobalt	‡.32
Furnace Creek	‡.05
Giroux	10
Gold Hill	½
Goldfield Con.	6¾
Granby	‡104½
Greene Gold	‡⅝
Greene G. & S.	‡9
Guanajuato	1¾
Guggenh. Exp.	215
Hanapah	‡15
Kerr Lake	[illegible]
McKinley-Dar.	[illegible]
Miami Copper	16⅜
[illegible]	[illegible]
[illegible]	[illegible]
Montezum. of C. R.	27
[illegible]	[illegible]
[illegible]	[illegible]
[illegible]	[illegible]
[illegible]	[illegible]
[illegible]	[illegible]
[illegible]	‡[illegible]
[illegible]	[illegible]
[illegible]	[illegible]
[illegible]	[illegible]
[illegible]	[illegible]
[illegible]	[illegible]
[illegible]	[illegible]
[illegible]	[illegible]

‡Last quotation.

BOSTON Aug. 18

Name of Comp.	Clg.
Adventure	7¼
Allouez	46
Am. Zinc	31⅜
Arcadian	4⅜
Arizona Com.	44¼
Atlantic	10⅞
Boston Con.	15⅜
Calumet & Ariz.	109
Calumet & Hecla	684
Centennial	35½
Copper Range	83
Daly-West	9
East Butte	11⅞
Franklin	16½
Greene—Can.	9⅞
Hancock	10¾
Isle Royal	28½
Keweenaw	3½
La Salle	14⅜
Mass	8
Michigan	‡10
Mohawk	‡64½
Nevada	24⅜
North Butte	57½
Ojibway	11¼
Old Colony	60
Old Dominion	57½
Osceola	145
Parrot	33⅝
Quincy	92
Rhode Island	‡4¼
Shannon	16⅛
Superior	58½
Superior & Bost.	16
Superior & Pitts.	17
Tamarack	70
Trinity	13½
U. S. Smg. & Ref.	55
U. S. Sm. & Re., pd.	52½
Utah Con.	45¼
Victoria	4½
Winona	6¼
Wolverine	150
Wyandotte	¾

‡Last quotation.

N. Y. INDUSTRIAL

Name of Comp.	Clg.
Am. Agri. Chem.	48¼
Am. Smelt. & Ref.	101⅞
Am. Sm. & Ref., pf	115
Colo. Fuel & Iron.	45½
Federal M. & S., pf.	91½
National Lead	92¼
National Lead, pf.	‡113¼
Pittsburg Coal	16¼
Republic I. & S.	38¾
Republic I. & S., pf.	105¾
Sloss-Sheffield	85½
Standard Oil	‡685
U. S. Steel	78
U. S. Steel, pf.	126⅛
Va. Car. Chem.	48

BOSTON CURB

Name of Comp.	Low.
Ahmeek	195
Chemung	15
Chino	7⅞
Corbin	7½
Globe Con.	4½
Gila	‡9
Ray Central	2¾
Ray Con.	19⅞
San Antonio	‡9½

Furnished by Hornblower & Weeks, N. Y.

ST. LOUIS Aug. 13

N. of Com.	High.	Low
Adams	.40	.30
Am. Nettie	.09	.07
Center Cr'k	1 80	1 70
Cent. C. & C.	83 00	81 00
C. C. & C. pf.	82.00	80 00
Cent. Oil	110 00	100 00
Columbia	9.00	7 00
Con. Coal	19 00	18 00
Doe Run	115 00	105 00
Gra. Bimet.	.30	.23
St. Joe	12 00	11.00

LONDON Aug. 18

Name of Com.	Clg.
Dolores	£1 5s 0d
Stratton's Ind.	0 3 3
Camp Bird	1 6 0
Esperanza	2 16 3
Tomboy	1 1 3
El Oro	1 5 9
Oroville	0 12 3

Cabled through Wm. P. Bonbright & Co., N. Y.

NEVADA STOCKS. Aug. 18.
Furnished by Weir Bros. & Co., New York.

Name of Comp.	Clg.
COMSTOCK STOCKS	
Belcher	.72
Best & Belcher	.49
Caledonia	.30
Chollar	.21
Comstock	.26
Con. Cal. & Va.	.80
Crown Point	.75
Exchequer	.25
Gould & Curry	.17
Hale & Norcross	.36
Mexican	.95
Ophir	1 22½
Overman	.30
Potosi	40
Savage	48
Sierra Nevada	38
Union	45
Utah	.05
Yellow Jacket	98
TONOPAH STOCKS	
Belmont	.88
Extension	.62
Golden Anchor	...
Jim Butler	.09
MacNamara	30
Midway	.20
Montana	.75
North Star	.02
Tono'h Mine of N.	6.87½
West End Con.	.31
GOLDFI'D STOCKS	
Adams	.01
Atlanta	.15
Blue Bell	.03
Booth	.12
C.O.D. Con.	.11
Columbia Mt.	.11
Comb. Frac.	.65
Con. Red Top	...
Cracker Jack	.01
Dia'dfield B. B. C.	.02
Goldfield Belmont	04
Goldfield Daisy	23½
Great Bend	07
Jumbo Extension	19
Kendall	02
Lone Star	.02
May Queen	.04
Oro	.07
Red Hill	07
Sandstorm	07

Name of Comp.	Clg.
Silver Pick	.17
St. Ives	.07
Triangle	.01
BULLFROG STOCKS	
Gibraltar	.02
Homestake King	...
Mont. Shoshone C.	2 18¾
Tramp Cons.	.04
MISCELLANEOUS	
Cumberland Ely	7.31
Giroux	10.00
Greenwa'r Copper	.04
Nevada Con.	24.50
Nevada Hills	.75
Nevada Smelting	1 00
Nevada Wonder	.35
Nevada-Utah	1 93¾
Penn-Wyoming	...
Pittsburgh S. Pk.	.45
Ray Central	2.81½
Ray Con.	20.25
Round Mt. Sphinx	08

COLO. SPRINGS Aug. 13

Name of Comp.	Clg.
Acacia	.08⅜
C. C. Con.	.03¼
Dante	.07⅛
Doctor	.11
Elkton	.75
El Paso	.64
Findlay	.11⅛
Gold Dollar	.13
Gold Sovereign	.04¼
Isabella	.24
Jack Pot	.10
Jennie Sample	07½
Jerry Johnson	.06¼
Lexington	.02
Mary McKinney	.50
Pharmacist	.03¾
Portland	78
U. G. M.	.07
Vindicator	.70
Work	‡06½

Assessments

Company.	Delinq.	Sale.	Amt.
Arcadian, Mich.	Sept 1	Sept 31	$0.50
Black Jack Con., Utah	Aug. 16	Sept 2	0.01
Boulder Cr'k M. & M., Wash.	Aug. 31	Sept 30	0.01
Columbus Ext., Utah	Aug. 14	Sept 4	0.01
Con. Virginia, Nev.	Aug 16	Sept 7	0.25
Copper Mt. M. & D., Ida.	Sept 7	Oct 4	0.003
Crown Point, Nev.	Aug. 21	Sept 17	0.10
East Buffalo, Ida.	Sept 10	Oct 10	[illegible]
Ely Con. Copper, Nev.	July 16	Aug 28	0.03
Exchequer, Nev.	Aug 16	Sept 14	0.05
Golden Winnie Tungsten [illegible]	Aug. 23	Sept. 15	0.001
Hypotheek M. & M., Ida.	Aug 26	Sept 25	0.005
Laclede, Ltd, Ida.	Aug 24	Sept 21	0.003
Lady Washington, Nev.	Aug 31	Sept 20	0.05
Massasoit, Utah	Aug 21	Sept 14	[illegible]
New Hope, Ida.	July 15	Sept 25	0.002
Pittsburg Con., Utah	Aug 20	Sept. 17	0.01
Seven Troughs Mon., Nev.	Aug 18	Sept 8	[illegible]
Springfield M. Co. Ltd., Ida.	Aug 13	Sept 13	0.002
Tarbox, Idaho	July 29	Aug 24	0.003
Utah Con. M. & M.	Aug 25	Sept 7	0.001

Monthly Average Prices of Metals

SILVER

Month.	New York.		London.	
	1908.	1909.	1908.	1909.
January	55.678	51.750	25.738	23.834
February	56.000	51.472	25.855	23.706
March	55.365	50.468	25.570	23.227
April	55.505	51.428	25.133	23.708
May	52.795	52.905	24.377	24.348
June	53.663	52.538	24.760	24.166
July	53.115	51.043	24.514	23.519
August	51.683	......	23.858	......
September	51.720	......	23.877	.....
October	51.431	......	23.725	...
November	49.647	......	22.933	......
December	48.766	......	22.493	.....
Total	52.864	......	24.402	......

New York, cents per fine ounce; London, pence per standard ounce.

COPPER

	NEW YORK.				LONDON.	
	Electrolytic		Lake.			
	1908.	1909.	1908.	1909.	1908.	1909.
January	13.726	13.893	13.901	14.280	[illegible]	[illegible]
February	12.905	12.949	13.098	13.295	58.786	61.198
March	12.704	12.387	12.875	12.826	58.761	56.231
April	12.743	12.56¼	12.928	12.93¾	58.331	57.363
May	12.598	12.893	12.788	13.238	57.387	[illegible]
June	12.675	13.214	12.877	13.548	57.842	59.627
July	12.702	12.880	12.933	13.363	57.989	58.556
August	13.462	......	13.639	......	[illegible]	......
September	13.388	......	13.600	.....	60.338	......
October	13.354	......	13.646	......	60.139	......
November	14.130	......	14.386	......	63.417	......
December	14.111	......	14.411	......	62.943	......
Year	13.208	......	13.424	......	59.902	......

New York, cents per pound. Electrolytic is for cakes, ingots or wirebars. London, pounds sterling, per long ton, standard copper.

TIN AT NEW YORK

Month.	1908.	1909.	Month.	1908.	1909.
January	27.380	28.060	July	29.207	29.125
February	28.978	28.290	August	[illegible]	......
March	30.577	28.727	September	28.815	......
April	31.702	29.445	October	29.444	......
May	30.015	29.225	November	[illegible]	......
June	28.024	[illegible]	December	29.154	......
			Av. Year	[illegible]	......

Prices are in cents per pound.

LEAD

Month.	New York.		St. Louis	London.	
	1908.	1909.	1909.	1908.	1909.
January	3.691	4.175	4.025	14.469	13.118
February	3.725	4.018	3.868	14.250	[illegible]
March	3.838	3.986	3.835	13.975	[illegible]
April	3.993	4.168	4.051	13.469	13.297
May	4.253	4.287	4.214	12.938	13.225
June	4.466	4.350	4.291	12.600	13.031
July	4.744	4.321	4.188	13.000	12.563
August	4.580	......	......	13.375	.....
September	4.515	......	......	13.125	......
October	4.351	......	......	13.375	......
November	4.330	......	......	13.538	......
December	4.213	......	......	13.156	......
Year	4.200	......	......	13.439	.....

New York and St. Louis, cents per pound. London, pounds sterling per long ton.

SPELTER

Month.	New York		St. Louis.		London.	
	1908.	1909.	1908.	1909.	1908.	1909.
January	4.513	5.141	4.363	4.991	20.563	[illegible]
February	4.788	4.889	4.638	4.739	20.875	[illegible]
March	4.665	4.757	4.527	4.607	21.075	[illegible]
April	4.645	4.965	4.495	4.815	21.344	21.531
May	4.608	5.124	4.458	4.974	19.906	21.975
June	4.543	5.402	4.393	5.252	19.000	[illegible]
July	4.485	5.402	4.338	5.252	19.031	21.969
August	4.702	...	4.556	.....	19.350	...
September	4.769	.....	4.619	......	19.563	...
October	4.801	.....	4.651	......	19.750	....
November	5.059	......	4.909	......	20.875	.....
December	5.137	......	4.987	......	20.625	.....
Year	4.726	......	4.578	......	20.163	.....

New York and St. Louis, cents per pound. London, pounds sterling per long ton.

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Copper Mines and Smelteries of Shasta County

Topography Favors Mining through Adit Levels; Cost of Mining $1.65 to $2.50 per Ton; Cost of Copper 8 to 10.25 Cents per Pound

BY GEORGE A. PACKARD*

Shasta county is one of the most northerly counties of California, being separated from Oregon by Siskiyou county. Redding, the county seat, is 260 miles north of San Francisco. The climate is agreeable, though the valleys are hot in summer. Except on the highest mountains there is little snowfall. The annual rainfall varies from 35 in. in the valley toward the south, to double that quantity in the mountains to the north. This precipitation takes place largely during the winter months; in January, 1909, it reached an abnormal monthly total of 40 in., 9 in. being recorded in one day at Kennett, where the mammoth smeltery is situated. This precipitation interfered seriously with transportation, even the old main line of the Southern Pacific railroad being operated only intermittently, while the newer lines from the mines to the smelteries were more seriously interfered with.

Water Power

To the north and east, on the high peaks of Mount Shasta and the Lassen buttes, this precipitation is in the form of snow and furnishes an all-the-year-round supply of water in the Pitt, McCloud and Sacramento rivers and their tributaries. This results in cheap power, which is developed and sold in the district by the Northern California Power Company and the Shasta Power Company. The plant of the former is of especial interest in that the power is derived from two small streams, each having a fall of 1200 ft. On a third stream a wheel now being installed to utilize a 525 ft. fall will develop 4000 kw., and below this on the same stream another wheel will develop 6000 kw. from a fall of 370 ft. Pelton and Doble wheels are used. C. F. Elwell[1] refers to the cost of this power to the Noble Electric Steel Company as $16 per kilowatt-year, but the power company is interested in the steel plant, and other plants are supposed to pay between $40 and $50 per horsepower-year.

Topography and Geology

From the stream fall mentioned it is easily seen that the topography, at least in certain parts of the district, is favorable to mining through adit levels; and this is especially the case with the mines to the west of the Sacramento river. East of this river, and as far north as the Pitt, the country is less deeply eroded

MAMMOTH MINE, KENNETT, CAL.

*Mining engineer and metallurgist, Wakefield, Mass.

[1] "Tests on Electric Smelting of Iron Ore," *Journ. Electricity, Power and Gas*, XXI, p. 331, 1908.

by streams. Nor has there been much mining east of Redding. In fact, looking at the "Map of the Mining Districts of the Western States," issued by the U. S. Geological Survey, one receives the impression that the entire zone of mining districts, if it may be so termed, has been faulted along an east and west line, in the vicinity of Redding, and transferred 10 miles west, from the Sierra Nevada to the Coast range.

The railroad from San Francisco traverses the Sacramento valley which, until Redding is left behind, is broad and level. Beyond Redding the valley rapidly narrows and on either side rise steep slopes covered with brush and oaks, which give place to pines near the summits. The copper mines occur in these mountains in two wide irregular areas of granite porphyry, one on each side of the Sacramento river. These areas are separated by eight miles or more of sedimentary and igneous rocks. The Redding quadrangle presents an interesting section across several thousand feet of Devonian, Carboniferous, Triassic and Jurassic sedimentaries, made up of slates, shales, sandstones, limestones and tuffs, with interbedded and intruded igneous rocks. The whole series has been uplifted, sheared, faulted, and compressed, and shows in general a sharp dip to the northeast.

An accompanying section gives an idea of the geological conditions along an east and west line, the geology of this quadrangle having been mapped by Dr. J. S. Diller[1] of the sedimentary forma-

[1] Redding, Folio No. 148, U. S. Geological Survey.

tions shown, the Kennett has been assigned to the Devonian and the others to the Carboniferous. Overlying the Bully hill granite porphyry, and not shown in the figure, is the Pitt shale of the Triassic period. In this folio the crushed granite porphyries containing the copper ores have been considered as rhyolite flows of different periods, and Dr. Diller assigns the Bully hill rhyolite to the Triassic, while most of the porphyry west of the Sacramento river, termed Balaklala rhyolite, he considers Devonian, though he states that some of the dike-like masses west of Copley may belong to the Triassic. Basil Prescott, who has made a study of the region between the Sacramento river and Bully hill, apparently agrees with Dr. Diller in so far as this eastern area is concerned[2].

Dr. L. C. Graton, in describing these deposits briefly, says[4]: "The orebodies are invariably associated with intrusive stocks of quartz monzonite porphyry, although the ore in some places extends out into adjoining rocks." In much of this rock the quartz phenocrysts are so prominent, and the ground mass is so compact, that rhyolite would appear to be the natural field term; but doubtless microscopic study has shown that the rock is more properly termed a granite porphyry, and is an intrusion rather than a flow, since this name is preferred by those who have given the most attention to the geology recently.

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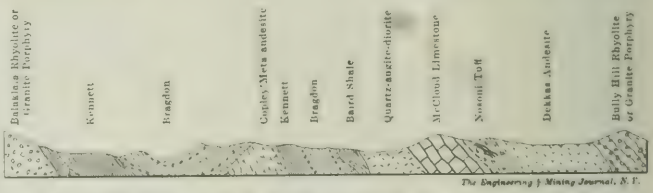
SKETCH MAP OF PORTION OF SHASTA COUNTY, CAL.



The Engineering & Mining Journal, N.Y.

EAST AND WEST SECTION ACROSS PORTION OF REDDING QUADRANGLE (AFTER DILLER)

Ores

The copper ores and associated minerals are only the same in part, in the two areas, while the structural character of the ore deposits is also somewhat dissimilar, tending to the conclusion that the ore deposits were not formed simultaneously; or, if the copper minerals were originally deposited under similar conditions in both areas, subsequent conditions have been dissimilar. The ore occurs in zones of crushing and shearing in the granite porphyry, and locally in adjoining shales on the west side of the Sacramento, and in an intruded basalt on the east. The occurrence in the eastern area is so different that it will be described by itself later.

From the relative location of the orebodies it is evident that the porphyry in which they occur has, in the western area, been faulted to a considerable extent since they were formed. This is well shown in the section marked "E-F" in the annual report of the Balaklala Consolidated Copper Company for 1908, reproduced in the JOURNAL of March 6, 1909, p. 503. On a line from south to north the Weil, Windy creek, and Bull orebodies are shown, each below the preceding. If this section were continued it would show, perhaps 1000 ft. further north and considerably lower, the orebodies of the Shasta King mine. Squaw Creek, between the Balaklala and the Shasta King, apparently follows an east-west fault line, and N. R. Bishop of the Balaklala states that nearly every gulch on the surface is indicated underground by a fissure or fracture, though not necessarily a fault, and that near the north and south fissures the orebodies become larger and better.

The ores on the west side of the Sacramento are a mixture of pyrite, sphalerite and chalcopyrite, in which the

[2] "Magnetite Ores of Shasta County, California," *Economic Geology*, III, p. 405, 1908.

[4] "Mineral Resources of the United States," 1906, p. 392.

pyrite largely predominates. Some chalcocite and covellite are found and the ore carries varying, but rather small, quantities of gold and silver. It is evidently a replacement of the granite porphyry. In the Mammoth and the Iron Mountain mine of the Mountain Copper Company, this replacement has gone so far that much of the ore mined and sent to the blast furnaces contains as high as 40 per cent. sulphur and only from 5 per cent. to 12 per cent. insoluble silicious residue. The Balaklala also has large bodies of similar ore, though the general average of the ore at this mine is lower in iron and sulphur, and bands of rock high in silica occur.

The orebodies themselves have been compared by A. S. Haskell, the manager of the Mammoth, to a series of overlapping lenses of irregular size and shape, separated by tongues of less mineralized porphyry.

These orebodies are closely associated with well-defined fracture planes having various strikes within the shear zone. They contain from a few, to many thousand, tons of ore. In general the orebodies are roughly tabular in form, with a low dip to the west in the Mammoth and Balaklala. They are commonly bounded by well-defined fissures, frequently marked by a clay gouge, though sometimes the mineralization appears to

Naturally in a region where the temperature reaches 100 deg. in the shade, and the rainfall is 65 in. per annum, such heavy sulphide ores, where exposed, have been oxidized and leached, resulting in large areas of gossan on the surface, and zones of secondary enrichment below. The most prominent of these outcrops is that at the Iron Mountain mine, where the gossan has an extent of several hundred feet. Dr. Graton[6] refers to the zone of secondary enrichment underlying this gossan as having been wonderfully productive of copper and silver at Iron Mountain and Bully hill, but now about exhausted, and practically absent in the other mines. The thickness of

LIME QUARRY, MAMMOTH COPPER MINING COMPANY, KENNETH, CAL.

GRAVITY TRAMWAY, 64 PER CENT. GRADE, MAMMOTH MINE, KENNETT, CAL.

Near the fissure planes the silicification and alteration of the granite porphyry frequently obscures the porphyritic appearance. Even in the sulphides, however, "The presence of crystalline quartzphenocrysts from the rhyolite" may be shown by dissolving the ore.[5] Not all the porphyry within the shear zone has been replaced by sulphides or silica and small patches which have escaped impregnation sometimes occur between seams in the solid sulphide ore.

fade off into the porphyry beyond the fissure bounding the solid ore. As a result of these sharply defined limits it is possible to determine ore reserves with considerable exactness. Thus, James D. Hague, in his report made at the time of the organization of the Mountain Copper Company, said: "The orebody has been developed with unusual thoroughness and its actual dimensions are known beyond doubt." Similarly, the Balaklala company has today one orebody roughly 1000 x 300 x 50 ft. in a block which is perhaps delimited on four sides by fault planes.

the ore deposits west of the Sacramento varies in the different localities. Weed says that the Iron Mountain has been worked to a depth of 600 ft. The present estimate for one point in the Balaklala is less than 50 feet

These flat orebodies west of the Sacramento lend themselves excellently to prospecting with drills, and one company alone has done many miles of this work. From the fact that some of the managers speak of "acres of ore" it may be pre-

[5] "The Copper Mines of Shasta County, California." D. F. Campbell. *Min. and Sci. Press* Jan. 5, 1907, p. 28.

[6] "Mineral Resources of the United States." 1906, p. 36.

[7] "Copper Mines of the World." p. 302.

sumed that this drilling has not been unsatisfactory.

Bully Hill District

East of the Sacramento river the orebodies have more of the nature of veins and are nearly vertical. I did not visit the Afterthought district, but understand the occurrence there is similar to that at the Bully hill, with perhaps more zinc. In the Bully hill district the ore occurs in a shear zone on a contact of the granite porphyry with a later basaltic rock, and in parallel shear zones, in both the basalt and the granite porphyry, but more especially in the basalt. The latter orebodies are of higher grade, and also carry silver, which is absent in the orebodies in the porphyry. Pyrite, which is so prominent west of the Sacramento, is less noticeable here.

The copper occurs not only as chalcopyrite but also as bornite and chalcocite, mixed with a large amount of sphalerite and some galena. More or less barite occurs, which carries up to three ounces of gold. Native silver is also found occasionally in the barite, and the galena carries both gold and silver. No gold is found with the blende. From the above it may readily be seen that east of the Sacramento, there is no definite ratio of gold and silver content to copper. Apparently secondary enrichment has played a much more important part here than west of the Sacramento, and the high-grade ores continue to greater depths. Compared with the western area the orebodies are much smaller. I should say 25 ft. was the thickest orebody I saw.

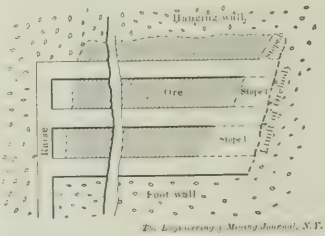
Genesis of Orebodies of Shasta County

The genesis of the Shasta county orebodies has been discussed by William Forstner[8], who reasons that since "No intrusives have been ascertained in the Balaklala rhyolite, the copper in the solution must then either have been derived from underlying formations, or have been leached out of the rhyolite." In view of the presence of basic intrusives in the Bully hill area he offers the hypothesis that a magmatic differentiation has taken place, and the basic material, intruded in the Bully hill porphyry, but perhaps underlying the Balaklala porphyry, has supplied the copper to the ascending solutions. I believe recent investigations have indicated the presence of large dikes in the Balaklala area, and as a detailed examination of this district is now being made by the U. S. Geological Survey we may expect to have a more complete statement of the geological conditions.

According to the Government report[9] the production of Shasta county for 1907, during which year the Balaklala and Bully hill smelteries were not in operation, included 288,578 tons of copper ores which yielded 23,457,417 lb. of copper, or an average of 4.06 per cent. These ores are also credited with 13,208 oz. of gold and 518,791 oz. of silver, or an average of 0.045 oz. gold and 1.7 oz. silver per ton, but this includes the precious metals derived from the silicious fluxes.

The Iron Mountain Mine

The oldest of the large copper mines is the Iron Mountain mine which is now owned by the Mountain Copper Company. It was exploited in 1880 as a large silver mine and in 1884 was equipped with 20 stamps and a pan mill for amalgamating the gold and silver contained in the gossan. Since 1895 it has been owned by English interests and worked for copper. The early reports show that the ore below the gossan averaged about 7 per cent. In 1907, according to D. F. Campbell[10], the ore averaged 6 per cent. copper, $1 in gold, 1½ oz. silver, and 48 per cent. sulphur. The original orebody as reported by Hague is now pretty well worked out. The company, however, owns much additional ground and has several million tons developed in the Hornet claim. While this ore does not average as well in copper as that in the Iron Mountain, it is high in sulphur. The mines are opened by tunnels from which an electric road delivers the ore to the bins above the narrow-gage steam road owned by the company and connecting with the Southern Pacific.



PROPOSED METHOD OF MINING AT BALAKLALA MINE

Mr. Campbell describes the method of mining[11] as a slicing system in which the mine is divided into pillars 50 ft. square. These pillars are robbed by horizontal slices one set wide, 10 ft. thick, and the openings are timbered and filled, no opening more than two sets wide being allowed to exist at one time. To lessen the danger of damage by fire from which the mine has suffered in the past, a pillar is left standing across the entire orebody, separating the two end stopes. The cost of mining is said to be $1.50 per ton.

Smelteries of the Mountain Copper Company

The Mountain Copper Company owns two smelting plants, one near the mines at Keswick, and one at Martinez on San Francisco bay, built after litigation on account of fumes had closed the Keswick plant. Recently the litigation has been settled and it is announced that the Keswick plant may be started again. When I first visited this district nine years ago the ore was roasted in heaps and smelted in cupolas. Subsequently pyritic smelting with the use of a hot blast, from stoves heated with oil, was developed. The ore reserves now contain less copper than the ores formerly worked, and the resourceful management, which has successfully fought strikes, fires and litigation, has developed a scheme for utilizing the high sulphur content in making sulphuric acid and fertilizers. The ore is roasted in furnaces of the MacDougal type. The matte is converted and the copper refined at the Martinez plant. A foundry is operated at Keswick, which also makes castings for neighboring mines.

Balaklala Consolidated Copper Company

The Balaklala group, situated about four miles northeast of the property of the Mountain Copper Company, comprises 1150 acres, besides a smelter site, the townsite of Coram and the tramway right of way. The property is operated by the Balaklala Consolidated Copper Company, the stock of which is owned by the First National company. The first discovery of ore was made where the sulphides outcrop in the creek, and there is little gossan here. Another similar outcrop is now being developed on a creek further east. The property has been prospected with drills, and is opened by a number of tunnels, which have exposed four orebodies, or portions of the same orebody separated by faulting. In one place a block of ore has apparently been thrown downward below the ore on the south, east and west sides. The greatest thickness of these orebodies is about 60 ft. Plans and sections are shown in the 1908 report[12].

The reports of the company show something over one million tons of ore averaging 2½ per cent. copper, 50c. in gold, and 0.8 oz. silver, actually blocked out, with much more than this indicated

[8] Min. and Sci. Press, May 18, 1907, p. 625; "Copper in Shasta County, Cal." and Aug. [illegible] "The Genesis of the Copper Ores in Shasta County West of the Sacramento River."

[9] "Mineral Resources of the United States," Part I., 1907, p. 222.

[10] Min. and Sci. Press, Jan. 5, 1907, p. 28.

[11] Min. and Sci. Press, Jan. 12, 1907, p. 55.

[12] Eng. and Min. Jour., May 6, 1909, p. 501.

from prospecting already done, and a considerable area not tested. The Balaklala ore differs from the ore of the Mountain Copper and Mammoth companies in that it averages nearly 30 per cent. silica. As the mine has large bodies of both high iron and high silica ores, it should be possible to secure any desired smelting mixture without purchasing fluxes other than lime. The upper orebody is quarried on the surface and delivered to the Weil tunnel, as is also the ore mined through the Windy Camp tunnel, connection having been made through a 240 ft. raise. The Weil tunnel is the main working tunnel, and from it the ore is delivered to the mine ore bins by five-car trains drawn by electric locomotives. The Bull orebody lies below the level of the Weil tunnel.

At the time of my visit mining operations had not progressed sufficiently to permit an inspection of the mining method which is proposed, as all of the ore at that time came from preparatory work. Manager Bishop has run tunnels below the orebodies, upraising at intervals in the country rock near the edge of the orebody, and from these raises he proposes driving a series of drifts, one about 15 ft. above the other, across the orebody to its farthest limit, the number of drifts depending on the thickness of the deposit. A modified slicing system of mining will then be used, the ore being mined back from the face a little faster in each drift than in the one above, as shown in an accompanying sketch.

At the same time the ore will be cut out on each side until connections are made with the slice being removed from the next series of drifts. All ore will be trammed through the lowest drift. The ore and the roof are both hard and stand well. The ore is delivered from the mine bins to the smelter by a wire-rope tramway, built in two sections and having a 1½-in. cable for loaded and 1¼-in. for returning buckets, with a 1-in. traction rope. The buckets hold 1500 lb. and as the grade is heavy great care is necessary in controlling the speed. Ultimately it is hoped to operate at 500 ft. per min. The length is about three miles.

MAMMOTH SMELTERY, KENNETT, CAL.

The Smeltery

The Balaklala smeltery, at Coram, on the Southern Pacific railroad, was described in the Journal of March 6, 1909. Briefly, it consists of four MacDougal roasters, three blast furnaces, one reverberatory and two converter stands. Up to January but a small portion of the plant had been put in commission, only one furnace being in operation most of the time. The ore treated in 1908 amounted to 15,960 tons, from the Balaklala mine, having an average content of 2.53 per cent. copper, 0.016 oz. gold and 0.71 oz. silver.

The Balaklala smeltery also receives the ore from the Shasta King mine of the Trinity Copper Company, adjoining this property on the north. The Shasta King is opened up by tunnels several hundred feet below the level of the Balaklala, and on the opposite side of Squaw creek. The ore is hoisted up an incline track 850 ft. long, and with nearly 45 deg. slope, to bins beside the mine ore bins of the Balaklala, from which it is delivered to the smeltery over the Balaklala tramway. At the time of my visit 200 tons per day were being treated. The Balaklala report shows that 7286 tons of this ore treated in 1908 averaged 2.78 per cent. copper, 0.032 oz. gold and 1.02 oz. silver per ton, which is about $1.10 better than the Balaklala average for the same period.

Mammoth Copper Mining Company

The Mammoth Copper Mining Company is a subsidiary company of the United States Smelting, Refining and Mining Company. Its mining property, over 1000 acres, lies about three miles northeast of the Balaklala. The workings from which ore has been mined extend vertically to a depth of about 100 ft. from the surface. The ore now being mined does not come from below a gossan outcrop of prominence, and there is little secondary enrichment. It averages about 4½ per cent. copper, 80c. gold and 2 oz. silver, or 2c. in precious metals for each pound of copper. It contains up to 12 per

cent. insoluble, about 40 per cent. sulphur, and an average of 4 per cent. zinc.

The ore is mined by a sheing and caving system. An interesting method of firing the caving holes by electricity, using a current in parallel, has been developed so that 400 holes may be fired together satisfactorily; though at present the roof is caved twice a week and a smaller number of holes required. Formerly this was done by hand, and 70 to 80 men used. Four hundred men are employed in the mine and a product of three tons per man per day obtained. The mine is operated through tunnels, all of the ore being delivered to the lowest, from which it is hauled over an electric road about one mile to the head of a gravity tram. This tram is 4500 ft. long, with a drop of 1500 ft. The ore is delivered to a standard-gage railroad, over which it is hauled two miles to the smeltery bins. Fines amounting to about 100 tons per day, and carrying over 40 per cent. sulphur, are screened out and shipped to the Peyton Chemical Company, where they are used for acid making and the residue smelted.

Mammoth Smeltery

The Mammoth smeltery is situated at Kennett. A complete description has been given by the manager, A. S. Haskell.[1] There are five blast furnaces, each 180 in. long. Three are 50 in., one is 58, and one 56 in. wide, all having been increased from the original width of 42 in. The increase to 56 in. gave an additional capacity of nearly 20 per cent., more than below the percentage increase in width. There are 16 tuyeres on the front and 18 on the back, each 3½ in. in diameter. A cold blast with 42 oz. pressure is used, and coke equal to about 4 per cent. of the charge. Coke is bought from Washington, Utah, Australia, Scotland, Germany and rarely from Pennsylvania, the place depending on the market conditions.

The ore is too zinky to permit of smelting with hot blast and practically no coke, as was formerly done at the Mountain Copper Company plant. The furnaces formerly had brick tops which gave much trouble on account of zinc incrustations, but water-jacketed tops have now been adopted and the difficulty has disappeared. The furnaces are run with a 9-ft. ore column and rather hot top. One furnace was being rebuilt at the time of my visit; the other four were handling 1000 tons of raw sulphide ore per day, two running on raw ore alone, making low-grade matte, and two running on raw ore and low-grade matte, making a converter matte.

The first matte runs from 20 per cent. to 25 per cent. copper and the second from 35 per cent. to 40 per cent. The slag carries 42 to 46 per cent. FeO, 35 to 40 per cent. SiO_2, and 8 to 12 per cent. CaO. There are two converter stands. The fluedust and fines are briquetted, no reverberatory being used. The ore received at the smeltery includes coarse ore, and some fines, from the company's mines, silicious gold ore from Quartz Hill, some custom ores, and the Bully Hill matte. The custom ores sometimes include ores from Nevada and Utah. The company has a lease on the Quartz Hill, a big low-grade gold quartz mine, and has built a narrow-gage railroad connecting it with the Southern Pacific. Lime is bought from the Holt and Gregg lime quarry although the company has purchased lime lands of its own.

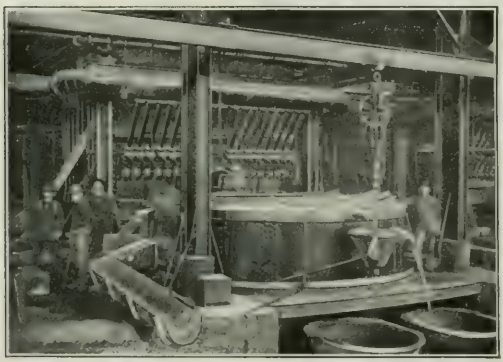
Bully Hill Copper Mining and Smelting Company

The property of the Bully Hill Copper Mining and Smelting Company is situated in the porphyry area east of the Sacramento river, and about 14 miles east of the Mammoth. It comprises over 200 acres, and includes the Bully Hill, Rising Star and Copper City mines. In January there was little doing at the last property. These orebodies being nearly vertical offer less opportunity for exploitation by drilling than do the flat bodies west of the Sacramento, but there are fair reserves in the former two properties.

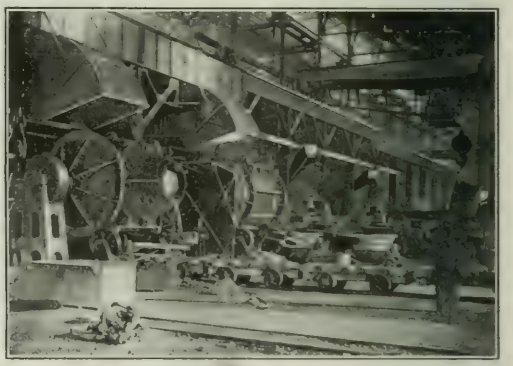
The gulches below these properties were productive placers in the '50s and later a stamp mill was erected in which the surface ores were treated. J. R. DeLamar bought the property in 1899 and equipped it with a smelting plant. Later he turned it over to the General Electric people. By them it was developed until the ore in sight justified the construction of a railroad 15 miles long, connecting with the Southern Pacific. During the construction, for a period of two years, the property was practically closed down.

The Bully Hill mine has a shaft down to a depth of 970 ft., and the Rising Star to 800 ft. below the surface. Both are equipped with electrical hoists having a capacity of 1000 tons per day. The pump at the Bully Hill, a quintuplex with brass parts, pumping through a lead-lined iron pipe, was operating in January from two to four hours per shift, or about nine hours per day, equivalent to 20 gal. per min. In summer there is little water to pump. Copper is precipitated from the mine water here, and also at some other mines of the district.

The orebodies appear to be lens shaped, and arranged somewhat like the steps of a step ladder. At the surface there is not a large amount of gossan, and this is much more silicious than at the Iron Mountain. Secondary enrichment, however, has resulted in higher-grade ores than west of the Sacramento, and copper, gold and silver ore aggregating $100 per ton is sometimes encountered. At the lowest level of the Bully Hill, 970 ft. down, is a stope 20 ft. wide showing much chalcocite and high in silver. The



NO. 4 FURNACE, MAMMOTH SMELTERY, KENNETT, CAL.



CONVERTER POURING COPPER; PART OF MAMMOTH SMELTERY

[1] "Copper Smelting at Mammoth Plant," Engineering and Mining Journal, March 13, 1909, p. 592.

appearance of the ore, with the excess of zinc, lead and dark copper sulphides, is widely different from that west of the Sacramento.

By prospecting along the shear zone, new orebodies, which do not reach the surface, are encountered. These zones are much crushed and the mine is timbered with 10x10-in. square sets which are promptly filled with waste. Samples are taken at close intervals and much sorting is done, the rock too low to pay being left underground. The mine openings are irregular. As a result of the heavy ground and the handling of the ore the mining costs must be large. The Bully Hill was producing somewhat less, and the Rising Star somewhat more, than two tons per man employed underground, but more development was being done at the Bully Hill. On account of the long period of inactivity, conditions underground are undoubtedly worse at present than they will be later.

Ore Handling and Smelting

At the Bully Hill the ore is hoisted to the 320-ft. level and trammed through a tunnel 1000 ft. long to bins from which, and from the Rising Star, it is hauled over a narrow-gage road to the smelter bins. The Copper City mine is on the new broad-gage railroad. The fines are screened out and go to two MacDougal roasters, each handling 30 tons per day. They are provided with oil jets which are used occasionally from one half to one hour when roasting ore from the Bully Hill mine. That from the Rising Star contains more sulphur. The roasted fines and the flue dust go to a reverberatory 16x35 ft. A five-ton charge, mixed with lime when necessary, is delivered from two hoppers every two hours. Three oil jets connected with ½-in. oil, and ½-in. steam pipes supply fuel.

It is found that the sides of the furnace are cut out more rapidly by the slag when oil fuel is used than was the case with coal. The gases from the reverberatory go to a U-type stove in which the air for the blast furnace is heated. The blast furnace is 42x200 in. with 15 tuyeres on each side. To permit varying the air supply these are made 5 in. in diameter and bushed down. Formerly a 3½-in. opening was used, but this has been increased to 4 in. The blast pressure is 35 oz. and the hight of the ore column 8 ft, The furnace smelts about 350 tons of ore per day.

In January hand feeding had temporarily replaced the dumping of cars directly into the furnace. As a result it was necessary to run down and bar off crusts only once in three or four shifts, in place of barring down once each shift as in the past. The ore contains much zinc and at times the crusts have nearly closed the furnace, while with the new method they are small. The furnace top is an air-cooled jacket.

The ore carries an average of 20 per cent. sulphur, 23 per cent. silica and 4 per cent. copper. Manager Keating states that charges have been run containing as high as 27 per cent. BaO and 12 per cent. Al_2O_3 or 16 per cent. Zn. Iron gossan bought from the Mountain Copper Company is occasionally added. A common slag carries 36 per cent. SiO_2, 21 per cent. FeO, 9 per cent. CaO, 8 per cent. BaO, 12 per cent. Al_2O_3, and 8 per cent. Zn. The matte, which carries about 37 per cent. copper, goes to the Mammoth smeltery for converting. The management is certainly entitled to credit for solving such a difficult smelting problem as this ore furnishes.

Costs

The cost of living in Shasta county is lower than in many mining camps of the West, and underground labor is generally paid about 25c. per day less than in Montana and Colorado camps. The mines have the advantage of comparatively cheap power, and in many cases of mining through tunnels. Coke is not the best and is more expensive than in some districts, but it forms an unusually small percentage of the charge.

The Balaklala is the only one of these properties publishing costs, and this company has not yet reached a point where conditions are normal. For the short time in operation in 1908 the figures are $2.424 for mining, $0.304 for tramming, and $2.924 for smelting. They expect to mine at a cost of $2 per ton, to reduce to matte for $2.50 per ton of ore smelted, and to convert at 0.75c. per pound of copper. Accepting these figures, and adding 15c. for delivering the ore from mine to smelter, if the Balaklala ore yields 50 lb. of copper to the ton, we have a cost of 4.3c. per lb. of copper for mining and ore transportation, and 5.75c. for smelting and converting, or a total of 10.05c. per lb. of copper converted. To this must be added the cost of freight, refining and marketing. This can hardly be less than 2c. per lb. Crediting the copper with the value of the precious metals in the ore, about 1.75c. per lb. of copper, the cost of Balaklala copper will approximate 10.25c. per pound.

At the Mammoth the mining cost, including exploration, development and administration, is $1.65, and transportation of ore to the smelter costs 20c., or a total of $1.85 per ton. With a recovery of 80 lb. of copper per ton, this gives a cost of 2.3c. per lb., or a decrease of 2c. per lb., as compared with Balaklala, on mining and transportation alone. As the ore carries precious metals exceeding 2c. per lb. of copper, as compared with 1.75c. for Balaklala, an additional credit of 0.25c per lb. is obtainable here; so that assuming other costs to be the same as Balaklala's, Mammoth copper would cost 8c. per lb. With its excellent management of longer experience, its ore of higher grade, its leased gold quartz mine and the connection with other large enterprises, Mammoth doubtless does better than this.

Bully Hill, with its complex ores and smaller production, must have higher costs, but these are perhaps offset by the higher content of gold and silver in the ore. The Mountain Copper Company, with the manufacture of acid and fertilizer, has become an industrial concern, no longer dependent upon the price of copper for its profits.

The Oak Creek section of the Yampa coalfield, on the Moffat road, in Colorado, has now four shipping mines: the Oak Hills company, fully equipped, preparatory to a 2000-ton per diem production; the James seam of the Prentice company, and the MacKinlay mine adjoining, both extensively opened but not yet fully equipped as to surface improvements; and the Juniper company, F. A. Craise, manager, also undergoing extensive underground development. This Routt county coal is being supplied to the Moffat road for locomotives, and is also for sale in Denver for domestic use, coming into competition with northern and southern coals, an important feature in the fuel supply of the inhabitants of Denver, and the State generally.

High prices for charcoal iron about 40 years ago are shown in an extract from the books of Jefferson furnace in the Hanging Rock district of Ohio, given by the Cleveland *Iron Trade Review*. These prices for 16 years were as follows:

Year.	Low.	High.	Year.	Low.	High.
1860....	$27.00	$32.00	1868...	$54.00	$57.00
1861....	24.00	32.00	1869...	54.00	61.00
1862....	27.00	31.50	1870...	52.00	56.00
1863....	31.00	52.00	1871...	50.00	58.00
1864....	52.00	75.00	1872...	58.00	60.00
1865....	57.00	85.00	1873...	57.00	60.00
1866....	61.50	68.00	1874...	53.00	61.00
1867....	57.00	64.00	1875...	.....	50.00

It must be remembered that these prices were in currency, in a period when gold was at a premium varying from 25 to over 100 per cent.

An article by Henry E. Birkenbine in the Cleveland *Iron Trade Review* calls attention to the fact, which few people now recall, that for over 30 years—1830 to 1873—iron was produced in the southern part of Illinois. At that time two blast furnaces were active in Hardin county, Ill., producing pig iron from local ores smelted with charcoal, and the ruins of these plants are still in existence. The ores used were carbonates and brown hematites which were found in a coal-bearing area

The Treatment of Steel in Electric Furnaces

Superiority of Electric Furnaces Largely Due to Freedom of Product from Oxide, Suspended Slag and Perhaps Hydrogen and Nitrogen

BY HENRY M. HOWE*

In an admirable article in the *Revue de Metallurgie*,[1] C. Clausel de Coussergues describes and discusses at great length and in a most interesting way the treatment of steel in electric furnaces. In taking his paper as a peg whereon to hang a sermon my purpose is not so much to compare the various electric furnaces as to consider with him the bearing of the phenomena noted in these furnaces on our general ideas about the purification of iron, i.e., the removal of carbon, phosphorus, and sulphur, whether in the bessemer converter or the open hearth or electric furnace. In beginning, it may be well to point out that the processes carried out in these electric furnaces are not really electric processes. Electricity is used in them solely as a source of heat, and the purification is brought about by the same old means to the use of which in the puddling, bessemer, open-hearth, and blast-furnace processes we have so long been accustomed. That is to say, carbon, silicon, and phosphorus are removed chiefly by oxidizing them to carbonic oxide, silica, and phosphoric acid, by means of iron oxide either formed in the process itself with atmospheric oxygen, as in both the bessemer and open-hearth processes, or added in the form of iron ore as in the open-hearth and puddling processes. The sulphur is removed in part as sulphide of manganese, which distributes itself between metal and slag, quite as in the puddling, basic bessemer, and basic open-hearth processes, and partly as sulphide of calcium which passes apparently wholly into the slag, quite as in the blast furnace.

But though electricity is here used solely as a source of heat, it has the great advantage over other sources of heat that it can supply its heat without simultaneously introducing oxygen. In the bessemer process the blast which generates the heat acts essentially through introducing vast quantities of oxygen. The flame which supplies the heat to the puddling and open-hearth processes brings with it much oxygen, and even when it is called reducing it is in fact violently oxidizing to iron and most of the non-ferrous elements which it contains. In the last analysis this freedom from oxygen seems to be the chief if not the only thing that gives the electric furnaces their advantage over others, as we shall see later.

The obstacle to the wide use of electric furnaces in iron metallurgy is the great cost of the electricity itself. It is true that these furnaces do their work of heating and melting much more cheaply than the crucible furnace does, but still they do it much less cheaply than the blast furnace, the cupola furnace, the bessemer converter, or the open-hearth furnace, and this will be the case in general until the exhaustion of our coalfields shall have greatly increased the cost of coal. In case where power is to be had at a small cost, for instance, near the coke ovens of great metallurgical works, it may indeed be possible to heat and melt with electricity more cheaply than with coal; but even in these cases it will probably be more profitable to use the power as a basis for some other industry, and to continue to use the blast furnace, cupola, converter, and open-hearth furnace for decades if not for generations to come.

That so costly a thing as electricity should compete with so cheap and efficient a thing as the iron blast furnace for the smelting of iron ores seems hardly to be on the cards. It might have been possible 50 years ago, before coke could be carried so cheaply to almost every place where it is needed; but it is hard to think of conditions such as to make it cheaper today to use current than coke. In places so remote and inaccessible that coke cannot be brought to them, one fears that this very inaccessibility and costliness of inward freight must imply such corresponding costliness of outward freight that the iron smelted from ore by means of electricity cannot be exported with profit.

Thus the natural work of the electric furnace is to replace the crucible furnace and to supplement the work of the converter and open-hearth furnace.

What the Electric Furnaces Are

Electric furnaces may be regarded as large internally heated crucibles, or, if I may use the hibernianism, as closed open-hearth furnaces with the flame replaced

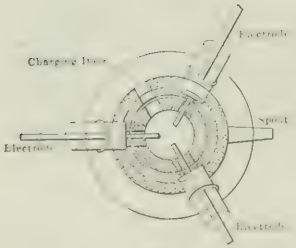


FIG. 1

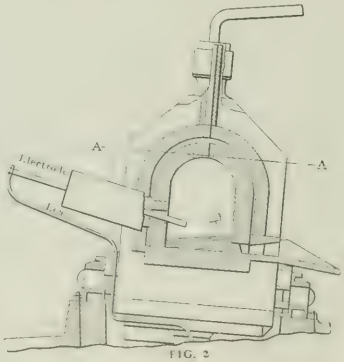


FIG. 2

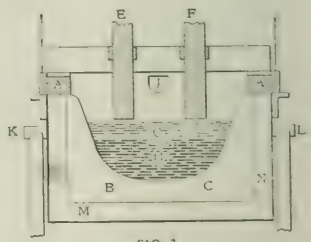


FIG. 3

FIG. 1. TRANSVERSE SECTION A-A. FIG. 2. STASSANO FURNACE. FIG. 3. HEROULT DOUBLE ARC FURNACE.

A A, working doors. *B C*, magnesite bottom. *E*, entering electrode. *F*, exit electrode. *G*, molten slag. *H*, molten metal. *J*, pouring spout. *K L*, trunnions. *M N*, outer brickwork.

*Professor of metallurgy in Columbia University.

[1] VI, June 1909, p. 589.

either by means of electric arcs from carbon electrodes; or by means of a current of electricity which heats the bath by resistance, quite as in the case of common incandescent electric lights; or by both means. The treatment in these furnaces may consist of three distinct steps: (1) melting down; (2) oxidizing the phosphorus of the molten metal, and its carbon and silicon if any excess of these elements is present, by means of iron oxide; and (3) removal of suspended slag, etc., and deoxidizing and desulphurizing by deoxidizing agents, such as carbon, ferro-silicon, aluminum, and, most effective of all, by forming calcium sulphide in the furnace itself. Of these three steps, the third is the only one which seems appropriate to the electric furnace, because the first and second can in general be carried out more cheaply by other means.

Arc Furnaces

In the arc furnaces the current may either pass both inward and outward through carbon electrodes which pass through the roof, or through the walls above the bath, as in the Stassano and Heroult furnaces (Figs. 1, 2 and 3); or it may enter through such overhead electrodes and pass out through the bottom of the furnace, using the bath of metal as the lower electrode. Our natural fear is that this must endanger the bottom of the furnace, but abundant experience with the Giffre and Girod furnaces (Figs. 4 and 5) shows that this danger need not be serious. In the melting-down stage these overhead electrode furnaces (Stassano and Heroult) have the defect, which may be of moment, of having violent fluctuations of current, owing to the short-circuiting, the abrupt making and breaking of the arc, caused by the settling of the charge. From this defect the bottom-electrode furnaces (Giffre and Girod) are nearly free. This defect might be important in case the current used for the electric furnace formed a large fraction of the whole, because of the consequent abrupt fluctuations in the load on the generating machinery, unless it is practicable to build this machinery so that such fluctuations will not injure it.

Even in the arc furnaces an important part of the heat is generated by the resistance of the metal itself or of the slag, or of both, to the passage of the current. This seems to me to be true even of the Stassano furnace. It is true that other writers describe this furnace as heated solely by means of the arc, but according to my own observations, the arc itself, though it nominally passes wholly above the charge, actually short circuits in no inconsiderable part through the charge, especially during the melting down, with abrupt and wide variations in the current like those which occur in the Heroult furnace.

Induction Furnaces

In those resistance furnaces which have come into the widest use (the Kjellin and the Roechling-Rodenhauser, Figs. 6 and 7), the current which does the heating is induced in the molten metal from without, somewhat as a current of great volume, but low e.m.f. is generated from the currents of high e.m.f., by means of which the electricity is carried long distances from the source of power. Hence these furnaces are called "induction furnaces." The Roechling-Rodenhauser furnace has, in addition to the induced current, a current passed through the metal from electrodes buried in the walls.

The induction furnaces have the advantage over the arc or electrode furnaces, of avoiding all troubles due to the flaking off of the electrodes and consequent indeterminate carburizing of the metal at inconvenient times. But to-day the manufacture of electrodes seems to have been so far perfected that this trouble has ceased to be serious, unless perhaps in case of the Stassano furnace in which gravity throws a serious stress on the outstretched horizontal electrodes. The induction furnaces may perhaps have a further advantage in avoiding the local high heating of the molten steel where the arc strikes it. It is possible that this local heating, to which in the arc furnaces one part of the metal after another may be exposed, may cause some injury; but this is purely a matter of speculation.

On the other hand the induction furnaces now in use have limitations of their own. The Kjellin furnace consists of an annular trough which holds the molten metal, and in this ring of metal a current is induced by means of a central core. Now it appears that in order that any large fraction of the inducing current shall be utilized, this ring of metal must be of very small diameter, i.e., that the furnace must be on a scale so small as to put it almost out of the race.

A natural objection to the induction furnaces is that they do not melt their slag thoroughly, because they generate their heat within the metal, which in turn heats the slag, with the consequence that the slag is always cooler than the metal, instead of being hotter, as it should be, and actually is in the open-hearth furnace and probably in the electric arc furnaces. Now in the normal practice of the electric furnaces, when a slag has become befouled with phosphorus or sulphur, it is removed carefully and thoroughly lest it later yield back its foulness to the purified metal. In the narrow ring of which the melting chamber of the Kjellin furnace consists, the removal of the slag is so difficult that the furnace is ill suited for purification, and it is no doubt this fact that has given rise to the current idea that it is impossible to purify in the induction furnaces. This may be true of the Kjellin furnace, but it is clearly absolutely untrue of the Roechling-Rodenhauser furnace. I have before me the analyses of 17 consecutive heats made in one of these furnaces in which the initial phosphorus content of from 0.035 to 0.085 per cent. was reduced—

In 12 heats to traces
" 4 " " 0.01 per cent., or less
" 1 " " 0.012 per cent.

The phosphorus was reduced to traces in seven consecutive heats. In another set of 25 consecutive heats the sulphur was reduced from between 0.048 and 0.097 per cent.—

In 15 heats to traces
" 3 " " less than .02 per cent.
" 7 " " between 0.02 and 0.032 per cent.

One would naturally fear that the narrow channels of this furnace would be likely to entrap part of the slag; but these excellent results lead us to believe that this is not necessarily true when the conditions are favorable. Thus, if this furnace is really under any disadvantage in this respect, it can only be that it has less perfect control over the purification than arc furnaces have.

Neither of these induction furnaces seems well suited for melting down cold charges, because it is only in a molten charge that the current is readily induced. The Roechling-Rodenhauser furnace seems to be further unfitted for the work of melting cold charges by the apparent vulnerability of its internal walls surrounding the cores. One naturally fears that, after these walls have become brittle through repeated heatings and coolings, the workmen will be very likely to damage them in charging cold scrap in irregularly shaped pieces. But to this objection I attach little weight. I do not think that any electric furnace should be used for melting down, because this work can be done so much more cheaply in a cupola or open-hearth furnace.

Beyond this the cost of installation and probably that of repairs is greater, and the consumption of electricity rather less in the Roechling-Rodenhauser than in the arc furnaces.

Another feature of the induction furnaces, the effect of which remains to be examined with care, is the rapid rotation of the molten metal, brought about by the action of current. How is this swift movement going to affect the removal of the suspended matter, slag, etc., from the molten metal? This, I think, must depend on the fluidity and cohesiveness of that matter. If it is dry and non-coherent, then its removal must be brought about by giving it a chance to rise slowly to

the surface by gravity, and such a slow separation is opposed by this rapid motion of the metal, quite as the clearing of muddy water would be by stirring it up, or the settling of dust would be by a high wind. But if the suspended matter is sticky, then this motion may assist its removal just as churning hastens the separation of butter, by helping it mechanically to coalesce into particles large enough to swim upward strongly.

The solution of this trouble would seem to be: (1) to give the suspended matter such composition as to make it sticky; (2) to put the bath into motion, as by poling or by the circulation which occurs in these induction furnaces, so as to aid mechanically the process of coalescing; and (3) to give quiet at last, so that the particles which thus have coalesced may rise to the surface.

Comparison of Furnaces

To sum this comparison up, if these furnaces are used for their normal work of completing the purification begun in the open-hearth furnace or bessemer converter, there really seems but little to choose between them, if we except the Kjellin furnace, the usefulness of which seems very limited. The electrode furnaces have their electrode troubles, which are likely to be at their worst in the Stassano furnace. In the other electrode furnaces this trouble seems now to have been reduced within practicable limits. There remain the cost of the electrodes, and a serious item, the possibility that the high heating opposite the arc may cause some permanent injury to the metal, and probably a slightly greater consumption of electricity than in the Roechling-Rodenhauser furnace. Against these slight disadvantages of the arc furnaces are to be weighed their probably somewhat better control over the purification in case the highest purity is aimed at; their smaller cost for installation and repairs; and perhaps their more complete removal of suspended matter because of the quiescence of their metal. Really, there seems but little to choose.

If cold charges are to be melted, the induction furnaces seem out of the race, and the violent oscillations of the current in the Stassano and Heroult furnaces would rather turn one's choice toward the Giffre or the Girod furnace.

Discussion

We are now in a position to take up the discussion of the metallurgical principles which underlie the various purification processes, whether the furnaces in which they are carried out are heated by electricity or by other means. Indeed, the main purpose of this present article is to add, if possible, to the already clarifying effect of Mr. Coussergues' work.

The discussion may be divided into that concerning the oxidizing stage of the process in which phosphorus is removed by means of iron oxide, and the deoxidizing stage in which sulphur and iron oxide are removed, together with suspended solid matter, and probably also together with hydrogen and nitrogen. The removal of the iron oxide may be begun by means of the usual reagents, carbon, ferro-silicon, aluminum, etc.; it is completed together with that of the sulphur by means of calcium formed in the process itself.

Dephosphorization

Mr. Coussergues remarks that the chemical composition of slags does not in and by itself give a fair basis for dividing them into those which do and those which do not dephosphorize,[3] because whether dephosphorization shall occur depends on other conditions in addition to the composition of the slag. A slag which will absorb phosphorus from an oxidized bath will not absorb it from an unoxidized one. Now, while it is perfectly true that whether dephosphorization shall or shall not occur depends upon the balance of several opposing forces, yet I wish to point out that we can simplify the matter considerably by discriminating between slags which actively dephosphorize and those which are simply retentive of phosphorus, or in short into the dephosphorizing and the nondephosphorizing on one hand, and the retentive

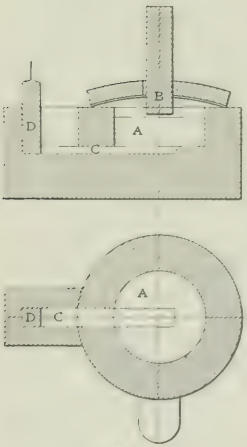


FIG. 4

FIG. 4. GIFFRE FURNACE

A, molten steel. B, upper electrode. C, solid steel connecting with lower electrode. D, lower electrode.

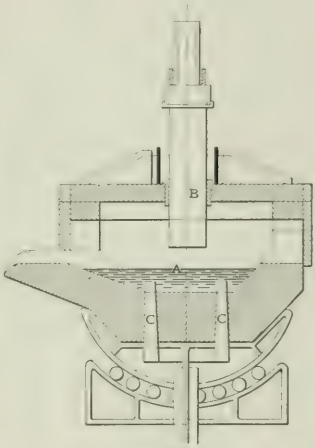


FIG. 5

FIG. 5. GIROD FURNACE

A, molten metal. B, upper electrode. C, lower electrode.

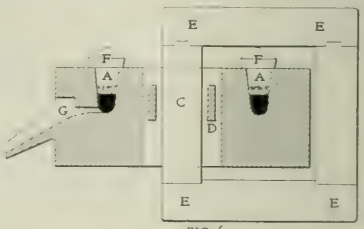


FIG. 6

FIG. 6. KJELLIN INDUCTION FURNACE

A, circular trough in which steel is melted and treated. C, magnetic core. D, primary coil. E, frame connecting ends of C. F, cover for melting chamber. G, spout.

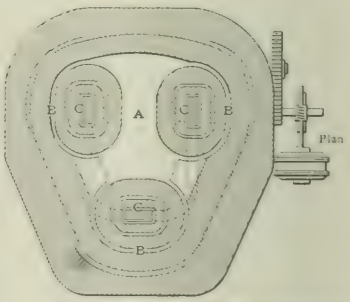


FIG. 7 *The Engineering and Mining Journal, N.Y.*

FIG. 7. ROECHLING-RODENHAUSER INDUCTION FURNACE

A, basin for molten steel. B, three narrow channels in which the steel lies. C, three cores and coils for inducing current in the steel.

[3] *Revue de Metallurgie*, June, 1909, p. 641.

and the irretentive on the other. Phosphorus cannot in general be removed except by oxidizing it. Hence a very basic lime silicate without iron oxide, made fusible by means of fluorspar, cannot appropriately be called dephosphorizing, because it has no strong power of oxidizing the phosphorus; yet it may be very retentive of phosphorus, so that if phosphorus is oxidized in presence of such a slag, it will be removed from the metal permanently.

It is from this point of view that I have said that silicates and phosphates of iron are more dephosphorizing for like basicity than those of lime. Those of iron play the double part of carrying oxygen from the atmosphere to the phosphorus, or, if put to it, of giving up their own oxygen to that phosphorus, which lime cannot do, and also of retaining through their basicity the resultant phosphori acid. Mr. Coussergues cites [3]one effective way in which the ferruginous slags do this, by impregnating the metallic iron itself with iron oxide, and thus placing this oxide most advantageously for oxidizing the phosphorus dissolved alongside it in the iron, and therefore exposed to it, ion to ion. But this is only one feature of the oxidizing power of ferruginous slags which gives them their advantage over the calcareous ones. The ferruginous slags are strong both in oxidizing phosphorus and in retaining the resultant phosphoric acid; the calcareous ones are strong only in retaining the phosphoric acid which some other agency has formed.

Mr. Coussergues properly points out the need of a formula[4] for expressing the relation between the several conditions, including the composition of the slag, and the strength of the dephosphorizing action to which they lead, and says reasonably that such a formula is likely to be based on the law of maximum work. For instance, the ratio between the phosphorus which enters the slag and that retained by the metal is likely to depend upon the heat generated by the formation of the phosphate, and the absorption or evolution of heat caused by the simultaneous reduction of the basicity of the slag. To this I would add that the law of mass action is likely to have a very important effect. I am sometimes tempted to call this the railroad-lunch-counter law. Here is a lunch counter spread with various things. Some of these we like much, some we like but little, some we barely tolerate, others we almost abhor. If the counter is not crowded, I select solely those things which I like best; if it is crowded enough, if I am hungry enough, and if the train is to start soon enough, I may be forced to eat those things least attractive to me, if the attractive viands are scarce and hidden behind masses of less tempting ones. So with my neighbors, and so with the processes of oxidation, reduction and the rest. If the oxygen comes upon the scene but slowly, it may select almost rigidly the most attractive element, i.e., it may form almost solely the combination which will yield the most heat. But let it rush through, and like a rough crowd at a lunch table, many molecules will snatch what they can get in their hurried passage, even if it is relatively unattractive, i.e., if the combination yields relatively little heat. This mental picture often helps.

The Oxidizing Period

Mr. Coussergues points out that this hardly differs materially from the corresponding period of the basic open-hearth process, unless it is in the fact that that fear of over-oxidizing the metal which is ever before the open-hearth melter, basic or acid, does not trouble the electric-furnace melter, for the simple reason that, in the following deoxidizing period, the deoxidizing conditions are so strong that he can undo any degree of over-oxidation, no matter how great. Hence the electric-furnace melter can push his dephosphorization, by rapid oreing, as the open-hearth melter cannot.

But we have to be guarded even in going as far as Mr. Coussergues does in favor of the electric furnace. The electric furnace slag richest in iron which he cites, contains only 56.36 per cent. of the combined oxides of iron and manganese (metallic oxides for short), which is not appreciably more than the reaction slags of the Monell open-hearth process contain at times without danger of over-oxidation of the metal. The difference between the two cases is that the metal which accompanied this electric-furnace slag had but little carbon, 0.05 per cent.; whereas that in the Monell process is much richer in carbon. Therefore, to speak accurately, if the metal is low in carbon the electric furnace enables us to ore more rapidly than we could in the open-hearth furnace; but I see no reason to think that it has any advantage even in this respect in case the metal is relatively rich in carbon, for then the rate of oreing is limited only by the resultant frothing. At best this advantage can hardly compensate for the much greater cost of the electric treatment.

In order to remove a large quantity of phosphorus, as for instance in making low-phosphorus steel from materials rich in phosphorus, several successive slags should be used. Here again as in the Monell process the first slag may be made rich in iron, so that it will take out the great bulk of the phosphorus, and may then be resmelted in the blast furnace, though, of course, if this were done on a large scale, it would continuously increase the phosphorus content of the pig iron, a trouble which hangs over the Monell process. The final dephosphorizing slag, once the metal itself is well charged with oxygen, may be relatively poor in iron and rich in lime. But here again it is not easy to see what advantage the electric furnace has over the open hearth.

As I have already pointed out, it is hard to see why it is worth while to use an electric furnace for dephosphorizing, because the basic open hearth does this same work so cheaply, and can be made to do it so thoroughly. The great accent that has been put on the possibility of making excellent steel in the electric furnace out of bad scrap seems, as far as phosphorus is concerned, very misleading. In short the reason for the existence of the dephosphorizing stage of the electric-furnace process has yet to be shown.

Deoxidizing and Desulphurizing

It is in this part of the process that the great interest lies; here, indeed, the formation of calcium sulphide introduces something of a new departure in steel metallurgy proper, and enables us to push the desulphurizing much farther than has been possible hitherto. For instance, with the best selected coal, the skilful French open-hearth men have not been able to reduce the sulphur below 0.02 per cent. In this country it has been found hard to reduce it to 0.025 per cent., and 0.03 per cent. is about as low as is attainable in common work, so fast is sulphur taken up from the flame. But in the electric furnace by forming calcium sulphide the sulphur can be reduced to mere traces. As to the importance of this reduction from 0.025 per cent. to traces, I shall have something to say later on.

If there has been an oxidizing stage, the first step after it is to remove with great care the phosphoric slag then formed, lest its phosphorus be deoxidized in the deoxidizing stage, and thus returned to the bath. For instance, in the electrode furnaces the electrodes may be withdrawn, and the slag thickened with lime or otherwise, so that it may be skimmed out completely.

Next comes the rough deoxidizing, brought about very much as in bessemer and open-hearth practice, by additions of carbon, silicon, manganese, or aluminum. As Mr. Coussergues points out, carbon should be used for removing the first of the oxygen, and the more expensive reagents should be used only for the last of it. He seems to think that carbon is intrinsically unable to finish the deoxidizing, and cites the large quantity of oxygen, at times enough to cause redshortness, that remains in steel recarburized by the Darby process, in which the oxidized products, the blown metal of the bessemer process, and the ored metal of the open-hearth process, are recarburized by bringing them into contact with solid

[3]*Revue de Metallurgie*, June, 1909, p. 647.
[4]*Revue de Metallurgie*, June, 1909, p. 643.

carbon. But the fact that the very brief contact of the Darby process leaves much oxygen in the metal does not necessarily prove that prolonged contact with carbon, such as can be had in the electric furnace, is incompetent to remove the whole of the oxygen. There are inded special circumstances under which carbon cannot be used, for instance in the Kjellin furnace, in which the upper surface of the slag may be so viscid that carbon cannot act upon it. In that case the fusible ferrosilicon, thrown on in pea-sized lumps, melts and finds chinks through which it can work down. In the use of the Roechling-Rodenhauser furnace, as I understand, this difficulty can be got over if necessary by breaking through the crust of slag in its large basin.

But in the electrode furnaces the action of carbon, thrown upon the metal, or upon the very basic slag now formed by adding lime, or lime and sand, can be prolonged. Now if, as seems clear, carbon can reduce lime by the reaction

(1) $C + (FeMn) S + CaO = CaS + FeMn + CO$,

it is hard to understand why that same carbon cannot deoxidize iron oxide completely.

The natural mechanism of this deoxidation is that the oxides of iron and manganese start to distribute themselves between metal and slag according to the coefficient of distribution corresponding to the existing conditions, such as temperature and composition of slag and of metal; and that the retort carbon or other form of carbon thrown upon the molten slag reduces the oxides of iron and manganese which have entered that slag, thus opening the door for the entry of other lots of those oxides.

An alternative way would be to begin the deoxidation with pure Swedish pig iron, which should work very quickly, and to follow it up with carbon.

Desulphurizing.

After the deoxidizing is nearly complete, comes the desulphurizing by reaction (1) just given, and probably, in case ferrosilicon is used, by the similar one

(2) $2 (FeMn) S + 2 CaO + Si = 2 CaS + 2 (FeMn) + Si O_2$.

Clearly neither of these reactions should occur as long as any important quantity of oxide of either iron or manganese remains, because such oxide would yield its oxygen to the carbon or silicon far more readily than the lime would. In point of fact the Remschied engineers maintain that the slag should not contain more than 1 per cent. of the oxides of iron and manganese jointly.

Phosphorizing or Dephosphorizing.

These oxides of iron and manganese tend to pass into the slag, so to distribute themselves thus between metal and slag, in a ratio called the "coefficient of distribution," which varies with the attendant conditions. It has been held that in a general way this coefficient increases with the temperature and with the percentage of lime in the slag, and decreases with the percentage of iron oxide in the slag. In other words, the higher the temperature, and the more lime and the less iron oxide the slag contains, the greater will the sulphur content of the slag be and the less will that of the metal be when the sulphur shall have distributed itself according to the then existing coefficient of distribution. Sulphur thus brought into the slag may escape thence by burning to sulphurous acid at its surface.

In view of this, the presence of metallic oxides (oxides of iron and manganese), of course, does not prevent sulphur from passing into the slag in the form of sulphide of iron or of manganese. Thus, one of the slags which Mr. Coussergues gives contains 6.35 per cent. of ferrous oxide and 11.16 per cent. of manganous oxide, or together 17.51 per cent., yet it has also 0.21 per cent. of sulphur. But, while the first of the sulphur can thus be slagged by "distribution," it is very slow work to reduce the sulphur to below 0.02 per cent. in this way. If, under favorable conditions, the coefficient of distribution rises to 5, so that the passage of sulphur from metal to slag might theoretically go on till the percentage of sulphur of the latter was five times as great as that of the former, then starting, say with 0.05 per cent. of sulphur and with a slag weighing one-fifth as much as the metal, the slagging of sulphur would cease when the sulphur content of metal and slag respectively had reached 0.025 per cent. and 0.125 per cent Moreover, this slagging would grow extremely slow as this limit was approached, so that before reaching it the slag should be withdrawn and replaced with a fresh one. If this was done when the metal still contained 0.035 per cent. of sulphur, then the lowest point to which the sulphur could theoretically be reduced by this fresh slag would be 0.0175 per cent., and so on. Thus the removal of the last of the sulphur goes on ever more and more slowly.

But, if the slag and metal are so free from oxides of iron and manganese that lime can be deoxidized and calcium sulphide formed, then the desulphurization is rapid and may be made complete, because the resultant calcium sulphide, instead of merely distributing itself between metal and slag in a limited ratio, seems to pass wholly into the slag, or if not absolutely wholly, then at least in a very much greater proportion than the sulphides of iron and manganese do. Thus one of the Volkmann slags quoted by Mr. Coussergues contains 125 times as much sulphur as the underlying metal. The sulphur content of the slag is 2 per cent. that of the metal, 0.016 per cent.

The symptoms by which the formation of calcium sulphide is recognized are (1) that the slag becomes snow white, and (2) that it falls to powder in cooling. Both these things are evidence that the slag contains no important quantity of the oxides of iron and manganese, but the slacking does not prove that the lime content is very high, as is often thought. As the presence of these oxides is the only obstacle to the formation of calcium sulphide and the thorough removal of the sulphur, these signs of their absence are accepted as proving that this strong desulphurizing has begun. But, as we wish not simply to begin but to complete it, the desulphurizing action should be prolonged for say 45 min. after these symptoms have become marked. During this time the consumption of electricity should be hardly more than that needed to make up for the losses by radiation, because the temperature remains practically stationary, and because no important endothermic chemical change occurs.

It is asserted that the carbon thrown upon the slag for forming the calcium sulphide has no important effect in carburizing the metal.

Is Extreme Basicity Needed for Desulphurization?

In the iron blast furnace basicity of slag certainly favors desulphurization, but even here the basicity should be held within such bounds that the slag remains fluid enough to change quickly its surface of contact with the iron, the place where desulphurization occurs. In the basic open-hearth furnace, too, the slag is habitually kept as basic as possible, by adding lime just fast enough to keep some lumps of it unabsorbed and protruding above the molten slag. And certainly it is true that, if lime is to be reduced, it should not be held too tenaciously by the silica, and plenty of it should be exposed to the carbon which is to reduce it, two ways of saying that the slag should have plenty of lime. Again, as already pointed out, there is good reason to believe that the coefficient of distribution of manganese sulphide, i.e., the ratio of the sulphur content of the slag to that of the metal, increases with the lime content of the slag.

But inferences from these facts should be drawn cautiously. In the first place, what would be very calcareous for a blast-furnace slag would not be for a basic open-hearth or electric-furnace slag. In the second place, the crowding of lime into the common open-hearth slag is rather for dephosphorizing than for desulphurizing. In the third place, though richness in lime may favor the

passage of manganese sulphide into the slag, it does not at all follow that it strongly favors the formation of calcium sulphide. In short, the conditions in the electric furnace are so unlike those of the blast furnace, and the mode of removal of sulphur is so radically different from that of the basic open hearth, that the experience with those furnaces is not a good guide for the electric furnace.

Turning now to the data which Mr. Coussergues gives, we find not only that the sulphur content of the slags bears no relation whatsoever to their basicity, but that the least basic but one, with only 2.08 molecules of base per molecule of acid, i.e., barely a bibasic silicate (singulo-silicate), has as much as 1.06 per cent. of sulphur.

I rearrange his data as shown in Table 1.

Though it is noteworthy that the only one of these which is less than bibasic, with a molecular ratio of base to acid of only 1.56, contains very little sulphur, only 0.04 per cent., yet we must set against this the fact that blast-furnace slags which are much less basic may yet contain much sulphur. In two cases given by Mr. Coussergues the ratio of the molecules of base to those of acid was 1.437 and 1.60,[5] yet the sulphur content was 3.90 per cent. in the first and 2.56 in the second.

TABLE 1. DESULPHURIZATION DOES NOT DEMAND GREAT BASICITY OF SLAG

Ratio of molecules of basic to those of acid...	5.083	3.925	3.667	3.572	3.429	2.828	2.472	2.154	2.081	1.56
Sulphur content of slag.....	0.75	1.48	1.47	0.06	2.00	0.21	0.44	1.26	1.06	0.04

In Table 2 I give several blast-furnace slags which contain a considerable quantity of sulphur, in spite of having much less lime and magnesia than basic open-hearth slags do. Thus, it may be found practicable to desulphurize in the electric furnace without recourse to strongly basic slags; indeed, one does not see at first any difference in conditions between the blast furnace and the electric furnace competent to prevent the very moderately basic slags which can desulphurize in the former from doing like work in the latter. The desulphurizing slags in both cases are almost free from oxides of iron and manganese; the temperatures are not far apart; and the actual contact between carbon and slag is common to them, and need not be limited in extent in the electric furnace, so far as one can see.

The observation at Völklingen that an accidental addition of sand which thinned the slag and was followed by a strong smell of sulphurous acid, increased the desulphurization so that only 0.04 per cent. of sulphur remained,[6] is interesting, and deserves a certain weight. But its importance is easily overrated, because, while we will all admit that such extreme basicity as makes the slag so viscid that its surface of contact with the bath does not quickly renew itself, is harmful, yet what we are now considering is the effect of basicity within the limits of good fluidity, on the removal of sulphur as calcium sulphide. It is very doubtful whether any such removal occurred in this particular case, because desulphurization by distribution, through the action of manganese sulphide, could easily reduce the sulphur to the percentage, 0.04 per cent. here reached.

Influence of Manganese on Desulphurization

The belief of some metallurgists that manganese hastens desulphurization has been opposed with evidence which, as Mr. Coussergues says, seems quite incompetent.[7]

TABLE 2. SULPHUR IN BLAST FURNACE SLAGS NOT STRONGLY BASIC.

No.	CaS.	S.	SiO_2.	Al_2O_3.	CaO.	MgO.	Reference.
1.	0.38	0.17	66.90	14.08	12.24	4.48	W. Matheisus, *Stahl und Eisen*, 28, pp. 1122-1125.
2.	4.75	0.78	47.94	12.01	31.20	4.36	Aug. 5, 1908; also *Revue de Métallurgie*, Extraits.
3.	2.10	0.93	45.57	7.35	33.20	6.13	6, pp. 144-147, March, 1909.
4.	4.39	1.95	27.65	24.69	36.56	3.55	
5.	7.76	3.44	33.10	24.56	25.92	6.97	
6.	.	0.24	42.15	11.02	43.00	1.25	R. H. Sweetser, *The Iron Age*, 82, p. 446, Aug. 13, 1908.
7.	...	1.23	35.00	11.17	46.40	4.68	My private notes.
8.	2.17	0.96	35.20	10.02	47.10	1.20	Jantzen, *Stahl und Eisen*, 23, p. 362, March 15, 1903.
9.		0.08	49.57	9.00		15.15	H. H. Campbell, "The Manufacture and Properties of Iron and Steel," 2d. Ed. (1903), p. 52.
10.	.	0.08	48.39	6.66	..	10.23	

The defect in the evidence is that in those of its cases in which the desulphurization was incomplete in spite of the presence of manganese, the slags themselves contained enough oxide of iron and manganese jointly to prevent desulphurization. In order to understand this we must bear in mind the true role of manganese which I have already explained. Its direct action seems to be confined to carrying sulphur into the slag by distribution in the form of MnS. As already pointed out, though it may in this way remove the first of the sulphur readily, it can remove the last only slowly. Certainly we cannot expect it to go beyond this desulphurizing by distribution, and actually lead to the formation of calcium sulphide and thereby to rapid and complete desulphurization, simply because we cannot expect it to deoxidize lime, a thing, of course, absolutely necessary to the formation of calcium sulphide. In the presence of sulphide of iron or manganese, lime can be deoxidized by carbon, silicon, and probably by aluminum and by silicide of calcium, but neither by iron nor manganese.

But manganese may hasten the formation of calcium sulphide in a very simple and effective way. It seems perfectly clear that manganese oxide and sulphide pass from metal to slag far more rapidly than iron oxide and sulphide do.

Indeed, one is often tempted to give it as a general law that the metals retain their own oxides and sulphides far more strongly than they retain those of other metals. Now carbon and lime can do their work of desulphurizing by reaction (1) only as fast as these metallic sulphides are brought before them in the slag, and only on the condition that the whole mill is not thrown out of gear by the presence of oxide of iron or of manganese in that slag. The presence of manganese certainly hastens the removal of iron oxide by carrying its oxygen from the metal to the deoxidizing action of the carbon floating on the

[5] Mr. Coussergues gives this as 0.889, but I calculate it as 1.60.

[6] Professor Osann, *Stahl und Eisen*, XVIII, July 15, 1908, p. 1018.

[7] Professor Osann gives the results of two heats in the Roechling Rodenhauser furnace at Völklingen, in which additions of ferromanganese so large as to put 0.96 and 0.64 per cent. of manganese into the metal, yet left 0.053 and 0.044 per cent. of sulphur in the slag (*Stahl und Eisen*, XXVIII, July 15, 1908, pp. 1011 to 1021). But these additions of ferromanganese were made immediately after the end of the oxidizing period, when the metal was sure to have been charged with oxygen, and the slag was sure to have contained much oxide of iron and manganese jointly. For the first of these heats the composition of the slag at that time is not given; but its final slag contained 8.12 per cent. of oxides of iron and manganese, in spite of the addition of ferrosilicon meanwhile; and the final slag of the other heat contained 11.30 per cent. of iron oxide and 5.88 per cent. of total manganese (not manganese oxide), or say more than 18 per cent. of oxides of iron and manganese jointly. No wonder that the sulphur was not fully removed under these conditions.

slag, and thus gradually slides the mill into gear; and it hastens the movement of grist to the mill by hastening the transfer of sulphur as manganese sulphide from metal to slag. Evidence that manganese does not cause immediate desulphurization of slags which are rich in oxide of iron or manganese only shows us what should not surprise us, that the wagon which brings grist to the mill cannot by itself jerk the mill into gear.

Influence of Temperature on Desulphurization

The opinion of many electric-furnace metallurgists that low temperature favors deoxidation and desulphurization does not really conflict with the well established fact that a high temperature in the blast furnace favors desulphurization by the formation of calcium sulphide, because in the blast furnace it may not be the high temperature as such, but the attendant conditions that are responsible. One of these conditions, as Mr. Coussergues point out, is absence of metallic oxides from the slag; a second is the presence of silicon in the molten iron, which at the junction of slag and metal may well co-operate with the lime of the slag to desulphurize by reaction (1).

But further evidence is needed. If, as seems very probable, high temperature favors the retention of iron oxide by the metal, by increasing its solubility in the metal or otherwise, that in itself would retard the freeing of the metal and slag jointly from metallic oxides in the electric furnace, and in this way would lengthen the operations of deoxidizing and desulphurizing taken together. With our present knowledge it is not so easy to discriminate between the effects produced on these two essentially distinct phases by variations in the attendant conditions such as temperature.

If it is really true that deoxidation and desulphurization taken jointly are favored by a low temperature, that may well be one reason why they are not favored by strong basicity of slag, because a very basic slag needs a high temperature to keep it fluid enough for active work.

Removal of Hydrogen and Nitrogen

Electric-furnace steels examined by Guillet contained less nitrogen and especially less hydrogen not only than open-hearth steel, which is natural enough in view of the exposure of the latter to the atmosphere in the open-hearth furnace, but also than crucible steel, which is rather surprising. Mr. Coussergues reasonably suggests that the relative freedom from hydrogen may be due to the formation of acetylene or other hydrocarbon at the surface of contact of metal and slag by the reactions

$$Ca + 2C = CaC_2, \text{ and } CaC_2 + 2H = Ca + C_2H_2.$$

Letting the Cream Rise

The conditions in the electric furnace may well lead to a more thorough separation of the slag and like suspended solid matter than is possible in the open-hearth process. Here the deoxidizing additions are made at the very end of the operation, just before the metal is tapped out of the furnace, or, as is too often the case, as the metal runs from furnace to ladle, so as to avoid any long exposure to the necessarily oxidizing conditions, which partly undoes the work of deoxidation and so increases the consumption of deoxidizers. But each of these deoxidizing additions gives rise to a harmful product, carbon to carbonic oxide which may form blowholes, manganese to manganous oxide which may later form them by reacting on the carbon of the metal, and silicon and aluminum to silica and alumina in a very fine state of division. Though we have not worked out thoroughly the conditions necessary for freeing the metal from these suspended substances and from dissolved carbonic oxide, there is probably good ground for the complaint that "we make too much steel in the ladle," i.e., that we do not give time enough for letting these harmful products of our deoxidizing rise to the surface and escape into the slag or the atmosphere.

Now note what advantages the electric furnace, with its strongly deoxidizing conditions, has in this matter over the open-hearth furnace with its strongly oxidizing atmosphere.

(1) Because the metal is thoroughly deoxidized by carbon thrown upon the slag, the final additions have very much less deoxidation to do and hence the quantity of harmful products of that deoxidation is very much smaller than in the open-hearth process, indeed hardly more than what is implied by the slight oxidation in passing from furnace to mold.

(2) The absence of oxidizing conditions leaves the metal in the electric furnace quiescent, with the best possible opportunity for any suspended matter to rise by gravity and escape from the metal, whereas in the open-hearth furnace the oxidizing atmosphere, ever generating iron oxide which forms carbonic oxide with the carbon of the steel, keeps the bath in a boil which, even if it is relatively slight, may be expected to oppose the separation of suspended matter. But here we must speak guardedly, for the reasons pointed out, in comparing the electrode and the induction furnaces with regard to the removal of suspended matter.

(3) In the electric furnace the absence of oxidizing conditions enables us to hold the molten charge long after the deoxidizing additions, in order to enable the suspended matter to separate, without fear of rapid change of composition, whereas the oxidizing conditions in the open-hearth furnace bring about such rapid changes of composition that only the most skilful can hold the charge in the furnace long after making the final additions without great and indeterminate changes in composition. In the open-hearth furnace our game is on the wing; in the electric furnace it is on the bough.

Mr. Coussergues thinks that the greater time available in the electric furnace for the separation of suspended matter by gravity is of little value, because this separation is in any event so rapid. If he has good evidence to prove this it will be welcome. The large quantity of slag which we so often find in our steel hardly prepares us for this belief. Certainly our natural expectation is that this extremely finely divided matter, which, as we find it in the sides of the pipe is an impalpable powder, should be very slow in rising, if we may reason from the time which cream takes to rise from milk and roily water takes to clear itself.

Summary

Looking back, we see that, as an instrument for melting and dephosphorizing, the electric furnace has no advantage over the cupola and open hearth, certainly none which can compensate for the great cost of its heat. It is in its thorough deoxidizing and consequent thorough desulphurizing, its removal of suspended matter, and probably of hydrogen, that the electric furnace is at an advantage.

Looking a little closer one naturally asks whether the reduction of sulphur and phosphorus from 0.025 per cent. to any smaller quantity is, in and by itself, enough either to pay for the great cost of the electric treatment or to make the steel materially fitter for any but the most trying uses. We are rather inclined to refer a very large part of the superiority of electric steel to open-hearth steel to its greater freedom from oxide, from suspended slag, and perhaps from hydrogen and nitrogen. But whatever its elements of superiority may be, it seems pretty clear that they are directly or indirectly the result of the strong deoxidizing conditions in the deoxidizing and desulphurizing part of the process, in short, to the freedom of its atmosphere from oxygen.

One of the oldest pumping engines in existence is still in service at the old Dolcoath tin mine in Cornwall. It was installed in 1815.

Alaskan Mineral Exhibit at A-Y-P Exposition

Wealth and Advantages of Alaska Displayed; $500,000 in Gold Exhibit. History of Mining Outlined and Recent Developments Shown

BY E. JACOBS

As the primary object of the Alaska-Yukon-Pacific exposition, now being held at Seattle, Wash., is to exploit the natural resources of Alaska, exhibits from that country properly form a prominent feature. The whole of the extensive and comprehensive exhibition in the Alaska building has been in charge of four heads of departments, all under J. C. McBride, commissioner for Alaska, who so assiduously furthered the efforts of his executive officials that, when the hour fixed for the formal opening of the exposition arrived, everything was ready—save only the placing in its booth of the placer-gold exhibit, which the insuring company would not permit until after some changes, deemed desirable for safety, had been made in the electric-light wiring.

The mineral department, the most important in the Alaskan exhibit, is in charge of John D. Fields, mining engineer, of New York, who is familiar with the mineral resources of Alaska and their development, and who has succeeded in collecting ample material for a thoroughly representative and effective display. The main purpose kept in view throughout, in organizing and arranging this department, has been to show results thus far obtained from money expended and labor performed in developing the mineral resources of Alaska. Special efforts have been made to overcome the generally prevailing idea that Alaska is a land of perpetual ice and snow, and to do this agricultural products from Alaska have been, and are still being obtained and exhibited, together with many enlightening photographs of the country as it appears during the part of the year—about six months—when it is not covered by snow.

THE ALASKA BUILDING

History of Mining in Alaska

From "Mining and Mineral Wealth of Alaska" (repeatedly drawn upon in preparing this article), it is learned that probably the earliest exploitation of any mineral deposit in what is now Alaska was the recovery of copper nuggets by the aborigines from the stream gravels of Copper and White rivers. Bering, the discoverer of Alaska, when he made his first landing on Kayak island in 1741, observed that the natives had copper knives, and later explorers reported a wide distribution of copper utensils among the indigenous inhabitants of the Territory.

American prospectors went to Alaska in 1867, soon after the transfer of Russian America to the United States, and, in 1869, found placer gold at Sumdum bay, southeastern Alaska. Gold-bearing quartz veins were first discovered in 1877.

near Sitka, and a small stamp mill was erected there in 1879.

The systematic development of copper ore deposits was commenced in 1899, both on Prince of Wales Island and Prince William sound. From 1898 on, the basins of Copper and White rivers were much prospected for copper ores.

Placer tin was first found near York, Seward peninsula, in 1900, and stream tin was produced in commercial quantity in 1902. Lode tin was discovered in 1903 since which year there has been a small output of this mineral.

The first commercial mining of coal was on Admiralty island in 1880, followed in 1888 by the opening of a mine on Cook inlet. In 1895 coal mining was attempted on the Yukon, and in the same year the high-grade coals of the Bering river field, near Controller bay, began to attract attention, though it was not until about 10 years later that systematic prospecting of these coal measures was begun. The Matanuska bituminous coalfield was being prospected in 1898. Similar coal has been found on Bering lake, and a small production was made here in 1907. Coal is also known to occur in many other parts of Alaska, but coal mining is as yet only a small industry. Statistics show the largest annual production to have been 53,600 tons, practically all lignite, in 1907.

Petroleum seepages in Alaska were probably known during Russian occupation of the country. The first drilling for oil was done at Controller bay in 1901, and the following year similar work was carried out at Cook inlet.

The quarrying of marble, for tombstones, was commenced in southeastern Alaska late in the nineties, but operations were limited prior to 1904, in which year they were considerably extended. A deposit of gypsum was opened on Chichagof island in 1904, since which year there has been an increase in output annually.

U. S. Geological Survey Exhibit

The U. S. Geological Survey has made at the Alaska-Yukon-Pacific exposition what may be regarded as a scientific exhibit, chiefly for the benefit of technical men and students, though it is also decidedly instructive to the general public. It shows, by reports, geologic and topographic maps, etc., as well as by mineral collections, the results of the work of the Survey in Alaska and how they had been brought about. It includes district and locality maps, photographs, transparencies, rocks, ores, and placer gold. The whole exhibit forms a comprehensive study of the geology and mineralogy of Alaska and its nature and effect are distinctly educational. It is arranged in sections and in these are placed on tables a number of the Survey reports on Alaska, for convenient reference and study by those interested in the subjects illustrated by the exhibits.

The rocks and minerals on exhibition include every known species yet found in Alaska, all named and systematically arranged in glass-covered cases. Among the metalliferous minerals there is much native copper, while in the exhibit of placer gold there is a sample from every Alaskan creek known to have yielded gold.

The fuels shown include peat; coal, lignite, bituminous and anthracite; natural and artificial coke; and crude oil.

The usefulness of this comprehensive and generally excellent exhibit is enlarged by a 46-page pamphlet containing a fairly full summary of facts and figures relating to the "Mining and Mineral Wealth of Alaska," prepared by Alfred H. Brooks, geologist in charge, Division of Alaskan Mineral Resources, U. S. Gelogical Survey, and published by the Department of the Interior for distribution in connection with the Alaskan exhibit.

Commercial Mining Exhibits

The numerous exhibits in this section show commercial mining in each of six divisions for districts of Alaska, namely; Seward peninsula, Fairbanks and Tanana, Juneau, Ketchikan, Valdez, and Katalla, the last-mentioned being chiefly a coal division. The samples of ore and other mineral products are from all the principal mines in each of these divisions. It is noteworthy that few districts possess so large a variety of minerals, both rare and common, as does the Nome or Seward peninsula district; gold, silver, lead, copper, tin, iron, bismuth, antimony, nickel, cinnabar, molybdenum, scheelite, coal, graphite, jade, asbestos, mica, etc., occurring on it. Many of the exhibits of ores and coal have been arranged in pyramidal form, thus facilitating examination.

Placer Gold and Copper

More than three-fourths of the value of Alaska's mineral production, which in four years, 1905-1908, totaled nearly $81,000,000, having been in placer gold, especial prominence has been given to exhibits in connection with that class of mining. A strikingly ornate compartment has been constructed in the center of the Alaska building, and in this has been placed a large pan, just six times the size of an ordinary gold washing pan, containing up to $1,250,000 worth of gold.

In one booth hydraulic placer mining is illustrated by a reproduction on a fairly large scale of the Porcupine Gold Mining Company's placer gold mine on Porcupine creek, in the Skagway district. Flume, pipe-line, giant, gold-bearing gravel, etc., are all shown, and numerous photographs of placer mining scenes are also exhibited.

Lode Gold

The largest exhibits of gold-bearing ores are from the Juneau district, from the Treadwell, Perseverance and Eagle river mines, and in connection with these the education idea is also kept well to the fore. The Treadwell has a small model of a 5-stamp mill in operation, and also has on exhibition large photographs of its mines and interior views of its big mills, in which there are altogether 880 stamps, 300 under one roof. The annual output of the four lode mines of the Treadwell group has a value of about $3,000,000, which is more than two-thirds of the annual lode gold production of Alaska. Their aggregate output to date is in excess of $36,000,000.

The Perseverance Gold Mining Company's mineral exhibit consists of about 1500 lb. of well mineralized quartz and 1000 lb. of gold-bearing concentrate. A large photograph of the company's 100-stamp mill shows its close proximity to high mountains and to the source of the water power which makes the mill practically independent of other provision of power for operating. Herein is another object lesson, showing that an abundance of snow on the neighboring mountains together with glaciers and springs, supplies cheap power and so admits of very low-grade ores being worked on a large scale and with profit.

Silver

There has been practically no silver mined in Alaska other than that associated with placer and lode gold. The total production to date has been nearly 2,000,000, oz. There are, however, some silver-lead ores shown, notably a pile of ore from the Sunset mine, on the south arm of Cholmondley sound, southeast Alaska.

Copper

Next to gold, copper ores are most prominent among Alaskan mineral exhibits, 97 copper properties being represented. There are several large blocks of chalcopyrite, among them, one weighing 2200 lb. from the Ellamar mine, Prince William sound—and many tons of similar ore in smaller pieces, large specimens showing how native copper occurs in amygdaloidal greenstone (one of these being "the largest piece of native copper ore from Alaska which came from 'in place' in the mine"), and samples of chalcocite, bornite, etc.

Owners of copper properties have done much to convey a clear idea of the conditions under which copper mining can be carried on in different parts of Alaska. One striking panorama embraces a large area of the Copper river country, bringing out in relief its topography and showing the location of some of its most important mines. It also indicates the progress in providing railway transporta-

tion, showing the routes of the railways in course of construction toward the mines. Nearly 50 miles of the Copper River and Northwestern railway were completed last year, and this year at least as much more will be finished, leaving 95 miles more to be built to provide railway transportation from the Guggenheims' Bonanza mine, at Kennicott, to Cordova on the sea. The extensive deltas of the streams are also shown, indicating the existence of a considerable acreage of land available for agricultural uses.

Tin

The exhibit of tin ores, both placer and lode, is of much interest since it is believed to be the largest of purely American production ever made on this continent. There is in one large show case about a ton of placer tin, and a number of kitchen plates manufactured from local tin. Other cases and stands contain lode tin ores, and associated secondary minerals, molybdenite, wolframite, and fluorite. Particular importance is attached to this display of cassiterite, since production in commercial quantities has already been commenced, according to Adolph Knopf. Up to the close of 1908 the total production of the Seward peninsula region was 160 tons of cassiterite concentrates, all of which, except a few tons from lode deposits, came from the stream tin of Buck creek. It is hoped that a valuable tin-mining industry will eventually be developed and the great demand for tin in the United States be in part met by the home product.

Coal and Petroleum

The known areas of coal-bearing rocks in Alaska cover 12,044 sq. miles, and of coal 1,238 sq. miles. Lignite, bituminous and anthracite coals with some good coking coal, have been found. The lower-grade coals are the most widely distributed and occur in the greatest quantities, so far as is known. The total production to date is 45,000 to 50,000 tons. The total available tonnage of coal in the Matanuska and Bering river fields has been estimated at about 1,000,000,000 tons. The Matanuska field is officially stated to be 150 miles from an ice-free port on the Pacific, and the Bering river field 25 miles from the coast at Controller bay and 100 miles from a good harbor on Prince William sound. The construction of a railway from Katalla to the latter field will shortly be commenced.

The fuel exhibit collected by Mr. Fields includes wood, peat, lignite, and on through various grades up to high-grade anthracite. In connection with this exhibit there is a model in relief of Carbon mountain, representing a 5-mile section of the anthracite coal measures in Bering river district.

Petroleum is represented by crude oil in 5-gal. jars and by its separated component parts. This exhibit causes much surprise, few having been previously aware of the occurence of oil in Alaska.

Other Metalliferous Minerals

Of these, the most noticeable exhibit is marble, a room constructed of large slabs of light-colored marble, from Prince of Wales island, being generally admired. The material is beautifully marked, free from flint, copes readily, and is easily carved and lettered. The market for this marble in Seattle, Tacoma and San Francisco is steadily becoming larger. The well-known Vermont Marble Company lately purchased marble quarries on Prince of Wales island.

Summary and Conclusions

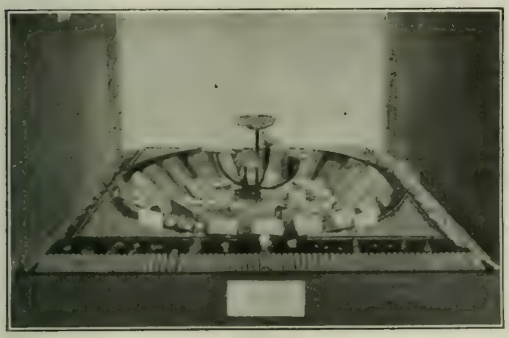
From Mr. Brooks' summing up[10] of the Alaskan situation, the following sentences are quoted:

Though placer mining has been carried on in Alaska for nearly thirty years, it has been chiefly by the crude methods of the pioneer that more than $100,000,000 worth of gold has been won from the auriferous gravels. The modern epoch of placer mining, with labor-saving machinery, has only just begun and the field in which such methods are used is capable of much expansion. Though the future discovery of bonanzas, such as have made Alaska famous in the past, cannot be predicted, it is certain that the possibilities of new finds are far from being exhausted, and that there are hundreds of creeks known to be auriferous which may yield gold in commercial quantities when means are found to reduce the present cost of operation.

The inland copper districts await the railway transportation which will not only lead to the development of known deposits, but also stimulate further search for orebodies. Such developments of a lode-mining industry will give a larger permanent population—at present Alaska's greatest need.

The value of the high-grade fuels of the Pacific seaboard probably exceeds that of the gold deposits, and the exploitation of these coalfields is of the greatest importance to the entire western seaboard of the continent. These coals will furnish not only the high-grade steam coals needed for various industries, but also the coke for metallurgical enterprises. If the iron ores of the Territory prove valuable, the west coast may yet be supplied from this source with the raw materials for the manufacture of iron and steel. In any event, the copper smelters can be provided with coke of a high grade.

A full development of the mining industry of Alaska is possible only by improvement of the transportation facilities. At least one railway must be built to the Yukon goldfields, and the inland copper-lode districts and coalfields must be connected with Pacific ports that are open throughout the year. Then, and not until then, can Alaska's mining industry be developed to the extent warranted by her known mineral wealth.



GOLD EXHIBIT LOANED BY THE SCANDINAVIAN-AMERICAN BANK, SEATTLE

GOLD BOOTH IN THE ALASKA BUILDING, A.-Y.-P. EXPOSITION

[10] "Mining and Mineral Wealth of Alaska," pp. 33-34.

The Prevention of Accidents in Coal Mining

Proper Supervision and Organization of Works of Greatest Value. Danger Minimized by Using Permissible Explosives and Efficient Spraying

BY E. H. COXE*

For the purpose of this discussion coal mine accidents will be divided into four different classes as follows: (1) Accidents caused by explosions. (2) Those caused by falls of rock or coal. (3) Those caused by defective or improperly protected machinery or appliances. (4) Including all other accidents.

Accidents Due to Explosions

Accidents due to explosions will be considered first, not because they are most frequent, but because when they do occur they are by far the most disastrous and widespread in their effect and so frequently happen where least expected and in mines which are considered almost explosion proof.

Of accidents due to explosions we have four kinds, sometimes two or three of these combined, classed as follows: Premature explosions; blownout or windy shots; dust explosions and gas explosions.

The premature explosions are caused, usually, by carelessness on the part of the employee, either in making up his cartridge or handling his explosive in a careless manner in the vicinity of a light from which a spark may fly, as in the case of a miner handling black powder with his cap on his head, or in such position that the air will carry a spark from his lamp into the powder. A great many accidents of this nature could be prevented by proper observation and the exercise of proper discipline on the part of the officers of the mine, who, in making their rounds, undoubtedly observe some of these things being done nearly every day. And it has been my own observation in going around the mines that this sort of carelessness is exercised frequently and the man who is guilty of this practice should be discharged or severely disciplined, for he is not only endangering his own life but also the lives of all his fellow employees in the mine, as explosions of this kind will frequently occur no sooner if it exists in the mine.

Premature explosions are also frequent by overcharging by tamping what is known among miners as a "dynamite load" that is, putting a free shot and improperly tamping the charge. This is sometimes done by miners to save time in the latter tamping, but should certainly not be allowed. The most part of the

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[illegible] Association of Engineers, Birmingham, Ala., before most recently of Birmingham, Ala., and at Birmingham, Ala., and also at Pittsburg, Pa., and Birmingham, Ala., and the Alabama Coal Operators' Association.

ing this have no place in a mine and should be discharged. It frequently results in either the shot going off before the man who fires it gets away, injuring or killing him, or in a windy shot due to the improper tamping.

Windy Shots and Their Prevention

Blownout or windy shots are usually caused by one of two things, either improperly tamping the hole or using too heavy a charge of explosive. If a shot of black powder or dynamite blows the tamping out, instead of doing the work it was intended to do, the shot comes out of the mouth of the hole, as from a gun barrel, in a long tongue of flame reaching at times, it is estimated as much as 100 ft. or more, making considerable wind, blowing doors open in the distant parts of the mine, and, in case there is any dry dust in this vicinity, stirring this dust up and exploding it, making a serious and far-reaching explosion out of what might have been, without the presence of dust, not particularly disastrous. Windy shots have, however, been known to do considerable damage without any evidence of dust having taken a part, but the presence of dust or gas makes the danger of windy shots a very grave one. If there happens to be explosives, in any quantity, kept on the side of the heading, or in a room within reaching distance of the windy shot, there is danger of an explosion and the recommendation, recently made by the State mine inspector that, in some of our mines, no explosives be kept within 150 ft. of a working face is a very good order and mine foremen should see to it that this rule is observed; also that all shots are properly tamped and not overcharged. This I realize is a very hard thing to do as it is impossible for any man, or a dozen men, to see all the holes that are loaded. But proper discipline if exercised when a man is caught doing this sort of thing, will go a long way toward accomplishing the desired result.

I believe, however, that the greatest preventative for explosions due to any cause mentioned above, is the use of what is known as safety or "permissible explosives" such as bituminite or carbonite, both of which are extensively used in this district. Neither concussion nor heat alone will explode them so that a combination can, giving a combination of the two, must be used and hence the handling of them is rendered much less dangerous. And, except in very exceptional quantities, the heat from the explosion is not sufficient to ignite either gas or dust. Two pounds, I believe, is the safety limit placed by the manufacturer on these explosives, and while I consider it wise to keep within this limit in charging a hole, it would no doubt take much more to produce an explosion of gas or dust, if present.

Tests of Explosive Qualities of Coal Dust

In this connection I will state that the Tennessee Coal, Iron and Railroad Company recently sent some samples of dust from four of its mines, one in the Pratt field, one in the Blue creek field, one in the Blocton field, and the other at Whitwell, Tenn., to the Government testing plant at Pittsburg, Penn., to be tested to see whether these explosives would fire the dust.

This portion of the testing plant consists of an iron gallery or tube made of boiler plate, about 6 ft. in diameter and 100 ft. long, at one end of which is a heavy nickel-steel cannon embedded in concrete. At intervals of every 5 or 6 ft. there are small heavy plate glass windows on the side of the gallery and port holes with heavy lids on the top to relieve the pressure when explosions occur.

The method of conducting the test is as follows: The dust to be used is distributed along the bottom of the gallery, as it would be in the bottom or floor of a mine and also along the sides of the gallery on shelves, as it would be found upon the gob or sides of the mine. After making a test to determine how much of the explosive is to be used as equivalent in strength to 227 grams or, about 7 oz. troy, of 40 per cent dynamite, which is the standard charge, this amount of explosive is then charged into the cannon and tamped with 1 lb. of dry clay and set off with electricity. The first shot was loaded with 295 grams or a little over 9 oz. of carbonite No. 2, 20 lb. of dust from Johns, in the Blue creek field, was distributed in the gallery and 2 per cent. of fire damp was introduced into the tunnel where the shot was fired. The flame was scarcely perceptible at the first window, the dust was not ignited and there was no explosion except of the explosive itself in the cannon.

The next test was made with 313 grams or 10 oz. of bituminite No. 1, other conditions being the same, and the result was the same as in the previous test.

The third test was made with 500

grams, or about 16 oz. of black blasting powder, which is equal in strength to the above charge of bituminite and carbonite, all other conditions of the experiment being the same, except that in this case to avoid the possible claim that the explosion was caused by gas there was absolutely no gas introduced into the chamber. The result of this test was that there was a long tongue of flame which stirred up the dust and ignited it, the flame extending for a considerable distance out of the mouth of the chamber and throwing dirt from the ground against a heavy iron sheet suspended about 50 ft. from the mouth of the tunnel. The flame was visible in all of the windows of the chamber and issued from 12 port holes on top. Three of the port holes remained open, but the balance were thrown open with such force that they rebounded into position, these doors being hinged. Dense volumes of black smoke from this explosion issued from these port holes and from the end of the tunnel. Coke was formed in large quantities.

The results of the other tests were the same in each case, bituminite and carbonite producing practically no flame and not igniting the dust, but in every case the black powder did without the assistance of any gas whatever. I was advised by the engineer in charge that dynamite produced about the same result.

This then proves conclusively that black powder or dynamite will produce dust explosions without the aid of any gas. This is not impossible, I am advised, with these safety explosives if used in very excessive quantities. The United States Geological Survey has issued a list of what are known as "permissible explosives," the tests having been made on May 15, 1909. This includes two grades of powder (Aetna) coal powder, five grades of Du Pont carbonite, two grades of Keystone special, two grades of Potts powder coal coalite, three grades of Sinnamahoning collier dynamite, masurite, meteor dynamite and monobal, the last two grades being also manufactured by the Du Pont company. You will note that bituminite, manufactured by the Jefferson Powder Company, is not on this list, but, on inquiry I learned that the reason was that bituminite and some other explosives were not received in time to be included in this test but will be included in a supplementary list to be issued shortly.

I believe then that one of the surest methods of preventing explosions, as the result of windy or blownout shots, is to use these so-called safety or permissible explosives, and I will say that the Tennessee company is using these explosives exclusively except on two divisions where the opposition of the men to it has been very strong, and where it has been seemingly impossible to produce as good a grade of coal as with black powder. But we are experimenting at these places and endeavoring to instill in the men the proper spirit of coöperation, due from the fact that our one object in wanting to use these safety explosives is to protect the lives of the men as well as our property.

I think that all mining men should where possible use these safety explosives, and, where it is not possible, use every precaution in their power to see that shots are properly loaded and properly tamped. Mining the coal either by hand or by machine will lessen the amount of explosive necessary to break down the coal and give the ammunition a better chance to do its work and hence lessen the probability of a blownout shot, but the cuttings should be removed from in front of the hole before blasting, for fear there should be one.

Dust and Gas Elimination

The next step in the prevention of explosions, it seems to me, where gas generates, is to introduce sufficient air into the mine and properly conduct it to the working faces in sufficient quantities to sweep the gas out, or render it harmless. In the detection of gas and preventing its accumulation or ignition, the gasman's position is a most important and responsible one and he should be chosen accordingly. In doing this, however, if our mines are not already dry and dusty we are apt during dry or cold months of the year, by introducing a large quantity of air and a rapidly traveling air current, to take up and carry a considerable quantity of moisture from the bottom and sides of the mine, and to render it dry and dusty, if it was not already so, and in this case the moisture must in some way be restored.

I read recently that in an average-size mine, producing 1000 tons of coal per day and properly ventilated, 20,000 gal. of water per day were taken from the mines in the air current during the winter months, all of this being picked up from the bottom or the ribs of the mine. This seems large on the first thought, but, while I have not checked the figures, I have reason to believe they are correct. Now, to avoid explosions of dry dust we must in some manner get rid of this dust, or wet it sufficiently to render it harmless. Of course, we can remove some of the dust, but it is absolutely impossible to remove it all, especially that which is lodged in a thin coating on the timbering along the ribs and gob.

Sprinkling with a hose has for several years been resorted to, but this is not regarded as very efficient for the reason that the nature of the dust seems to be such that if there is any quantity present, where it is sprinkled from a hose, the top layer only seems to be dampened. No matter how a large a quantity of water is thrown on the dust, it simply runs off, leaving a thin coating on top which is dampened; in sprinkling it is also impossible to get into the crevices of the gob. A very much more effective method is to use sprays, of which there are several kinds: one is a homemade affair, made of a piece of 1- or ¾-in. pipe, with very small holes drilled in one side. This is not particularly efficient, as the holes soon cut out so large that the water is thrown out in a stream. Another which gives very fair results, is the ordinary copper or brass spray nozzle, such as is used on the ordinary garden hose. There are now several other very efficient sprays being manufactured. Our company has tried two of these; one is known as the Leebler spray, which is manufactured in Germany, and the other is a spray manufactured for mine or mill purposes by the American Moistening Company, of Boston, Mass. After trying all of these we have decided that the American company's spray is most effective, and we are introducing it in large numbers in all our mines; and I think the State mine inspector will back me up in a statement that in this respect we are getting our mines about as safe as they can be made.

By screwing off the cap of this spray the construction of it may be seen. It appears to split the water up and disintegrate it into a mist which seems to thoroughly saturate the atmosphere and is carried and deposited for quite large distances. The advantage of this over sprinkling is that it moistens the dust as it is carried in the air, and, instead of depositing dry dust, it deposits moist dust. The operation of this device being practically continuous there is no chance for the dust to dry and it seems to settle the dry dust carried in the air. On this device, where the spray issues, there is a removable copper bushing which can easily be changed if the water cuts it.

Tamping with coal dust is a dangerous practice, but one which is indulged in too frequently by miners and, in many places is a common practice. Clay should be provided and its use insisted upon.

Electrical Shot-firing System

After all the precautions that are being taken by various mining companies throughout the country, these same companies seem to have, occasionally, disastrous explosions, resulting in the deaths of a large number of men and great damage to property. As these explosions are always liable to occur, the next step, after using all the preventatives possible, is to fire the shots, if practicable, after everyone has left the mine. This has been done successfully for a year or two, by electricity, by the Utah Fuel Company, in their mines in Utah, a description of which will be found in the JOURNAL of Jan. 23 and 30, 1909.

At the No. 3 Pratt mine of the Tennessee company a system of shot-firing, spraying and sprinkling is now being tried out. There are two men in the daytime and one at night called shot inspectors, or shot firers. In the daytime each one takes a certain part of the mine. In the morning their time is spent in inspecting the

wiring and making the necessary extensions, and at noon they commence their rounds, going to the working faces and carrying with them sufficient exploders to fire all the shots, giving to each miner as many exploders as he has shots to fire which meet with the inspector's approval.

After the inspector has finished his rounds, which is about quitting time, he comes to the surface, closing the switch at each entry as he comes out. He then goes to the check office where the timekeeper is stationed, this timekeeper's duty being to carefully check every man in and out of the mine. When he has ascertained to a certainty that all the men are out, and not until then, he goes to the power house and requests the engineer to close the switch at that point, watching him to see that it is done. He then goes to the check office, unlocks his box there and closes the final switch which fires the shots, leaving it closed only a few seconds; it is then opened and left open and the box locked again. He then goes to the power house to see that that switch is opened. As the night inspector comes into the mine he opens all the switches along the slope leading into, the various entries so that there is no possible danger of any accident by the power accidentally being turned on the line. He then performs the same duties as the day man.

The proper tamping of the holes and connection of the exploders to the wire in the room is left to the miner, instructions being given to him by the shot firer.

The expense of installing the system in this mine, which covers a large amount of territory, was about $3500, including all labor and material, and the cost of operation, as well as we have been able to figure at the present time, will be as follows: Two inspectors or firers in the day time at $2.60 or $5.20, one inspector at night $2.60, wire and insulator for extensions $1.50, total $11.30 per day. The mine is provided with pipe lines for sprinkling and fire protection, the pumps, in all cases, being our regular mining pumps for unwatering the mine.

This covers what I have to say about what I regard as the most serious cause of accidents, the other minor causes will be treated more briefly.

Accidents Caused by Fall of Rock and Coal

In many cases these accidents are caused by the miners themselves not properly timbering their work as they should, or by not properly supporting the coal which is being undermined, or through the lack of proper care in pulling down coal or digging out what might be termed a standing shot. A great many of such accidents can be prevented by proper inspection on the part of the mine management of their duly appointed assistants, also by sufficient timbering. Frequently, there is a laxness on the part of the mine management, in the way of providing necessary timber, and, when such is provided, it is left to the judgment of the miner as to how close props shall be set, or whether they shall be set at all, the result being that a great many men, especially in districts where the roof is bad, are severely injured or killed from lack of proper or sufficient timbering, often due to lack of supervision and discipline on the part of the mine management. It is the duty of the mine foreman to see that men who are too ignorant to protect themselves are made to do so.

Defective or Improperly Protected Machinery or Appliances

These accidents happen on the surface as well as in the mine, and a great many of them could be prevented. In many cases this can be accomplished by properly guarding or shielding gear wheels, or any rapidly moving parts of machinery, such as the crank pin on an engine, which can have a rail around it; exposed gears, or pumps, or engines, which can be protected with metal or even wooden shields. In cases of electric wires, especially where high voltage is used, the wire, where possible, should be insulated, and in case of trolley wires, which cannot be insulated, they can be shielded by a 6-in. board, the bottom 3 or 4 in. below the wire, and fastened with an iron bracket between the clamp holding the wire and hanger.

This is of the utmost importance where high voltage is used, as is sometimes the case with long transmission lines. These shielding boards should be placed not over 4 in. apart, so that a man raising his head could not get it between the shielding and thus come in contact with the wire. A shock from a current as high as 500 volts is usually considered to be fatal. A still better precaution along this line is to use a lower voltage, not over 250, which is not fatal, except in rare cases. In fact, the shock from 250 volts is usually not serious unless it is continued for quite a length of time. High platforms should also be protected by hand rails to keep men from falling off.

A great many of these accidents can also be prevented by proper inspection on the part of the mine foremen, master mechanics, and their representatives. In many cases there is too great a tendency when a thing is one, to let it run right not to keep it right, but to allow it to get in bad repair, and many accidents caused by breaking of machinery, breaking of hoisting and haulage ropes or car couplers, can be prevented by keeping these things in proper condition.

All Other Accidents

I have not tried to subdivide this fourth class of accidents, as there are too many possibilities, but, as a rule, they are due to lack of proper organization, lack of proper discipline, and care lessness on the part of individual employees, also to the failure, on the part of the employer, to furnish proper facilities and protection for employees. For instance, men are frequently hurt on the roadway on account of there being insufficient passing room for the trip, either moved mechanically or by mule power. To guard against this class of accidents there should be provided either a separate walkway for the men to go to and from their working places, or a sufficient place beside the track for a man to walk without danger of being struck by a passing trip. And, when either of these are provided, they should, like machinery, be kept in proper condition, i.e., obstructions in the shape of rock should not be piled in this place, or falls from the roof should not be allowed to accumulate so that it is either impossible, or a hardship on the man to travel what is supposed to be a traveling road. And this can only be kept in proper condition by necessary supervision and discipline. If neither of the above are practicable a manhole should be cut in the rib every 30 or 40 ft., and kept whitewashed and free from dirt or rock.

Accidents such as collisions of two trips running in opposite directions are usually the result of lack of proper discipline or system in handling the mine. Derailments, caused by defects in the track, bent axles, or any of the numerous causes, are usually the result of lack of discipline or lack of proper supervision in keeping the plant in good condition.

Summary of Conclusions

In conclusion, I will say that not only in Alabama, but in all parts of the country, there is too much of a tendency on the part of the superintendents and mine foremen, and incidentally their assistants, to produce the greatest possible amount of coal at the least possible cost, regardless of anything else. The consequence is in many cases that the energies of the whole organization are expended in the efforts to produce the greatest results today, and the fact is lost sight of that machinery cannot run forever without attention, and that no part of the mine can remain in proper working condition without being attended to. The fact that to produce coal our employees must be properly protected is also lost sight of, with the result, in many instances, that the loss of life and injury to employees, or delay, or damage to property from accidents or wrecks, will far more than offset the gain made by thinking of nothing but getting coal.

It will probably appear that I have placed a great deal of responsibility on the mine foremen and hold them responsible for a great many accidents which occur. In doing this I realize that the mine foreman has a responsible position; that he has many and varied duties to perform, and that he cannot be at all places at one time, as he is frequently expected to be, and I have thought that many of us do not give the mine foremen sufficient consideration or sufficient as-

sistance to do all that we expect of them. In a large mine they cannot do it all, but, by organizing their working force on a systematic basis, exercising proper discipline, and choosing for their main assistants men who will do the same, they can build up an efficient organization, and, by preventing many of the accidents which now happen, not only save human life and limb, but also increase output and decrease cost by avoiding delays caused by accidents.

I also, before closing, want to give the master mechanics, and electricians, and their departments, their share of responsibility in keeping the plant in proper working order and safeguarding the lives of employees, and to say that they should consider it their duty to prevent breakdowns, if possible, rather than to repair them, and by so doing their labors will be light and their burden easier to carry.

In 1908 Indiana took second place among the States in the production of cement, Pennsylvania being first. The output for the year in Indiana was 6,478,165 bbl., valued at $5,380,503; an increase over 1907 of about 2,000,000 bbl. There were eight factories in operation last year.

Some German Mine Props

German engineers have for a long time beeen engaged in devising mechanical props, generally made of metal, with the idea of replacing the less durable and, in Europe, more expensive timber props. Several such contrivances were descibed by Dr. Hecker in *Glückauf* of April 8 and October 24, 1908.

Angle-Iron Prop

The angle-iron prop, shown in Fig. 1, consists of two pieces of angle, the upper of which fits inside the lower. A triangular collar surrounds the upper end of the lower angle and a triangular wedge fits between this collar and the smaller angle. The outer side of the wedge is notched, to provide greater frictional resistance.

The wedge is tightened or loosened by blows of a hammer. The lower end of the stull is provided with a cast-iron acorn and the upper end with a bearing surface to receive the cap piece. Size No. 7, of about average length, has the following dimensions: Length extended, 2 m.; length closed, 1.6 m.; outer angle, 70x70x9 mm.; inner angle, 60x60x10 mm.; weight, 27 kg.; cost, 13.10 marks. If desired, the upper angle can be fitted with a screw jack as shown in Fig. 2.

Tubular Stull

A tubular stull, made of cast iron, is shown in Fig. 3. It consists of two tubes, the upper one fitting inside the lower. A heavy collar surrounds the joint, and a wedge can be driven inside the collar to hold the tubes in position. Size No. 4 has the following dimensions: Length extended, 1.9 m.; length closed, 1.325 m.; outer diameter smaller tube, 82 mm.; outer diameter longer tube, 93 mm.; thickness of both tubes, 4 mm.; cost, 27.80 marks.

Tests at Mine No. 2 of the Gewerkschaft Deutscher Kaiser, employing 2960 of the angle stulls and 100 of the tubular stulls, showed a total saving, during the year 1907, of 9071 marks as compared with the estimated cost of an equivalent number of wooden stulls.

Adjustable Temporary Stull

An adjustable stull for temporary use,

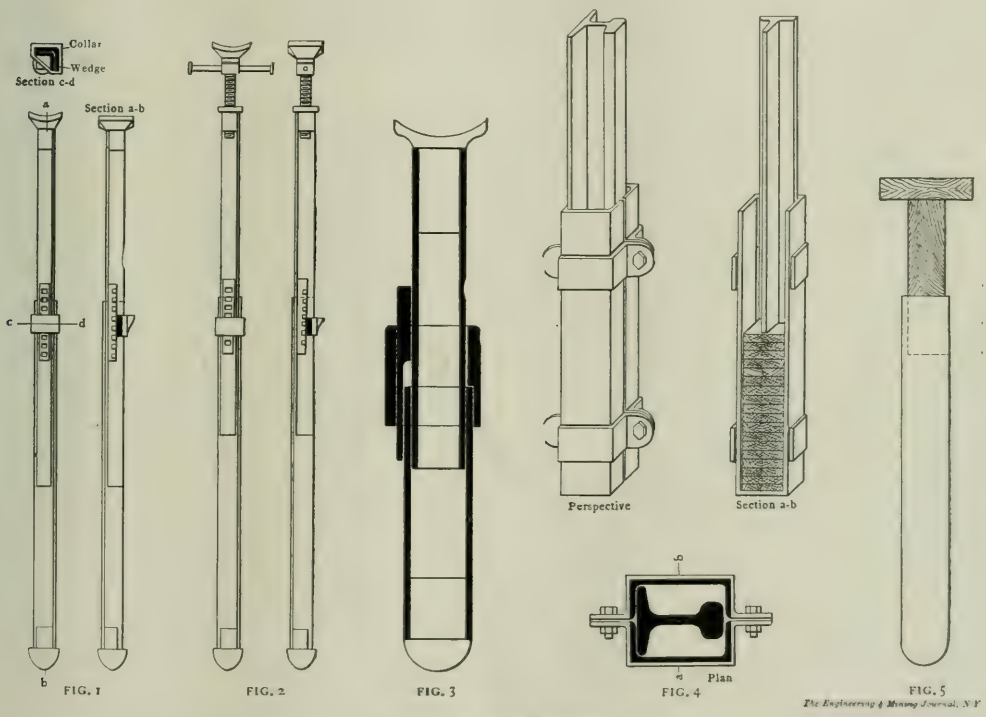


FIG. 1 FIG. 2 FIG. 3 FIG. 4 FIG. 5

DIFFERENT TYPES OF STULLS

devised by Schmalenbach, is shown in Fig. 4. The lower end consists of two pieces of channel iron clamped together by two pairs of straps. The upper part of the stull is made of a section of rail; blocks of wood are fitted into the rectangular box formed by the two channels, to receive the pressure and to give elasticity to the stull. A test on a stull of this sort in which 10 oak blocks were used, having a total thickness of 245 mm., showed a depression of 70 mm. with a load of 10,000 kg., and of 150 mm. with a load of 30,000 kg. At a load of 20,000 kg. the five bottom blocks, and at 36,000 kg. by two lower blocks, were uninjured, while those above them were crushed.

Nellen Stull

The Nellen stull, shown in Fig. 5, consists of a cast iron pipe closed at the lower end, but open at the top. The pipe is three-quarters filled with tamped sand and a short section of timber, standing on the sand, projects out of the pipe. Such a stull, the pipe having a diameter of 130 mm. and a length of 1.275 m., filled with sand to a depth of 935 mm., and the oak block extending 525 mm. beyond the pipe, supported, under test, a load of 12,000 kilograms.

Concrete Stull

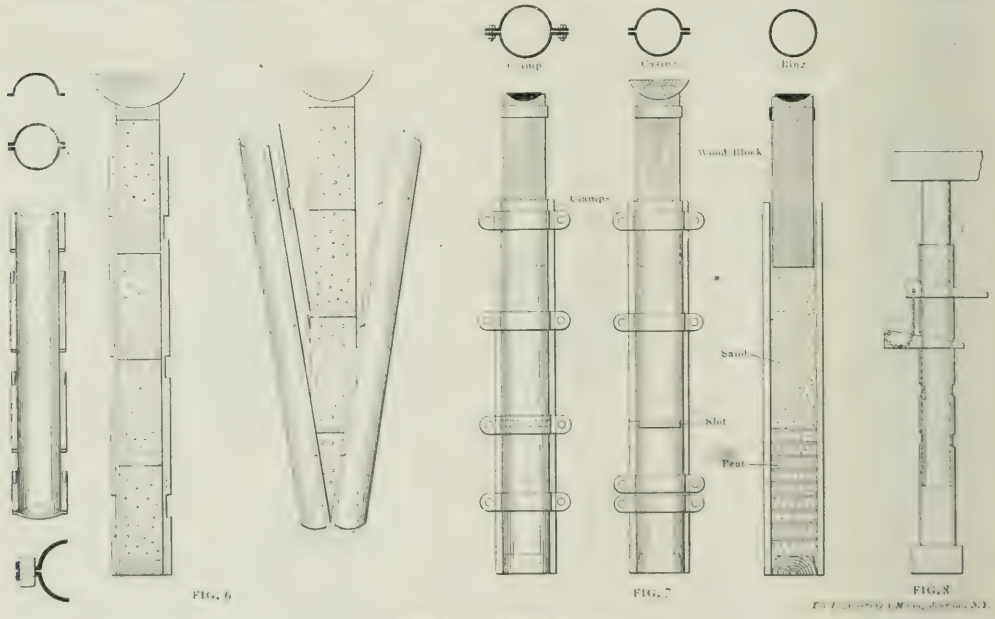
A composite concrete stull devised by F. Nellen is shown in Fig. 6. It consists of cylindrical blocks of concrete separated by pads of peat and all inclosed in a divided sheet steel cylinder. The concrete blocks are 20 to 35 cm. long, with various appropriate diameters, and are made of a mixture of 70 per cent. sand, about 27 per cent. of granulated blast-furnace slag, and about 3 per cent. of lime; after molding, the blocks are subjected for 10 hours to a pressure of eight atmospheres in a steam bath. The peat pads are about 5 cm. thick. The sheet-steel jacket is made in two sections, which can be locked together along the edges with soft iron clamps. The cost of such a stull, 1.5 m. long, is 30 to 35 pfennig, exclusive of the jacket, which costs about 2 marks. A test of one of these stulls was made in the following manner: A tubular jacket, 1.6 m. long and 118 mm. diameter, was filled with four cement blocks, each about 300 mm. long, with a 50-mm. pad between every two blocks. On a pad surmounting the upper block was placed a short wooden block 420 mm. long, making a total length of 1.82 m. and a total weight of 56.5 kg. With a load of 800 kg. the stull showed a decided shortening; at 13,900 kg. the wooden block was compressed to the end of the stull jacket, showing a shortening of 220 millimeters.

An improved type of the stull just described is shown in Fig. 7. It consists of a cylindrical steel jacket in two halves, one of which is continuous throughout its length, while the other is cut in two just below the middle, in such a way as to leave a narrow, horizontal slot. A wooden block, 40 to 65 cm. long, fits into the upper end of the jacket and is reinforced by a ring around its upper end. The two halves of the jacket are clamped together by four ring clamps.

The lower part of the jacket is filled with peat, the upper part is then nearly filled with sand and the wooden block is inserted. One of the clamps ordinarily covers the slot in the side of the jacket, but if it is desired to loosen and remove the stull, the slot is opened and some of the sand raked out. The weight of a stull having a jacket 1.5 m. long, or a total length of about 1.8 m., and a diameter of 120 mm. is 40 kg., of which the steel jacket alone weighs 15 kg. The price of a stull having a tube 100 mm. diameter and 1 m. long, complete with clamps, blocks, etc., is 7 marks.

Nonius Stull

The Nonius stull, Fig. 8, is made of two telescoping sections of pipe, without distinguishing top or bottom parts. Both sections of pipe have slots cut through them in such a way that, while the slots of each section are diametrically opposite, the slots of one section do not register exactly with those of the other section. This insures that, at any position of the two sections, at least two sets of slots shall be continuous clear through the stull, and can receive wedges, by which the length of the stull can be adjusted to take the load. A certain-sized stull has an outer diameter of 72 mm., a maximum length of 1.97 m., a minimum length of 1.10 m., weighs 18 kg., and costs 13.55 marks.



NONIUS AND NELLEN STULLS

Concentration at the Butte Reduction Works

By A. H. Wethey*

The smelting plant of the Butte Reduction Works is situated about 1½ miles south of Butte, Mont. Most of the ore treated comes from what are known as the Clark mines, and is brought down by the street railway in self-dumping ore cars and discharged into bins at the plant. Other ore comes from various parts of Montana in railroad cars, and some ore is still hauled by teams. The works was first established in its present location in 1885 but no part of the old plant now remains. The plant is essentially a custom smelter, as the Colusa-Parrot Mining and Smelting Company which owns the plant does not own or operate any mining property.

The principal ore supply is low grade and requires concentration before being smelted in the furnaces; the other portion comes as smelting ore of high enough grade to go direct to the smelting furnaces after being crushed and sampled.

Concentrating Plant

Treatment of the Ore—The second-class ore intended to be concentrated is discharged into a series of bins from which it passes through a 15x30-in. Blake crusher. On each side of the crusher is a bin that will discharge directly into it, the ore first passing over an electric magnet built by the Electric Controller and Supply Company, of Cleveland, for removing pieces of iron and steel which come from the mines with the ore; then over a grizzley (which takes out all the fine material) to the crusher itself. As these two bins which discharge directly to the crusher are not sufficient to handle all the ore, a conveyer is used to bring the ore from other bins. This conveyer discharges the ore over another magnet and grizzley before reaching the crusher. The pan conveyer used was purchased from the Jeffrey Manufacturing Company, of Columbus, Ohio.

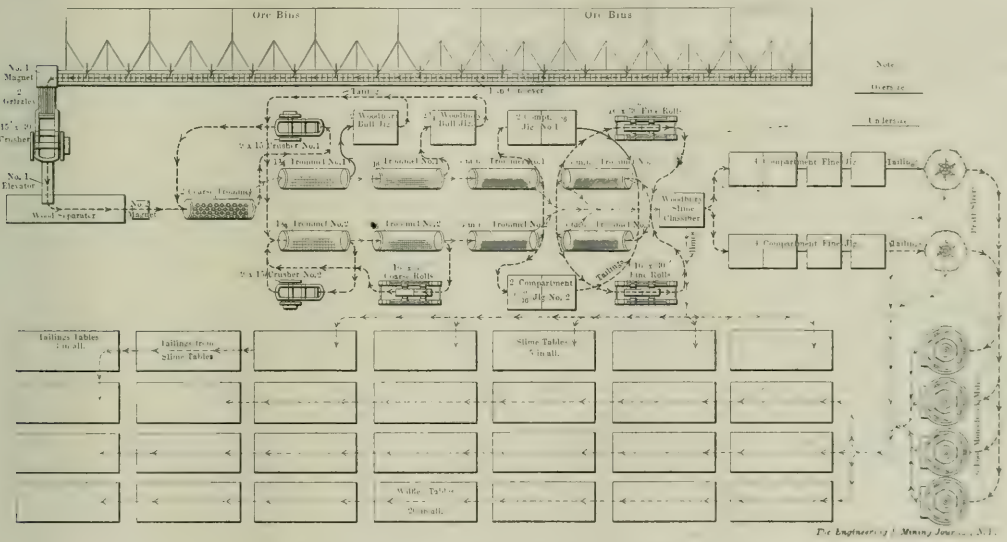
The fine ore passing through the grizzley and the coarse ore passing through the crusher are carried up together by a bucket elevator to the top of the concentrating plant, where the ore is all discharged into a tank of water in order to remove the wood which comes down from the mines with the ore. The ore is removed from this tank by a small bucket elevator, the buckets having numerous perforations through which the water passes and returns to the tank, and the wood is washed automatically over an outlet provided for that purpose. The wood and water pass over a perforated screen which separates the wood and allows it to go down into a pocket where it is collected. The water passes to other concentrating machinery. Over 40 tons of wood per month are removed from the ore by the method described.

The ore carried up by the elevator is discharged into a trommel having holes 2 in. in diameter. All the material too coarse to pass through these holes goes to 9x15-in. Blake crushers and is re ground.

The fine material passing through the trommel goes to a trommel having holes 1¼ in. in diameter. The oversize goes to a so-called "bull jig" (built by the National Ore Concentrator Company, of Great Falls) and the undersize to another trommel having holes 9/16 in. in diameter. The oversize from this trommel goes to a second bull jig, and the undersize to another trommel, having holes 3 mm. in diameter. The oversize from this 3-mm. trommel passes to 2 two-compartment Pratt jigs, and the undersize to two Woodbury slime classifiers, built by the National Ore Concentrator Company, which separate the slimes from the fine jigging ore.

The tailings from the first bull jig go to two 9x15-in. Blake crushers and then to a second trommel having holes 1¼ in. in diameter, the oversize returning to the crushers and the undersize to a second trommel having holes 9/16 in. in diameter. The oversize from this trommel goes to one set of 16x30-in. rolls, built by the Montana Iron Works, of Butte, and the undersize to a second 3-mm. trommel. The oversize from this trommel goes with the oversize from the first 3-mm trommel to the two-compartment Pratt jigs, and the undersize to the two Woodbury slime classifiers

The tailings from the two-compartment jigs go to two sets of 16x30-in. rolls and then to two more 3-mm. trommels, the oversize returning to the rolls and the undersize to the two Woodbury slime classifiers. The jigging ore from the slime classifiers goes to two four-compartment Pratt jigs, and the slimes to Woodbury and Overstrom tables.



FLOW SHEET OF 500-TON CONCENTRATOR, BUTTE REDUCTION WORKS

*General manager for W. A. Clark, Butte, Mont.

The tailings from the four-compartment jigs go to two Pratt ore separators, the fines from the separators going to Wilfley (built by the Mine and Smelter Supply Company, Denver), and Overstrom (built by the Allis-Chalmers Company, Milwaukee) tables, and the oversize to chilian mills furnished by the Trent Engineering and Machinery Company, Salt Lake. The fines from the chilian mills go with the fines from the ore separators to the tables. The Pratt ore separators and jigs were designed by Fred Pratt, the foreman in charge of the concentrating plant of the Butte Reduction Works, and were built in the local shops at the plant.

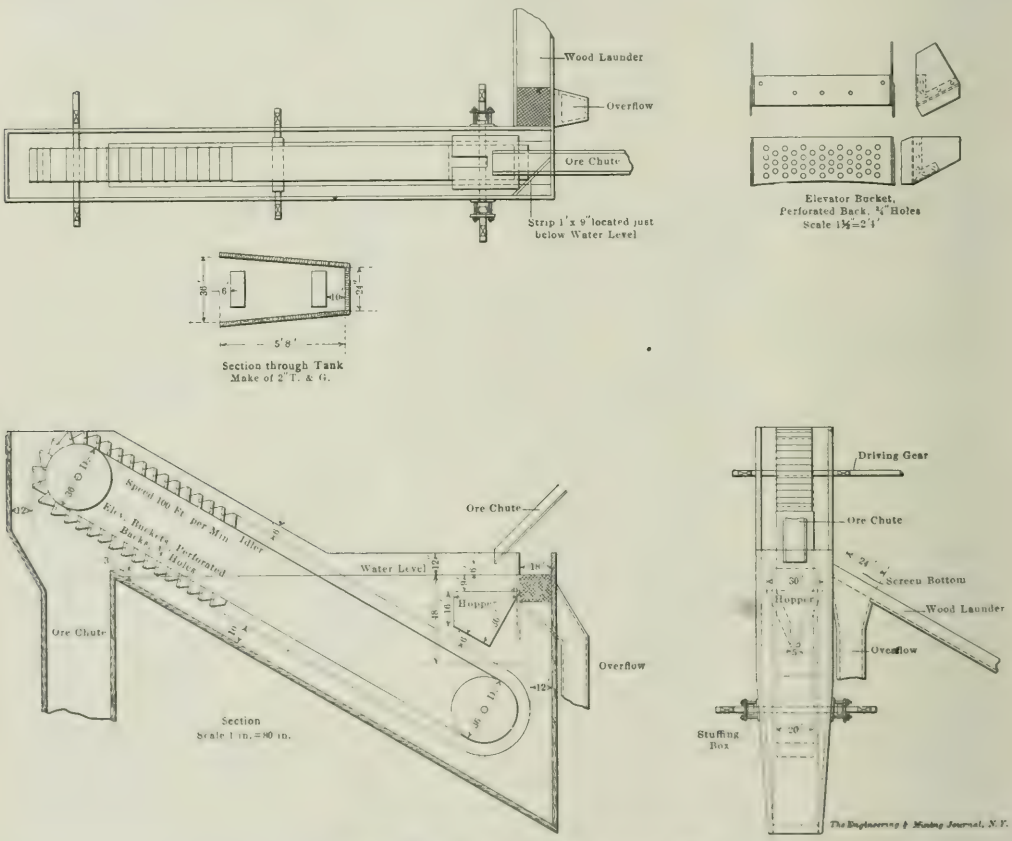
But few carbonate ores, upon which are built the original iron industry of Ohio, are now used, and in a number of other sections of the country deposits of iron ore which in earlier years supported industries, are inactive; in fact, the knowledge that such industries existed has passed from the memory of the people.

Geology and Mining in Mexico

SPECIAL CORRESPONDENCE

The mining companies of Mexico seem to be awakening to the need and advantage of thorough and competent geologic and scientific investigations of their properties. The firm of Spurr & Cox, Inc., of Mexico City and New York, has made in the past year for the American Smelting and Refining Company and allied interests, examinations in Aguascalientes, at Velardeña, Durango, and in Nuevo Leon. The same firm has made an investigation of the Esperanza mine at El Oro and is now engaged in a geologic survey of the Peñoles Mining Company's property at Mapimi in Durango. E. Ordoñez, a geologist of Mexico City, is engaged on a geological study of the mines of the Real del Monte y Pachuca company, in the state of Hidalgo. C. W. Botsford, an American geologist, has been for some time engaged by the Guanajuato Development Company in studying the geology of the important Guanajuato district, and has made investigations at Zacatecas and in Sonora for private companies. An American syndicate recently arranged for a reconnaisance of the Guerrero and Michoacan region by skilled geologists.

These are a few of the investigations recently made by scientific men in the interests of Mexican mining. The need of such work is great in Mexico because the limited staff of the Mexican Institute of Geology, which corresponds to the United States Geological Survey, has been unable to undertake any extended economic work in connection with the mining districts. Also it is held by many that the Institute devotes too much of its energy to strictly scientific work, especially with the great existing need for economic investigation in the interests of mining. At any rate, some very important work is being done in geologic investigation in Mexico now, and more or less of the results are becoming general information for the benefit of the public from time to time.



WOOD SEPARATOR USED AT BUTTE REDUCTION WORKS

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The Tariff on Iron Ores

The reduction of the duty on iron ore to 15c. per ton, on careful consideration, does not appear likely to result in any important changes, or in any detriment to our own mines. In the case of Cuban iron ores, which have constituted about two-thirds of our imports, the new duties are less than the amount named. By the reciprocal trade agreement between the United States and Cuba, the latter obtains a concession of 20 per cent. below the existing tariff rates, so that the duty on Cuban ore is only 12c. per ton.

For a series of years past the imports of iron ore into the United States have averaged about 3 per cent. of the total supply. If we deduct the exports—which are chiefly of Lake Superior ores to Canadian furnaces—the proportion of foreign ores used in this country is less than 2 per cent. of the total. Of these imports about 70 per cent. come from Cuba, about 20 per cent. from Europe—chiefly Spain—and about 10 per cent. from Newfoundland. It is not likely that the latter sources of supply can send us any great increase in quantity. The Spanish mines are not increasing their output, and any improvement in the iron trade of Great Britain and Germany will diminish the surplus sent here. It is much the same case with the Newfoundland ores, which find their chief market in Canada, their surplus for sale depending chiefly on the activity of the Canadian trade. No large quantity of ore comes to this country from Canada as yet. The chief increase in imports must therefore be in Cuban ores; unless, indeed, there should be some development of the iron deposits of Brazil and Venezuela, which are believed to be extensive. That, however, is entirely in the future, and need not be taken into account at present.

That a considerable increase in the mining of iron ore in Cuba, and its importation thence into this country, is not only possible but probable, appears certain. It must be remembered, however, that a limit on the use of such ores more effective than the tariff is found in the railroad rates from the seaboard. This limit will probably be found to have its line approximately coincident with the Alleghenies. To furnaces east of that line, Cuban ores will furnish the mixture they need with local ores, and will, to a great extent relieve them from the disadvantage they now suffer from, as compared with furnaces west of the line, in the high cost of freight on Lake ores for that purpose. Quite probably this will make possible the continuous operation of some furnaces which can now only be run at a profit during periods when demand for pig iron is heavy and prices are high.

Looked at from the other side, this is not at all likely to diminish seriously the trade or the profits of our own iron mines. By far the greater part of our pig iron is made in the Central West, where Lake ores find their chief and natural market; and in the South where the supply of local ores is so large and of such quality as to preclude any possibility of imports. That part of the demand which is likely to be filled by imported ores is too small to be of great importance; and we believe that this will be realized as the results are gradually worked out by time and experience.

The Labor Question in the Transvaal Mines

The labor question is once more beginning to be of serious interest to the mine managers of the Transvaal. Probably it has never been quite absent from their minds, though for two years past there has been a sufficient supply for the time being, and the number of Kafirs brought in increased from month to month, as the Chinese mine laborers were gradually deported under the law forbidding the renewal of their contracts. This was chiefly due to the facts that public works and railroad construction were almost stopped, and that general business in the country, outside of the mines, was not prosperous. Partly also it resulted from outbreaks of cattle disease and other troubles which forced the natives to seek work for their support. The Kafir "boy," when he finds it necessary to work at all, decidedly prefers outside work to that in the mines, where discipline is more strict and the conditions harder. For several months past, however, general business has shown a marked improvement in the Transvaal, and there has been also a partial resumption of public and other construction work. The Native Labor Association, the cooperative body which supplies laborers to the mines, has found it more and more difficult to recruit negroes; while the num-

ber of Chinamen was, of course, constantly decreasing.

The total number of laborers employed in the Transvaal mines—not including white men, who are mainly foremen, gang bosses, miners and overseers—at the end of July was 154,844, of whom 5,370 were Chinamen and 149,474 Kafirs, according to the returns of the Chamber of Mines. This was a decrease of 4794 during the month of June, at a time when more labor was badly needed. As compared with January of this year, there was a loss of 6563 men, of whom 5855 were negroes and 708 Chinamen. The Native Labor Association has been unable to keep up the supply, although it has extended its recruiting ground into Portuguese territory at a long distance from the mines. In June the number of laborers lost was considerably greater than those received, and this condition will probably continue; while the total elimination of the Chinese is only a matter of a few months.

Some Witwatersrand managers estimate that before the close of the present year at least 190,000 men could be profitably employed in the mines. Where the increase of 35,000 men is to come from it is not easy to see, when it seems difficult to keep up the present number. Possibly the total given is an over-estimate, but the requirements for labor are certainly increasing with the extension of development, and the prospective opening of more deep-level mines. To fill the demand promises to be a serious problem.

Since the Chinese law was passed, over 15,000 Chinamen have been returned to their own country on the expiration of their labor contracts. This labor movement has been accomplished quickly and with very little friction, and we hear no more about the troubles which were prophesied when the law was adopted. In another year the Chinese episode in the Transvaal will have become a matter of history.

Hydraulic Mining Difficulties in California

There has been another check to hydraulic mining in California, and some operations in the gravel mining counties have shut down entirely because the California Debris Commission has decided that hereafter all dams constructed for holding back débris or tailings must be of stone or concrete. Heretofore large numbers of these dams have been built of logs or even brush. In most instances the miners cannot afford to build expensive concrete dams, and if this ruling be enforced there will be fewer hydraulic mines started and operated than ever.

In the smaller mountain towns, where operations are not upon a large scale, the brush or log dams appear to have answered the purpose of holding back the débris, and miners have been permitted to continue hydraulicking. With recent changes in the personnel of the commission the rules have been made more rigid and more difficult to comply with than those formerly in force. The commission is given the right by Congress to formulate such rules as it sees fit, and the miners must comply with them, or have their properties closed down. It looks now as if these new rules were such as to shut out the small operator altogether and allow hydraulic mining in the region affected only by the larger companies, which are able to stand the expense required for permanent dams. There is, of course, much complaint from those who have had to shut down, but there appears to be no redress.

British Mine Taxation

The British Chancellor of the Exchequer has, wisely, abandoned the proposal to tax "ungotten minerals," which he recently submitted to Parliament. It soon became evident—in fact it was evident from the first—that the attempt to levy such a tax could only result in endless confusion and litigation. The Chancellor himself, when it came to the point, was unable to indicate any method of determining the quantity and value of the minerals which would be subject to the tax. He might, had he known of them, have been warned by the failure of the attempts made in several States in this country to tax property in accordance with the supposed value of its mineral contents. No equitable method of assessing such taxes has yet been devised, and it is not probable that any ever will be.

The place of this tax in the budget is taken by a tax on "mining royalties, dead-rents and wayleaves," that is, upon the income derived from mining property by those who do not work it themselves, but leave the operation to others. Two objections have been made to this special tax, the first being that to a large extent it will duplicate the income tax. This can, of course, be met by omitting receipts from royalties from the total of taxable income.

The other objection, which seems more difficult to meet, is that the royalty represents, or is supposed to represent, the gradual depreciation in value resulting from the removal of mineral from the land. It would seem hardly fair to tax an owner on the decrease in value of his property, however it might be to tax him on an increase. The certain effect of such a tax, moreover, would be an increase in royalties wherever it could be made, and the consequent incidence of the tax on the mine operator and not on the mineowner.

For the first time, apparently—judging from the various public discussions of the proposals—English financiers are beginning to realize the difficulties attending the taxation of mining property as such. Fortunately the British tax system is flexible, and an unpopular or clearly inequitable tax is not likely to last over a year.

Steel Making on the Pacific Coast

The reorganization of the company operating at Irondale, Wash., and the improvements made in its plant are a matter of interest to the Pacific Coast. It is the first serious and carefully considered attempt to establish the manufacture of iron and its subsequent conversion into steel and finished material on the coast. Wrought iron and steel have been made in California for a number of years in several mills and furnaces, using pig iron imported or brought from the East and scrap collected locally, but they did not carry through the whole process as it is to be worked out at Irondale. The old charcoal furnace there, which has been operated intermittently, has been rebuilt as a coke furnace of larger capacity, and the company has added open-hearth steel furnaces and a rolling mill.

Some prominent mining engineers appear to have ambitious political aspirations. It is gossiped that John Hays Hammond will sooner or later have a post in the cabinet. D. C. Jackling, of the Utah Copper Company, is said to be desirous of representing Utah in the Senate.

Steel Works on the Pacific Coast *

The Irondale Steel Company, Seattle, Wash., is building a small steel plant which it expects to operate in connection with its blast furnace at Irondale, near Port Townsend, Wash. The additional equipment, now under construction, consists of two 20-ton open-hearth furnaces and three rolling mills, 22 in., 14 in. and 9 in., respectively.

The new plant is something of an experiment because it marks the first serious attempt to manufacture steel west of the Rocky mountains. A small plant is being built partly because of the experimental nature of the undertaking and also on account of the relatively limited market on the Pacific slope.

The price of steel scrap in the Pacific States is relatively very low, due to the absence of steel foundries and open-hearth plants which consume a large amount of scrap. Ordinary prices range from $6 to $11 per net ton, depending on the quality, against $12 to $16 in the East. Considerable quantities of steel scrap are shipped from the Pacific Coast to the Atlantic seaboard and to Europe. It is the purpose of the designers of the Irondale plant to take advantage of this condition and use as large an amount of scrap as possible in the open-hearth furnaces, together with some of the pig iron from the blast furnace. The annual consumption of all iron and steel products, except heavy rails, in the States west of the Rocky mountains, including export business, is about 1,500,000 tons. The new Irondale plant will have an approximate annual capacity of 21,000 tons of pig iron and 45,000 tons of steel. The plant will be prepared to roll squares and rounds from ¼ up to 4 in., 20 ft. long; flats up to 3x10 in., also angles and channels up to 7 inches.

The plant originally consisted of a blast furnace with a capacity of 70 tons per 24 hours and a number of stationary charcoal kilns. This furnace was operated on charcoal which was produced from sawmill refuse purchased from the lumber mills in the vicinity. The furnace was last blown out in January, 1908. The stack has been repaired and is now in condition to be blown in.

The company was reorganized at the close of last year and reincorporated with a capitalization of $1,000,000. James A. Moore is president; John Schram, treasurer; M. M. Lyter, secretary; William Price, manager; R. A. McLellan was only recently appointed chief engineer and Oscar Stromberg is consulting engineer.

The company owns coal properties in the Tacoma district and the blast furnace will hereafter be operated on coke made from this coal. This distance from the mines to the furnace is about 60 miles. The iron-ore properties operated by the company are located in Washington and British Columbia at distances about 50 and 350 miles, respectively, from the furnace.

The new open-hearth department consists of two 20-ton furnaces designed by Oscar Stromberg, consulting engineer. The furnaces are fired by oil and the melting chamber is 22 ft. in length and 11 ft. 3 in. in width. The hearth will be made of Austrian magnesite. The air regenerators will be 16 ft. x 12 ft. 3 in. x 14 ft. 8 in. The slag pockets are situated directly under the downtakes, of which there are two, 2 ft. 6 in. x 4 ft. 6 in. The weight of the hearth is carried on brick piers which support six I-beams on which the rails supporting the brickwork are laid. The air valve is of the ordinary Siemens butterfly type. The oil burners are supported on the melting platform and can be withdrawn from the furnace at will. The oil is atomized by steam and is supplied under 60 to 80 lb. pressure at 250 deg. F. The ladle equipment consists of three 25-ton ladles designed by Mr. Stromberg. The steel will be tapped into a ladle resting on an electrically operated car, from which it is tapped into small ingots.

Bottom-poured or rising ingots will be cast. The ingot molds are 8¾x10 in. inside; the walls of the mold are 3⅝ in. thick at the bottom and 2¾ in. at the top. The ingots will be 4 ft. 3 in. in length and will weigh about 965 lb. each. The molds are made open at both ends and are set on a specially designed bottom-cast plate. Twelve molds are set on a single plate and cast from one 6¾-in. runner. The plate is provided with slots which hold the clay pipes that conduct the metal from the central runner to the various ingot molds. The bottom-cast plate is made of cast iron; it is 8 ft. long by 6 ft. 1½ in. in width and 6 in. high, the thickness of the metal being 2½ in. The casting pit in front of the open-hearth furnace is 40 ft. long, 8 ft. wide and 5 ft. deep, with a cinder pit at each end 8 ft. wide by 5 ft. deep.

Two coke-fired heating furnaces are situated just in front of the casting pit, while a third furnace is adjacent to the 9-in. mill.

The rolling mills, which are placed in two parallel rows, are located in front of the casting pit. The 22-in. mill is nearest the furnace, with the 9- and 14-in. mills placed 115 ft. back of the 22-in. mill. The mills are to be direct driven by Corliss engines; the boilers are six in number, 500 h.p. each, three being of the Badenhausen water-tube type designed by John Badenhausen, of Seattle.

*Abstract of article in the Cleveland *Iron Trade Review*, Aug. 19, 1909.

The average wage paid at the Doloeath tin mine (*Queensland Government Min. Journ.*, Feb. 15, 1909) in Cornwall during the past three years was £6 per month.

The American Mining Congress

The American Mining Congress will hold its twelfth annual session at Goldfield, Nev., Sept. 27-Oct. 2. A program is being arranged which will include a discussion of various matters pertaining to the welfare and progress of the mining industry, the aim being to give greater opportunity for practical discussion, and consume less time in the reading of technical papers.

During the past year the Congress has had several committees at work conducting investigations, report of which will be made to this session. These reports will be open for discussion, and the committee reports will be presented as follows:

On Vertical Side Line Law, by George W. Riter, Salt Lake City, Utah, chairman.

On Coal Tax Insurance Fund, by Samuel A. Taylor, Pittsburg, Penn., chairman.

On General Revision of Mining Laws, by Walter R. Ingalls, New York, chairman.

On Standardization of Electrical Equipment, by Dr. Edward B. Rosa, Washington, D. C., chairman.

On Prevention of Mine Accidents, by H. Foster Bain, San Francisco, chairman.

On National Forest Service, by Col A. G. Brownlee, Denver, Colo., chairman.

On Alaskan Mining Laws, by J. L. Steele, Landlock, Alaska, chairman.

The silver question will be discussed with a view to devising means of bringing about a greater use of silver, and decreasing the rate of exchange between the United States and countries using a silver standard. Moreton Frewen, of London, England, James J. Hill and John Hays Hammond, have been invited to speak on this subject.

Goldfield citizens are making elaborate arrangements for showing the district to the delegates, and the State of Nevada has appropriated $5000 to pay the expense of collecting and classifying a comprehensive display of minerals, which is being installed at Goldfield.

The Congress will consist of the regular members of the organization, and all duly appointed delegates, who have equal powers in all the deliberations of the open body. Mining men contemplating attendance should address J. F. Callbreath, Jr., secretary, at Denver, Colo., for more complete information.

The Wolfram Mining and Smelting Company has been organized in London to acquire as going concerns the two wolframite mines of Panasqueira and Cabaco da Piao, these properties having been worked by Sociedade de Minas de Wolfram em Portugal, situated in the province of Beira Baixa and district of Castello Branco, Portugal. The Panasqueira mine is already equipped with machinery.

Cost Analysis of Stone Consumption in Underground Diamond Drilling

By Benjamin H. Case*

The cost of carbons and borts consumed in boring 39 underground holes at the Burra Burra and London mines, Ducktown, Tenn., is shown in the table accompanying this article. The holes were drilled in 1907, with two Sullivan machines of the "S" type, and all but three holes, aggregating 284 ft., were horizontal across the formation. The core was 15/16 in. diameter, and the holes 1½ in. diameter.

The highest cost per foot was $3.66, in a horizontal hole started in the footwall, and drilled to a depth of only 8 ft., consuming 1 61/64 k. of $15 borts. Excepting this hole, which penetrated very hard blue quartz, the highest cost for a hole drilled with borts was $0.8338 per ft. This hole was drilled in the footwall of the Burra Burra mine to a depth of 52 ft., 37 ft. being in hard silicious vein material and 15 ft. in country rock; 2 57/64k. of $15 borts were consumed in boring it.

The lowest cost per foot was $0.0321, and was obtained from a horizontal hole bored to a depth of 190 ft. in the hanging-wall of the Burra Burra mine. This hole penetrated 10 ft. of vein material at its mouth, and the remainder cut through soft mica schist so thinly foliated that there were but few pieces of core recovered more than ¼ in. thick. The stone consumption was only 39/64 k. of $10 borts.

Cost Using Carbons

The highest cost of a hole drilled with carbons was $1.155 per ft. This hole was drilled in the footwall of the London mine to a depth of 92 ft., and penetrated 22 ft. of vein and 70 ft. of country rock. The loss in stones was 1¼ k. at $85. The lowest cost with carbons was $0.0718 per ft., from a hole in the footwall of the London mine which penetrated 30 ft. of vein, and 44 ft. of country rock. The stone consumption for the hole was 1/16 k., at $85.

Cost Using Borts

The stone consumption given in the table does not take into account the loss from scrap borts in the drilling. This loss was: 4 58/64 k. @ $15, $73.59; 5 57/64 k. @ $10, $58.90; total, 10 51/64 k., $132.49. The above amount distributed to the 2948 ft. drilled wholly and in part with borts gives an additional cost of about 4½c. per ft. for holes drilled with these stones. There was no loss in carbon scrap, this loss occurring usually when the stones have worn too small to be utilized in a bit.

Summarizing, and leaving out of the calculations those holes where both borts and carbons were used, the costs with borts were for 2781 ft. drilled, $687.12, or the cost per foot, $0.247. The additional loss for scrap, which amounted to $0.045 per ft., brings the cost up to $0.292 per ft. This is considerably less than the carbon cost of $0.5090, given in the table.

ANALYSIS OF STONE CONSUMPTION.

Feet Drilled.			Stones Consumed.	Cost per Carat.	Total Cost.	Consumed per Foot.	Cost per Foot.
Total.	Vein.	Country.					
1437	411	1026	25 33/64 k.	Borts at $10	$258.60	1.151/64 k.	$0.18
546	65	481	16 47/64 k.	Borts, 7 13/64 @ $10 . . . . Borts, 9 34/64 @ $15	72.03 135.94	1.304/64 k.	0.3809
798	226	572	14 33/64 k.	Borts at $15 . .	220.55	1.179/64 k	0.2764
167	90	77	8 33/64 k.	Borts, 6 33/64 @ $15 . . Carbons, 1 33/64 @ $85 . .	99.84 154.06	3.246/64 k.	0 9225
840	228	612	5 3/64 k.	Carbons at $85.	427.66	0.383/64 k.	0.5090
3788	1020	2768	70 3/64 k.	Totals and averages. .	$1368.68	1.184/64 k.	$0.3613

Adaptability of Each Stone

Borts may be profitably used in drilling soft ground, but in hard material they are useless, as the stones, all of which contain flaws, will shatter when encountering hard rock. It is doubtful if borts could have been used with cheaper results in drilling the 840 ft. that were drilled with carbons. Some of this ground they would not have cut without great waste. Where part carbon and part borts were used, the carbons were substituted for the borts when it was found that the borts would not stand the work.

In some formations, where there are strata or zones of varying degrees of hardness, bits set with carbons might alternately be used with those set with borts, but the bits could not very well be set in advance owing to the varying gage of the hole.

*Mining and civil engineer, 63 Atkin Street, Asheville, N. C.

Development Work*

If a mining venture is likely to prove payable, then the objective should be to win the asset as soon as possible, so that it can earn still more profit. If it is found not worth going beyond the prospecting stage, then the sooner that knowledge is acquired the better, for it is cheaper to do this quickly than to drag on indefinitely. At first, when opening up a mine, a limited number of men can be employed, until the main entrance, whether it be by shaft or adit, is sufficiently far advanced to warrant levels or crosscuts being put in. The called-up capital is not earning interest while such development is going on. Therefore, a good organizer will push on with the dead work, even if he has to pay a bonus over and above a fair rate, so as to encourage the miners to work their best.

This fact is recognized by the more up-todate directors, and recently the managers of an optional mine were instructed to "crowd on development work as much as possible, in order that we may not only obtain the most economical results (there is nothing so extravagant as development on a small scale), but also in order that we may obtain knowledge of the mine, and its possibilities, at as early a date as possible."

Carry Development with Production

When a mine has once been opened up it is naturally cheaper to carry on development at the same time as productive work, than to work the mine to a temporary standstill, and then start developing again. In the former case development shares the standing charges, such as management, pumping, engine drivers, etc., with the productive work. In the latter case development has to stand the whole cost. Not only that, but, as a rule, fewer men can be engaged on development than on productive work, as there are more faces to be worked in stopes, than in drifts, winzes and shafts. The consequence is that the services of certain men have to be dispensed with, and labor conditions become disorganized.

Then, again, if we look at it from a market point of view, this irregular way of working a mine gives to those who desire it every opportunity to run the shares up or down, irrespective of the real value of the mine. It is more advisable to push on with development, even if one has to borrow to do so. Later on, ore can be got out quickly, or the output curtailed, according to the market price of metals or other conditions that may affect the management.

*From *West Min Stand* June 30, 1909.

Details of Practical Mining

Notes of Interest to the Operators of Small Mines as Well as of Large Mines. The Things That Have to Be Done in Everyday Mining

REPORTS FROM EXPERIENCE

Readers of the JOURNAL are invited to contribute to this department. Articles should be brief, thoroughly practical, and preferably illustrated by drawings or sketches. Our draftsmen will prepare properly any kind of a pencil sketch that is intelligible. Something that is an old story in one district may be quite unknown in another. Articles accepted and published are suitably paid for.

Some Mining Appliances in Western Australia *

By O. B. WARD†

The accompanying sketches illustrate some useful devices which have been designed and used at the Lake View Consols mine in Western Australia, in connection with underground work; each of them has proved itself efficient and economical in practical use.

HINGED SHOES FOR CAGES

This type of shoe was designed for use in the main shaft where skips are ordinarily employed for hauling both men and ore. Occasionally, however, it is necessary to use a cage, as, for instance, in raising mullock in trucks and shifting trucks from level to level or to the surface for repairs. In such cases the cage is fixed on beneath the skip and with the hinged shoe, illustrated in Fig. 1, the cage can be swung into or out of the shaft in a few minutes, without any necessity for removing and replacing a skid in the shaft. The hinged portion of the shoe is folded back, as shown in the top portion of the sketch, until the cage is in position; it is then closed and the bar raised, as shown in the lower portion of the sketch, the bar being firmly secured in position by means of a split pin. This cage is used solely for conveyance of material, all men being strictly forbidden to ride in it.

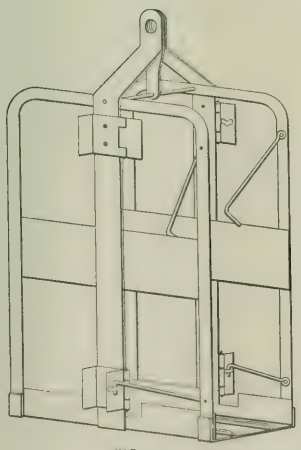


FIG. 1

CAGE WITH HINGED SHOES

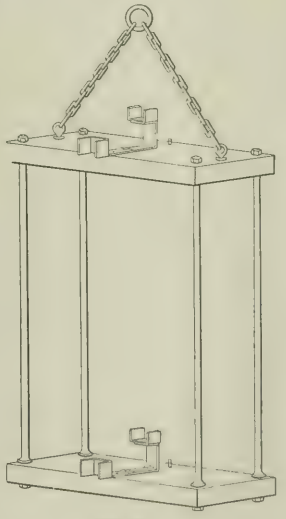


FIG. 2

GIG FOR REPAIRING SHAFT

GIG USED IN SHAFT WORK

The gig was designed for inspecting and repairing timbers in the shaft with a view to affording the timbermen an overhead protection while carrying out this work. Previous practice was for the timbermen to ride on the top of the skip, where they were of necessity exposed to the danger of anything falling down the shaft. The construction of the gig is shown in Fig. 2. It is fitted with a hinged shoe, of a different design from that described above, which allows the gig to be placed in the shaft without removing a skid. It is open on all sides and there is thus ample room for all inspection and repair work. In the ordinary way the gig is hung on beneath the skip, or it may be attached direct to the winding rope. For the work in which it is used the gig of course travels only very slowly through the shaft, so that there is no danger of breaking the bolts that hold the shoe in position.

SAFETY GRIPPERS ON SKIPS

These grippers are of the usual design with the addition of a special toe or lug to prevent the grippers from cutting through the skids in the event of a loaded skid falling in the shaft. When the grippers come into action the toe of the gripper comes into contact with the shoe on the skip just at the point where the grippers have their greatest hold on the runners, and their further penetration into the skids is prevented. This is shown in Fig. 3 herewith.

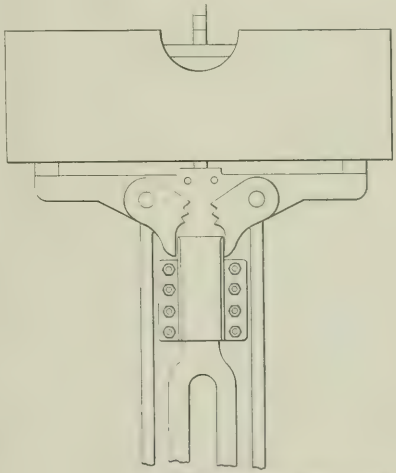


FIG. 3

SAFETY GRIPPERS WITH LUGS

STEEL CHUTES FOR SHRINKAGE STOPES

For drawing ore from stopes worked on the shrinkage system it is necessary to provide a type of chute that will allow for the breaking of large rocks in the chute itself. Such rocks are invariably found among the ore and their presence there is

*From the *Journal* of the Chamber of Mines of Western Australia, May, 1909.
†Kalgoorlie, W. A.

due either to flaking from the walls of the stope, or to their being buried beneath finer ore during the process of stoping. For this purpose the device called in Australia the "Chinaman" chute is in general use, but recently the Chinaman has been replaced by the steel chutes illustrated in Figs. 4 and 5. The sketches show the whole of the chute, as there is nothing but broken ore behind the timbers. Rocks can be broken in the chute, either by hammer or by blasting with dynamite, without in any way damaging the chute. The lip [illegible] and ex- [illegible] many ad- [illegible] Two truck- [illegible] per shift; the necessity for taking off a [illegible]

are reduced to a minimum and the initial cost of the chute is much less than that of the Chinaman.

Thawing Dynamite

A method of thawing dynamite used by the Vermont Copper Company consists in heating the thawing box by electricity. The box referred to is about 16x40x36 in., and stands on edge. It is made of wood with a number of trays that will slide in and out. Each tray is made of small strips of wood, and it is upon these trays that the powder is placed. Doors are made to nearly airtight as possible. The lower 8 in. of the box has wire coils through which the current is passed, and the heat from the coils warms the box. [illegible] The box is usually thoroughly heated before placing the dynamite on the trays, and then the current is turned off. The thawer is placed in some remote part of the mine and is thoroughly inclosed in a small house, at the end of a drift which can be closed from draft.

Lining for Ore Chutes

The majority of mining companies usually line the bins and ore chutes with sheet steel. It is seldom that the steel sheets are worn uniformly and as soon as a hole occurs it is necessary to renew the entire sheet, which often means a waste of material and extra expense. At Mineville, New York, Witherbee, Sherman & Co. found that it is more economical to use bar steel. At present they use [illegible] bars. By using bars it is less trouble to do repair work and it is necessary to remove only the worn-out part and put in a new piece. All the steel may then be used. [illegible] bars with one

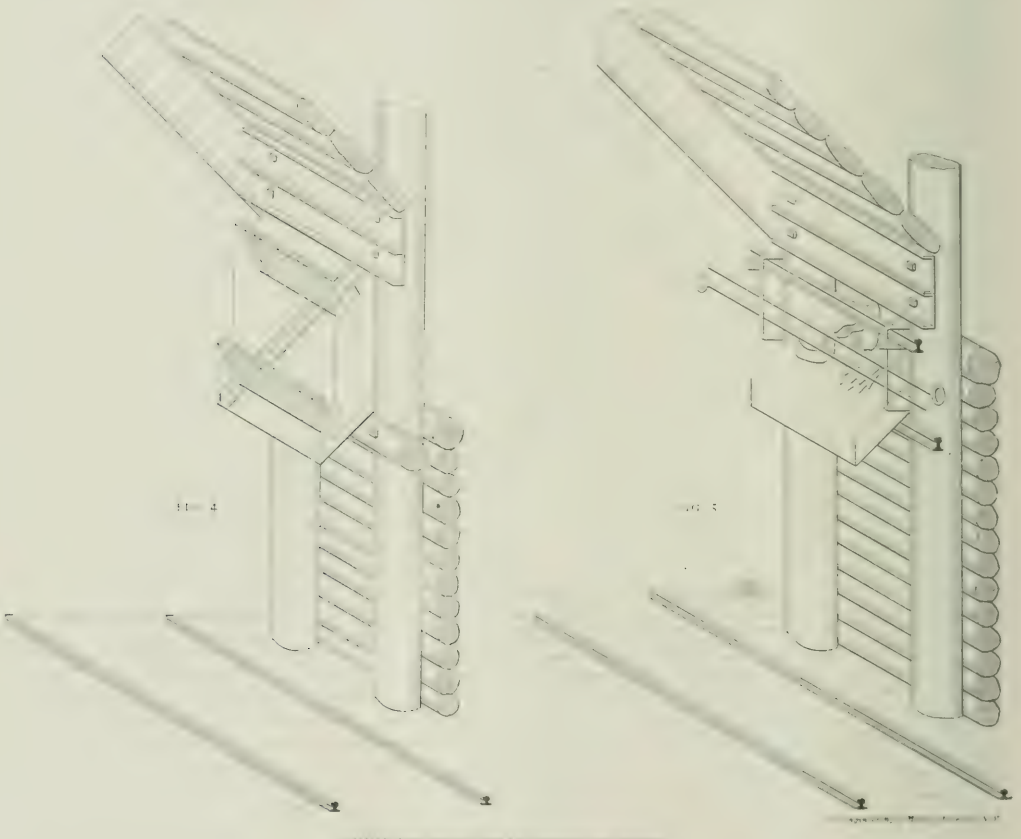


FIG. 4

FIG. 5

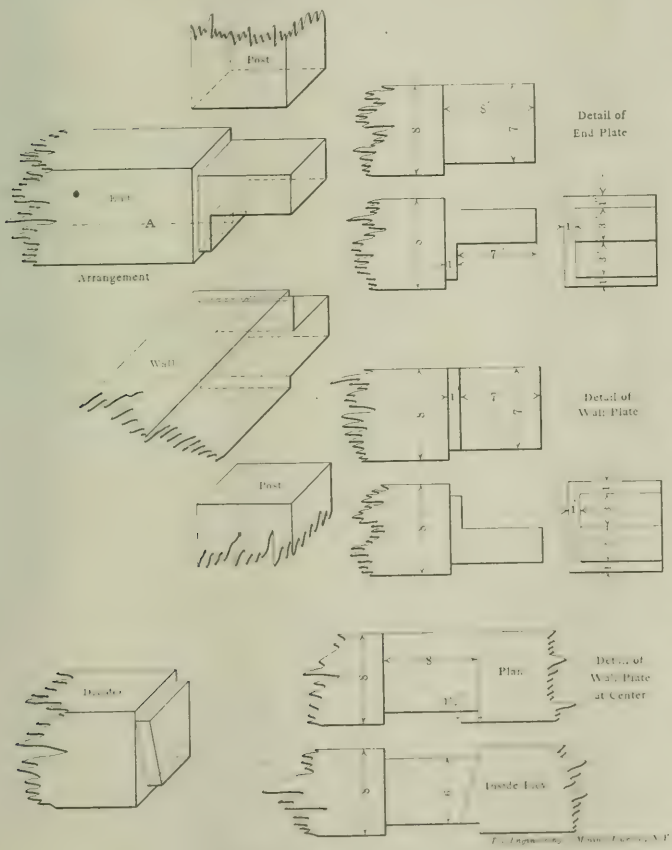
CHUTE FOR ROUGH ORE IN SHRINKAGE STOPES

end worn thin may be used. Railroad rails of heavy weight are also good for lining the front of ore bins at a point directly opposite the place where the cars dump. They are occasionally suspended by the upper end and are free to move at the lower end. They form an excellent buffer for heavy ore as it comes from the mine car or skip.

Selection and Framing of Timber

By W. L. Fleming*

At a small mine in a remote region, timbers have usually to be framed by hand from the logs as a small sawmill is numbered among the things the superintendent wants but cannot get. For shakes use cedar, for split lagging red fir or spruce and sugar pine are preferred. Cedar splits better than the other woods but lacks the strength. The splitting qualities of a tree are gaged by the bark as the general lines of the bark follow the grain of the wood. A tree whose bark shows a slight tendency toward a spiral, is unfit for shakes or lagging. For ordinary mine timbers, the ease of supply carries greatest weight, even gnarled juniper trunks and branches with a shape like the letter S doing duty underground in Nevada. Red fir and spruce are the best of the usually available timbers, then pine. Tamarack is a fair timber, but is very heavy to handle. Black pine is heavy and does not grow to large size. White fir is worthless except for temporary work where no great strain is to be put upon it. Peeled timber will outlast that used with the bark on, especially in damp places.



METHODS OF FRAMING TIMBER

Mine timber should be cut as long as possible before it is to be used, peeled on the spot, and left clear of the ground to season. For shaft timbers, or square setting, it is easier to secure a good fit if the logs are hewn square with a broad-ax. To frame a set from hewn timbers there is necessary a one-man crosscut saw, hand saw, brace and bits, iron square, framing chisel, hand ax, and foot-adze. A templet should be made from inch lumber for the full length and breadth of the desired piece and for as many sides as necessary, one generally being sufficient. Tack the templet lightly to the timber, being sure it remains straight and is not drawn out of line by the inequalities of the hewn edge. Frame from templet, using the square only from templet, never from a hewn edge. Daps and gains not covered by the teplet may be framed from the finished faces already made. Each set should be put together and examined before going into the mine and the joints marked so the set may be put together in the same manner underground.

The accompanying sketch shows the method of framing shaft sets from 8-in. timber which is probably in most common use. It combines the maximum strength with the minimum labor of framing. Angles other than right angles are to be avoided as far as possible. They are hard to fit. To frame this joint, fasten templet to side *A* of wall and end plates and frame top and bottom faces of tongue and shoulder, squaring from the templet. Also frame daps for posts at center of wall plates and mark top and bottom of dap for the divider. The sides may be framed and squared from these faces when finished. The wedge shaped gain on divider holds the divider on the bottom set and avoids the deep cut in the wall plate necessary for a tongue.

The false set which protects the bottom timbers from the blasts is easier to handle if made of half-round logs without framing. The false wall plates should cover the shaft wall plates over all and are attached by bolts through the holes drilled for the hangers. The false end plates and divider need only reach from one false wall plate to the other and holes should be drilled in the shaft-end plates to accommodate bolts in the same manner as in the wall plates.

*Mining engineer, Room 717, 93 Nassau street, New York.

A unique winding plant of the Dolcoath tin mine, Cornwall, is described by L. C. Ball (*Queens. Gov. Min. Journ.*, Feb. 15, 1909). In order to prevent angling of the rope, the engine and drums travel from side to side, being mounted on 20 bogies which run on rails and are worked by tooth gearing from the main shafting. Steam is used at 100 lb. per sq. in., and some difficulty was experienced in bringing it from the stationary boilers to the moving engines, but this was ultimately overcome by the use of three telescopic joints, one fixed, the second running on a curved rail, and the third on a straight rail with the engines.

Developments in Nevada County, California

SPECIAL CORRESPONDENCE

In Nevada county, the leading quartz-mining county in California, several new developments of importance are being inaugurated. The Brunswick Consolidated Gold Mining Company, of Grass Valley, of which C. H. Mallen is superintendent, is about to break ground for a new three-compartment shaft, some distance east of the old shaft. It is to be sunk vertically for 1250 ft., whence work will be pushed to the eastward. When the mine closed down last year the works were in rich ore, but it had to be handled so often before reaching the mill that costs became excessive. The rich ore will now be tapped by a new shaft and certain virgin ground will also be opened. The new shaft will be kept free of water by the pumping plant at the old works.

Ground has also been broken for the new Central shaft of the Mountaineer Mines Company at Nevada City. It will be sunk at an angle of 45 deg. to a depth of 2000 ft. The new shaft is 1200 ft. south of the shaft now in use and will be to the mines of the company what the Central shaft is to those of the North Star Mines Company. A powerful hoisting engine has been ordered and a large Lakenan hydraulic pump will also be installed. At present the mine has a 10-stamp mill, but a much larger one will be built. All the machinery will be operated by hydraulic power. The company owns a surface area of about 600 acres, including the following claims: Mountaineer, Layton, Walratin, Rogers, Price, Reward, Arbogast, Black Prince, Langdon, Fortuna, Live Yankee, Orleans and its extensions and East Orleans. The principal owners are John and Peter Bender, of Hamilton, Ohio, and the superintendent is John N. Becker, of Nevada City. Several of the mines named have been producers in their day, and others have been but little developed. At 700 ft. depth in the new shaft a drift will be started to the south to develop the properties of the company south of Deer creek. When the 2000 ft. level is reached a drift will be started north to develop the orebodies north of Deer creek. The 2000 will be 800 ft. lower than the bottom of the old shaft. The property is one of the most extensive in the State.

A further extension of coal lands has been made by the Utah Fuel Company, which has recently returned to the Government [illegible] and in addition has [illegible] to the Government the sum of $[illegible]. Recently the company relinquished to the Government 1440 acres, paid a fine of $[illegible] and an additional $112,000 for coal extracted from the land.

New Operation in the Tintic District, Utah

SPECIAL CORRESPONDENCE

An interesting mining operation will be undertaken in the Tintic district of Utah by the Eureka City Mines Company, which has been organized by Walter Fitch and associates with a capital of 1,000,000 shares, par $1, for the purpose of acquiring the right to mine under the boundaries of the Eureka townsite. Mr. Fitch announces that his company is prepared to spend $100,000 in the attempt to open up bodies of paying ore under the streets, dwellings, business houses and railroads in the town. A novel method of securing the right to do this work has been hit upon and it is now being subscribed to by the people of the mining camp. It is agreed that no mining or mine openings will be made nearer the surface than 700 ft. and that all property owners shall receive stock in the new company on a basis of 1000 shares for each acre of ground signed up. As the property in the townsite is cut up into small lots, not many, if any of the resident property owners will receive as much as 1000 shares, but in the aggregate, quite a proportion of the company's stock will be issued for this purpose. Working privileges have been obtained from the Chief Consolidated, the property of which is near the townsite, and exploratory work will probably be done from one of the deep levels of that property, if a sufficient number of signatures from the townspeople are obtained to warrant the company in proceeding with the exploration.

Mining Returns in the Transvaal

At the beginning of July there were 78 mines and mills operating in the Transvaal, the mills having a total of 9500 stamps. The total gold yield reported for July was 509,078 oz. fine from the Witwatersrand and 21,716 oz. from the outside districts. The total gold production for July and the seven months ended July 31 was as follows:

	1908.	1909.	Changes.
July oz.	584,455	620,791	+ 36,336
Seven months oz.	4,981,412	4,257,452	+ 253,040
Seven months value	$82,357,706	$88,001,543	+ $5,643,837

The labor return shows that at the end of July there were 149,474 Kafirs and 5370 Chinese at work in the mines, a net decrease of 2,786 Kafirs and 8 Chinamen during the month. As compared with January last there was a net decrease of 8855 Kafirs and 708 Chinese, a total of 9563 laborers. It is claimed by some of the mine managers that 100,000 men could be profitably employed, or 35,000 more than are now at work. The recruiting of negroes for the mines is slower each month, for the reason that there is an increased demand for labor outside the mines, and that kind of work is preferred by the men.

OTHER METALS AND MINERALS

The production of ores, other than gold, for the half year ended, June 30, included 2046 tons copper ore, 1198 tons tin ore and 1054 tons lead ore. The value of other minerals for the half-year was: Flint, £12,850; lime, £33,700; asbestos, graphite, etc., £6742; magnesite, £839; these values making £54,131 in all.

During the half-year diamond production was reported by five companies and 18 individual diggers. The total result shows 3,689,169 loads of dirt washed, the yield being 926,738 carats of diamonds of £580,807 estimated value. The greater part of this production was from the Premier mine.

COAL PRODUCTION

In the first half of 1909 there were 28 collieries in operation in the Transvaal. The total coal mined was 2,381,226 tons, of which 640,594 tons, 26.9 per cent., were sorted or screened out as waste and culm. The total coal sold and delivered during the half-year was 1,736,459 tons; the average price realized being $1.21 per ton at the colliery.

ACCIDENTS

For the six months ended June 30, 1909, there were 1064 separate accidents reported; the total number of casualties being as follows:

	White.	Negro.	Chinese.	Total.
Killed.....	55	586	27	668
Injured..	141	601	39	781
Total....	196	1,187	66	1,449
Per 1000 employed.				
Killed	2.46	2.95	2.95	2.90
Injured	6.29	3.03	4.26	3.39
Total...	8.75	5.98	7.21	6.29

The average number employed for the half-year was 22,403 whites, 198,036 Kafirs and 9153 Chinese; 230,192 in all.

The Russian consul-general at Bushire gives in a report some particulars of recent borings carried out in Arabistan. The oilfield, disclosed by the operations of an English company, appears to be small in area, and the two wells at present working are as deep as 1200 and 750 ft., respectively, but though no figures are given, it is clear that the Russian consul considers the discovery of great importance. The oil is of good quality, and the development of the field is expected to greatly restrict, if not entirely stifle, the import of Russian and American oil. It is remarkable, having regard only to distances and not to means of communication, that until now American importations of petroleum products have exceeded Russian importations in the ratio of 12 to 1.

Patents Relating To Mining and Metallurgy

A Selected and Classified List of New Inventions Described during the Past Month in the Publications of the Patent Offices

UNITED STATES AND BRITISH PATENTS

A copy of the specifications of any of these patents issued by the United States Patent Office will be mailed by THE ENGINEERING AND MINING JOURNAL upon the receipt of 25 cents. British patents are supplied at 40 cents. In ordering specifications, correspondents are requested to give the number, name of inventor and date of issue.

ALUMINUM

ORE TREATMENT—Method of Treating Aluminum Ores. Frank J. Tone, Niagara Falls, N. Y., assignor to the Carborundum Company, Niagara Falls, N. Y., a Corporation of Pennsylvania. (U. S. No. 929,517; July 27, 1909.)

ORE TREATMENT—Process of Treating Aluminum-Silicate Ores. Frank J. Tone, Niagara Falls, N. Y., assignor to the Carborundum Company, Niagara Falls, N. Y., a Corporation of Pennsylvania. (U. S. No. 929,518; July 27, 1909.)

SILICATES OF ALUMINUM—Process of Treating Silicates of Aluminum for the Purpose of Obtaining Valuable Products. Alf Sinding-Larsen, Christiania, Norway. (U. S. No. 927,758; July 13, 1909.)

ARSENIC

ORE TREATMENT for the Extraction of Metallic Arsenic. G. M. Westman, New York, N. Y. (Brit. No. 3480 of 1908.)

CEMENT

APPARATUS AND PROCESS for Making Cement. Robert W. Lesley, Haverford, and Henry S. Spackman, Ardmore, Penn., assignors to Pine Street Patents Company, a Corporation of New Jersey. (U. S. Nos. 929,144 and 929,145; July 27, 1909.)

COAL AND COKE

BY-PRODUCTS FROM GASES — Process of Obtaining By-Products from Gases of Dry Distillation of Coal. Gustav Hilgenstock, Dahlhausen-on-the-Ruhr, Germany. (U. S. No. 928,974; July 27, 1909.)

COAL-CUTTING MACHINE. Ludwig Schütt, Saarbrücken, Germany. (U. S. No. 931,017; August 10, 1909.)

COKE OVENS—Improvements in Coke Ovens. Theodor von Bauer, Berlin. (Brit. Nos. 6575 and 6845 of 1908.)

COKING PLANT. William R. Elliott, Denver, Colo. (U. S. No. 925,428; June 15, 1909.)

PEAT-CUTTING MACHINE. Otis E. Moulton, Dover, N. H., assignor to New England Fuel Company, Kittery, Me., a Corporation of Maine. (U. S. No. 928,995; July 27, 1909.)

COPPER

ORE TREATMENT—Process of Treating Copper Ores Containing Sulphur. Paul L. T. Héroult, La Praz, France, assignor to Société Electro Metallurgique Française, Froges, France. (U. S. No. 930,666; Aug. 10, 1909.)

PURE COPPER—Process of Obtaining Pure Metallic Copper from a Solution of a Salt of Copper. Lucien Jumau, Paris, France. (U. S. No. 930,968; Aug. 10, 1909.)

REVERBERATORY FURNACES for Refining Copper, etc. A. J. Boult, London, Eng. (Brit. No. 3394 of 1908.)

GOLD AND SILVER

AMALGAMATOR. Elymus Hackett, North Yakima, Wash. (U. S. No. 929,086; July 27, 1909.)

WASHER—Gold and Sand Washer. William R. Graham, Phoenix, Ariz. (U. S. No. 929,586; July 27, 1909.)

IRON AND STEEL

ALLOYS—A Metallurgical Process for Obtaining Alloys and Steels Containing Silicon. Louis H. Baraduc-Muller, Paris. (Brit. No. 14,093 of 1908.)

BLAST-FURNACE-CHARGING APPARATUS. Frank C. Roberts, Philadelphia, Penn. (U. S. No. 929,631; July 27, 1909.)

DRYING AIR for Iron and Other Blast Furnaces. F. W. Harbord, London, Eng. (Brit. No. 4424 of 1908.)

ELECTRIC EXTRACTION of Iron or Other Metals from the Ore. K. A. F. Hiorth, Christiania, Norway. (Brit. No. 3680 of 1908.)

FURNACES—Improvements in Metallurgical Furnaces for Iron and Steel. William F. M. McCarty, Rocky Ridge, Maryland. (Brit. No. 19,356 of 1908.)

ORE TREATMENT—Method of Treating Iron Ore. John T. Jones, Iron Mountain, Mich., assignor to Jones Step-Process Company, Duluth, Minn., a Corporation of Minnesota. (U. S. No. 930,764; Aug. 10, 1909.)

REVERBERATORY REGENERATIVE FURNACE. Thomas S. Blair, Jr., Elmhurst, Ill. (U. S. No. 927,098; July 6, 1909.)

SMELTING—Process of Smelting Iron Oxides. Horace W. Lash, Cleveland, Ohio. (U. S. Nos. 924,676 and 924,677; June 15, 1909.)

SMELTING AND REFINING — An Improved Process of and Apparatus for Smelting and Refining Iron and Steel. William F. M. McCarty, Rocky Ridge, Maryland. (Brit. No. 19,035 of 1908.)

TITANIFEROUS ORES—Process of Treating Titaniferous Iron Ores. Wilhelm Borchers, Aix-la-Chapelle, Germany. (U. S. No. 930,344; Aug. 10, 1909.)

NICKEL

ALLOYS—Process of Making Alloys. John T. H. Dempster, Schenectady, N. Y., assignor to General Electric Company, a Corporation of New York. (U. S. No. 926,980; July 6, 1909.)

ZINC

ALLOY—Process of Making Alloys of Zinc with Copper. Sterling Elliott, Newton, Mass. (U. S. No. 927,843; July 13, 1909.)

EXTRACTION OF ZINC from Its Sulphide by Means of Molten Copper or Iron. T. J. Heskett, Surrey Hills, Victoria, Australia. (Brit. No. 1761 of 1908.)

GALVANIZING Method of Galvanizing. George L. Patterson, Thomas L. Mornes, and Carl H. Zieme, Newcastle, Penn. (U. S. No. 928,398; July 29, 1909.)

ORE DRESSING—GENERAL

CONCENTRATING-TABLE. John W. Meyers and Daniel F. Paine, Ely, Nev. (U. S. No. 930,553; Aug. 10, 1909.)

CONCENTRATION Apparatus for Concentrating Ores by Means of Currents of Water. P. F. Peck, Chicago, Ill. (Brit. Nos. 3682 and 3683 of 1908.)

CRUSHING Stamps for Ore and the Like. Fraser & Chalmers, London, England. (Brit. No. 1038 of 1908.)

ORE CLASSIFIER. Frank G. Janney, Salt Lake City, Utah. (U. S. No. 928,455; July 20, 1909.)

ORE CRUSHER. Robert S. Watt, Robert B. Watt and Arthur B. Watt, Los Angeles, Cal. (U. S. No. 929,177; July 27, 1909.)

ORE CRUSHING APPARATUS. Harry W. Hardinge, New York, N. Y., assignor to Hardinge Conical Mill Company, a Corporation of New York. (U. S. No. 928,967; July 27, 1909.)

ORE FEEDER. Elmer F. Gustafson, Idaho Springs, Colo. (U. S. No. 925,337; June 15, 1909.)

ORE-REDUCING APPARATUS. Wenceslas V. Jean, Minneapolis, Minn. (U. S. No. 926,492; June 29, 1909.)

ORE SEPARATING MACHINE. Wenceslas V. Jean, Minneapolis, Minn. (U. S. No. 926,493; June 29, 1909.)

PULP-FEEDER. Joseph B. Green, Wallace, Idaho. (U. S. No. 929,420; July 27, 1909.)

SLIME-BREAKING ATTACHMENT for Ore-Dressing Machines. Joseph O. Dimmick, Los Angeles, Cal. (U. S. No. 927,954; July 13, 1909.)

STAMP MILL. Joseph P. Rinker, Tres Piedras, N. Mex. (U. S. No. 929,328; July 27, 1909.)

METALLURGY—GENERAL

SMELTER FUMES—Condenser. Hascal A. Hogel, New York, N. Y. (U. S. No. 926,943; July 6, 1909.)

SMELTER FUMES—Process of Condensing Fumes in the Treatment of Refractory Ores. Hascal A. Hogel, New York, N. Y. (U. S. No. 927,241; July 6, 1909.)

SULPHIDE ORE REDUCTION—Improvements in the Reduction of Complex Sulphide and Other Ores. Henry R. A. Silverdale, London, England. (Brit. No. 19,882 of 1908.)

SLAG—Method of Handling Slag, Cinder, etc. John B. Clark, Cleveland, Ohio. (U. S. No. 926,242; June 29, 1909.)

SLAGS—Process of Recovering Volatile Metals and Metalloids, especially Zinc from Lead and Copper Slags. Wilhelm Witter, Hamburg, Germany. (U. S. No. 927,916; July 13, 1909.)

COATING METALS WITH PLATINUM—Process for the Production of a Coating of Platinum on Base Metals not Easily Fusible, such as Iron, Nickel, Cobalt, or the Alloys Thereof. Max Braun, Hanau-on-Main, Germany. (Brit. No. 22,455 of 1908.)

SLAG—Method of Treating Slag. Story B. Ladd, Washington, D. C. (U. S. No. 929,142; July 27, 1909.)

MINING MACHINERY AND APPARATUS

BORING-TOOL. Frederick Thomas, Wigan, England, assignor of one-half to Walker Brothers, Wigan, Limited, Wigan, England. (U. S. No. 930,436; Aug. 10, 1909.)

HOISTING AND DUMPING APPARATUS. Thomas C. Wright, Goldfield, Nev. (U. S. No. 929,530; July 27, 1909.)

MINE-CAR. Thomas W. Weaver and Clyde B. Weaver, Tunnelton, W. Va., assignors of one-third to Scott W. Shahan, Tunnelton, W. Va. (U. S. No. 926,446; June 29, 1909.)

MINE-CARS — Running-Gear for Mine-Cars. John M. Phillips and Robert F. Phillips, Carrick, Penn., assignors to the Phillips Mine and Mill Supply Company, Pittsburg, Penn., a Corporation of Pennsylvania. (U. S. No. 928,066; July 13, 1909.)

ROCK DRILL PACKING Improvements in Packing for Rock Drills. Heinrich Flottmann, Cardiff, Wales. (Brit. No. 23,518 of 1908.)

MINE CAGES Improved Safety Brake for Pit Cages and the Like. James H. Williamson, Dalkeith, Midlothian, Scotland. (Brit. No. 15,892 of 1908.)

MINERS' CANDLE PROTECTOR. Will Cooper, Black Bear, Idaho. (U. S. No. 924,741; June 15, 1909.)

MINERS' LAMPS Improvements in Miners' Electric Lamps Communicated from Deutsche Gasglühlicht Aktiengesellschaft, Berlin. (Brit. No. 9654 of 1908.)

MINERS' LAMPS Improvements in Miners' Lamp Lighting Appliances. Henry M. Darrah and Frederick Perrins, both of Manchester. (Brit. No. 12,286 of 1908.)

ROCK DRILL MAKING AND SHARPENING MACHINE. Grant W. Smith, Ottumwa, Iowa. (U. S. No. 927,181; July 6, 1909.)

ROCK DRILLS—Improvements in Rock Drills and Other Pneumatically Operated Tools. Heinrich Flottmann, Cardiff, Wales. (Brit. No. 23,519 of 1908.)

METALLURGICAL MACHINERY AND APPARATUS

MECHANICAL STOKING. Improved Method of and Apparatus for Utilizing Coal or Coke Dust or Like Fuel in Furnaces Fitted with Mechanical Stokers. Thomas D. Stonehouse, Guernsey, Channel Island, Eng. (Brit. No. 13,176 of 1909.)

METALLURGICAL FURNACE. Robert G. Reilly, Corona, N. Y., assignor to North American Reduction Company, a Corporation of Arizona. (U. S. No. 927,283; July 6, 1909.)

REGENERATIVE FURNACES. Reversing Apparatus for Regenerative Furnaces. Thomas S. Blair, Jr., Elmhurst, Ill., assignor, by mesne assignments, to Blair Engineering Company, Chicago, Ill., a Corporation of New York. (U. S. No. 929,277; July 27, 1909.)

Personal

Mining and metallurgical engineers are invited to keep THE ENGINEERING AND MINING JOURNAL informed of their movements and appointments.

A. E. Drucker has been visiting the Thames and Waihi districts in New Zealand.

Herbert Haas was in New York this week, on his way home from London to San Francisco.

C. B. Marshall has resigned his position as superintendent of the Gemini mine in the Tintic district, Utah.

Morris Gallagher, of Nevada City, Cal., has been appointed superintendent of the Lucky Boy mine at Hawthorne, Nevada.

E. B. Hinsdale has been chosen a director of the Wolverine Copper Mining Company, to succeed C. R. Corning, resigned.

W. H. Trewartha-James, of Victoria, B. C., general manager of the Tyee Copper Company, was a recent visitor to the exposition at Seattle.

R. G. McConnell, of the Geological Survey of Canada, has gone to Queen Charlotte islands, B. C., to do geological work in some new mining camps.

H. W. deG. Boleo, a mining engineer and special commissioner of the Brazilian government, is visiting the iron mines of the Mesabi range in Minnesota.

George B. Squires has been appointed superintendent of several silver-lead mines, situated in Ainsworth camp, B. C., recently acquired by J. S. Airheart.

It is understood that Frank Fox, of Cincinnati, Ohio, will succeed his brother, the late Martin W. Fox, as president of the Hale & Norcross Mining Company, of Nevada.

S. E. Bretherton, San Francisco, Cal., has been retained by the Lodi Mines Company of Nevada, until its smeltery, to treat extremely rich ore low in lead content, is in successful operation.

Charles Fergie, of Montreal, Canada, is examining the Western Development Company's coal lands in the upper Skeena river district, British Columbia, for British prospective purchasers.

Judd Stewart, assistant to the president of the American Smelting and Refining Company, has been elected a director and member of the executive committee of the American Smelters' Securities Company.

H. Collins, [illegible] leaving British Columbia for England two or three years ago, had been to the mines of the Dumaruni Development Corporation, in Argentina, [illegible] recently to Vancouver Island.

Lionel Levy, who is associated with Alexander Hill & Stewart, London, is to [illegible] and start a [illegible] plant for treating ore by the Murex process at the Van Roi mine, Silverton, Slocan, British Columbia.

James McEvoy, geologist for the German Development Company, Ltd., Ottawa, Canada, was at Victoria, B. C., lately, after having spent the summer on the company's Bighorn and Brazeau coal areas in Alberta.

John Seward, recently appointed manager for the New Dominion Copper Company, has commenced his duties in the Boundary district of British Columbia, where are situated the company's copper mines and smeltery.

R. G. Drinnan, formerly superintendent of the Hosmer coal mine, Crow's Nest Pass, B. C., is in Toronto, Ont., after having spent two months examining coal lands in the Brazeau field, north of Banff, Alberta, for a Toronto syndicate.

Lord Grey, governor-general of Canada, has gone to Dawson, on his first visit to Yukon Territory. His party will be joined by Hon. W. Templeman, Dominion minister of mines, and R. W. Brock, director of the Canadian Geological Survey.

E. H. Webster, until recently manager of the Fianza Mining Company at Guanacevi, Durango, has assumed the management of La Republica mine at Ocampo, district of Rayon, Chihuahua, Mexico, under J. Gordon Hardy, consulting engineer.

Charles Emmerson has decided to continue as superintendent of the Bellevue colliery of the West Canadian Collieries, Ltd., near Frank, Alberta, instead of taking charge of the International Coal and Coke Company's mine at Coleman, as it was lately announced he would do.

Thomas Derby has retired from the management of the New Almaden quicksilver mines in Santa Clara county, California. He has been connected with the mine for 45 years, and has been manager for many years. His successor will be Arthur Feust, formerly at the Standard Consolidated mine at Bodie.

Dwight E. Woodbridge, of Duluth, Minn., has been in New York this week, and sailed on the "Mauretania," Aug. 25, for Liverpool. He is on his way to Norway to examine some iron mines for American parties. He intends also to visit the Dunderland iron ore mines, and those of Kirunavaara and Luossavaara.

Severn P. Ker, vice-president and general manager of sales of the Republic Iron and Steel Company, has resigned, effective Oct. 1 next, and promotions will be made in line. Mr. Ker has become interested in the Sharon Steel Hoop Company and will become its general manager. That company recently increased its capital stock from $1,000,000 to $2,500,000, and will make some important extensions. It is now adding a sixth to its battery of [illegible] open hearth steel furnaces.

B. Britton Gottsberger resigned from the managership of the Tennessee Copper Company in February, 1909, to take the position of general manager of the Miami Copper Company at Globe, Arizona. N. H. Emmons, who has been acting manager since that time has now been appointed general manager. J. V. Bohn is now general superintendent of mines for this company with headquarters at Ducktown, Tenn. The general office of the Tennessee Copper Company is at Copperhill, Tennessee.

Obituary

Robert Reid died suddenly Aug. 21 at Ogunquit, Me., where he was passing a vacation. Mr. Reid was widely known in Canada as an engineer and constructor. He was a member of the Reid syndicate, which built the Newfoundland railway and started the exploration of the mineral resources of the island. He was a member of the Canadian Transcontinental Railway Commission.

S. P. Jellum, who died at Newsome, Idaho, last month, at the age of 40 years, was born in Iowa. After having been two years in the Minnesota State University, he went to the Pacific Coast and there, in the Washington State College, continued his studies. Following his graduation he was engaged in mining engineering and practical mining work in Washington, and last year proceeded to central Idaho, where he made a study of the geology and mineral deposits of the districts he visited. He contributed to the *Northwest Mining News*, published at Spokane, Wash., a series of articles which were afterward issued in book form, entitled, "Some Central Idaho Gold Districts." He was a man of exceptional parts and sterling character, and as a mining engineer enjoyed a good reputation.

Societies and Technical Schools

Canadian Mining Institute. The sixth general meeting of members of the Western branch of the Canadian Mining Institute will be opened at Nelson, B. C., on Saturday, Sept. 25. At the close of the day's session an adjournment will be made to Spokane, Wash., to meet the American Institute of Mining Engineers, which will open its autumn session in Spokane on Sept. 27. It is proposed to hold on one day a joint session of the two institutes at which papers on the "Coal Resources of Southeastern British Columbia and of Alberta" will be read and discussed. Several well known coal mine managers have promised papers, and much information will be given relative to the coal deposits of the country above mentioned.

Special Correspondence from Mining Centers

News of the Industry Reported by Special Representatives at Butte, Denver, Salt Lake City, Goldfield, Cobalt and Toronto

REVIEWS OF IMPORTANT EVENTS

San Francisco

Aug. 18—The Northern Light and Power Company and the Shasta Power Company, having appraised the respective properties, have consolidated under the name of the Sacramento Valley Power Company, and have, near Redding, developed some 4000 h.p. There is water enough to develop 10,000 h.p. and the power lines will soon be extended south from Redding as far as Chico, Butte county.

The water right on the north fork of the Yuba river between Sierra City and Downieville, Sierra county, was taken up years ago and will now be utilized by the Southern Pacific Company, which will locate one of its power plants near Downieville. The water will be diverted below Sierra City for the intake. The mountain stream is very steep at that point, and a large amount of electric power can be generated and the water returned to the river.

John A. Britton, general manager of the San Francisco Gas and Electric Company, has commenced installing a power plant near Horseshoe bar on the middle fork of the American river about three miles from Forest Hill, Placer county. Power will first be furnished to the Cash Rock mine, a few miles from the bar, and the lines will be later carried farther south to several industrial plants.

The men who have been for years quarrying granite at Rocklin and Penryn, Placer county, have formed a committee to visit the San Francisco municipal authorities to urge upon them the use of granite for curbing. This was formerly used exclusively, but since the great fire concrete has been largely substituted, with the result that 19 of the granite quarries out of 24 at Rocklin are in danger of being put out of business altogether.

The committee appointed at the recent Anti-Dredge convention to confer with the members of the California Débris Commission has made a formal call on Captain Jackson, U. S. A., who is secretary of the commission, but they did not get much comfort from the interview. He told the committee that it was not within the province of the commission to gather data on any operation, mining, commercial, or otherwise that did not directly interfere with the navigability of the rivers. The commission has no concern with any damage overflowing waters may do to private lands. A survey of the Feather river is, however, being made below the scene of dredging operations.

The California Débris Commission was appointed under an act of Congress to control the operations of hydraulic miners in the drainage basin of the Sacramento and San Joaquin rivers, California. Hydraulic mining, as defined by act of the legislature of the State of California is "mining by means of the application of water, under pressure, through a nozzle, against a natural bank." The gold dredgers do not mine in that way, so that the Débris Commission has no authority to interfere with their operations in any manner. Should, however, a navigable stream be injured, the engineer officers on this coast might interfere, but not as the Débris Commission. The committee will now wait until the commission holds a meeting when they will again bring the matter up. The Federal authorities look upon these matters dispassionately, and will not allow themselves to be drawn into a controversy with which they have no official concern.

The activities at Brandy City, Pike City, and those at Alleghany have stirred up mining matters in eastern Yuba county, as well as in western Sierra county. Around Pike City and that portion of Oregon creek flowing through the Tippecanoe district, a great many locations were made by prospectors this summer. Moreover, a number of old properties which have been lying idle for years are once more being worked.

In Plumas county also, increased activity is apparent in mining matters. Many miners who went to Alleghany, Sierra county, this summer have crossed to the north and gone into Plumas on prospecting trips. Not only Californians, but mining men from Nevada and Colorado are now looking up old mines and prospects in Plumas, trying to get favorable bonds, or else purchasing outright. There is some complaint that prices charged are too high to attract conservative purchasers, but the miners themselves consider that they know what their claims are worth. Now that the long-looked-for Western Pacific railroad is approaching completion the miners in this region will have efficient means of transportation. The many copper properties around Taylorville, Genesee, Crescent Mills and Greenville, which have been partly developed, will be able to ship ores and become of some value to their owners. Plumas is a high mountain county where much snow falls every winter, but it is well wooded and watered and has a large extent of undeveloped mining ground.

In Sierra county, where much quartz mining is now going on, there is complaint of scarcity of hard-rock men. Most of the mines operated there previously have been gravel deposits, but now quartz mining is in the ascendancy.

Denver

Aug. 20—It is reported here that the Doherty Power Company, an offshoot of the Denver Gas and Electric Company, is about to commence the construction of a $6,000,000 plant at the Joplin zinc mines in Missouri, and that the operators have already contracted for 160,000 h.p., which it is estimated is worth $50 per h.p. per annum.

The crosscut from the Kohler, or main, tunnel on the property of the San Antonio company, in the Red Mountain district between Ouray and Silverton, has been completed to a point directly underneath the main shaft, and a raise of 300 ft. will be made to connect. In driving the crosscut, 40 ft. of ore was traversed and this body, it is now ascertained, is not a continuation of that discovered in the shaft, but an entirely separate one, and what is more important, it is of a higher grade in silver, with about the same copper contents. The ore is of the same character (enargite) as that found at the 200 level, the former being 300 ft. deeper, but it carries gray copper, which accounts for the increase in silver contents, as nearly all the San Juan tetrahedrite is rich in silver. The newly discovered orebody will be exploited at once with machine drills. This opening up of what bids fair to prove one of the great mines of that long-neglected and only half exploited district, will probably revive one of the most sensational producing camps of the San Juan region, which simply had a knock-out by the silver panic of 1893, from which it is only now beginning to recover.

The output of ore in the Silverton district is steadily increasing, and last month reached a total of 3710 tons. This includes 440 tons from the San Antonio.

The extravagant story comes from the Cripple Creek district that an ore shoot 40 ft. wide has been struck in the Damon mine on Ironclad hill, and that the ore runs from one to four ounces gold per ton without sorting. The property is controlled by the United Gold Mines Company.

The Royal Flush mine on Hahns peak, has at last sent down its much advertised carload of ore via the Moffat road from Steamboat Springs to a Denver smeltery.

and the ore gave returns of $104 per ton in gold and silver. The ore is brittle and contains some ruby silver, associated with iron pyrites, and of course was closely hand sorted. The vein is a shear zone in the porphyry mountain, and was intersected by a crosscut tunnel which has been driven into the mountain about 800 ft. The ore was discovered 14 years ago, according to the prospectus, and the mine has 5000 ft. of tunnels, drifts and shafts.

In the Gilpin County district, the Topeka mine, in Russell gulch, which has been tied up in litigation for nine years, has passed into the hands of Henry P. Lowe, of Denver, owner and general manager, who will sink the shaft to connection with the Newhouse tunnel, through which the mine will be drained and the ore brought to the surface. This is one of the richest mines in the district, and Mr. Lowe was awarded a gold medal and diploma for a block of its free gold ore shown at the Paris Exposition in 1901.

Butte

Aug. 19—From the latest reports it appears that the troubles of the Panhandle Smelting and Refining Company are nearing an end. It is stated that former president Anderson and Thomas Greenough have come to an agreement which will end the long legal battle which has been waged, and that the plant will be running within 60 days. The smeltery was acquired by interests affiliated with the Montana Mine Owners Association in the early part of the present year and was operated until March, when T. L. Greenough applied to the Idaho courts for a receiver for the company, alleging over issue of stock and other irregularities on the part of the officers of the Panhandle company. A receiver was appointed who took charge of affairs until June, when the company was thrown into bankruptcy by creditors in sympathy with president Anderson. Bruce Blake now has charge as receiver appointed by the court of bankruptcy. The resumption of operations by the smeltery will be welcomed by the independent mine operators in Montana who, previous to the shutdown, were shipping their ores there for treatment.

Ellen Kleinschmidt, Albert Kleinschmidt and R. A. Kleinschmidt have instituted action against R. H. Kleinschmidt and the American National Bank for the purpose of securing an accounting and enjoining the further payment of certain mining royalties to R. H. Kleinschmidt. The complaint alleges that George H. Boggs is working the property of the American Milling Company under a lease which calls for the payment of certain royalties to the American National Bank for the benefit of the mining company and that by a secret agreement between Boggs, the bank, and defendant Kleinschmidt, who is general manager of the company, Kleinschmidt is receiving 5 per cent. of the royalties which should go to the mining company.

At a recent meeting of creditors of the bankrupt Butte Central & Boston Copper Corporation a final dividend of 7 per cent. was declared, making a total of 11 per cent. which the creditors will receive. The Butte Central Copper Company, the new corporation formed to take over the property and affairs of the old concern, some months ago started to remodel the surface plant at the Ophir mine but the creditors of the old concern prevented the new company from continuing since, under a trust agreement, the creditors were to be paid in full by the new company before it was to receive title to the mine and the payments called for have not as yet been made.

Salt Lake City

Aug. 20—D. C. Jackling, general manager of the Utah Copper Company, returned during the week from the properties of the Ray Consolidated Copper Company, of which he is also general manager. Speaking of this low-grade property, Mr. Jackling said: "Work is still being done to increase the copper-ore reserves, which are now sufficient for many years' supply. Work will be started on the new mill early in the fall and the majority of the plant used in the construction of the Utah Copper mill will be used. It will have a daily capacity of 5000 tons."

The ore bins at the new plant of the International Smelting and Refining Company at Tooele are completed, and it is expected that ore shipments will be received in the near future. The contract of the Utah Consolidated with the American Smelting and Refining Company expires on Jan. 1, and from that time the Utah ores will be sent to the Tooele smeltery. It is planned to blow in the furnaces of the new smeltery about April 1.

Tony Jacobson, president and general manager of the South Columbus Consolidated Company, has prepared a statement for the stockholders relating to the conditions which necessitated the levying of an assessment of 5c. a share on the outstanding capital stock. He shows that there are thousands of tons of ore developed which could not be shipped profitably under existing metal prices and excessive treatment charges. Mr. Jacobson says this will be mined at a good profit when the new plant of the International Smelting and Refining Company and the copper plant of the U. S. smeltery are in commission, as he believes that smelting charges will be reduced.

The Gold Springs Mining and Power Company has placed order with local firms for a complete electrical power plant to be installed near the old Jennie mine in southern Utah. The plant will cost $50,000 and will have a capacity of 300 h.p., which will be doubled within the next six months. General Manager Charles A. Short said that the work of installing the plant will start within the next 10 days. The provision for electrical power in this district will cause a number of mines to open that have not been working for years.

A severe cloudburst in Bingham cañon wrecked part of the plant of the Yampa smeltery. A torrent of water coming down the hill struck part of the smeltery and caused one of the reverberatory furnaces to explode. Two other reverberatories and the blast and converters were not injured. A large force of men are at work on the damaged furnace and the management expect to be able to blow it in in a few weeks.

During the week ending Aug. 13, the shipments of ore and concentrates from the Tintic district were as follows: Centennial Eureka, 47 tons; Uncle Sam, 6; May Day, 2; East Tintic Development Company, 1; Eagle and Blue Bell, 1; Grand Central, 4; Victoria, 4; Sioux Consolidated, 12; Chief Consolidated, 1; Bullion Beck, 1; Mammoth, 1; Ajax, 2; Scranton, 4; Eureka Hill, 1; Utah Consolidated lease, 1; Undine, 1; Iron Blossom, 36; Colorado, 38; and Beck Tunnel, 40.

Goldfield

Aug. 18— The next quarterly meeting of the board of directors of the Goldfield Consolidated Mines Company will be held at Chicago Aug. 26, the meeting place having been changed from New York. The usual quarterly dividend of 30c per share, amounting to about $1,065,000, will be declared payable Oct. 31 to stockholders of record Sept. 30. The vacancy caused by the resignation of Charles Hayden, of Boston, will also be filled.

George Wingfield, who owns a controlling interest in a number of Goldfield properties, has decided to again adopt the leasing system and intends granting leases on the following properties: the Blue Bull, Columbia Mountain, Conqueror, Berkley, Ethel, Milltown, Kendall, Sandstorm and Booth.

Helena, Montana

Aug. 13. In the case of the St. Louis Mining and Milling Company vs. the Montana Mining Company, Ltd., the court found that the defendant had extracted from the Drumlummon vein, belonging to the plaintiff, ore totaling 1012 tons, with a value of $237,470. This ore was extracted beneath the surface of the Nine-Hour claim, north of the 133 ft. plane and east of the compromise strip. The court further found that no ore had been extracted by the plaintiff from the Nine-Hour claim belonging to defendant, but that the plaintiff had taken ore from the compromise strip, belonging to the defend-

ant company, amounting in quantity to 218.29 tons, with a value of $34,341. Thus the St. Louis company has obtained a verdict of $203,129 in its favor. In the previous trial in 1905, the plaintiff was awarded a verdict of $159,000. The judgment of the present trial was ordered to be entered and a stay of execution of 90 days was granted the defendant to prepare and file a bill of exceptions. Between 150 and 200 exhibits were introduced by the two parties, and the testimony submitted covered about 7000 typewritten pages.

The activity in the Corbin-Wickes camp is increasing. Work on the old Alta is in progress, and new machinery is being installed. The only shipper of note in the camp at present is the Blue Bird mine. Several companies, such as the Corbin Copper Company, are employing large forces of men in development work, and are rapidly restoring to the camp its pristine mining activity.

Cobalt

Aug. 21—A number of members of the British Association for the Advancement of Science visited the samp this week to look over some of the properties. They were conducted by Prof. W. G. Miller, provincial geologist, and others of the department.

In drifting on the 75-ft. level of the Silver Leaf the value of the vein was found to increase. In one place there was 8 in. of high-grade ore, but it is extremely irregular, and breaks up into stringers. In surface trenching on the Nipissing to the southwest of Herbert pond a new vein called No. 128, has been discovered. In places it is from 4 to 6 in. in width of smaltite, with high silver contents. The Imperial Crown property, formerly known as the Warner lot, which is now controlled by the Crown Reserve, is doing much trenching. A few days ago a calcite vein 4 in. wide, carrying about 600 oz. in silver was uncovered. The vein has been stripped for about 100 ft., and shows some smaltite.

Among the new companies that have been incorporated, the one of most interest to Cobalt will be the Hudson Bay Mines, headquarters at New Liskeard, with capital of $3,500,000, shares at $1 par value. This company is at present known as the Temiskaming & Hudson Bay. Other new companies incorporated are as follows: Waldman Silver Mines, head office Toronto, capital $2,500,000; Silver Fall Mines, headquarters Niagara Falls, capital $1,000,000; Delaware Cobalt Mining and Exploration Company, headquarters Toronto, capital $40,000; Haileybury Frontier Mining Company, headquarters Haileybury, capital $1,250,000; Doric Reserve Mines, Ltd., headquarters Toronto, capital $1,500,000; Clawson Silver Mines, Ltd., headquarters Toronto, capital $1,500,000; Gowganda Reserve Mines, Ltd., headquarters Toronto, capital $500,000; Argo-Cobalt Mines, Ltd., headquarters Toronto, capital $1,000,000; Northern Mining Company, headquarters Ottawa, capital $100,000.

The Bailey mine has ordered a complete plant, and is now excavating for the necessary buildings. The machinery on order consists of a compressor, 100-h.p. boiler, electric driven hoist, and other necessary equipment. On the John Black property a station is being cut at the 93-ft. level, in the shaft, and from that point a crosscut will be run to cut the cobalt vein on which the shaft was started. The vein dipped from the shaft, and the management expect that only a very short crosscut will be necessary.

On Aug. 15 the camp buildings at the University mine were destroyed by fire. They include bunk house, cook camp and office. The headframe and power house, which were some distance away from the rest of the buildings, escaped, so that work will not be interrupted. The University was a separate mine before the original owners of the La Rose obtained control. The results obtained were not very satisfactory, and in 1907 the mine was shut down and remained closed until the La Rose Consolidated took charge, and started work again. Since that time the outlook for the property has much improved.

In a drilling contest, held in Cobalt Aug. 18 and 19, the first prize of $1000 was taken by the team from the Temiskaming mine, who drilled 43⅛ in. The winners were Page and Pickens, the famous Globe, Ariz., team.

Toronto

Aug. 20—A promising new silver area in the township of Otter about 25 miles north of Thessalon, in Algoma district, is attracting some attention. The first discoveries were made last fall by two prospectors, who kept the matter quiet until they had secured their locations. They disposed of their properties at a good figure. When the find became known a rush followed, and about 100 prospectors are now on the ground and others coming in. Many are from Cobalt and Gowganda. The formation is diabase, in which calcite veins, some of considerable width at the surface, have been discovered, some carrying native silver. The location of a record office for claims at Thessalon is asked for, the nearest at present being at Sault Ste. Marie, 40 miles distant.

The provincial Department of Public Works has received reports to the effect that eight miles of the new wagon road being built from Elk lake to Gowganda has been cleared and grubbed. One hundred men are busy grading, and it is expected that the entire 30 miles of roadway will be complete before winter.

Mexico

Aug. 9—The Southern Pacific Guaymas to Guadalajara line is now operating from Orendain on the Etzatlan branch of the Mexican Central to Tequila, about 25 miles, and is laying track west of Tequila at the rate of a kilometer a day. The road is graded to about 8 km. west of Magdalena, a *puebla* on the north end of Lake Magdalena. Further grading is stopped on acount of the rainy season, and because the line to the west is being resurveyed to find a better route from Quemada west. The present location line is by way of Tequisquite, but the new route runs to the south and more direct to Ixtlan, giving a better grade and shorter route. The road will be completed to Magdalena in about a month, and then will be operating to that point, serving the Cinco Minas property and the San Pedro Analco district. It is likely that a branch will be built from near Magdalena to the Santa Maria branch, which will still better serve these mines, which are now reached from Etzatlan on the Mexican Central branch. When the road is through to Ixtlan the important Hostotipaquillo district will have easy access to rail.

Considerable interest is being taken in the reported discovery of gold, combined with tellurium, in the ore of the San Vicente mine near San Martin de Cal, a few hours southeast of Ameca. The ore is now being tested and interesting results are expected. There is the usual disagreement between different assayers as to the value of gold in the ore and the character of the ore.

One of the most extensive formations of obsidian in Mexico is on the western slope of Mount Tequila extending to Lake Magdalena. It takes more than two hours to cross it on horseback. The obsidian is black and glossy, in thick beds and in masses in beds of volcanic ash. It covers several square miles and is found scattered over neighboring mountains. It has no present commercial use, but was well known to the ancient people of Mexico, who used it extensively for cutting implements and for ornaments.

Johannesburg

The Western Rand Estates Company, which holds a large area on the western extension of the Witwatersrand and which has encountered auriferous banket in several boreholes, considered by many to be the Main Reef, has announced its intention of sinking a shaft to strike the reef at 1500 ft. This is about the least depth at which the sub-outcrop occurs, the boreholes indicating a much greater average. As in the case of most claims in this section the ground is covered by an unconformable sheet of the dolomite and other formations.

Mining News from All Parts of the World

New Enterprises, Installations of New Machinery, Development of Mines and Transfers of Property Reported by Special Correspondents

THE CURRENT HISTORY OF MINING

Alabama

LAUDERDALE COUNTY

It is reported that deposits of phosphate rock have been discovered on a tract covering about 1500 acres of land, about 20 miles north of Florence. J. N. Wilcoxson, Loretto, Tenn., is organizing a company to explore the tract and to work it, if the discoveries are confirmed.

Alaska

Fairbanks—Gold bricks weighing 2400 lbs., and worth more than half a million, recently reached the Seattle postoffice from here, and were sent to the assay office. The gold was in the form of dust and nuggets, accumulated by the Fairbanks Banking Company and the First National Bank of Fairbanks in course of business.

Sitka—The Mills Company, operating on Chicagoff island, of which W. H. Mills, of Sitka, is president, has a new 10-stamp mill installed, and in coöperation with the Chicagoff Mining Company, has built a hydraulic power plant which is to transmit power a distance of five miles to the mines.

Juneau—The Perseverance Gold Mining Company's mine is operating steadily. The transmission wires are now being strung from the power house on Sheep creek to the Perseverence. The power is to be generated by a large stationary gas engine. At Nevada creek, Douglas island, on the Alaska Treasure group, several buildings have been erected and a new tunnel is to be driven in from the bench a distance of 3000 ft. The work is under the direction of D. J. Argall.

Skagway—The North Columbia Gold Mining Company, of Atlin, recently struck a vein of coal on Pine creek. The coal is of good quality.

Arizona

COCHISE COUNTY

Courtland—The Calumet & Arizona is installing another large boiler and two more pumps in the Germania shaft in this district. The Great Western company is shipping to the El Paso smelters two cars of ore daily from the Mary and Hardshell mines. Dug in the Cost ore sent out at Courtland is ore. In the Sulphur Springs valley, near Courtland, a promising prospect is being developed by John Power, discoverer of the noted Commonwealth mine at Pearce. His prospect shaft has uncovered a 4-ft. body of copper ore of smelting grade.

Bernoudy-Turkey Creek—New equipment, including two tubular boilers, 415-cu.ft. cross-compound compressor, five 2¼-in. Pacific drills, tram cars, etc., has been installed on the property near Paradise, and further development will be carried out.

PIMA COUNTY

Helvetia—The July report of this company states a profit of $4.62 per ton was netted in the shipment of 1434 tons of ore, which contained 156,268 lb. of copper.

PINAL COUNTY

Ray Northern—Sinking operations are to be resumed on the two-compartment shaft on this company's property, comprising 14 claims three miles east of Ray.

YUMA COUNTY

Harcuvar Copper—Two shifts are at work on the tunnel, now in 260 ft., on this property, 17 miles from Wendendale. R. R. McDonald, superintendent.

Yuma Copper—The company is developing a fine body of oxidized ore at the 130-ft. level of the shaft. The property is near Vicksburg, and the main office of the company is at Houghton, Mich.

California

AMADOR COUNTY

Kennedy Extension Mining Company—This company at Jackson, operating the Muldoon mine, south of the Argonaut, is working on the old shaft which was sunk 15 years ago. An electric hoist is being installed. The shaft is 800 ft. deep.

BUTTE COUNTY

Buck's Ranch—In this vicinity several mines have lately been bonded, including those of H. W. Davenport and G. W. Hoes. There is a five-stamp mill on the latter claim.

Yankee Hill District—A strike of rich gold ore has been made on the Ward place near Yankee hill by Mr. Helms, of Grass Valley, who recently bought the ranch from Ward. The placers in this vicinity yielded largely in early days.

CALAVERAS COUNTY

Hanging—It is understood that operations will soon be resumed at this mine and at the old Hooper tunnel at Mokelumne hill.

Boston—The water has all been taken out of the old mine at Mokelumne hill. The ledge is very wide at the bottom of the 1000-ft. shaft.

Black Metal—An incorporated company has secured control of this mine near Mokelumne hill. The old workings have been abandoned and a new shaft started.

Independent Mining and Milling Company—This company has been incorporated to work a mine of the same name at Vallecito. Hans C. and Alfred Sletten, of Vallecito, and Flora McVaugh, of Los Angeles, are the principal owners.

Standard Amalgamated Exploration—The company has begun operating the Cuneo and K. J. claims at San Antonio camp near San Andreas, under the direction of Oliver Reece. The claims will now be known as the Economic mine. New houses have been erected and a 20-stamp mill is being put up.

EL DORADO COUNTY

Mount Pleasant—At this old mine at Grizzly Flat, development work will be extended to the 600 level, and a 10-stamp mill will be erected. A. V. Judson is manager.

Landecker—This mine near Placerville is being reopened by Howard C. Plummer and associates. This is a gravel mine equipped with a mill.

HUMBOLDT COUNTY

Salmon Summit Mining Company—At this property, 32 miles from Hoopa, largely owned by Frank A. Smith, of Arcata, a ledge of high-grade ore has been encountered. A two-stamp mill is being erected. The location is high in the mountains where the snow lies deep, and it can only be worked two thirds of the year.

INYO COUNTY

Gold Stowage—At this new camp northeast of Bishop, a number of locations are being made.

KERN COUNTY

Copper Basin—R. H. Piggott, William H. Schmidt and other Oil Center men are opening a new copper deposit at this place, seven miles west of Randsburg. The property is located on the new railroad. The Castaway silver-lead claims are in the same section.

MADERA COUNTY

Mud Springs—George T. and S. M. Stanhouse and H. Hunter, of Los Angeles, have bonded this mine at O'Neals, and have come to San Francisco to purchase machinery for it. The mine has been idle

for some time, but was formerly a producer.

Fresno Flats—Prospectors have lately found a wide ledge carrying free gold. Fresno Flats was formerly a placer camp.

MARIPOSA COUNTY

Mariposa Commercial and Mining Company—The company is preparing to open the big shaft on the Mariposa property and develop the lower levels. At present, leasers are operating the mine, which is at Mariposa.

MODOC COUNTY

Hoag—It is reported that the money for a custom mill at this camp, Bidwell, has been subscribed. The machinery was ordered some time since, but the man who bought it desired subscriptions from the miners to assist in construction.

MONO COUNTY

Crystal Lake—After some years of development work on the property at Lundy, an increased force will shortly be put on for active production. The company has a 20-stamp mill, machine drills, electric plant, etc., and is well equipped.

NEVADA COUNTY

Peekaboo—The mine at Grass valley has been bonded to C. D. Tregonning.

Pittsburg—A new electric hoist is being installed.

SHASTA COUNTY

Milkmaid—A yield of $13,000 from 160 tons of ore is reported. The mine, which is situated at French gulch, has made its second shipment under the new management; H. F. Musser is manager.

Colorado

LAKE COUNTY—LEADVILLE

Highland Mary—On this property at Breece hill a station was cut at 70 ft. in the shaft and a drift has been driven 40 ft. to the south, in the direction of the Weston fault. Ore shows in the bottom of the shaft and also at the breast of the drift. The high-grade ore is being sacked; also the material from the stringer which contains 45 per cent. bismuth. The balance of the ore is being shipped by carload lots. The lessees are installing an electric hoist.

Alps-Aztec Group—The tunnel to develop this group on Little South Evans gulch, is now in 300 ft. with a depth attained of 178 ft. In another 100 ft., the contact should be reached.

Ballard Dump—Local men have secured a lease on the main dump of this mine located on Breece hill and are shipping 200 tons daily; the ore is sent to the Leadville District mill and an excellent concentrate is turned out. This work will be kept up until snow flies.

Corrine Mountain—Thomas F. Walsh recently visited his two claims in the Mosquito range section and has made an offer to lease several adjoining claims; if accepted, work will be started at once. In one of the Walsh claims the vein crops out at the surface, carrying gold up to 5 oz. per ton.

Martha—At South Evans sinking the new shaft has started, and it will be sent down to the contact, when drifting will be started. The lessees expect to catch the Tenderfoot orebody.

Weston Pass—To the south of the Leadville district, a number of lessees are at work on the Cincinnati and other claims in the section. Lead ore is principally found here; but at present none of the proprietors are shipping, as the work being done is mostly for development purposes.

Houston—From this and adjoining claims at Iowa gulch, under lease to the same people, ore is being regularly shipped to the local smeltery. The ore is silicious, carrying 2 oz. gold per ton.

Wolftone—From the 1250-ft. level of this property at Carbonate hill, 300 tons of lead and zinc ore are being shipped daily; the ore is of such a grade that it is unnecessary to send it through the mill.

Castle View—Development in new territory is the principal work at present being done on this property at Carbonate hill; about 30 tons of ore are being hoisted daily.

Printer Boy—After being idle for several years, the property is now to be developed by J. Clarence Hersey through the Spring Steel tunnel.

SAN MICHEL COUNTY

Walcott & Waltemeyer—This Boulder, Colo., firm has acquired a group of vanadium-bearing claims on Bear creek, near Newmire. Test shipments are being made to determine the advisability of erecting reduction works.

TELLER COUNTY

Old Gold—The company has granted a 12-months' extension of the lease of this Beacon hill property to Joe Brentlinger and associates of Cripple Creek.

Idaho

COEUR D'ALENE DISTRICT—SHOSHONE COUNTY

H. E. M.—A contract has been placed for the extension of the No. 3 tunnel another 100 ft., the last 100-ft. contract having been completed. The last survey indicated the vein as being 47 ft. from the face.

Copper King—The tunnel is now in 1200 ft. and is in solid quartzite. Work is progressing without timbering. Much water is being encountered.

Canyon Creek Mining Company—A contract for the extension of the lower tunnel 500 ft. has been let to John Weir. Another 400 ft. must be driven to tap the vein. A 3-drill compressor plant was recently installed at the portal of the tunnel.

Samson Mining Company—The claims of this company are near Murray, on Eagle creek. The vein in the present working is now 7½ ft. wide with two perfect walls of quartzite. The drift is in about 325 ft. and the ore is reported to run high in lead and silver.

C. & R. Mining Company—A contract for 200 ft. of crosscutting has been let to E. J. Duff and Jack Wilson.

Bear Top—A good body of ore was recently encountered in the lower workings. The mill at Murray is working steadily and from six to eight cars are shipped per month.

Hypotheek—Favorable ore development continues at the mine at Kingston and a copper furnace may be purchased. Olaf Bergstrom, of Butte, is reporting on the matter.

Handspike—A new hoist for 500-ft. depth, and a new sawmill plant has been ordered, preparatory to development of this copper property on Little North Fork.

NEZ PERCE COUNTY

Idaho Mining—The company is building a second dredge to operate on the high placers adjoining the town of Pierce.

Black Lead Mining Company—On Aug. 17, a report came from Lewiston, Idaho, that the claims, including the Iron Cap, Copper Queen, Black Quartz Lead and Black Lead lodes, were sold to Fred Bradley, president of Bunker Hill & Sullivan Mining Company. From information available it was learned that the deal involved about $100,000. These claims are in the Bitter Root National Forest, three miles east of Rhodes peak on the Idaho side of the Bitter Root range.

Indiana

DECATUR COUNTY

Harvey Steele, county recorder, has been kept busy for a week or more recording oil leases from Monroe township where oil mining is assuming quite a boom. There is little doubt but this new oilfield will prove a bonanza to the land owners. Land values have already increased 50 per cent.

SULLIVAN COUNTY

Thos. L. Lewis, president of the United Mine Workers, has decided several of the disputes submitted to him by the operators' association and the local miners' association and his decision favors the miners. In the Burnett mine dispute he holds that the men were justified in refusing to go through a muddy manway, thus endangering their health. President Lewis stated that while the contract provides for proceedings preliminary to a strike, there was an emergency in this case and proceedings could not be started. The men were fined the $1 a day as provided

in the contract when they failed to start proceedings toward a settlement. President Lewis holds that this money must be refunded to the men. The operators are greatly disappointed over the ruling and say there is little use to enter into contracts with miners relative to strikes.

As the result of a mass meeting of miners held at Shelburn, an organization has been formed to operate a cooperative general store. Heretofore the stores were conducted by the operators or their interests.

Kansas

Cherokee County

Ohio Mining Company—Pumps are being installed preparatory to working to the 150 level. Rich runs of sheet zinc ore were encountered in the pump shaft.

Canyon Zinc Company—On this company's town lots Neil and Crawford have found lead and zinc at 40 ft. Steam machinery is being installed.

Pollard & Co.—Prospect work will be started immediately on a 35-acre lease on the Connor land, which is surrounded by producing tracts.

Straddling Mining Company—An important discovery of lead has been made on the Straddling farm one mile north of Baxter Springs. The strike was made in new territory and at a depth of 75 ft. The drill shows 7 ft. of lead dirt.

Mission Mining Company—The property south of Baxter Springs is again in operation. A new 500-ton plant will be erected soon.

Clermont—A. M. Wagner and associates, of Webb City, Mo., have taken a lease on this land south of Galena.

Baker—This old tract of land at Galena has been leased to Donald Malloy, W. Robinson, et al., Joplin, Mo., and development will be started at once.

Cook & Stone—F. J. Stone and H. S. Cook have secured control of the old Black Hills 40-acre lease, and are installing pumps to drain the entire tract. A large concentrating plant will be erected. The Black Hills tract was a heavy producer when zinc ore sold at $20 a ton.

Michigan

Copper

Lake—The shaft is down 900 ft. and from the 5th level a crosscut is being driven to cut the formation. Conditions in the drifts are continuing very favorable; the south drift from the 3rd level has again entered good ground, after passing through a small stretch carrying no copper.

Superior—The new vertical shaft being sunk to tap the three copper [illegible] by diamond-drill [illegible] has been closed down for [illegible] after being closed for some time. The company is also carrying on diamond-drill work on various portions of its lands.

Challenge—All work has been suspended at this property, which is owned by the St. Mary's Mineral Land Company. Exploratory work has been carried on at this tract for several years, a large amount of diamond-drill work done and a shaft put down vertically to a depth of about 850 ft. Some copper-bearing rock was revealed in the lateral openings, but nothing of a consistent nature opened.

Hancock—Sinking is going forward at the rate of about 85 ft. per month at the No. 2 shaft, which is down over 1800 ft. From the 18th level a crosscut is being driven toward No. 1 shaft to tap the various lodes and also to take care of the rock coming from the 15th level. An assessment of $2 per share on the outstanding stock has been called to provide funds to carry on this work. A right of way has been secured for the proposed railroad from No. 2 shaft to the site of the stamp mill which was recently acquired.

Ojibway—Sinking is progressing in both shafts. No. 1 shaft is down about 1000 ft. and No. 2, 1100 ft. Sinking will be continued to a depth of 1250 ft. and then temporarily suspended; levels will be established at 950, 1100 and 1250 ft. Drifting on the 800-ft. level between shafts continues, the south drift from No. 1 shaft has been deflected from the foot to the hanging-wall side of the lode; the north drift from No. 2 shaft is in about 130 ft. in good ground.

Keweenaw—Bedrock has been reached in two pits and at these points shafts are to be sunk to determine the value of the Kearsarge lode.

Laurium—This company, which is now under the control of the Calumet & Hecla, has started sinking a shaft to open up the Kearsarge lode. The site of this shaft is about one mile north of the Tecumseh shaft. The overburden at this point is only about 20 feet.

Oneca—This company has started diamond-drill operation on its lands.

Isle Royale—Drifting from the 500-ft. level of the company's "A" shaft, which it is opening on the Baltic lode, has been temporarily suspended and a crosscut is under way to explore the formation. At this point the Baltic lode is nearly 100 ft. wide, with the shaft going down about midway between the footwall and hanging-wall; as there has been practically no copper either in the shaft or the drifts up to this time it has been deemed advisable to drive this crosscut to locate the mineralized portion of the formation. The drill core taken from the site of this shaft showed good copper content in the rock, but it may have gone on either side of the line of the shaft.

South Lake—At a recent meeting of the Aztec company, it was decided to change the name of the company to South Lake, and also to increase the capitalization from 40,000 to 100,000 shares; 20,000 are to be sold at $2 per share, and with these funds exploratory work will be undertaken, diamond drilling to start as soon as possible. The property is situated between the Lake and Adventure properties, with the Copper Range railroad passing through it. R. C. Pryor, of Houghton, is president.

Minnesota

Iron—Cuyuna Range

Chesultawney—The first concrete-lined shaft on the new range is to be sunk on this property, near the town of Deerwood. It is owned by the Rogers-Brown Ore Company.

Missouri

Joplin—Zinc-lead District

Aurora Betsey—The shaft is down into 50 ft. of ore.

Alladin—This company at Spring City has completed its mill and has started running. Every mill in the district is now operating. The mills are the Alladin, McKee, Microbe, Alpha, Wilson and Sunrise, all working on the blanket formation.

Hancock—A very rich body of ore has been opened up here at Spring City in an entirely different formation at 144 ft. depth.

McGee—This company at Duenweg has one of the greatest silicate mines in the district producing 9 to 10 tons of high-grade ore a shift. Mr. Krugg, of Joplin, is manager.

Chandler—This mine, south of Spring City, last week made a carload shipment of silicate that assayed 50 per cent., and brought $37 on a $27 base price.

Moler-Smith—Both the large mills at Carl Junction are operating from the open cut. The dirt is loaded with a steam shovel.

Excelsior—This mill, situated at Four Corners, northwest of Joplin, has been completed and is ready to run. D. V. Sholl is manager.

Gundling & Maitland—The company has sold a 20-acre lease on the Brooks land, near Zincite, to O. J. McLane, of Carthage.

Anderson—The Williams Mining and Milling Company, of Kansas City, has opened this old mine in the Chitwood district, near Joplin.

Little Persimmon—The company has nearly completed its 150-ton mill southwest of Carthage.

Natural Gas—The Kansas Natural Gas Company has made arrangements for a greater supply of gas and has rescinded its order of a few weeks ago notifying all the mills that on Dec. 15 fuel gas for mills would be cut off.

Montana

BUTTE DISTRICT

Tuolumne—The management states that at a point about 150 ft. southeast of the shaft on the 1400 level they have cut what is supposed to be the continuation of the North Butte company's Edith May lead. The lead is 20 ft. wide and has been drifted on a distance of 30 ft. Another lead has since been struck on the same level about 80 ft. west of the shaft, which, it is stated, is 46 ft. in width and contains 8 ft. of good concentrating ore. Sinking on the shaft, which is now down 1450 ft., has been discontinued and the company will develop the leads on the 1000-, 1200- and 1400-ft. levels. On the 1000 level a crosscut has already been run to the vein, but on the 1200 level no work has been done except the cutting of a station.

Butte Coalition—The company is hoisting about 1750 tons of ore per day, which is being sent to the Washoe smeltry. Favorable developments continue on the first-class orebory on the 1700 level of the Minnie Healy. It is stated that the company is in a position to ship much more heavily whenever market conditions warrant.

JEFFERSON COUNTY

Boston & Alta—The gallows frame from the Hope mine is being transferred to the Alta and the compressor from the old Bullion mine near Basin will also be set up at the Alta.

MISSOULA COUNTY

Ben Hur—About 1000 ft. from the portal the tunnel at Saltese has cut a body of shipping ore.

RAVALLI COUNTY

Girds Creek District—It is reported that Z. Jones, J. B. Shipman and William Bennett have made a strike of gold ore on their claims near Girds creek, twelve miles from Hamilton. The ore is said to assay phenomenally high.

Nevada

ESMERALDA COUNTY—GOLDFIELD

Florence Goldfield—Four card concentrating tables and the amalgamating plates, part of the new equipment for the mill addition, have been placed in position. The new tube mill has arrived and is now being installed. With this new installation the capacity of the mill will be increased to 160 tons per day. While the main shaft is being enlarged to three compartments the ore supply will be drawn from the Little Florence workings which have been connected with the mill by an aërial tramway.

Sandstorm Mining Company—The annual report just issued shows the total work completed to date to be 1733 ft. of drift, 1808 ft. of crosscut, 280 ft. of raise, 273 ft. of winze, and shaft, 551 ft. The property was only operated in May during the past year, when ore yielding $4340 was removed from the dump. Leasing is being adopted.

NYE COUNTY—PIONEER

Aurora Bullfrog—Supt. Joseph Murphy has received instructions to sink an additional 100 ft. and then to crosscut to the orebody opened in the upper levels. If the new devlopment is satisfactory, preparations will be made for the construction of a 40-stamp mill.

New York

ST. LAWRENCE COUNTY

St. Lawrence Pyrites Company—The combined output of the Stella and Anna mines is approximately 10,000 tons per month. The Harz jigs have been replaced by Hancock jigs. A large amount of development work is being done on known orebodies, as well as some prospecting.

Texas

In the coast region, during July, 45 new wells were completed, of which 35 were producers and 10 dry. There were 68 wells under the drill on July 31. Production in July was 710,150 bbl. Shipments by rail were 395,267 bl.; by sea, 322,624; total, 717,891 bbl., or in excess of the production.

Utah

BEAVER COUNTY

Frisco Consolidated—A strike of 4 ft. of ore has been made on the 700-ft. level. The vein is the extension of that in the Horn Silver mine. D. P. Rohlfing, Beaver, Utah, is general manager.

Commonwealth—Plans for larger operations have been formulated, resulting from the development of two good ore showings within the last few months. In the east and west fissures cut by the tunnel, at the depth of 300 ft. from the surface, an oreshoot from 1 to 2 ft. wide has proved to be at least 125 ft. long. N. A. Dunyon is general manager.

Moscow—From 8 to 10 carloads of ore, valued at from $1200 to $1600 each, are being shipped from the mine every month. Two years ago, when the first shipments were made, the ore ran from $400 to $500 per carload.

JUAB COUNTY

East Tintic—An English syndicate has entered the Tintic district and recently bought control of the East Tintic Mining Company, which owns a large group of claims in that district. It is said that the new company will proceed to develop on an extensive scale and make a large milling property out of the mine. A body of ore 18 ft. wide with streaks of varying thickness which run as high as $48 per ton in gold and silver has been opened up in the lode, a fisure vein in quartzite.

May Day—The management is diligently sinking from the 1000- to the 1100-ft. level in order to get under a new orebody. On this upper level the ore extended 24 ft. John Dern, Salt Lake City, is general manager.

Iron Blossom—Production has now started from the old workings and within the last few weeks a body of ore has been opened which permits working in a full face of shipping ore. The face which is being advanced northward is about 3500 ft. from the face of the silver-lead ore in No. 3 working of the Colorado-Sioux Con vein which is being followed southward.

Beck Tunnel—Electric power is being substituted for steam and the new plant will soon be in commission. The power to supply the Beck tunnel has already been contracted.

Swansea Consolidated—Improvements are sufficient to permit further mine development. A powerful pumping plant has been installed along with a reservoir of 2,000,000 gal. capacity. The mine has been unwatered to the 800-ft. level and the large flow of water can now be handled.

Tintic Smeltery—Three of the lead furnaces are now in commission and the fourth will be blown in next week. The copper furnace is in readiness to be blown in as soon as sufficient ore accumulates.

SUMMIT COUNTY

Daly-West—Connections have just been made between the main shaft and the tunnel level, the shaft now reaching to the 2100-ft. level. The work of sinking the shaft and raising to meet it from the Ontario tunnel level has been under way for several months and General Manager Ernest Bamberger says that the management is also engaged in crosscutting for the ore in the 1700- and 2100-ft. levels.

Daly-Judge—A compressor will be purchased, which will double the present compressor capacity. Electrical power instead of steam will be used for this new machinery.

Washington

CHELAN COUNTY

Chelan—The Chelan Butte Gold Mining Company shipped a car of high-grade ore to the smeltery. The ore comes from the surface working of the mine.

FERRY COUNTY

Ben Hur—High-grade ore has again been encountered in this property, near Republic. The ore will be treated at the Granby smeltery.

Gem—This mine, near Orient, has resumed operations after a shutdown of several months.

Easter Sunday—A cyanide plant is being installed for the mine, near Orient.

KITTITAS COUNTY

Ellensburg—O. E. Kerstetter, a forest ranger, reports a strike, in the Swauk country on the Jordan and York claim, which mining men say is the best ever made in the State of Washington.

SNOHOMISH COUNTY

Index—Survey was recently made for a 2000-ft. surface tram at the Washington-Iowa mine, to connect the mine with the wagon road. This will facilitate ore shipments and the getting of supplies to the mine.

SPOKANE COUNTY

Tungsten King—O. M. Woods, president, announces that a new mill is in contemplation as a result of the recent strike in No. 1 tunnel.

Canada

ALBERTA—TABER

Canada West Coal and Coke—An agreement, running for two years, has been signed by the company and its miners and, after four months' suspension, work has been resumed.

Lee Lake Coal and Coke Company—Operations will shortly be commenced on this property, 11 miles east of Frank. There are 11 known seams of domestic and steam coal on the property. F. St. C. Farran, Lethbridge, is directing preliminary arrangements.

ALBERTA—PASSBURG

Leitch Collieries, Ltd.—The opening of a new coal mine, at Police flats, east of the company's main workings at Passburg, is in progress. W. L. Hamilton, Passburg, is general manager.

BRITISH COLUMBIA—SLOCAN LAKE

Westmont—A 2-ft. vein of copper-silver ore has been encountered. An air compressor is to be installed to expedite driving an adit 500 ft. below No. 2 tunnel. F. F. Griffiths, Slocan City, is manager.

BRITISH COLUMBIA—NICOLA

Nicola Valley Coal and Coke—A Canadian Rand 30-drill air compressor has been ordered for delivery in three months. The daily output of coal is to be increased from 300 to 1000 tons. W. H. Armstrong, Vancouver, is managing director.

ONTARIO—COBALT

Nipissing—Shipments of ore for the week ending Aug. 14 were as follows: City of Cobalt, 64,000 lb.; Cobalt Central, 41,675; Crown Reserve, 182,800; La Rose, [illegible]; McKinley-Darragh, 122,350; Nipissing, 322,390; Peterson Lake, 40,000; O'Brien, 83,200; Silver Queen, 167,350; total, 1,198,750 pounds.

Buffalo—During July 3009 tons of ore were milled. The average assay before milling was 41.55 oz. silver and the silver recovered amounted to 97.085 oz. Milling expenses were $1.627 for labor and $0.211 for supplies.

Kerr Lake—No. 3 shaft is down to the 400-ft. level, and the vein maintains the same phenomenal showing at that depth. A winze is being sunk from this level 100 ft. farther down, which will be the deepest working in the camp. Drifting has been done for 100 ft. on the vein recently found at the 150-ft. level under the Lake; the ore runs high in silver.

Nancy Helen—A vein struck recently in the crosscut near the main shaft at the 100-ft. level has a width of 4 in. and carries silver contents.

Temiskaming—A blind vein 2 in. wide and rich in silver has been encountered in the shaft at a depth of 320 feet.

ONTARIO—GOWGANDA

Bartlett Mines—The shaft is down 112 ft., and from the 100-ft. level a crosscut will be run to cut the vein, which dipped from the shaft at a depth of about 40 ft. from the surface.

Boyd-Gordon—Good ore is showing at the 75-ft. level, and veins have been encountered underground which were not located on the surface.

Blackburn—Drifting has progressed 125 ft. in the tunnel. The vein is about 2 in. wide, and carries very high-grade ore; this is being stoped out. The shaft is down about 80 ft., and the vein was just cut in the bottom. The sinking was interrupted on account of the amount of water.

Bonsall—All underground work has been stopped and the men put on surface prospecting. Two promising surface showings have been located.

QUEBEC—MONTREAL

Pacific Pass Coal Company—This company, a recent flotation, owning 35,000 acres of coal lands near the head waters of the Pembina and MacLeod rivers, Alberta, which will be opened up as soon as the Grand Trunk Pacific Railway is completed to Pembina, has received a report from F. S. Landstreet, of New York, who recently examined the property. He states that the company has 800,000,000 tons of high-grade bituminous coal lying practically all above high water level, making the workings self draining and capable of operation by gravity haulage.

YUKON TERRITORY—DAWSON

The Duncan, Highet and Haggert districts are more active this season than ever. A good clean up is expected. The Big Salmon district is also flourishing.

Mexico

BAJA CALIFORNIA

Boleo—The new copper-smelting plant of this French company is nearing completion. A new power plant with Connersville blowers will supply blast for the eight new furnaces. No converting equipment has yet been provided and the company will continue to ship matte and black copper.

CHIHUAHUA

El Rayo Mines—The report for July states that the mill ran 27 days; ore crushed, 3612 tons; value of ore per ton, $16.46; extraction, 90.39 per cent.; value of product shipped, $47,947; operating expenses, $25,831; operating profit, $22,116.

Encinillas Mines and Smelting Works, Ltd.—The Santa Rosalia smelting plant has made a lead bullion production of over 2300 tons during the past seven months. The product is marked in England. It is stated that additional furnaces will be installed. J. L. Saint-Dizier is the manager in charge.

DURANGO

Mexico Consolidated—A 15-stamp mill has been purchased for installation at Tepehuanes.

GUANAJUATO

Guanajuato Consolidated—The July report states that the mill crushed 7577 tons: estimated value of bullion, 60,000 pesos; concentrates, 62,000 pesos; estimated profit, 48,200 pesos; mill extraction, 95.3 per cent. About 400 ft. of development work was done during the month.

MEXICO

Esperanza—During July the mill operated 25 days, crushing 15,146 tons of ore; estimated value of bullion, $112,133; concentrates, $34,242; estimated net profits, $23,270. Development work aggregated 1013 feet.

South America

ARGENTINA

Famatina Development Corporation, Ltd.—This company, at Santa Florentina in the province of Rioja, smelted during July, 2300 tons of ore, producing 212 tons of 18 per cent. matte and one ton of blister copper, assaying 99 per cent. copper, 23 oz. gold, 450 oz. silver. Estimates are being obtained by the consulting engineers, Hooper & Speak, Salisbury House, London, for briquetting and calcining machinery to handle accumulated fines and flue dust.

BRITISH GUIANA

Exports of gold from the colony for the half year ended with June were 31,343 oz. bullion in 1908, and 30,700 oz. in 1909; a decrease of 573 oz. The bullion reported this year was equal to $533,704, or 25,821 oz. fine gold. Exports of diamonds this year were 2210 carats, valued at $13,994; an increase of $3152 in value.

Metal, Mineral, Coal and Stock Markets

Current Prices, Market Conditions and Commercial Statistics of the Metals, Minerals and Mining Stocks

QUOTATIONS FROM IMPORTANT CENTERS

Coal Trade Review

New York, Aug. 25—The coal market in the West continues to gain. The demand for steam coal is constantly growing and dealers are beginning to take account of winter stocks for domestic trade. Prices almost everywhere continue low, any increase being prevented by heavy shipments from the mines.

The Lake trade continues rather quiet, and many shippers claim that there must be a rush in October if the Northwest is to have its usual supplies.

The Eastern bituminous trade continues to improve to some extent, though not as rapidly as operators would like to see. West Virginia coal still continues a disturbing element, and most operators are hoping that the New River people will be successful in their attempt to regulate shipments and prices.

The anthracite trade is quiet and steady. Very few of the companies are running their collieries full time, four days a week being the rule. The summer discounts on tidewater prices will terminate next week, but there does not seem to be much rush to anticipate this.

Two coal stocks have been specially active recently. Lehigh Coal and Navigation has advanced heavily and is in demand. There is a report that offers have been made for the controlling interest in this stock, which was pooled three years ago, but nothing is publicly known of the supposed purchasers. The $50 shares of this company have sold as high as $120. Pittsburg Coal has also been active, which has given rise to rumors of a probable change in ownership; but none of these rumors have been confirmed.

Wabash-Pittsburg Terminal Association—Coal-mine operators along the Wabash Pittsburg Terminal railway have formed an association for the purpose of broadening their traffic connections and generally to conserve their mutual interests in the section of the Pittsburg coal district in which they are located. Among the companies represented in the association were the Pittsburg & Southern Coal Company, the Penobscot Coal Company and the Pryor Coal Company. William R Turney of Greensburg, was elected president, and Thomas Donohoe, secretary-treasurer The association has its office in the Bessemer building, Pittsburg.

Coal Traffic Notes

Coal and coke tonnages originating on Pennsylvania Railroad lines east of Pittsburg and Erie, year from Jan. 1 to Aug 14, short tons:

	1908.	1909.	Changes.
Anthracite	3,178,254	3,001,348	D. 176,906
Bituminous	20,162,724	22,096,482	I. 1,933,758
Coke	4,195,605	6,322,704	I. 2,127,099
Total	27,536,583	31,420,534	I. 3,883,951

The total increase this year to date was 14.1 per cent.

Coal and coke traffic of Chesapeake & Ohio Railway, fiscal year ended June 30, short tons:

	Coal.	Coke.	Total.
New River	6,753,304	279,973	7,033,277
Kanawha	5,111,841	30,236	5,142,077
Kentucky	331,100	.....	331,100
Connecting lines	210,683	78,649	289,332
Total, 1908-09	12,406,928	388,858	12,795,786
Total, 1907-08	10,525,382	330,891	10,856,273

Total increase in 1908-9 was 1,939,513 tons, or 18.4 per cent. Deliveries for the year were: Points west of mines, 6,280,024 tons coal and 220,009 coke; points east, 1,516,730 tons coal and 168,849 coke; tidewater, 4,000,883 tons coal; anthracite to line points, 9291 tons.

Coal tonnage of the Buffalo, Rochester & Pittsburg railroad for the fiscal year ended June 30, short tons:

	1907-8.	1908-9.	Changes.
Anthracite	82,189	68,346	D. 13,843
Bituminous	5,849,240	5,186,043	D. 663,197
Total coal	5,931,429	5,254,389	D. 677,040
Coke	476,886	301,386	D. 175,500

Coal and coke were 69.3 per cent. of the total freight carried. The average rate received on all freight in 1908-9 was 0.482c. per ton-mile; the average haul was 155.4 miles.

New York

Anthracite

Aug. 25—The anthracite market continues quiet with about the usual business. Dealers look forward to a little rush next week to save the discount of 10c. At some of the collieries considerable trouble is being experienced from shortage of water owing to the dry weather

Schedule prices for prepared sizes are now $4.65 for lump, and $4.90 for egg, stove and chestnut, f.o.b. New York harbor For steam sizes quotations are: Pea, $3.15@3.25; buckwheat, $2.35@2.50; No. 2 buckwheat or rice, $1.70@2; barley, $1.35@1.50, all f.o.b. New York harbor

Bituminous

The seaboard trade continues to do fairly well, the wave of business last week not having subsided as yet. More orders are coming in from the Far East. The shoalwater ports have not yet waked up but may do so in another week or so The Sound is doing a little better than recently and New York harbor has a slight lift of activity All rail trade continues steady.

Prices continue as they have been for some time Good Miller vein steam coal can be had at a delivered price which nets $1.30@1.35 at mines, while lower grades bring 90@95c. per ton at mines, and gas coal can be had at 60@65c. per ton at mine for run-of-mine.

Transportation is a little slower, consignments sometimes taking a day or so over the schedule time to come through. There is no question about car supply as yet, though special cars are occasionally hard to get.

In the coastwise trade vessels continue in abundant supply and captains and owners are still willing to shade 5c. a ton to get cargoes. The quoted rates continue unchanged at 60c. from Philadelphia to Boston, 60c from New York to points around Cape Cod; and 30@40c. for small vessels to Providence and the Sound

Birmingham

Aug. 23—The coal production in Alabama is still improving and there is a better demand. J. R. Pill, general manager of the Galloway Coal Company, is authority for the statement that the coal trade in this State is picking up and that it will not be long now before the activity will approach conditions that prevailed a couple of years ago. Edward Flynn, State mine inspector, is also authority for the statement that there is an improvement right along in the output at the coal mines. Some healthy contracts have been placed for delivery during the fall and winter. There will be a need for miners shortly, is a prediction that is made.

The coke demand is good and the production is being given attention

Chicago

Aug. 24—Strength continues in the coal market because of increasing consumption of steam grades, the laying in of stocks of domestic grades early by retailers and the restriction of shipments by mine operators. To the last-named cause most of the strength of the market is due Little coal is sacrificed to meet demurrage requirements. Eastern as well as Western operators have learned that it is disastrous to make Chicago a dumping ground.

Lump from Illinois and Indiana mines is maintaining its relatively better position by demands for the domestic autumn trade and brings $1.75@2.35 on cars. Run-of-mine is steady at $1.60@1.75 and screenings hold an important place in the steam trade at $1.25@1.55. Smokeless has yet some demurrage sales but is in general held well up to $3.40 for lump and $2.95 for run-of-mine quoted for the best grades. Hocking is fairly well regulated, with moderate, steady demand, at $3@3.15. Anthracite continues in light but well distributed demand.

Cleveland

Aug. 24—Quite a rush of orders has been coming in from large consumers and from dealers. There are signs that a shortage of cars may delay shipments, which are now heavy. Several roads have notified mineowners that their supply of cars for September will be limited.

Prices continue about the same. No. 8 district steam brings $1.90@2.05 for lump; $1.70@1.80 for run-of-mine; $1.30@1.35 for slack. Middle district steam is quoted at $1.85@2 for lump; $1.65@1.75 for run-of-mine; $1.15@1.20 for slack. Massillon coal for domestic use is $2.70 for lump. Pittsburg coal is $2.15@2.25 for lump, and $2@2.05 for run-of-mine.

Indianapolis

Aug. 24—The activity among buyers and consumers which was expected to set in during the month has evidently been realized. Railroad companies report that the coal traffic is unusually heavy and the indications are for a still larger haulage. Indiana steam coal, for which there is an increasing demand has been for some time placed at a decided disadvantage in a number of markets in this and adjoining States because of an alleged excessive exchange rate charged by some of the railroads. The Indiana Railroad Commission has been appealed to, and an effort is being made to lower the rates at connecting points.

Pittsburg

Aug. 24—Demand from local consumers continues fairly good, while Lake shipments are only moderate. Nominal prices remain at $1.20 to retail dealers and $1 to to manufacturers for mine run, with slack at 65c., but competition continues keen, prices being shaded 5 or 10c. a ton and occasionally more.

Connellsville Coke—Prices continue to harden, although new buying is not very heavy. There has been considerable shortage of labor, which has retarded the increase in production, but conditions are improving. Prompt furnace coke is quoted at higher, at $1.70@1.75, contract furnace coke brings $1.70@1.85. Standard 72-hour foundry coke remains at $2@2.25 for prompt or contract, depending on grade.

The *Courier* reports the production in the Connellsville and lower Connellsville regions in the week ended Aug. 17, at 395,188 tons, substantially the same as in the preceding week. Shipments are reported at 4481 cars to Pittsburg, 7187 cars to points west of Pittsburg and 809 cars to points east of Connellsville, a total of 12,477 cars, a decrease of 100 cars in a week.

Foreign Coal Trade

German Coal Trade—Imports and exports of fuel in German Empire, six months ended June 30, metric tons:

	1908.	1909.	Changes.
Imports:			
Coal	5,559,334	5,420,296	D. 139,038
Brown coal	4,432,288	4,051,445	D. 380,843
Coke	258,576	325,629	I. 67,053
Briquets	94,133	98,947	I. 4,814
Exports:			
Coal	9,838,175	10,320,519	I. 482,344
Brown coal	13,328	15,634	I. 2,306
Coke	1,812,642	1,593,303	D. 219,339
Briquets	802,463	758,514	D. 43,949

The coke exports this year included 16,083 tons sent to the United States.

British Coal Exports—Exports of fuel from Great Britain, together with coal sent abroad for the use of steamers engaged in foreign trade, seven months ended July 31, long tons:

	1908.	1909.	Changes.
Coal	35,890,560	36,080,190	I. 189,630
Coke	595,429	619,234	I. 23,805
Briquets	912,448	858,171	D. 54,277
Total exports	37,407,377	37,557,595	I. 150,218
Steamer coal	11,141,974	11,288,941	I. 146,967
Total	48,549,351	48,846,536	I. 297,185

The larger exports this year were 6,171,030 tons to France, 5,367,562 to Italy, 5,180,432 to Germany and 2,128,781 tons to Sweden.

Belgian Coal Production—The total coal production in Belgium for the half-year ended June 30 was 11,813,650 metric tons in 1908, and 11,559,745 in 1909; a decrease of 253,905 tons, or 2.1 per cent.

Welsh Coal Prices—Messrs. Hull, Blyth & Co., London and Cardiff, report current prices of coal as follows, on Aug. 14: Best Welsh steam, $4.26@4.32; seconds, $4.08; thirds, $3.96; dry coals, $4.08; best Monmouthshire, $3.60; seconds, $3.48; best small steam, $2.40; seconds, $2.10. All per long ton, f.o.b. shipping port.

Iron Trade Review

New York, Aug. 25—There is not much change to record in the iron and steel markets this week. There is a continuous steady demand and some new buying, but an absence of the rush which existed a few weeks ago.

In pig iron there has been considerable buying, both in the Central West and in Eastern territory. In the West the chief buying has been on basic and bessemer pig while in the East foundry iron has been more in demand. Prices are generally firm, but show little change. Many sellers are inclined to think that they have nearly reached the limit which can be asked without checking demand, while others say that we will soon be at the point where the possibility of imports will have to be taken into consideration. It is also to be remembered that production is increasing, as quite a number of merchant furnaces are going into blast, as well as more steel-work furnaces.

In finished material the steady demand for bars and plates has brought about advances of $1 a ton in most cases. In sheets and tinplates the advance recorded last week is likely to be held. In structural material there have been fewer larger contracts, but a pretty steady run of small orders, which mount up to a considerable total.

While the present year will go out with a comparatively light rail business, heavy orders are being booked for 1910 delivery. The total so far taken for next year is estimated at between 400,000 and 450,000 tons.

There is nothing new in the Amalgamated strike, but the Sheet and Tin Plate Company seems to be gaining ground.

Republic Iron and Steel Company—The report for the year ended June 30 shows production as follows:

	1907-8.	1908-9.	Changes.
Iron ore mined	1,025,460	1,451,434	I. 425,974
Pig iron made	494,676	678,799	I. 184,123
Finished iron and steel	434,230	565,151	I. 130,921

On June 30, 1909, the unfilled orders on the books reached a total of 392,420 tons, an increase of 108,677 tons over June of last year.

Baltimore

Aug. 23.—Exports for the week included 484,726 lb. tin scrap to Rotterdam. Imports included 224 tons ferromanganese from Liverpool; 6800 tons manganese ore from India; 5760 tons iron ore from Russia; 21,080 tons iron ore from Cuba.

Birmingham

Aug. 23—Southern furnace companies are taking care of regular customers in pig iron, but are not anxious yet for business for next year's delivery. There is not much business going on though in quiries are being received in this territory steadily for iron for future needs. No. 2 foundry is being held firmly at $13.50 per ton. A small lot of No. 1, soft, sold a few days ago at $14.50 per ton. It was a special order and the only significance is in the sounding of a higher price. Confidence is expressed that within a few weeks the level for No. 2 foundry will have reached $14 per ton, and perhaps in October, the price will have gone even above that. The steady buyers in this territory have been notified that their immediate needs will be cared for. The make is holding up well. The month of August will show a better production than for several months. The repair work on

the several furnaces mentioned in the past few weeks is nearing the end. There is a considerable amount of pig iron on furnace yards in this district but it is positively announced that this product does not belong to the producers. At one place where there is a big pile of iron, the statement was made that on the first of the coming month the producing company where the furnaces are, owns not more than 5000 tons of iron. The shipment of iron from this territory is about equal to the make. The visit to this district recently of G. Dominico, representative of the Argentine Central railroad, which road will receive 50,000 tons of steel rail from Ensley, may result in further business. The Tennessee company will deliver this 50,000 tons of rails to Buenos Aires during a period of 12 months.

Chicago

Aug. 24—The strength of the iron market is indicated by the advance of prices to $14 Birmingham ($18.35 Chicago) for No. 2 Southern and to $18 on No. 2 Northern pig iron for ordinary first-half business. That some foundry iron is sold 25 or 50c. under these prices is admitted, but the tendency is upward, especially for Northern. There is little iron remaining to be sold for 1909 delivery, requirements being small and scattering in foundry grades. Large sales are wanting, but the aggregate disposal of small lots makes up a fair amount and melters incline to contract more heavily as the market advances. Several sales of malleable bessemer in lots up to 2000 tons have strengthened the market; foundry iron lots run up to 600 tons. Northern charcoal iron is active at $19.50@20 per ton.

Railroad supplies lead the heavy demand for iron and steel products, practically every line of which continues booming. Coke is in better demand, showing activity at $4.70 for the best Connellsville.

Cleveland

Aug. 24—Shipments of ore continue heavy. Sales are rather slower. Several of the large shippers of merchant ore are practically sold out for the season. Prices are unchanged.

Pig Iron—Business in foundry and basic is active. Some sellers are turning down orders which they believe are of a speculative character. Quotations for local delivery are $16.25@16.50 for bessemer; $16.50@16.75 for No. 2 foundry; $15@15.50 for gray forge; $19.50@20 for Lake Superior charcoal. Prices are firm.

Finished Material—The demand for almost all kinds of material is good. Mills are making many sales, and jobbers report active business. Steel bars are held at 1.35c., Pittsburg basis; local mills have advanced their prices on plates to 1.45c., Cleveland delivery.

Philadelphia

Aug. 25—All kinds of pig iron are being taken, basic as usual leading because of the large increase in steel products. Furnacemen report constant inquiry for future deliveries, some being for 1910 consumption. It is more difficult than ever to make satisfactory arrangements for basic iron, and it is stated today that a further advance will be made soon. It is understood here that basic requirements have been underestimated, and that large supplemental purchases will soon be made. Forge iron is at present more active than for a year or more, and quotations in certain special grades were advanced 50c. yesterday for 60-day delivery. No. 2X foundry is doing well, as all foundry work is improving. Pipe iron is again under negotiations for winter delivery. Present outside quotations are $17.50 for No. 2X foundry and basic, and $16.25 for forge.

Steel Billets—Midsummer activity exists in view of advancing prices and the necessity for supplies during September and October.

Bars—Bars are exceptionally active for immediate delivery. Iron stores are endeavoring to stock up. Small consumers are taking iron all the time. Car builders are in the market for remote deliveries, and there is a disposition to meet their views.

Structural Material—Business has been stimulated during the past week by the anticipation of a further advance. In fact on small orders it has already taken place. The bridge works are endeavoring to preserve some spare capacity to take care of an expected rush of small orders.

Scrap—The new system of buying scrap inaugurated by some steel mills is not pleasing to scrap dealers, but they report good prices for everything they have to sell. Sales for the past week of No. 1 yard scrap and heavy melting steel were double any recent week.

Pittsburg

Aug. 24—New buying in iron and steel products continues comparatively light, while specifications on old contracts are up to the average in July and are entirely satisfactory.

There have been no important changes in prices of finished steel products in the week, but the trend is toward greater strength. In plates and shapes 1.40c. is still done on attractive orders, but a great many small orders are going at 1.45c. The same condition prevails in steel bars, many orders being taken at 1.40c., while only the most desirable business goes at 1.30c. In the past fortnight there have been sales of bars at 1.30c. in the Baltimore district, when the Pittsburg basis was 1.35c., but the lower price is understood to have been withdrawn.

Pig Iron—Pig iron has resumed its advancing tendency after a slight halt. Bessemer iron has scored a clear advance of 50c. a ton in the week, chiefly on the purchases of the Youngstown Sheet and Tube Company, which set out to buy 25,000 tons at $16, Valley. It secured 7500 tons at this price, as reported a fortnight ago, but in the past few days has paid $16.50 for 6500 tons additional, for delivery any time this year, firmly establishing the market at that figure as a minimum. A sale of 1500 tons of bessemer for equal delivery over the first half of next year at $17 has made a market for that delivery, but the majority of furnaces will not quote at all for next year on bessemer. Basic has been quiet and nominally remains at $15.25, Valley, the price done on the last important sales, but is evidently in line for an advance. Foundry iron has been selling in a quiet way for this year's delivery, prices depending largely on brand, and the market is nominally quotable at $15.25@15.75, Valley, for this year, although it is difficult to do the lower price. Sales for next year are assuming more important proportions and the market shows less range. One interest has bought upward of 2000 tons of foundry iron for the first half, paying $16, Valley, for the bulk, but taking some tonnage at $16.25 and even higher, for special brands, and next year's market can be quoted at this range. Forge is quotable at $14.25@14.75, Valley. Pittsburg prices are 90c. higher than Valley.

Ferromanganese—The market has firmed up. In the past few days several moderate-sized lots for early delivery have been sold at $42, Baltimore, or $43.95, Pittsburg, an advance of $1 a ton from last week, while some relatively small sales have been made for next year at $43.50, seaboard.

Steel—The market is very firm, but transactions are light. Quotations remain at $24 for bessemer billets, $25@26 for open hearth billets and $25.50@26 for sheet bars, all f.o.b. Pittsburg.

Sheets—The market continues strong, with a good demand, and prices are firmly held at 2.20c. for black and 3.25c. for galvanized, $1.55 per square for painted corrugated roofing and $2.80 for galvanized.

Foreign Iron

German Iron Production—The German Iron and Steel Union reports the make of pig iron by the German furnaces in July at 1,091,050 metric tons, or 23,038 tons more than in June. For the seven months ended July 31, the total make was, in metric tons:

	1908.	1909.	Changes.
Foundry iron	1,308,453	1,375,387	I. 66,934
Forge iron	407,519	408,617	D. 1,902
Steel pig	570,907	614,404	I. 43,597
Bessemer pig	241,216	236,092	D. 5,124
Thomas(basic)pig	4,582,499	4,709,048	I. 126,549
Total	7,060,491	7,340,548	I. 280,057

The total increase was 4 per cent

Metal Markets

New York, Aug. 25.—The metal markets show comparatively little change during the week. A fair degree of activity is reported, with speculative interest in some lines.

Gold, Silver and Platinum

UNITED STATES GOLD AND SILVER MOVEMENT

Metal.	Exports.	Imports.	Excess.
Gold:			
July 1909..	$16,661,782	$ 3,269,885	Exp. $13,391,897
" 1908..	4,845,272	2,949,179	Exp. 1,896,093
Year 1909..	80,496,119	23,405,477	Exp. 57,090,642
" 1908..	58,363,098	29,357,076	Exp. 29,006,172
Silver:			
July 1909..	5,049,366	3,926,117	Exp. 1,123,249
" 1908..	4,930,746	3,039,581	" 1,891,165
Year 1909..	34,409,032	26,798,145	" 7,610,887
" 1908..	30,445,291	24,180,929	" 6,264,362

Exports from the port of New York, week ended Aug. 21: Gold, $1,250,000, to Argentina; silver, $675,990, to London and Paris. Imports: Gold, $94,533; silver, $56,659; both from the West Indies, Mexico and South America.

Gold production of Rhodesia in July is reported by cable at 53,512 oz. fine. For the seven months ended July 31 the total was 353,058 oz., or $7,310,312 in value.

Gold—The price on the open market in London remained through the week at the minimum, 77s. 9d. per oz. for bars and 9s. 4d. for American coin. There was little competition for gold arriving and most of it was taken for Berlin and Vienna. In New York there were exports of $1,250,000 to Argentina and $200,000 to Panama, while $1,750,000 was taken for shipment to Paris later.

Platinum—Demand is improving. Prices are higher, and dealers this week asked $23@24.50 per oz. for refined platinum, and $28.25 for hard metal; while $19@21 per oz. is paid for good scrap.

Silver—The market has held steady most of the week at 23⅛d. in London, advancing on buying by China banks to 23¼d. and closing steady at that figure.

SILVER AND STERLING EXCHANGE

Aug.	19	20	21	23	24	25
New York...	50⅞	51	51	51	51⅛	51⅛
London...	23⅛	23⅛	23⅛	23⅛	23⅛	23⅛
Sterling Ex.	4.8625	4.8625	4.8625	4.8675	4.8700	4.8690

New York quotations, cents per ounce troy for silver. London pence per ounce sterling, 925 fine.

Exports of silver from London to the East, Jan. 1 to Aug. 12, as reported by Pixley & Abel:

	1908	1909	Changes
India..	£ 319,500	£3,891,000	I. £1,571,500
China	516,400	1,465,700	I. 949,300
Straits	80,200	92,900	I. 7,710
Total	£ 916,100	£5,449,600	I. £ 2,533,500

[illegible] from the [illegible] £[illegible] from New York and £[illegible] from Bombay. Exports to Paris and Italy are not included in the above. £63,500 [illegible]

Movement of gold and silver in Great Britain, seven months ended July 31:

	Imports.	Exports.	Excess.
Gold	£42,601,416	£24,357,656	Imp. £9,244,760
Gold, 1908...	27,801,227	25,847,038	Imp. 1,954,189
Silver	7,357,536	7,658,919	Exp. 301,383
Silver, 1908.	6,106,868	7,700,536	Exp. 1,593,668

The United States furnished this year £2,035,412 of the gold and £6,216,044 of the silver imported.

Copper, Tin, Lead and Zinc

Aug.	Copper. Lake, Cts. per lb.	Copper. Electrolytic, Cts. per lb.	Copper. London, £ per ton.	Tin. Cts. per lb.	Lead. New York, Cts. per lb.	Lead. St. Louis, Cts. per lb.	Zinc. St. Louis, Cts. per lb.
19	13⅛ @13⅜	12⅞ @13⅛	59½	30 @30⅛	4.37½ @4.42½	4.25 @4.27½	5.65 @5.67½
20	13⅛ @13¼	12⅞ @13⅛	59⅜	30⅛ @30¼	4.37½ @4.42½	4.25 @4.27½	5.65 @5.67½
21	13⅛ @13¼	12⅞ @13⅛	....	30¼ @30⅜	4.37½ @4.42½	4.25 @4.27½	5.65 @5.67½
23	13⅛ @13¼	12⅞ @13⅛	59½	30¼ @30⅜	4.37½ @4.42½	4.25 @4.27½	5.62½ @5.67½
24	13⅛ @13¼	12⅞ @13⅛	59⅞	30⅞ @30⅛	4.37½ @4.42½	4.25 @4.27½	5.62½ @5.67½
25	13⅛ @13¼	12⅞ @13⅛	59 7/16	30⅛ @30⅜	4.37½ @4.42½	4.25 @4.27½	5.62½ @5.67½

London quotations are per long ton (2240 lb.) standard copper. The New York quotations for electrolytic copper are for cakes, ingots and wirebars, and represent the bulk of the transactions made with consumers, basis, New York, cash. The price of cathodes is usually 0.125c. below that of electrolytic. The quotations for lead represent wholesale transactions in the open market. The quotations on spelter are for ordinary Western brands; special brands command a premium.

Copper—A very good business has been done during the week, Aug. 18-25. It is reported, however, that the bulk of the transactions were for export, although some fair business for domestic delivery was also done. The demand was liberally met and generally speaking, it looks as though the market had reached an equilibrium around the current level. Since the 21st inst. there has been a slackening in the demand. The bulk of the business in electrolytic appears to have been done on the basis of 13c., net, cash, New York. About all of the agencies have participated in this business, with considerable competition, those which are nominally asking a slightly higher price being apparently willing to make concessions in order to obtain business. Lake copper has been freely offered at 13⅛c. net, cash, New York, although the Calumet & Hecla is still understood to be asking 13¼c. The trade of this company is, however, largely a specialty at certain times which enables it to be a law unto itself. Some transactions of considerable magnitude in Lake from second hands, which apparently were more or less forced, have been made at prices below the market as quoted from first hands and closely approximating the market for electrolytic. The above is stated at 13 cents for Lake and 12⅞ to 13c. for electrolytic in cakes, wirebars or ingots. The average for casting copper during the week has been 12¾@12⅞ cents.

Copper sheets are 17@18c., base for large lots. Full extras are charged, and higher prices for small quantities. Copper wire is 15c. base, carload lots at mill. Business is good.

The London standard market has fluctuated within narrow limits, and closes practically unchanged at £59 11s. 3d. for spot and £60 10s. for three months. Refined and manufactured sorts we quote: English tough, £63; best selected, £62@63; strong sheets, £74@76.

Exports of copper from New York and Philadelphia for the week were 2340 long tons. Our special correspondent reports exports from Baltimore for the week at 1437 tons copper.

Tin—The operations for higher prices have been successful in creating a considerable following and prices went up practically from day to day. While consumers are taking care not to be caught short, there has been no particular enthusiasm shown on their part, and the advance is altogether out of proportion to the business transacted with the trade.

London closes a little below the top at £137 12s. 6d. for spot and £138 15s. for three months, while business locally is being done at 30¼@30⅜ cents.

Lead—The market is quiet and quotations are unchanged at 4.25@4.27½c. St. Louis and 4.37½@4.42½c. New York.

The London market is neglected at £12 8s. 9d. for Spanish and £12 11s. 3d. for English lead.

Spelter—Transactions were not as heavy as in previous weeks, which in a measure may be due to the fact that smelters are reluctant to offer their current output for sale, on account of the enormous advance in the price of Joplin ore, which has now reached a point where 6c. for spelter would be warranted. It would seem, however, that consumers supplied themselves liberally during the recent activity, and are inclined to await developments. After a small further advance the market relapsed to 5.77½@5.82½c. New York and 5.62½@5.67½c. St. Louis.

New York quotations for spelter Aug. 19-21, inclusive, were 5.80@5.82½c. per lb.; Aug. 23-25, inclusive, 5.77½@5.82½ cents.

London is somewhat higher at £22 2s. 6d. for good ordinaries and £22 7s. 6d. for specials.

Base price of sheet zinc is now 7½c. per lb. f.o.b. La Salle-Peru, Ill., less 8 per cent discount.

Other Metals

Antimony—The market is quiet, with little demand except for current supplies. Quotations, both for spot and futures, are 8¾c. per lb. for Cookson's, 8½c. for Hallett's, 7@7½c. for outside brands.

Aluminum—There is no change in the market. No. 1 ingots can be had at 20@23c. per lb. for large lots. The higher price is that asked by the American maker. The foreign market is in an unsettled condition, and a movement is on foot to secure higher prices.

Quicksilver—The market is quiet and unchanged at $43.50@44 per flask of 75 lb., New York. San Francisco is weaker at $42@43 for domestic orders, and $40@41 for export. London is £8 5s. per flask, but as low as £8 1s. 3d. is quoted by jobbers.

Nickel—Large lots, contract business, 40@45c. per lb. Retail, spot, from 50c. for 2000-lb. lots, up to 55c. for 500-lb. lots. The price for electrolytic is 5c. higher.

Magnesium—Quotations for this metal are $1.25 per lb., New York, in 100-lb. lots; for 5-lb. lots, $1.40 per pound.

Cadmium—Current quotations are 75c. per lb. in 100-lb. lots at Cleveland, Ohio. In Germany 450@475 marks per 100 kg., at factory in Silesia.

British Metal Imports and Exports

Imports and exports of metals in Great Britain, seven months ended July 31, figures in long tons, except quicksilver, which is in pounds:

Metals:	Imports.	Exports.	Excess.	
Copper, long tons	92,973	36,230	Imp.	56,743
Copper, 1908....	98,847	36,317	Imp.	62,530
Tin, long tons....	23,681	24,196	Exp.	515
Tin, 1908.....	26,839	23,784	Imp.	3,055
Lead, long tons..	123,191	28,473	Imp.	94,718
Lead, 1908.....	134,778	32,664	Imp.	102,114
Spelter, l'g. tons.	64,011	4,296	Imp.	59,715
Spelter, 1908....	61,666	4,757	Imp.	56,909
Quicksilver, lb...	2,925,521	556,582	Imp.	2,368,939
Quicksilver, '08	3,021,528	926,701	Imp.	2,094,827
Ores:				
Tin ore and con.	14,068	.....	Imp.	14,068
Tin ore, 1908...	15,559	.....	Imp.	15,559
Pyrites.....	459,734	.....	Imp.	459,734
Pyrites, 1908...	493,773	.....	Imp.	493,773

Copper totals include metallic contents of ore and matte. Exports include re-exports of foreign material. Of the imports in 1909 the United States furnished 175 tons copper matte, 35,329 tons fine copper and 20,327 tons lead. This lead was chiefly Mexican, refined in this country.

Zinc and Lead Ore Markets

Platteville, Wis., Aug. 12—The highest price paid for zinc ore was $50; the base price of 60 per cent. zinc was $49 per ton. The highest price paid for lead ore was $59.50; the base price of 80 per cent. lead ore was $58 per ton.

SHIPMENTS, WEEK ENDED AUG. 21.

Camps.	Zinc ore, lb.	Lead ore, lb.	Sulphur ore, lb.
Highland.....	895,600	.....	.....
Benton.....	657,240	67,650	.....
Platteville.....	462,800	73,000	412,700
Hazel Green.....	425,950	.....	.....
Cuba City.....	306,200	85,260	140,140
Days Siding.....	264,000	.....	.....
Harker.....	203,490	.....	.....
Linden.....	193,960	.....	.....
Strawbridge.....	66,000	.....	.....
Total.....	3,474,340	225,910	552,840
Year to Aug. 21.....	84,587,559	4,965,820	7,707,710

In addition to the above there was shipped to the American Zinc Ore Separating Company, 800,930 lb. and to the Joplin Separator Works, 142,000 lb. zinc ore.

Joplin, Mo., Aug. 21—From a high price of $54.50 per ton for zinc sulphide ore, and a base of $51.50 the market slumped at the week-end to a $50 base as highest offering this evening, and slimes were bought today on a $46 base. Zinc silicate ore sold as high as $35 per ton on a base price of $28 per ton of 40 per cent. zinc, ranging down to a $25 base, with one lot selling on a $27.50 base. The average price, all grades, was $47.04. The highest price for lead ore was $60.50, with heavy sales at $60 for next week's delivery. This week's average, all grades, was $58.10 per ton.

The shipment is a little under an average one, while the output was increased several hundred tons by the restarting of idle mills and the starting of a number of new ones. The shipment was 5557 tons, with an output of approximately 6300 tons. The high price of ore is stimulating a probable maximum production, as there is already a shortage of men for shoveling ore in the ground, and each mill to start emphasizes this want.

SHIPMENTS, WEEK ENDED AUG. 21.

	Zinc, lb.	Lead, lb.	Value.
Webb City-Carterville	3,960,260	1,010,710	$128,316
Joplin.....	2,365,290	347,140	68,191
Prosperity.....	477,100	208,210	17,965
Galena.....	690,750	60,110	17,871
Oronogo.....	601,720	.....	15,312
Granby	649,700	22,810	11,417
Duenweg.....	472,620	46,980	11,190
Spurgeon.....	332,760	64,270	9,036
Aurora	386,510	.....	6,634
Carthage.....	244,120	.....	6,103
Miami	199,410	.....	4,387
Quapaw.....	107,450	4,760	2,717
Alba-Neck	106,970	.....	2,674
Cave Springs.....	106,750	.....	2,668
Sarcoxie.....	120,070	.....	2,245
Peoria.....	119,960	.....	1,799
Zincite	69,200	.....	1,661
Stott City.....	53,620	.....	1,287
Badger	50,120	.....	1,253
Totals	11,114,280	1,764,990	$312,726
34 weeks.....	384,386,560	58,022,130	$8,897,228

Zinc value, the week, $261,438; 34 weeks, $7,327,297
Lead value, the week, 51,288; 34 weeks, 1,569,931

MONTHLY AVERAGE PRICES.

Month.	Zinc Ore. Base Price. 1908.	1909.	All Ores. 1908.	1909.	Lead Ore. All Ores. 1908.	1909.
January.....	$37.60	$41.25	$35.56	$38.46	$46.88	$52.17
February...	36.63	36.94	34.92	34.37	49.72	50.60
March.....	36.19	37.40	34.19	34.71	49.90	50.82
April.....	35.40	38.63	34.08	37.01	52.47	55.63
May	34.19	40.06	33.39	37.42	56.05	56.59
June.....	33.06	44.15	32.07	40.35	60.48	57.52
July	34.55	43.06	31.67	41.11	57.06	53.74
August	36.53	.....	33.42	.....	60.34	.....
September..	37.63	.....	34.44	.....	54.59	.....
October.....	35.95	.....	33.28	.....	52.63	.....
November...	39.13	.....	35.02	.....	54.53	.....
December...	42.75	.....	39.63	.....	49.68	.....
Year.....	$36.63	.....	$34.31	.....	$53.93	.....

NOTE—Under zinc ore the first two columns give base prices for 60 per cent. zinc ore. The second two the average for all ores sold. Lead ore prices are the average for all ores sold.

Chemicals

New York, Aug. 25—The general market continues to show fair deliveries on contracts, while spot sales are improving slightly.

Copper Sulphate—The market is unchanged, current quotations being $4.22½ per 100 lb. for large orders, carloads or over, and $4.32½@4.47½ per 100 lb. for smaller orders.

Arsenic—There has been little trading in this article, and prices are somewhat easier, quotations being 2⅝@2¾c. per lb. for white arsenic.

Nitrate of Soda—Business continues at a fair rate, and 2.12½c. per lb. is still being quoted for spot. Futures are rather quieter and 2.10c. is named for all positions next year.

Potash Salts—Exports of potash salts from Germany, half-year ended June 30, metric tons:

	1908.	1909.	Changes.
Kainit, kieserite, etc	272,607	344,867	I. 72,260
Potassium chloride.....	59,787	92,539	I. 32,752
Potassium sulphate....	18,533	27,072	I. 8,539
Pot.-magnesium sul....	65,370	64,674	D. 696
Total.....	416,297	529,152	I. 112,855

Of the exports this year a total of 216,650 tons went to the United States.

Mining Stocks

New York, Aug. 25—In the general stock market the week has shown another professional market with comparatively little public interest. In the early part of the week, fluctuations were generally upward, but in the last three days there was a marked reaction, and the market was very heavy, with slow trading.

The Curb has been inclined to dullness throughout the week, with moderate trading on small fluctuations. In the copper stocks quite a number showed lower quotations, among them Boston Consolidated, Miami and Nevada Consolidated; while Cumberland Ely and Ohio Copper each gained a fraction. The fluctuations in either direction, however, were small. The Nevada gold stocks were generally steady and rather inclined to be quiet. Cobalts were fairly active, but without any important changes in price. The industrials were the most active and at the same time the weakest section of the market. Southern Iron and Steel and Standard Oil both record losses for the week.

The directors of the Great Northern Ore properties have declared a dividend of $1 per share payable Sept. 15. This is the third dividend. No. 1 was paid Sept. 16, 1907, and No. 2 March 16, 1908, both $1 per share.

Boston, Aug. 24—After weeks of uncertain market fluctuations mining shares are looking up again. There was a general decline in prices during the week in sympathy with the weakness of New

York stocks, but sentiment is improved and there is a disposition to take the long side again.

North Butte is again coming in favor and a high at $61 per share was recorded, which represents a gross advance of $5 during the week. Superior Copper also acted well and has had a $4.25 advance to $60.25. Lake Copper had a $3.25 drop in the market today to $34.50, but it was largely the result of a raid. Street talk is that Lake Copper, North Butte and Superior will lead the Boston list when an advance does set.

U. S. Smelting has been an active issue and considerable pool work has been manifest. The price ran off $2.25 to $52.75, but recovered to $54 today. Kerr Lake had an active spell and the result was a $1 advance to $9.37½. Amalgamated followed the course of the New York Exchange and broke $3 to $83, with subsequent recovery of all but a fraction. Parrot has been active at from $33 to $34, and Old Dominion is up $1.50 to $57. The latter stock is reported quite scarce in the market.

Curb trading was of fair amount, but is now in lessened volume. Prices are generally below those of a week ago. First National and Davis-Daly were active features, as was Rhode Island Coal, Henry M. Whitney's enterprise. The latter rose $1 to $10.50. The new promotion, Champion, broke from 28 to 17c. with some slight recovery, and Willet broke to 16c. Eclipse Oil made a low at 10c. Some slight recovery has been made to date.

STOCK QUOTATIONS

NEW YORK Aug. 25

Name of Comp.	Clg.
Alaska Mines	‡.11
Amalgamated	85[illegible]
Anaconda	49[illegible]
Balaklala	2[illegible]
British Col. Cop.	6[illegible]
Buffalo Mines	3½
Butte Coalition	25[illegible]
[illegible]	‡[illegible]
Cum. Ely Mining	7[illegible]
Davis-Daly	6[illegible]
Dominion Cop.	7
Douglas Copper	2
El Rayo	2
Florence	3[illegible]
Foster Cobalt	‡.32
Furnace Creek	‡.05
Giroux	10
Gold Hill	‡[illegible]
Goldfield Con.	[illegible]
Granby	‡104[illegible]
Greene Gold	‡[illegible]
Greene Gold & S.	‡[illegible]
Guanajuato	1⅜
Guggen. Exp.	200
Hanapah	‡15
Kerr Lake	8[illegible]
McKinley-Dar.	90
Miami Copper	16[illegible]
Micmac	[illegible]
Mines Co. of Am.	[illegible]
Montezuma of C. R.	27
Mont. Sho. C.	2⅛
Nev. Utah M. & S.	2
Newhouse M. & S.	3[illegible]
Nipissing Mines	10[illegible]
Old Hundred	[illegible]
Silver Queen	‡.15
Stewart	[illegible]
Tennessee Copper	‡[illegible]
Tri-Bullion	[illegible]
Union Copper	10[illegible]
Utah Apex	4[illegible]
Utah Copper	51[illegible]
Yukon Gold	5[illegible]

‡Last quotation.

BOSTON Aug. 25

Name of Comp.	Clg.
Adventure	7
Allouez	47¼
Am. Zinc	31
Arcadian	‡4
Arizona Com.	43½
Atlantic	11
Boston Con.	15
Calumet & Ariz.	107
Calumet & Hecla	‡680
Centennial	37¾
Copper Range	83
Daly-West	9
East Butte	11[illegible]
Franklin	16[illegible]
Greene-Can.	9[illegible]
Hancock	‡10[illegible]
Isle Royal	27½
Keweenaw	‡3½
La Salle	14[illegible]
Mass	7[illegible]
Michigan	9
Mohawk	‡61
Nevada	24⅞
North Butte	60[illegible]
Ojibway	10½
Old Colony	‡[illegible]
Old Dominion	57
Osceola	146
Parrot	33¾
Quincy	‡91
Rhode Island	‡4[illegible]
Shannon	16
Superior	59[illegible]
Superior & Bost.	15¼
Superior & Pitts.	16⅝
Tamarack	‡68
Trinity	12¾
U. S. Smelt. & Ref.	53[illegible]
U. S. Sm. & Re. pd.	51
Utah Con.	45¾
Victoria	‡4
Winona	6½
Wolverine	154
Wyandotte	2[illegible]

‡Last quotation.

N. Y. INDUSTRIAL

Am. Agri. Chem.	49¾
Am. Smelt. & Ref.	100½
Am. Sm. & Ref., pf.	114[illegible]
Colo. Fuel & Iron	46
Federal M. & S. pf.	‡91½
National Lead	92¾
National Lead, pf.	112½
Pittsburg Coal	21
Republic I. & S.	39
Republic I. & S. pf.	105¾
Sloss-Sheffield	85¼
Standard Oil	‡685
U. S. Steel	77⅞
U. S. Steel, pf.	125⅛
Va. Car. Chem.	48¼

BOSTON CURB	Low.
Ahmeek	200
Chemung	15
Chino	8
Globe Con.	4½
Gila	9⅝
Mason Valley	2$\frac{5}{16}$
Ray Central	2$\frac{3}{16}$
Ray Con.	19
San Antonio	9¼
Yuma	2⅜

Furnished by Hornblower & Weeks, N. Y.

ST. LOUIS Aug. 20

N. of Com.	High.	Low.
Adams	.40	.30
Am. Nettie.	.09	.07
Center Cr'k	1 80	1 70
Cent. C. & C.	83 00	81.00
C. C. & C. pf.	82.00	80.00
Cent. Oil	110.00	100 00
Columbia	9.00	7.00
Con. Coal	19 00	18 00
Doe Run	115 00	105.00
Gra. Bimet.	30	.23
St. Joe	12 00	11.00

LONDON Aug. 25

Name of Com.	Clg.		
Dolores	£1	5s	0d
Stratton's Ind.	0	3	3
Camp Bird	1	5	9
Esperanza	2	17	6
Tomboy	1	1	3
El Oro	1	5	6
Oroville	1	5	6

Cabled through Wm. P. Bonbright & Co., N. Y.

NEVADA STOCKS. Aug. 25.
Furnished by Weir Bros. & Co., New York.

Name of Comp.	Clg.
COMSTOCK STOCKS	
Belcher	.90
Best & Belcher	52
Caledonia	.28
Chollar	.28
Comstock	28
Con. Cal. & Va.	1.30
Crown Point	.82
Exchequer	40
Gould & Curry	.26
Hale & Norcross	45
Mexican	1 02
Ophir	1 27
Overman	37
Potosi	48
Savage	46
Sierra Nevada	47
Union	51
Utah	10
Yellow Jacket	98
TONOPAH STOCKS	
Belmont	85
Extension	63
Golden Anchor	
Jim Butler	11
MacNamara	32
Midway	20
Montana	94
North Star	02
Tonopah Mine of N.	6.75
West End Con.	31
GOLDFIELD STOCKS	
Adams	01
Atlanta	15
Blue Bell	03
Booth	14
C. O. D. Con.	11
Columbia Mt.	12
Comb. Frac.	73
Con. Red Top	
Cracker Jack	01
Dia'dfield B. B. C.	02
Goldfield Belmont	.04
Goldfield Daisy	21
Great Bend	07
Jumbo Extension	20
Kendall	02
Lone Star	.03
May Queen	04
Oro	07
Red Hill	.07
Sandstorm	07

Name of Comp.	Clg.
Silver Pick	.15
St. Ives	.07
Triangle	.01
BULLFROG STOCKS	
Gibraltar	.02
Homestake King	...
Mont. Shoshone C.	2.12½
Tramp Cons.	.04
MISCELLANEOUS	
Cumberland Ely	7.06¼
Giroux	9.87½
Greenwa'r Copper	.04
Nevada Con.	23.50
Nevada Hills	.70
Navada Smelting	.87½
Nevada Wonder	.70
Nevada-Utah	1 87½
Penn-Wyoming	...
Pittsburgh S. Pk.	.50
Ray Central	2.56
Ray Con.	18.75
Round Mt. Sphinx	08

COLO SPRINGS Aug. 20

Name of Comp.	Clg.
Acacia	.08⅛
C. C. Con.	.06¾
Dante	.07⅜
Doctor	.09⅞
Elkton	.79½
El Paso	.65
Findlay	.11
Gold Dollar	.13½
Gold Sovereign	.04
Isabella	.23¾
Jack Pot	.08½
Jennie Sample	.07½
Jerry Johnson	.06¾
Lexington	‡.02
Mary McKinney	.49
Pharmacist	.03¼
Portland	.82
U. G. M.	.08
Vindicator	.70
Work	.07¾

Assessments

Company.	Delinq.	Sale.	Amt.
Arcadian, Mich.	Sept 1	Sept 31	$0.50
Black Jack Con., Utah	Aug 16	Sept 2	0.01
Boulder Creek M. & M., Wash.	Aug 31	Sept 30	0.01
Columbus Ext., Utah	Aug. 14	Sept 4	0.01
Con. Virginia, Nev.	Aug 16	Sept 7	0.25
Copper Mt. M. & D., Ida.	Sept 7	Oct 4	0.003
Crown Point, Nev.	Aug 21	Sept 17	0.10
East Buffalo, Ida.	Sept 10	Oct 10	0.000[illegible]
Exchequer, Nev.	Aug 16	Sept 13	0.05
Golden Winnie Tungsten, Ida.	Aug 23	Sept 15	0.001
Hancock Con., Mich.	Oct 10		1.00
Hypotheek M. & M., Ida.	Aug 26	Sept 25	0.005
Laclede Ltd., Ida.	Aug 21	Sept 21	0.003
Lady Washington, Nev.	Aug 31	Sept 20	0.05
Massasoit, Utah	Aug 21	Sept 14	0.00[illegible]
New Hope, Ida.	July 15	Sept 25	0.002
Pittsburg Con., Utah	Aug 20	Sept 17	0.01
Seven Troughs Mon., Nev.	Aug 18	Sept 8	0.00[illegible]
Springfield M. Co. Ltd., Ida.	Aug 13	Sept 13	0.002
Winona, Mich.	Sept 14		1.00
Utah Con. M. & M.	Aug 25	Sept 7	0.001

Monthly Average Prices of Metals

SILVER

Month.	New York. 1908.	New York. 1909.	London. 1908.	London. 1909.
January	55.678	51.750	25.738	23.834
February	56.000	51.472	25.855	23.706
March	55.365	50.468	25.570	23.227
April	55.505	51.428	25.133	23.708
May	52.795	52.905	24.377	24.348
June	53.663	52.538	24.760	24.166
July	53.115	51.043	24.514	23.519
August	51.683	.....	23.858	.....
September	51.720	.....	23.877	.....
October	51.431	.....	23.725	...
November	49.647	.....	22.933	.....
December	48.766	.....	22.493	....
Total	52.864	.....	24.402	.....

New York, cents per fine ounce; London, pence per standard ounce.

COPPER

	New York. Electrolytic 1908.	New York. Electrolytic 1909.	New York. Lake. 1908.	New York. Lake. 1909.	London. 1908.	London. 1909.
January	13.726	13.893	13.901	14.280	62.386	57.688
February	12.905	12.949	13.098	13.295	58.786	61.198
March	12.704	12.387	12.875	12.826	58.761	56.231
April	12.743	12.56¼	12.928	12.93¾	58.331	57.363
May	12.598	12.893	12.788	13.238	57.387	59.338
June	12.675	13.214	12.877	13.548	57.842	59.627
July	12.702	12.880	12.933	13.363	57.989	58.556
August	13 462	.....	13.639	.....	60.500	.....
September	13.388	.....	13.600	.....	60.338	.....
October	13.354	.....	13.646	.....	60.139	.....
November	14.130	.....	14.386	.....	63.417	.....
December	14.111	.....	14.411	.....	62.943	.....
Year	13.208	.....	13.424	.....	[illegible]	.....

New York, cents per pound. Electrolytic is for cakes, ingots or wirebars. London, pounds sterling, per long ton, standard copper.

TIN AT NEW YORK

Month.	1908.	1909.	Month.	1908.	1909.
January	27.380	28.060	July	29.207	29.125
February	28.978	28.290	August	[illegible]	.....
March	30.577	28.727	September	28.815	.....
April	31.702	29.445	October	29.444	.....
May	30.015	29.225	November	30.348	.....
June	28.024	29 322	December	29.154	.....
			Av. Year	29.465	.....

Prices are in cents per pound

LEAD

Month.	New York. 1908.	New York. 1909.	St. Louis 1909.	London. 1908.	London. 1909.
January	3.691	4 175	4 025	14.469	13.118
February	3 725	4 018	3 868	14.250	13.318
March	3.838	3 986	3 835	13 975	13.438
April	3 993	4 168	4 051	13 469	13.297
May	4 253	4.287	4.214	12 938	13 225
June	4 466	4.350	4 291	12 600	13.031
July	4 744	4 321	4.188	13 000	12 563
August	4 580	....	......	13 375	....
September	4.515	.....	....	13 125	.....
October	4.351	.....	.....	13 375	....
November	4.330	.....	.....	13.538	.....
December	4.213	.....	.....	13.156	.....
Year	4.200	.....	.....	13.439	....

New York and St. Louis, cents per pound. London, pounds sterling per long ton

SPELTER

Month.	New York 1908.	New York 1909.	St. Louis. 1908.	St. Louis. 1909.	London. 1908.	London. 1909.
January	4 513	5.141	4 363	4.991	20.563	21.425
February	4 788	4 889	4 638	4 739	20 875	[illegible]
March	4 665	4 757	4.527	4.607	21 075	[illegible]
April	4 645	4 965	4.495	4 815	21 344	21.531
May	4 608	5 124	4 458	4.974	19 906	21 975
June	4 543	5.402	4 393	5 252	19 000	22.000
July	4 485	5 402	4 338	5 252	19.031	21 969
August	4 702	....	4.556	.....	19 350	...
September	4.769	...	4.619	.....	19 563	...
October	4 801	....	4 651	.....	19 750	...
November	5.069	.....	4.909	.....	20.875	....
December	5 137	....	4.987	....	20 625	...
Year	4.726	.....	4.578	.....	20.163	....

New York and St. Louis, cents per pound. London, pounds sterling per long ton

The Engineering and Mining Journal

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Sulphuric Acid Lead Chamber Construction

Increased Efficiency and a Substantial Saving in Lead and Ground Space Required Is Claimed for the New Type of Chambers

BY FREDERIC J. FALDING*

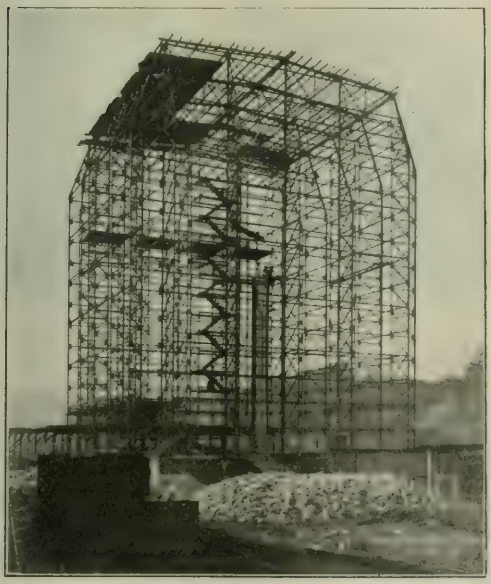
The first sulphuric acid chambers were merely lead boxes into which weighed quantities of sulphur and nitrate of soda were introduced and burned in the presence of water vapor. After reaction of the gases and the formation of sulphuric acid was complete, a new charge was introduced, the process being entirely intermittent.

At a later date the sulphur and niter were burned in special apparatus distinct from the chambers, and the resulting burner gas was carried to a series of such lead boxes, sufficient in number and capacity to permit the reaction of the gases and to secure their more or less quantitative conversion into sulphuric acid before the discharge of the residual gases into the air. This involved a continuous admission of burner gas (sulphur and nitrogen oxides, nitrogen and oxygen) and water vapor and a continuous discharge of the residual gases at the exit. No attempt as yet was made to recover the nitrogen oxides.

Gay Lussac towers were added at the exit in 1827 to accomplish the saving of the nitrogen oxides by means of their absorption in strong sulphuric acid and in 1859 the Glover tower was interposed between the burners and the chamber system to effect the partial cooling of the burner gas and concurrently the partial concentration of the weak chamber acid by means of the heat so abstracted together with the denitration of the nitrous vitriol produced in the Gay Lussac towers and the return of the nitrous oxides to the circulation of the chamber process.

The chambers have always been simply a series of enlargements of the flue or gas conduit connecting, at first, the sulphur burners with the outer air or exit and later, the Glover and Gay Lussac towers. These enlargements of the flue retarded the speed of the gases, permitting them to mingle and react.

The principal dimension of the chamber space has always been the horizontal axis in the same direction as the travel of the gas. As the chambers have been almost universally framed with wood construction, the hight and width have varied principally in conformity with considerations of carpentry—a width of 30 ft. and a hight of 24 ft. having been rarely exceeded, whereas a length of 100 to 200 ft. or over, for each chamber used to be quite common. Lead chambers have been constructed empirically and of all shapes and sizes but always of greatest length on the horizontal axis. Sometimes the gas would pass through from 4 to 10 chambers in series, having a total length of from 400 to 1000 ft. in all.



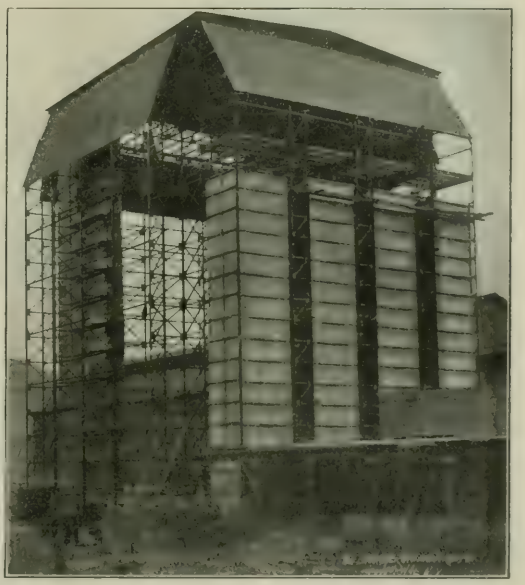


FIG. 1. STEEL FRAMEWORK AND PARTIALLY COMPLETED CHAMBERS AND TOWERS AT VANDERGRIFT, PENN.

Facts about the Chamber Reactions

The gas mixture on its first entrance to the chambers from the Glover tower is better fitted, in every respect, to react rapidly than it will be at any subsequent stage of its passage toward the exit. It is richer in SO_2 at this point and as it

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passes forward through the chamber system it becomes poorer in SO_2 and more and more dilute and the reactions become rapidly more sluggish and less intense.

It is an admitted observation that irrespective of the length of the first chamber of a series, all the active work of such chamber is performed within the first 30 to 40 ft. of its length and that the remainder of the chamber is practically in active and reaction is not resumed until the gas has again been mixed and probably dried and cooled by passing through a comparatively small flue or special cooling apparatus in the nature of a surface or spray condenser, when a new zone of activity is induced in a succeeding chamber, the condition existing in the first chamber being reproduced, but in a lesser degree of intensity, due to the diminished percentage of the sulphur dioxide content of the gas and evidenced by a reduced temperature of the active zone. The same conditions with increasing reduction of activity apply to all subsequent chambers of the series until the absence of sulphur dioxide in the final chambers sometimes actually permits the conversion of the nitrous gases into nitric acid and peroxide, causing severe losses of niter and rapid destruction of the lead. It has even been the practice in some cases to admit a fresh supply of burner gas into the last chamber to counteract such conditions.

Now, just as in the old days of the intermittent process, providing a quantitative mixture of sulphur dioxide, oxygen, nitrous oxides and water vapor is introduced into a lead-lined chamber of sufficient size and the conditions are such as to prevent any mechanical interference, a quantitative reaction or series of reactions will rapidly take place.

It is [illegible] to understand how in the [illegible] system of flue enlargements [illegible] a quantitative reaction can be interfered with mechanically, as evidenced by the common case of the "loss of process" by a sudden storm or other meteorological conditions when the gas body has been pulled forward in the chambers by a sudden increase in suction at the exit until the sulphur dioxide not converted into sulphuric hydrate at the proper part of the chambers is carried into the Gay Lussac towers and the niter recovery interfered with to such an extent that the gas mixture at the beginning of the process does not contain its proper proportion of nitrous compounds. The same pull toward the exit affects the normal chamber process, but in a lesser degree, and prevents the quantitative reaction taking place in the first chamber where all the necessary ingredients are best balanced and where such quantitative reaction should naturally take place.

Various attempts have been made to secure a quantitative reaction in the first part of the chambers at the time when the gases are richest, better balanced and better fitted for active reaction. These attempts have been generally known as efforts to reduce the necessary chamber space. Among the schemes tried are the following: (1) Increase in the proportion of the nitrous oxides to the sulphur dioxide in circulation, thereby increasing the speed of the initial reaction—Systeme intense. (2) Shortening up the first chamber and passing the gases through cooling and drying apparatus or surface condensers before admission to succeeding chambers so as to increase the intensity of the secondary reactions—Lunge plate columns, Gilchrist pipe columns, etc. (3) Division of initial volume of gas into two or more chambers in parallel instead of in series with a reduction of the secondary chamber space. All these, and some other methods (Meyer tangential, Pratt process, etc.) have only been partially successful, principally I believe on account of the flue shape of the chambers tending constantly to pull the gas forward before sufficient time has elapsed for quantitative reaction at the proper place, with results as above stated, i.e., reduced intensity of reaction, etc.

From the foregoing it seems to be reasonably clear that if the first part of the chamber system could be increased in size and the gas contents could be allowed to remain for a sufficient time free from interference by the draft pull to the exit then a quantitative reaction would take place under the best possible conditions both as to speed and completeness.

The Most Modern Type of Chamber

The difficulty in securing the desired condition lies in the difficulty of separating the gases which still contain sulphur dioxide and are capable of further reaction from those in which the reaction is completed, but as the reaction is strongly exothermic it seemed to me that it should be possible to take advantage of the laws of convection of gases to bring about such separation. To do so would clearly necessitate increasing the length of the vertical axis of the chamber or the hight in relation to all other dimensions, so as to allow relative zones of reaction and inaction therein, the incoming gas being admitted to the zone of reaction and the outgoing gas being drawn from the zone of inaction. The cubic contents of the chamber of course would have to be proportionate to the volume of gas admitted and the hight proportionate to the time necessary for quantitative reaction, and the gas travel would be vertically downward, subject to convection currents, instead of horizontally forward.

Bearing these considerations in mind it becomes clear what may be the effect of increasing the length of the vertical axis of the chambers or in other words the hight in relation to all other dimensions. The gas mixture, admitted to the

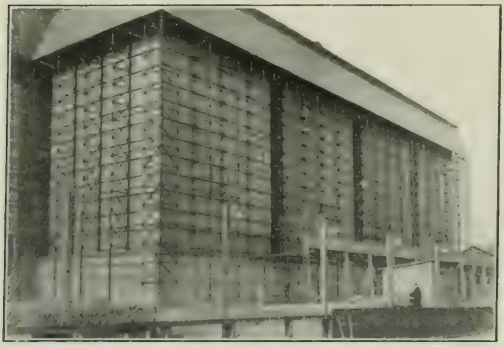


FIG. 2. GROUP OF HIGH CHAMBERS AT COPPER HILL, PENN.

FIG. 3. COMPLETED PLANT AT VANDERGRIFT, PENN.

chamber, immediately sets up a strong exothermic reaction. If the chamber is high, convection currents will be set up and the reacting gas will immediately tend to rise and to remain at the top so long as the active reaction goes on, only the inert, non-reacting, non-heat producing, and therefore cooler gases tending to return to the bottom of the chamber, probably down the cooler chamber sides where their heat is radiated. If the relationship of the hight to the area and the volume of gas admitted is correct, the reaction taking place in the chamber will be quantitative and the gas drawn from the chamber at the bottom will consist entirely of nitrous compounds and inert nitrogen with some oxygen. In other words the process will be completed in one chamber and the necessity of further chambers, which cost just as much as the first active chamber, for more and more sluggish processes or decreased efficiency in work done will be obviated and a great economy in cost of chamber space will be secured.

The accompanying diagram, Fig. 1, will best illustrate this point. Three systems of chambers are represented. No. 1 shows the actual dimensions of the new chambers as recently built by me near Pittsburg, Penn., and in Tennessee.[1] Capacity 175,000 cu.ft. (4952.5 cu.m.). No. 2 shows approximately the same capacity, 174,480 cu.ft., erected according to Dr. Theodor Meyer's tangential plan. No. 3 represents approximately the same capacity, 174,960 cu.ft., in horizontal chambers, not an unusual construction. Admitting that the efficiency of this cubic capacity is the same in each case, then the approximate relation as to surface area and lead required between the three systems is as shown in the accompanying table:

COMPARISON OF SURFACE AREA AND LEAD REQUIRED.

No. 1. 19,000 sq.ft. 7 lb. lead = 66.5 short tons (1765 sq.m. = 60.3155 metric tons).
No. 2. 31,412.3 sq.ft. 7 lb. lead = 110 short tons (2918.2 sq.m. = 99.77 metric tons).
No. 3. 32,004 sq.ft. 7 lb. lead = 112 short tons (2973.17 sq.m. = 101.584 metric tons).

As shown, there is a saving of approximately 40 per cent. of lead required in favor of my system of high chambers, for the same cubic capacity and without reference to the increased efficiency of such chamber space.

Referring to this high chamber, System No. 1, it is true that the gas leaving the chamber will still be too moist and at too high a temperature to permit its admission at once into the Gay Lussac towers and apparatus must be provided for the drying and cooling of the gas. This, however, can be done with much greater efficiency and economy than by providing additional chamber space.

Recent Installations

Two sulphuric acid plants have recently been constructed, by me, on this principle with chambers 50x50 and 70 ft. high. In both places the chambers function in identically the same way, i.e. they are hottest at the top and cool gradually to the bottom where the difference in temperature between top and bottom, taken with side bent-thermometers, varies from 22 to 7 deg. F., according to the intensity with which the system is being driven. When the chambers are in normal condition in neither case does the gas leaving the chambers contain any SO_2 and the reaction taking place in the chambers is therefore quantitative.

It is too soon to state what the ultimate capacity of this form of chamber will be. There were few data available for such a radical change in construction. The one plant was supplied with fluctuating gas diluted with carbon dioxide from copper matte-smelting furnaces, which in itself was a novel undertaking. At the other plant, which was the first to be built, consisting of one chamber (175,000 cu.ft.) with Glover and Gay Lussac towers and a small cooling column, the chamber capacity was found to be entirely in excess of the burner capacity, in other words the chambers proved capable of doing more work than had been anticipated. By forcing the burners, however, to an undue extent which could not be maintained for a great length of time, the following results have been attained

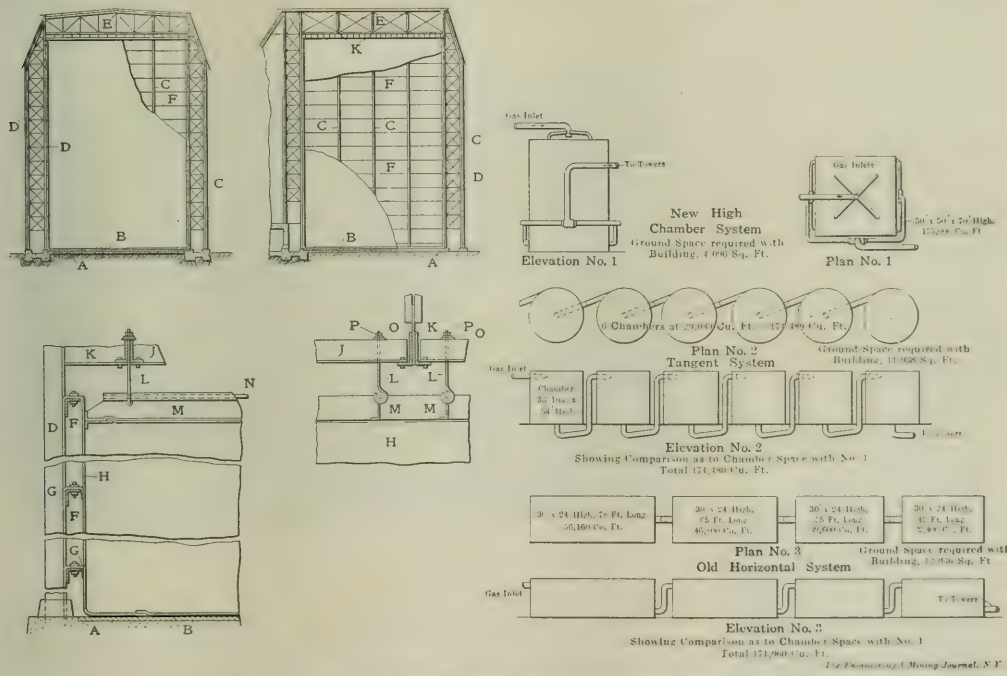


FIG. 4. DETAILS OF CONSTRUCTION AND CHAMBER-SPACE COMPARISONS

[1] U. S. patent 470,189 of 1909.

[illegible] it is [illegible] expected that with adequate gas supply, these results can be obtained normally and can probably be bettered. These results were obtained during the month of May, neither in hot summer nor the cold winter.

Test No. 1.—Sulphur, 25,000 lb. (11,-[illegible] kg.) yielding 48 tons (43,536 metric tons) of 50 deg. B. acid in 24 hours. Equal to 1 lb. of sulphur to 6.85 cu. ft. of chamber space (1 kg. S. to 0.4274 cu. m.). Average gas, 7.0 per cent. SO_2. Average $NaNO_3$ in nitrous vitriol 2.2 per cent. $NaNO_3$ 0.5 per cent. 720 lb. (326.52 kg.) = 2.81 per cent. on sulphur burned. Average difference between temperature at top and bottom of chamber 7 deg. F. (3.88 deg. C.). Temperature of gas entering Gay Lussac towers, 114 deg. F. (45.5 deg. C.).

Test No. 2.—Sulphur, 23,200 lb. (10,-521 kg.) yielding 43.5 tons (39.45 metric tons) of 50 deg. B. H_2SO_4 in 24 hours. Equal to 1 lb. of sulphur to 7.55 cu. ft. of chamber space (1 kg. S. to 0.4709 cu. m.). Average gas 8.1 per cent. SO_2. Average $NaNO_3$ in nitrous vitriol = 2.10 per cent. Average $NaNO_3$ 0.5 per cent. 720 lb. (326.52 kg.) = 3.1 per cent. on sulphur burned. Average difference between temperature at top and bottom of chambers [illegible] (1.61 deg.). Temperature of gas entering Gay Lussac towers 113 deg. F. (45 deg. C.).

At this plant the normal burner capacity does not exceed 10,000 lb. (7,56 kg.) of sulphur to 24 hours or 1 lb. of sulphur to [illegible] cu. ft. of chamber space and at this rate the plant readily takes care of the gas and a reasonably low consumption of nitrate of soda.

It is evident that the gas, especially when the chambers are performing high duty, enters the Gay Lussac towers at too low a temperature, although the [illegible] and high percentage of the NO_2 content, 2.1 per cent. of the nitrous vitriol, [illegible] absorption of the nitrous oxides in the Gay Lussac towers, the reasonable consumption of nitrate of soda, the high yield of acid and the failure to find the presence of SO_2 by the ordinary gas tests, show conclusively the complete oxidation of the SO_2 in the chamber. When adequate burner capacity and sufficient cooling apparatus between the chamber and the Gay Lussac towers are installed, the efficiency as well as the economy of this method of construction would seem to be evident. Attention might also be called to the great economy of ground space occupied by these chambers, approximately a saving of 100 per cent in favor of the high chambers for the same cubic capacity and without reference to the increased efficiency of such chamber space.[2] The general arrangement and relative proportions of such a plant are shown diagrammatically in Fig. 5.

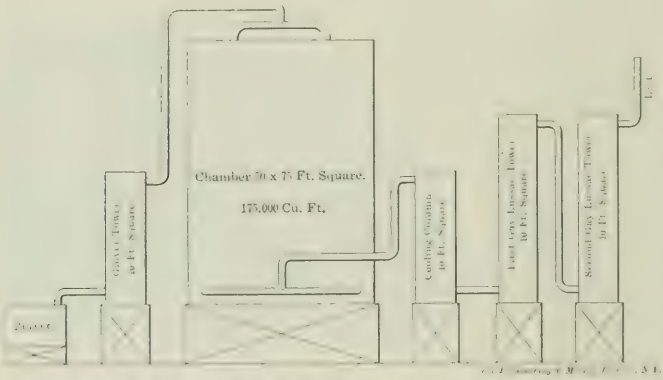


FIG. 5. DIAGRAM SHOWING RELATIVE PROPORTIONS OF A SINGLE HIGH CHAMBER PLANT.

CONSTRUCTION OF CHAMBERS.

The chambers are built upon a slab of reinforced concrete, *A* Fig. 4, which may rest directly upon the ground or which may be supported upon concrete pillars in such a way as to provide a room or basement which serves for the tanks and pumping apparatus for the acid circulation and other purposes. On the slab is placed a layer about ¾ in. thick of specially prepared asphalt *B*, perfectly smooth to receive the bottom lead of the chambers.

The framework of the chamber consists of a number of steel side trusses *C* with *Z* bar chords or posts *D*. These trusses or truss posts at the bottom are bolted to suitable anchorage embedded in concrete piers and at the top carry the roof trusses *E*. These side trusses are tied in place by angle-iron girts *F*, those on the lower chord of the truss carry the lead sides of the chambers which are connected to them by continuous horizontal straps *G* burned to the lead sides and clamped and bolted to the angle-iron girts in such a way that the angle iron is in contact with the strap only and does not touch the side lead sheets *H*. The girts at the outside of the vertical trusses serve to attach the sheeting of the building to the lead side of the adjoining chamber. The roof trusses *E* are connected by a series of pairs of angles forming posts *I* which rest upon the lower chords of the trusses *E* and are bolted to them. Hook bolts *J* pass between these pairs of angle and engage in specially constructed straps burned to the top of the chamber lead *M*. These straps are continuous and are reinforced with ⅜ in. iron rods *N*. These straps also greatly assist radiation from the chamber tops and sides. The hook bolts are supported by cast iron washers *O* resting on the pairs of angles and may be adjusted as to length by the nuts *P* threaded to the bolts and resting on the cast-iron washers. The outer chords of the truss may be flat or so shaped as to conform to the roof slope desired.

This framework, though light, is rigid and strong and the details of construction are such as to allow great facility of access for repairs or painting. At no point does the framework come into actual contact with the lead sheets forming the sides or top of the chambers.

The Chinese government has granted a concession to work gold mines in three districts of Jehol, little more than 100 miles in a northeasterly direction from Peking. The feature of this concession is the combination of Chinese and foreign capital, the concessionaires being an Anglo-Chinese company known as the Ling Yuen Company, the capital of which is to be subscribed in equal proportions by Chinese and foreigners.

The mineral production of Queensland during 1908, according to the *Report* of the Department of Mines, Queensland, amounted to £3,844,487. All minerals other than gold showed a decrease from the output of the preceding year, and there seems to be no ground for expecting a better record in 1909.

At the Tennessee plant, using smelter gas, a series of gas tests was made in December, 1908, under the direction of N. L. Heinz; the average results are given below. On Dec. 8 and 9 the high percentage of the burner gas precluded the possibility of there being a sufficient excess of oxygen on account of the dilution of the gas with CO, as will be more fully explained in a future article. This accounts for the SO_2 present at the exit of the chambers. At the time these tests were being made the condition of the smelting furnaces was most unsatisfactory and the chamber process was by no means at its best.

	Dec. 6	Dec. 7	Dec. 8	Dec. 9
Entrance to eleven per cent. SO_2	6.8	6.1	7.8	8.4
Exit from chamber per cent. SO_2	none	none	0.81	0.46
Exit from cooling chamber, per cent. SO_2	none	none	none	none
Entrance to Gay Lussac per cent. SO_2	none	none	none	none
Exit from Gay Lussac per cent. SO_2	none	none	none	none

Copper in the Eastern Townships of Quebec

By G. R. E. Kennedy

In the region above Sherbrooke, in the eastern townships of Canada, there are many deposits of pyrite carrying low percentages of copper. The ore from this region, though not rich enough in copper to pay for shipping to England, has been proven payable where proper mining methods are adopted and smelting facilities afforded. The great handicap to the rapid development of the district is the lack of a customs smeltery at some central point, like Sherbrooke.

Capleton and Eustis Mines

The two largest mines in the region are the Capleton and the Eustis. The former is owned by the Nichols Copper Company, the latter by Colonel Eustis, of Boston. Both of these mines have been in successful operation for about 40 years. The Eustis is developed to a depth of 3000 ft., employs from 150 to 175 men, and produces about 1500 tons of ore per week. The ore contains as high as 45 per cent. sulphur, and much of it is shipped to chemical firms in Boston, who use the sulphur, shipping the residue to the Eustis smeltery in Norfolk, Va. The Nichols Copper Company also takes several hundred tons of the residue each month. The mine is well equipped, and good accommodations are afforded the men.

Other Properties

Over the range to the west of Sherbrooke is situated the Norton property owned by A. O. Norton, of Boston. At this mine a large tonnage of ore has been developed, and it is said that the erection of a smeltery is contemplated. To the north is the pioneer mine of the region, the Ascot, a well equipped property under the management of John McCaw. The Smith holdings at Lake Memphremagog are also being actively developed now by the same men who are working the MacDonald lands in Weedon. A new property has also been recently opened in Ditchfield.

*Mining engineer, Sherbrooke, Que.

Coal Production of Missouri in 1908

Advance figures on the coal production of Missouri for 1908, made public by George Bartholomaeus, secretary of the Bureau of Mines and Mine Inspection of Missouri, show that the total output for 1908 was 3,383,991 short tons, as against 4,355,494 tons in 1907, a decrease in production of 971,005 tons, or 22.28 per cent. The total value of all coal mined in 1908 was $5,610,212, as against $7,306,125 in 1907, a decrease in value of $1,695,913. Thirty-five counties contributed to this production.

The report states that mining machines were in use in but seven counties, and the total machine coal mined was 491,670 tons, or 14.53 per cent. of the total production. There were 10 fatal accidents and 37 nonfatal accidents. Out of 47 accidents, 31 were caused by falls of roof. The death rate per 1000 in 1908 was 1.06, as against a fraction of less than one in 1907. The total number of men employed in coal mines of the State during the year was 9301, as compared with 9433 in 1907.

The reports of operators to the Bureau of Mines show that many of the smaller mines which operated in 1907 closed down entirely in 1908, and the big producing mines did not work full time. The average price per ton for coal shipped by railroad and not sold locally during 1908 was $1.71 per ton, an increase of 3½c. over the price of 1907.

FIG. 6. LEAD BURNERS AT WORK ON UPRIGHT SEAMS IN CHAMBERS

The Habit of Observing

The efficiency of a mining engineer is to a high degree dependent upon his ability to see and remember small details from a passing glance. In underground operations it is not possible to keep a record of all the small features of rock structure encountered, yet it may be that such unnoticed trivialities have a bearing upon the question in hand and the knowledge of their existence may throw light upon an otherwise knotty problem. For instance, in a stockwork deposit the cutting out of a small stringer from the main series of fractures may give a clue to the position of an orebody that has been lost in following the main series.

One who has not acquired the habit of observing and remembering might never detect the presence of this stringer, and even if he did notice it, would probably immediately forget about its existence.

To train one's self into this habit or faculty requires time but is not difficult, the most common method being to glance into shop windows in passing and then trying to write down as many of the articles displayed as can be remembered. After a time it will be found that nearly the whole exhibit can be recalled.

One who has trained himself in this way will find his memory to be a storehouse of facts recorded unconsciously upon each visit to a mine or part of the country new to him, and which will be ever at his disposal for reference when a similar circumstance is encountered.

A great deal of interest continues to be displayed in the South Lorrain district, Ontario, and from the work done so far it is fair to assume that this section will be one of the most important outside of Cobalt. During the coming week a car of high grade and a car of medium grade will be shipped from the Kelly. The Wetlaufer will also ship 40 tons of high grade ore, and probably a car of medium. The Wetlaufer is drifting at the 60 ft. level on the vein in the shaft, and they have crosscut to a parallel vein, on which they are also drifting. The vein in the shaft is about 6 in. wide, carrying a good amount of high grade ore. The parallel vein is 12 in. wide with 6 in. of smaltite, carrying some silver. So far the Keely has experienced considerable trouble with its new plant.

Smelting Refractory Lead Ores at Laurium

From 80,000 to 90,000 Tons of Lead Ore, Mostly Oxidized, together with About 50,000 Tons Mixed Lead and Zinc Ore, Treated Yearly

BY L. GUILLAUME*

The Compagnie des Mines Françaises du Laurium is working comparatively important deposits of lead and zinc ores at the extremity of Attica. The zinc ores are exported, but the lead ores are smelted, the work lead then being exported. The tonnage of lead ores, most of which are oxidized, amounts to 80,000 to 90,000 tons per year. The northern district, in addition, yields annually 50,000 tons of mixed lead and zinc sulphides, which, after mechanical separation, afford 7000 to 8000 tons of galena concentrates, containing 60 per cent. lead. After roasting, these latter are mixed with the oxidized ores and smelted with them. The average content of the smelted ore ranges between 10 and 12 per cent. lead. The problem at Laurium is therefore, to treat ores low in lead and silver.

Metallurgically, the ores are quite refractory. They are high in calcium carbonate, zinc oxide and alumina, and frequently the zinc is equal to the lead in amount. The low percentage of lead precludes the addition of barren fluxes and none are added. The slags are, therefore, hard to fuse at the usual temperature of the ordinary lead furnace. These refractory ores, which are the heritage of past generations of lead workers, have compelled this company to adopt new methods of smelting. Following American ideas it has designed a plant which is probably superior to any similar plant in Europe for the treatment of low grade lead ores.

THE OLD METHOD

The old furnace, an illustration of which is herewith given, had been but slightly modified since it was brought into the country from Spain about 30 years ago. The blast at a pressure of 25 to 30 cm. of water, was introduced through four tuyeres. The lining was local schist and the crucible was brasque. Lead was discharged two or three times per 24 hours. The slag discharged periodically into little conical pots holding about 50 kilograms.

The disadvantages of this furnace were its small capacity, 25 tons of charge per 24 hours, its high consumption of coke, 17 to 18 per cent., and its lead losses, 20 to 25 per cent. Neither would this primitive furnace permit of the economical treatment of refractory ores. The temperature at the tuyeres was not high enough to slag the zinc and the lime, the lining became covered with accretions, the crucible became obstructed and a campaign would hardly ever last more than two months. The work was also unhealthy for the workmen, not only because of the frequent eruptions of lead fumes, but on account of the arsenic which was present to the extent of 30 per cent. in the flue dust.

FIG. 1 to 3. Outer Valve of Main Air Duct

FIG. 1

FIG. 2

NOTE. Air Dimensions in Meter

FIG. 3

FIG. 4 Detail of a Tuyere

FIG. 5 and 6 Fore-hearth

FIG. 5

FIG. 6

PLAN OF NEW LEAD FURNACE AT LAURIUM

* Translated from Annales des Mines, Tome XVI, 1909, 2nd number.

* Chief Engineer of the Compagnie Française des Mines du Laurium, Laurium, Greece.

The company had 12 of these old furnaces with a daily capacity of 300 tons of charge, from which they produced 25 to 28 tons of work lead.

The New Furnace

The new furnace, the metal parts of which were furnished by the Colorado Iron Works, is of the same type as the largest in use in the United States. One large unit was selected instead of two small ones in order to gain the following advantages: High temperature in the zone of the tuyeres, which would fuse the refractory ores; reduced consumption of coke; reduction in labor per ton; more satisfactory operation of a fore-hearth. It was believed that these advantages would outweigh the disadvantage of having to rely upon a single furnace, even though an accident to it would shut down the works completely. The dimensions of the furnace are: Section at the tuyeres, 4.06 x 1.22 m., or 4.95 sq.m.; total hight from foundation to charging floor, 8 m.; hight from tuyeres to charging floor, 6 m. This relatively great hight was purposely adopted in order to reduce the loss of lead in the flue dust. The water jackets rest on the crucible, but the masonry lining is independent and is supported by four columns.

The accompanying section shows the construction of the hearth. It rests on a masonry foundation surmounted by an iron sheet, 2.9x5.5 m. The inner lining of the hearth consists of brick made of three-quarters magnesia and one-quarter chrome ore containing 50 per cent. chromic oxide. At the right of the figure is shown a tap hole for use when the crucible is to be emptied, and to the left is the automatic siphon. The outer walls of the crucible are made of 10-mm. sheets, reinforced by I-beams; this kind of wall seems to be much more durable than the customary ribbed cast-iron plates, which are soon broken by unequal expansion.

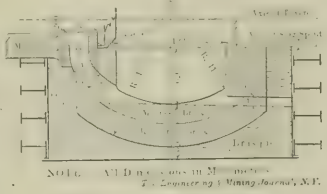
The Laurium ores yield, on smelting, an abundance of speiss, containing about 33 per cent. arsenic, so that special precautions have to be taken to avoid destruction of the crucible lining as ordinarily made. At the temperature in the zone of fusion either basic or acid brick are rapidly destroyed, but the magnesia-chrome brick prove highly satisfactory.

High Water Jackets

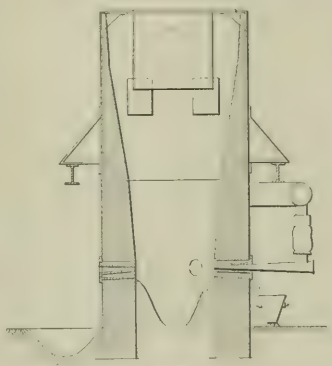
The water jackets are notable for their hight, 2.13 m. Having to work with zinky ores, these tall jackets were adopted so as to enable the use of a high-blast pressure and to facilitate the removal, from above, of the accretions, which form most abundantly on the upper part of the jackets, accretions being much more easily detached from a metallic than from a masonry surface. The jackets were made in such a way that there are no rivet heads on the inside surface. The inner ends of the tuyeres were expanded against the interior walls of the jacket like boiler tubes, but after a run it was found necessary to braze these joints with an oxy-acetylene blowpipe. The jackets are supplied with sea water, and by circulating large volumes of it, so as to maintain an escaping temperature of 50 deg., no difficulty is experienced from the deposition of salt.

Wall Accretions

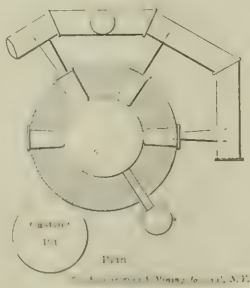
Wall accretions, working with an air pressure of 1.75 to 1.95 m. of water, are



CRUCIBLE OF NEW FURNACE



Section



OLD LEAD FURNACE

generally formed around the top of the jackets and within a distance of 0.8 to 1.0 meter above them. They contain 30 to 40 per cent. zinc, 15 to 20 per cent. lead, and are usually sulphides. Higher up in the furnace they contain as much as 60 per cent. zinc and very little sulphur.

A sample of these accretions taken just above the top of the water jacket gave: Zn, 32.25 per cent.; Pb, 16.00; S, 12.23. One taken 1.5 or 2m above it contained: Zn, 57.05 per cent.; Pb, 16.00; S, 2.75 per cent.

Method of Charging

The sheet-iron flue is fastened rigidly to the roof, but the hood, to which the flue is connected by a flexible collar, is hung on hinges in such a way that it can be swung entirely to one side, if desired, to facilitate the barring down of accretions. On each side of the hood are four balanced doors which open automatically when the charge is dumped from the cars and close when the car is withdrawn. The draft is generally sufficient to prevent the escape of fumes, but a fan, run by electric motor, is placed in the flue to render occasional assistance. The temperature of the gas in the hood varies from 40 to 60 deg., and water frequently condenses on the inner walls. Such dust as does escape is rich in arsenic, but carries very little lead.

The usual charge consists of 4800 kg. of ore and 624 kg. of coke. The coke fills four cars, each of which is twice as long as an ore car, and is dumped in advance of the ore, which fills eight cars. Results of an attempt to double the size of the charge were discouraging.

The Air Blast

Blast is supplied by two Root blowers, independently driven by two gas engines. One blower is held in reserve. Each engine, when operating, consumes 100 to 120 h.p. and delivers 350 cu.m. of air per minute at a pressure of 1.75 to 1.95 m. of water. This comparatively high pressure insures complete fusion of the ore, while the hight of the charge, 6 m., prevents escape of undue amounts of dust. A pressure of 2 m., or more, did not afford a proportional increase in the output and overheated the upper part of the furnace.

The furnace has 10 tuyeres on each side and one at each end. The best results are obtained by closing the end tuyeres, and using only the 20 lateral tuyeres. The construction of a tuyere is shown in an accompanying figure. Additional cast-iron thimbles can be placed inside the point of the tuyere so as to produce a greater velocity of air current. At Laurium, experience shows that an internal diameter of 90 mm. gives the best results with the pressure used. Each tuyere has a valve by which it can be shut off. On the main air pipe also, is a gate having behind it a safety valve to which it is connected by a chain and pulley, so that the action of the two is simultaneous. If the gate has to be closed quickly, the safety valve opens and prevents excessive pressure in the air main.

Tapping Slag, Speiss, Etc.

When the furnace is smelting 250 to 300 tons of ore per 24 hours, the slag flows constantly, except during necessary cleaning of the discharge spout, which occupies 15 or 20 min. per day. All the waste

produces [illegible] charge [illegible] at the ends of the furnace. It would naturally be supposed that discharging in this way from such a long furnace, the flow of slag would not be regular, but it has always been found to be so at Laurium, and the descent of the charge has always been remarkably uniform. The waste products flow through a water-cooled bronze spout having an internal diameter of 70 mm. They then flow to a fore-hearth through a water-cooled trough 2.3 m. long.

The fore-hearth is of large dimensions, its capacity being 3 cu.m. It is lined with magnesite-chrome brick and can be cooled by water. It is mounted on a truck of 1.8 m. gage. The whole apparatus, in working order, weighs 30 tons. The fore-hearth was built on these large lines so as to minimize the influence of sudden changes in the working condition of the furnace. The hearth is emptied through the bottom, and from 3 to 5 tons of matte and 7 to 9 tons of speiss are drawn off once in 24 hours, or occasionally only once in 48 hours. The slag flows off continuously from the top into a trough of running water and thence, in granulated form, into one of two cars, carrying 8 tons each. Four workmen per 24 hours attend to the disposal of all the slag, matte and speiss derived from the smelting of 300 tons of ore. None of the slag is returned to the furnace. By making the fore-hearth of large dimensions it is possible, in case of repairs to the furnace, to let the charge stand in the hearth for 24 hours without danger of freezing.

COMPOSITION OF WASTE PRODUCTS.

	Slag.	Matte.	Speiss.
	Per Cent.	Per Cent.	Per Cent.
SiO_2	25.20		
Fe	23.24	40.00	50.00
Al_2O_3	11.58		
Mn	2.24		
CaO	17.33		
MgO	trace		
S	0.78	20.00	
Zn	9.87	12.70	
Pb	0.80	11.00	3.00
O of the [illegible]	9.71		
As			33.00
Ag [illegible]	10		150

Cleaning the Lead.

The lead flows continuously through one of two siphons on one of the long sides of the furnace, the other siphon being held in reserve. The overflow level of the lead varies from 14 to 20 cm. above that of the slag, this being depending upon the pressure employed. The lead flows through a [illegible] steel kettle holding 2500 kg., where it is cooled and skimmed before running out intermittently, into molds, making pigs of 45 to 50 kg. each. Analyses of the lead gave the following composition: Pb, [illegible] per cent.; As, 0.8; Sb, [illegible]; Cu, [illegible]; Fe, [illegible]; Ag, [illegible] per ton; Au, [illegible] per ton.

Efficiency of the Operation.

Working with a blast pressure of 175 to [illegible] mm. of water, the furnace regularly smelts 250 to 275 tons of ore per 24 hours. With a slag richer in iron the capacity might readily exceed 300 tons. Its operation requires the services of 30 men per 24 hours of whom 12 work on the furnace floor, manipulating and disposing of the slag, speiss and matte, tapping and weighing the lead, and 24 work on the charging floor. The total expense for labor is 1.30 fr. per ton smelted.

The yield averages 90 per cent., which, considering that the charge contains about 1[illegible] per cent. lead, means a loss of only one unit, which is not disgraceful in view of the refractory nature of the ore. The slag carries 0.7 to 0.9 per cent. lead. The consumption of coke amounts to 14 per cent. of the ore. Compared with the old furnaces at Laurium, the present plant shows a reduction in every item of expense, and as to its technical aspects, affords extremely satisfactory results.

Mining Conditions in Nicaragua

Special Correspondence.

The Atlantic Coast of Nicaragua is one of the most promising mining regions of the world, but its exploitation requires plenty of capital and theoretical as well as practical knowledge. The northern part of the coast contains many producing mines, as quartz mining followed directly the working of placers. For the south, however, the geological conditions are better, but the quartz has not been developed on account of the fact that the placers were worked out years ago by the aborigines, who also took the rich croppings.

There are quantities of low grade gold, copper and silver ore, plenty of water during 10 months of the year (120-in. rain fall) and sufficient timber. The mining laws are more liberal than those of Mexico, or the English possessions, but are not stable. On this account, people investing a large capital must count on a high rate of return.

Taxes and Duties High.

Established mines (not prospectors) import machinery, cyanide tanks and such supplies as cyanide, lime and soda duty free. Provisions and similar supplies are subject to high duty, prohibitive in some instances. Dynamite should be free according to the constitution and the mining code, but it is sold by a monopoly which supplies a poor quality at high price. Some of the mines import their own dynamite by paying heavy toll to the monopoly.

A mine acquired under the mining law has a perfect title, which is always secure, providing the taxes are paid. This tax amounts to $2 per hectare per year. Concessions are not safe, being contrary to the constitution and subject to annulment at any time. There is a strong feeling against concessions, both among natives and foreigners, and the government will some day be forced to call them all in.

Diamond drilling has not as yet been introduced in this district. Through the use of such a drill on undeveloped ground, I believe that many good properties could be secured at a nominal price.

Life on the Nicaraguan coast is not congenial, the desert region of the United States being attractive by comparison, and on this account it is hard to get competent men to remain in the country.

Smelting Titaniferous Iron Ores in the Electric Furnace

B. F. Haanel gives some figures (*Canadian Engineer*, Aug. 13, 1909) on the experimental run of iron ore high in titanium at the Welland plant of the Electro-Metals Company. The ore was from Wyoming and contained as high as 2 per cent. TiO_2. The principal figures relating to the run are as follows: Length of run (deducting stoppages), 22 hours, 45 minutes; mean volts on furnace, high-tension side, 10,800, low-tension side, 35.6; mean amperes on high-tension side, 25; power factor, 0.91; power used, $\frac{10{,}800 \times 25 \times 0.91}{746}$ = [illegible] h.p.; pig iron obtained, 3317 lb.; output of pig iron per 1000 electrical h.p. days, 5.04 short tons; electrical h.p. years per ton of pig iron, 0.543.

The analyses of the iron ore, charcoal, lime, slag, and pig iron produced have not yet been made by the chemists of the mines branch; but some analyses made in the laboratory of the Electro Metals Company, Limited, of Welland, show that with a charge containing 35 lb. lime only a trace of iron was found in the slag, and that the iron content of the slag increases with the increase of lime.

In the runs containing 50 lb. of lime the amount of slag produced was large. In future runs on this ore, however, the amount of lime per charge will be reduced to 25 lb., which, it is calculated, will greatly reduce the amount of slag.

The lime was only reduced to 35 lb. in runs preceding or after Mr. Haanel's visit. The charges used were as follows: 10 charges containing 200 lb. iron ore, 60 charcoal, 50 limestone; 3 containing 200 lb. iron ore, 65 charcoal, 50 limestone; 22 containing 200 lb. iron ore, 70 charcoal, 50 limestone, a total of 35 charges.

Some analyses of the pig iron obtained showed only a trace of titanium.

The output in pig iron per 1000 h.p. days for this run must not be considered as the best result that can be obtained, as the furnace during the first 7 hours of the run operated badly. To arrive at definite and reliable results as to output the furnace should run continuously for at least three days.

Seismic Disturbances and Coal Mine Explosions

A Discussion of the Possible Effect of Seismic Disturbances on the Accumulation of Gas in Coal and Its Extension into the Workings

BY AUDLEY H. STOW*

The possible increase in danger resulting from sudden atmospheric depressions, or from seismic disturbances, will quite probably be a favorite subject of discussion, so long as these interesting but regrettable phenomena termed explosions continue to occur; at least, until it is clearly proved that the increase in danger indicated cannot possibly occur, even under the most favorable conditions. It is not contended that we should relax our efforts in other directions, nor even that a large proportion of all the explosions are due to the influences referred to. Yet it does not appear in line with modern ideas, to disregard a danger, the extent of which is uncertain or unknown. The possible, if not probable, effect of atmospheric depressions, as well as of seismic disturbances, is to increase the volume of gas to be handled underground, and for this reason, these phenomena may perhaps be classed as similar; that there is any direct relation between the two does not at all necessarily follow. One is perhaps but an evidence of the other; and yet, on the other hand, it is also possible that there is not the remotest relation.

Of seismic disturbances, two classes or types more particularly are suggestive of consideration. The first is that form of internal disturbance which results in the flow of lava from volcanoes; the second is that which results in movements of the earth's crust, or more particularly in the movement of the strata on one side of a fault adjacent to mining operations, with respect to the strata on the opposite side.

Volcanic Action

That immense forces must be in action within the interior of the earth, to produce a flow of lava from the summit of a volcano, would appear from a consideration of their hights, in connection with the thickness of the earth's crust. Mt. Vesuvius varies in hight from time to time, within the limits of several hundred feet, the average hight being somewhere about 5000 ft. above sea level. The "American Encyclopedia" gives the hight at 3876 ft. after the eruption of 1845 and 1253 after the eruption of 1868. Aconcagua, however, is given as 23,000 ft. or more than four times as high, while there are other volcanoes also of much greater hight than Vesuvius; so that 10,000 ft. above sea level may be used in illustration of the pressure required.

The thickness of the earth's crust is variously stated. Jukes gives 20 to 30 miles; Recluse 20 to 25 or at most 50 (Humbolt "Studer"); Chamberlin and Salisbury many thousands of feet and probably many miles; Geikie 1 per cent. of the semi-diameter of the earth (Arrhenius).[1] Lava is perhaps but the slag, as it were, which floats on top of the heavier matter beneath, the solid crust of the earth possibly to a certain extent floating in the lava or similar fused matter. It appears a somewhat plausible view that the primary pressure which produces the flow of lava, originates beneath the solid crust of the earth. The more rapid shrinkage of the earth's crust as compared with the molten interior, due to the more rapid rate of cooling, should rather tend to leave open spaces in the surface of the earth; if so, shrinkage would hardly serve to explain the flow of lava from the summit of a volcano.

That the level of the lava, during periods of inactivity, falls far below the top of the crater in instances, would appear to be indicated by the large volumes of steam occasionally accompanying eruptions. The adjacent strata may, during the period of inactivity, become filled with water. The rise of the molten lava through such strata would readily account for large volumes of steam accompanying an eruption.

If we attempt to estimate the primary pressure which produces the eruption, from the hight of the column of lava supported, it is then of interest to consider the probable minimum hight above or below sea level of the lava, during periods of inactivity. As the specific gravity of lava is 2.5, a given column would be equilavent to 2.5 times this hight of water. If previous to the eruption, the lava had stood at sea level, a volcano 10,000 ft. in hight for instance would represent a water column of 25,000 ft. If previous to the eruption, the level of the lava had stood at 30,000 ft. below sea level, or less than 6 miles, we would thus have 100,000 ft. as the equivalent water column; 150,000 ft. below sea level, less than 30 miles, would correspond to 400,000 ft. of water. The corresponding pressures in atmospheres would be approximately 730, 2940, and 11,760 atmospheres respectively.

Dana's "Geology" gives a list of over 500 volcanoes; there being, in addition, many districts in which the number of volcanoes is not known, or at least not stated. There are in all perhaps somewhere between 700 and 1000 volcanoes that have been at one time or another in action. Judging by their wide distribution, the ebb and flow of pressure represented by inactivity and eruption, must have occurred in many quarters of the globe, during long periods of time.

It is, however, hardly clear in what manner even the maximum pressure could directly affect the amount of gas encountered in mining. Were coal mines in the close vicinity of volcanoes, there might possibly be some direct connection; coal mines, however, are usually far removed from regions of volcanic activity. That the seismic disturbances which result in eruptions may not, however, under certain conditions, indirectly increase the quantity of gas to be handled underground, is not altogether clear.

Movements of the Earth's Crust

The gases encountered in the advance work result perhaps in large part from the slow or gradual distillation of volatile hydrocarbons, due to the heat in the interior of the earth. The strata adjacent to the coal seams often also contain much carboniferous matter. If this possible view is correct, it is not difficult to understand why the resultant pressures may be considerable, perhaps sufficient to force the gases long distances through open-grained sandstones, for instance. The gradual escape of the gases, in this manner, will reduce the initial pressure; yet the pressure incident to their passage should still leave a considerable pressure at the point of origin. A vertical or steeply inclined fault or fissure may pass through such strata, the foot-and-hanging-walls, however, being in such close contact that no gases can escape through the fissure. Under these conditions, mining operations in close proximity to the fault may be seriously endangered by seismic disturbances. Such a movement of the walls of the fault as would perhaps escape observation, may still be sufficient to permit large volumes of gas to reach the immediate vicinity of the mining operations, if not the actual open work.

Where there are several faults through strata consisting largely of open-grained sandstones, an obstruction in one fault may simply result in the gas being di-

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[1] Courtesy editorial staff, A. I. M. E.

verted to some other fault in the vicinity, in which the pressure is thereby increased. If the advance work should then hole into an extremely small crevice leading into any one of the system of faults, a sudden outburst of gas would probably result. The interval of time since the original disturbance might, however, be considerable. Seismic disturbances have perhaps been at least contributory to fatalities that have possibly been accredited by many to coincident atmospheric disturbances, particularly in districts in which the latter are closely observed and recorded.

Such an internal pressure as will support a column of lava perhaps 10 miles in hight, or possibly as much as 50 miles, might easily be sufficient to produce a slight movement of the walls of a fault. If this possible view is correct, the seismic disturbance which produces the flow of lava, may also be indirectly the cause of the sudden outburst of gas; not that the pressure that acts on the lava, actually also exerts itself on the gas, but that the rocks that contain gas under great pressure are incidentally so moved or disengaged, perhaps horizontally instead of vertically, that the pent-up gases below can escape toward the surface.

Varieties of Coal

The heat increases with the depth below the surface of the earth. For the same grade of coal therefore the danger should then increase with the depth. Coals containing high percentages of volatile matter should produce much more gas than anthracite, for instance. Were the gases volatilized, without being allowed to escape, the pressure would in due course be enormous; however, the pressure is probably merely that incident to the resistance represented by their escape to the surface; thus the pressure of gas in the anthracite field of Pennsylvania is perhaps approximately as great as if the coal contained a high percentage of volatile matter. The gas produced by distillation may extend laterally a considerable distance beyond the actual limits of the field, while the greatest pressure should be at the lowest point at which carbonaceous matter occurs which can be volatilized.

Variation in Danger

The danger depends, perhaps, more particularly upon the depth below the surface of the earth, and upon the extent to which the strata are faulted or fissured. If so, the anthracite fields in Pennsylvania may thus possibly approximate the maximum danger due to seismic disturbances. On the other hand, bituminous coals in horizontal unbroken strata may represent the minimum degree of danger, particularly if well above water level. Adjacent to West Virginia, the well known Abbs Valley fault parallels Blue[illegible] dips for quite a distance and may be said to form the limit of the coal measures in the Flat-top field. Passing northwestward, toward the Ohio river, prospecting at intervals for 20 years has failed to show any indications of faults or fissures, until the little town of Dingess, on the Norfolk & Western railway, is reached, about 60 miles from the Ohio river. About eight miles from the town mentioned, what appeared to be a true fault was found. A 3-ft. seam of coal was sheared at a rather sharp angle, the footwall showing striations or slickensides. No effort was made at the time to determine the throw of the fault, which was not readily apparent.

That the Dingess fault is not of great extent, is probable, as no other indications of faulting have been found in the adjacent country, as far as noticed; the coal seams, however, to the northwest more particularly, are somewhat disturbed. The magnificent Island Creek seam rises about 150 ft. vertically in a short distance, and going in the direction in which it should be dipping about 2 ft. in 100, it then splits into three seams, of about equal thickness. The Island Creek seam also shows the same marked reversion of the dip at another point in the same vicinity, but without splitting. Other indications of disturbances are also found in the vicinity of Dingess. The fault referred to is in line with the Warfield gas belt.

The coal seams along the Abbs Valley fault are more usually well above water level, while in addition, the strata on the opposite side of the fault are fissured in many directions. Even immense volumes of gas, if forced upward, would probably be distributed laterally over a large extent of country. As the seam joined along the margin of the field adjacent to the Abbs Valley fault is in the sub-carboniferous measures of the Rogers Brothers, there is perhaps little carbonaceous matter at great depths below the seam mined. Mining operations in the Flat-top field should perhaps, as a general proposition, represent the minimum danger from seismic disturbances. Were the Dingess fault of wide extent, the danger from seismic disturbances might be an item to be considered, for mining operations in the immediate vicinity; in addition, the seams which in the Flat-top field are more usually above water level, are, in the vicinity of Dingess perhaps 1500 ft. below water level, although the strata are becoming shoaler as the Ohio river is approached.

Transmission of Gas

That a pressure relatively slight as compared with that required to support a column of lava the hight of Vesuvius, for instance, will force gas through the solid coal, is beyond question. The pressure incident to the distillation of volatile hydrocarbons from carbonaceous matter perhaps many thousands of feet below the surface, should also be no small amount. The pressure of gases in the solid has been measured, in a number of instances, the greatest recorded, as far as noticed, being 32 atmospheres.

If the lowest carbonaceous matter is 500 ft. below the coal seam being mined, and if the latter is 500 ft. below the surface, the greatest pressure due to distillation should be that required to force the products through 1000 ft. of strata. We will suppose a vertical fault to pass through the strata and mine under consideration, and that a certain number of extremely small cavities exist along the plane of the fault. If through seismic disturbances, the fault be opened sufficiently to permit the gases at the greatest depth to reach the scene of mining operations, gas should then be delivered in the open workings at a pressure at least approximating that required to force the gas through 500 ft. of solid strata. If, however, the fault did not open directly into the mine workings, the effect would be masked as it were, depending upon the distance. That the sudden outbursts of gas commonly encountered in certain mining districts are perhaps due to seismic disturbances, does not appear at all impossible, under certain conditions.

The foregoing views and opinions quite possibly—or perhaps quite probably—appear altogether untenable to many, if not to the large majority; yet if so, a statement of the reasons therefor would be most welcome, even to one seemingly situated in one of the safest quarters of the globe, at least so far as seismic disturbances are concerned.

International Coal and Coke Company, Ltd.

The report of the International Coal and Coke Company, Ltd., for 1908, shows the net profits to have been $284,211, against $251,049 in 1907. Dividends totalling $182,000, or 6½ per cent. on the issued capital of $2,800,000, were paid, as against $154,000, or 5½ per cent., in 1907. The accompanying figures for the last three years further indicate the progress made by the company.

	1906	1907	1908
No. of men employed	365	465	586
Amount of coal [illegible]	$360,574	$446,734	$505,416
No. of days worked	249	266	236
No. days per man average	144	1575	1884
Cost of additions	$ 85,112	$ 45,948	$129,955

The mines and coke ovens of the company are at Coleman, in southwest Alberta, on the Crow's Nest branch of the Canadian Pacific. The coal produced is used chiefly for railway and other purposes in southern Alberta and eastern British Columbia.

The Ferro-Cerium Lighter

In a recent issue of *Annales des Mines de Belgique* (1909, No. 2), Emmanuel Lemaire reports the results of his experiments on the ferro-cerium relighter for safety lamps, which has recently been put on the European market. The only relighter in general use in Belgium is the one consisting of little disks of white phosphorus attached to a strip of paraffined paper. This relighter is perfectly satisfactory from the point of view of safety, but it has the disadvantage of blackening the inside wall of the glass chimney of the lamp, owing to the combustion of the paraffin. An electric lighter, consisting of a coil of platinum wire which is heated to incandescence by an electric current, has also gained some popularity, although it necessitates carrying around a storage battery. Another form consists of a sponge of platinum which is dipped automatically into methyl alcohol, the vapors of which heat the platinum to incandescence, which in turn lights the wick. This method, besides being elaborate, is not altogether reliable under all conditions.

Composition and Construction

The ferro-cerium relighter reminds one somewhat of the old flint and wheel which was the only available means of illumination in gassy mines before Davy's discovery. It consists of a pencil of ferro-cerium, the composition of which is reported to be cerium 70 and iron 30 per cent., which is pressed by a spring against a corrugated steel disk; this can be revolved by a wire passing through to the outside of the lamp. Friction of the steel against the ferro-cerium pencil throws off an abundance of sparks capable of lighting, without failure, the wick of a benzine lamp.

In regard to its mechanical simplicity, this relighter excels all other known types, but some question still remained as to its degree of safety in an inflammable atmosphere. It was feared that some of the incandescent sparks might pass through the gauze of a safety lamp, or that some unburned particles of the ferro-cerium might fall upon the gauze, if the lamp should be overturned, and if the gauze happened to be redhot that the resulting sparks might be dangerous in a gaseous atmosphere. The following tests were made at the Government testing plant at Frameries with a view to ascertaining the safeness of the ferro-cerium relighter. In all tests the relighter was attached to Wolf and to Mulkay lamps.

Tests Conducted

For the first test, the lamps, having single or double gauzes and no hoods, were placed in the testing chamber and subjected to horizontal currents of air containing 8, 9 and 10 per cent. of methane, and traveling with velocities of 3, 5, 7, 10, and 12 m. per sec. In order not to allow the gauze to become hot, the gaseous current was stopped immediately after each relighting and as soon as the gas began to burn in the lamp. The gauze was thus always black at the moment of relighting. Not once during 25 tests with double gauze and 800 tests with single gauze was combustion transmitted to the outside of the lamp, although incandescent sparks were often seen penetrating the gauze.

For the second test, the lamps having single and double gauzes and no hoods were subjected to currents of 3, 4, 5, 5½ and 7½ m. per sec. carrying 8, 9 and 10 per cent. of methane. The gauze was allowed to get redhot, the flame was then extinguished by cutting off the supply of air while maintaining that of gas, the normal current was then restored and the flame relighted by the mechanism. The gauze was thus red at the moment of relighting. Results of this test are stated in the accompanying table.

RESULTS OF TEST NO. 2.

Velocity of Current, Meters per Second.	Per Cent. of Gas.	Number of Tests.	Number of Transmitted Combustions.
Single Gauze, Red Hot.			
3	8	75	0
3	9	75	0
3	10	126	1
Double Gauze, Red Hot.			
3	8	25	0
4	8	20	0
4	8	1	1 (*a*)
5	8	20	0
5.5	8	28	5 (*b*)
5.5	8	37	1 (*c*)
7.5	8	55	6 (*d*)
		462	14

(*a*) Several attempts to relight had failed; gauze was almost black.
(*b*) New gauzes.
(*c*) Old gauzes.
(*d*) Inner gauze was heated until the flame passed through the outer gauze.

During the preceding series of tests, the sound of the explosion that occurred at each relighting was distinctly audible, and the soldered joints of the relighter melted frequently.

The third series of tests was conducted with the purpose of ascertaining the danger residing in the unconsumed particles of ferro-cerium alloy which collected, in considerable amounts, particularly on the top of the oil reservoir. It was feared that these particles, if thrown against a red-hot gauze, might penetrate it and cause exterior combustion. The test lamp was mounted on an axle, which could be turned from outside the chamber, in such a way as to tip the lamp upside down and shake it. All tests were made in a current of air carrying 8 per cent. of methane and velocity of 3 m. per sec. After working the relighter a few times, the lighted lamp was put into the chamber in its natural position. As soon as the gauze began to get red, the supply of air was cut off so as to extinguish the flame of gas burning inside the lamp then, after restoring the air current and noticing that the redness of the gauze had disappeared, the lamp was upset so as to throw particles of the alloy against the gauze. Under these conditions, at contact with the black but still hot gauze, the particles would become incandescent, relight the gas inside the lamp, and sometimes transmit the flame to the outer atmosphere. By extinguishing the gas flame as soon as it began to burn and repeating the shaking of the lamp as soon as the gauze had lost its redness, it was possible to obtain as many as 21 consecutive combustions of gas inside the lamp without removing it from the test chamber. In the course of this series, the gas inside the lamp was lighted 148 times, merely by shaking particles of ferro-cerium against the hot gauze, and the fire was communicated 39 times to the outside gaseous atmosphere.

At first, in order to provide the particles of unconsumed ferro-cerium needed for the test, the lighting mechanism was worked as many as 200 times before putting the lamp through the test, but it was later discovered that a single operation would provide enough of the particles, provided that the lamps were carefully cleaned, to yield several combustions of gas in the overturned lamp by repeated shakings.

Binder-Materials Made from Sulphite-Pulp-Waste

By Robert Schorr*

This subject has received a great deal of study and practical attention in Europe for many years, and more recently also in this country. While even a gigantic commercial development in that direction would not wholly solve the serious problem of stream pollution by waste liquors resulting from the manufacture of paper-pulp by the sulphite process, it would reduce the nuisance in many localities where the material could be marketed in competition with coal-tar products, asphaltum or other binders. A glance over the figures as presented in Water Supply Paper No. 226 of the U. S. Geological Survey and in Circular No. 120 of the Forest Service, must impress one with the wide scope of the work, which, in spite of most exhaustive research, has established no important results or remedies.

About half of all wood-pulp is made in

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the United States by the sulphite process. In 1909 almost 2,000,000 cords of wood were consumed by it, and yielded over 1,140,000 tons of "dry" pulp. The amount of solid material discharged with the waste liquor per ton of pulp produced varies from 2200 to 2700 lb. Assuming an average of 2500 lb. this represents a total of over 1,350,000 tons of solids for 1909.

Every ton of dry pulp requires about 2285 gal. of acid liquor and the same amount of water for each of the two washes. The acid application and the first water-wash constitute, as a rule, the waste liquor discharged by the mill. Consequently we had, in 1909, about 1,140,000 × 2 × 2285 equal to over 5,200,000,000 gal. with over 1,350,000 tons of solids contaminating our waters. These figures are approximate only, as the degree of dilution varies with different plants and equipments. The relation between pulp output and solid waste, however, is more definite. This waste contains 70 to 80 per cent. wood material (ligno-cellulose), 8 to 10 per cent. inorganic matter ($CaSO_4$ and $MgSO_4$) and 8 to 11 per cent. sulphur. This will give a general idea of its character and, as far as concerns our theme, it is not necessary to discuss the complex chemical nature of the organic portion. There is much valuable literature on this subject, foremost being the *Journ. f. prakt. Chem.*, Carl Hoffman's book on Paper Manufacture and the *Papier-Zeitung*.

Utilization of Waste

Numerous processes for utilizing this immense waste have been patented, and, it appears to me, the condensation into pulp-tar or pitch by simple evaporation seems most promising at the present time in a number of States. This statement is made with the knowledge that some of the earlier installations for this purpose have not proved a financial success, but since that time conditions have improved with the progress in the design of evaporators and the increased demand for binder. The cost of adhesives is, in many localities where pulp factories exist, excessively high, and this fact should insure a commercial success in spite of the rather high expense of manufacturing pulp pitch.

It can be used as a substitute for glues, as a binding agent for coal, coke breeze, dog dung, dry fuel, sand and the like. Although this concentrated extract has been used for these purposes for several years, the most rapid progress was made in that direction during the last year. A number of large German iron works have again abandoned the practice of sintering their ores, and it is reported that they are briquetting them and doing away with sulphite pulp pitch as a binder. Coke for briquetting are extensively made only in this country and in Europe.

Utilization of Pulp-pitch

For the purpose of concentrating the waste liquor, its degree of concentration is obviously of vital commercial importance, and, to avoid undue dilution, the acid-wash should be kept separate from the water washes and other drains wherever practicable. The operation is costly even when handling comparatively strong solutions, as large quantities of water have to be expelled to obtain a limited amount of pulp-pitch or pulp-tar. However, in investigating the commercial end of such undertakings the superior adhesive qualities of these materials have to be borne in mind.

The melting point of pulp-pitch is high, and it can be shipped in bulk as it does not soften at ordinary temperatures. The briquets I have made with it fulfil all physical requirements. They ignite readily and as coking sets in they retain their shape, not disintegrating until completely consumed. The briquets are strong but not entirely waterproof. The pulp-pitch does not increase smoke or odor, and, as nearly all of it is combustible, it adds but little to the ash content. Its influence upon the heating value of the fuel is negligible.

The great adhesive power it possesses makes it an ideal binder for mineral substances, both in connection with metallurgical undertakings and also for the manufacture of artificial stone masses. In many cases, however, waterproofing will be necessary.

The installation for the evaporation of waste liquor is rather expensive, and before designing such a plant it is important to secure an average sample.

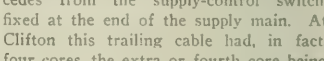
Pulp pitch sells in Germany for 40 marks, about $10, per ton and the manufacturing cost is said to be in the neighborhood of 25 marks. The evaporating has to be done at a low temperature to avoid charring and excessive losses. In most pulp mills exhaust steam is available for this purpose, or live steam could be cheaply generated by using the large amount of refuse from the barkers and the ¼-in. screens as boiler fuel. In the latter case low-pressure steam could be made and an exhaust-steam turbine could be operated in conjunction with the evaporators.

An Accident Caused by an Electric Coal Cutter

Special Correspondence

An inquest was held, some weeks ago, at Nottingham, England, concerning the deaths of two men killed by electric shock, on June 28 last, at the neighboring Clifton colliery. There was no doubt as to the cause, which was that the men had touched the case of an electrical coal cutter which had become charged. The coal cutter was supplied with current at 550 volts three-phase (center point not earthed), and the stator winding had come in contact with the case. Evidently there was sufficient earth on one of the other phases to give the fatal shocks. Artificial respiration was tried without success. There was a fourth wire in the trailing cable for earthing the frame of the machine, but the evidence showed that the connection between this and the machine was defective.

R. Nelson, electrical inspector of mines, and W. Walker, district inspector, explained that electricity is used for driving coal cutters in the form of three-phase alternating current at 550 volts pressure. Though the Home Office special rules do not provide for the earthing of coal-cutter frames, nevertheless at Clifton colliery the machine frames were connected to earth by a special wire as a precautionary measure. Connection from the supply main to a coal cutter is made by what is known as a trailing cable—a flexible cable with three or more cores, usually kept in a coil and unwound as the coal cutter recedes from the supply-control switch, fixed at the end of the supply main. At Clifton this trailing cable had, in fact, four cores, the extra or fourth core being for the purpose of providing the earth connection above referred to for the machine frame. The insulation of the wires



EARTHING CONNECTION FOR COAL CUTTER

is in the motor winding had become worn through, probably by rubbing caused by the vibration of the machine in working, and in this way live metal touched the inside of the machine casing; and as the earth connection was imperfect in spite of the fourth wire in the cable, the machine frame became charged to a dangerous pressure.

Taking the failure of the motor winding first, the memorandum pointed out that such a failure through abrasion is uncommon; but periodical inspection of the windings of the motor where any danger exists of abrasion should have disclosed the fault before it became actually dangerous.

The fault occurred in that part of the winding where three wires are led to the motor-control switch. Special attention should, therefore, be given to the substantial support and fixing of these wires, so as to remove the possibility of abrasion of this part through vibration. The trailing cable above referred to was fitted with a wooden plug or pommel containing three sockets, which sockets were designed to fit over three prongs in the coal-cutter motor-terminal box. The earth wire, forming the fourth wire in the trailing cable, was fastened to a small brass plate

on the side of the timber pommel, and connection between this brass plate and the machine frame (upon which the earthing of the latter depended) was made by a ⅝-in. bolt, provided with a lever handle for screwing into the machine frame. In ordinary circumstances these arrangements should provide a sufficient earth, but in the present case an oversight upset them. The brass plate to which the trailing-cable earth wire is attached was fixed on one side only of the pommel, and unfortunately on the wrong side. The result was that the bolt was bearing on dry wood only, so that the earth wire was at least partially insulated from the machine frame. This fact would not necessarily have been fatal had the brass plate on the other side of the pommel been pressing against the coal cutter, but this again was not so. The brass plate stood very little, if anything, above the flat side of the pommel, but in any event the rounded end of the pommel, where the trailing cable entered it, served to keep the plate from contact with the machine frame. This point will be made clear by reference to the accompanying sketch.

To sum up, the recommendations to provide against such an accident in the future are four in number:

1. Coal-cutter motors should be of such design as to admit readily of weekly inspection without introducing the possibility of damage.

2. The wires inside the motor case forming the windings, and especially the end connections, should be substantially fixed and supported, so as to remove the possibility of the insulating material wearing away through abrasion caused by vibration.

3. Machine pommels should be provided with a brass plate all over both sides to remove the possibility of bad connection between earth wire and machine frame.

4. Some easy means—say a few cells and an electric bell—should be readily available for occasionally testing the efficiency of such earth connections as that between a cable pommel and a portable machine frame, so that after overhaul the latter may be left beyond doubt in safe working order.

Coal Mining Method at Kaylor, Penn.

By Edward K. Judd*

The method of coal mining employed by the Great Lakes Coal Company, at Kaylor, Armstrong county, Penn., if not unique, is certainly not as commonly employed as it deserves to be. The conditions at Kaylor, particularly with respect to the roof, are unusually favorable, which may be the reason I have never seen the same method elsewhere.

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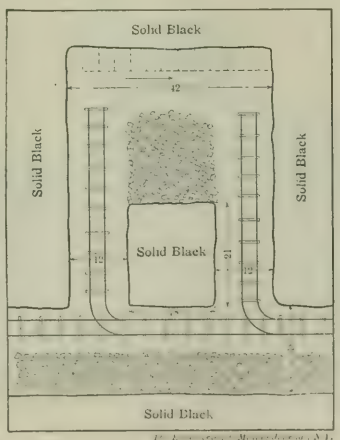
The Coal Seam

The coal in question is the Lower Kittanning seam, which has a total thickness of 4 ft., the upper 10 in. of which is bony coal. The floor of the seam is fireclay, extending downward for at least 8 ft. before it grades into the slate that lies immediately on top of the ferriferous limestone. The roof of the seam is sandstone, lying without any intervening shale directly on the bony coal. The sandstone is fine grained, brownish gray in color, but contains thin partings of carboniferous mat-

AVERAGE SECTION OF LOWER KITTANNING SEAM AT KAYLOR



TWO-NECKED ROOM, KAYLOR MINE

ter. The stone is exceedingly strong, but when it does break, as it will occasionally, the fracture is sharp and clean and the break will come exactly at the edge of the supporting pillar.

Haulage Entries

Haulage entries are driven with a width of 18 ft.; the bottom is taken up for a width of 5 ft. along one rib, so as to give head room for the mules and the electric locomotive; this clay, together with the bony coal, is packed along the opposite wall. This method obviates extra wages for narrow work, the mining and loading of the entry coal being paid for at regular rates, while only $1.57 per yard is paid for taking up the floor to the width of the track. It also avoids handling and hauling the bony coal and clay. When switches and partings are needed, the entry is left open to its full width, and the roof stands indefinitely, with no intermediate support. The comforts of switching and making up the trips in a wide, clear space, without a single prop in the way, should be seen to be appreciated.

Rooms and Pillars

The rooms are driven with a width of 42 ft., and have two necks, each 12 ft. wide, as shown in the accompanying figure. The stub pillar has a width of 18 ft., and a length of 21 ft. The gob, consisting mainly of the bony coal, is piled up along the middle of the room.

This double-necked arrangement is of great advantage in the operation of the electric-driven chain undercutters. The cutting gang brings its machine, on a self-propelling truck, into a room through the left-hand opening, sets up the machine, cuts across the face of the room to the right in 13 cuts, loads the machine on its truck, which meanwhile has been brought around, and withdraws through the right-hand opening. This obviates the necessity of sliding the cutter back again to the point at which it started, which is a laborious operation, and it also permits the mining gang to come in with their car, set up props, bore holes, and even begin to mine the coal before the cutting gang is out of the room, and without interfering with them in the least. As a result of this saving of time, a good pair of workmen with a chain machine can undercut the coal in one entry heading and six rooms per shift, yielding an output of 125 tons. The average room yields about 10 tons of run-of-mine coal for each cut of the machine.

In the late coal mine accident at Tolerville, near Trinidad, Colo., in which men were killed by an explosion, the Cedar Hill Coal and Coke Company was exonerated from blame, as it was shown that the men had been told by Superintendent E. D. Fisher that there would be no work that day. The men, of their own volition went down into the mine to clean out their rooms and make ready for next day, and were killed while going down in the cage.

Consul William Coffin, of Tripoli in Barbary, reports that a party of French engineers are said to have discovered phosphate deposits in Tripoli, but they cannot be profitably worked without constructing a railway to the coast. If such deposits exist in sufficient quantity to attract foreign concessionaires, that would be the entering wedge for the development of the interior, which has been practically closed to foreigners.

The Rock-salt Mining Industry in Kansas

Beds of Rock Salt Discovered in 1888; Fourteen Seams with Total Thickness of 300 Feet. The Mining and Milling Methods Employed

BY SAMUEL AINSWORTH*

The salt industry of Kansas has been growing steadily during the past 20 years. The mines and evaporating plants of the State have been described briefly in some of the early Kansas agricultural reports. The geological survey of Kansas, under the supervision of Prof. Erasmus Haworth, has made several reports including descriptions of the Kansas salt deposits and industry, the best of these being the one made by M. Z. Kirk, in 1898.

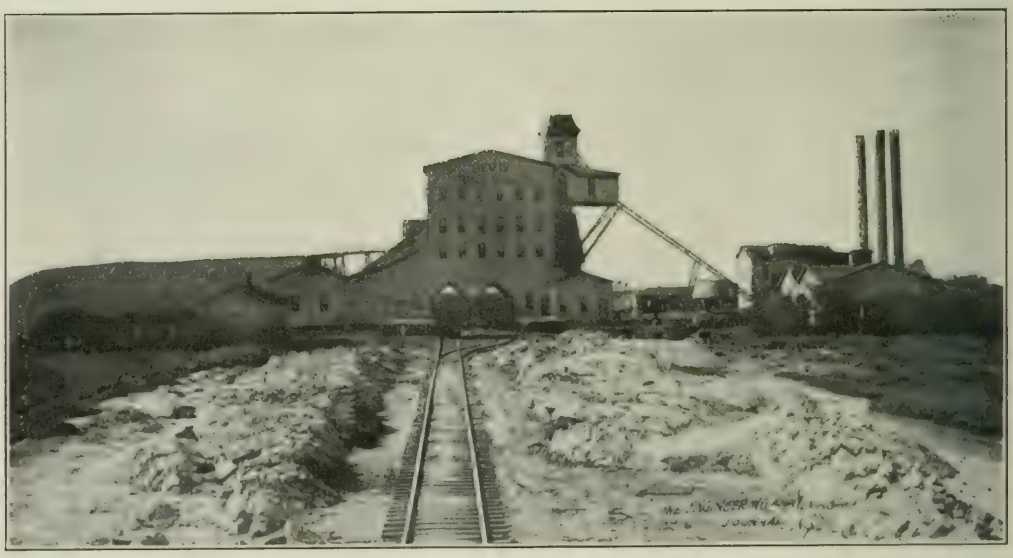
Salt is obtained in Kansas by evaporation processes and by mining rock salt. The evaporated salt business has been largely developed in Hutchinson and evaporating plants are far more numerous than rock salt mines. This paper, however, will deal only with the rock salt mines.

History

The Kansas salt industry was commenced in the early 1860 and the first salt produced came from the Tuttle marsh in Republic county. This salt was an impure grade but at that time it brought a high price. Salt was afterward produced from numerous salt marshes over the State but the large Kansas salt beds were not found until about 1887. Several brine wells were located at Solomon City and a solar evaporating plant was operated there from about 1868 until a few years ago. In 1887 and 1888, the large Kansas salt beds were found while drilling for oil and gas in Ellsworth, Lyons, Hutchinson, Great Bend, Kanopolis, Sterling, Kingman, Anthony and Wellington. The salt bed in all of these drill holes was found to be from 50 to over 400 ft. thick. Various shafts were started at this time, but lack of mining experience and funds caused most of them to be failures.

In 1888, the Kingman Salt Company put down a shaft 4½x8½ ft. and operated a mine for two years, when the company failed and the mine was allowed to fill with water. A shaft 14x16 ft. was put down at Kingman in 1890, but in 1893 the company failed. Nine years later, the mine was pumped out and reopened. This mine has operated since then and a large amount of salt has been taken out. In December, 1908, the mine buildings were destroyed by fire and at present the workings are filled with water. The condition of the shaft and of the mine in general make it improbable that the mine will ever be operated again. Only three other salt mines in Kansas have ever produced salt to any extent and they are: the Bevis Rock Salt Company's mine, at Lyons, and the mines of the Royal Rock Salt Company and the Crystal Rock Salt Company at Kanopolis.

Two shafts have been put down at Lyons to the salt bed, one by the Bevis Rock Company in 1890 and the other by the Midland Rock Salt Company in 1892. The Midland Rock Salt Company reached the salt bed, but failed financially and no salt was ever hoisted. The Bevis Rock Salt Company commenced to hoist salt in 1890 and has been in operation continuously up to the present time. At Kanopolis, two shafts have been put down, one by the Royal Rock Salt Company in 1891 and another by the Crystal Rock Salt Company in 1908. The former company has worked only part of the time, but at present the mine is in operation. The Crystal Rock Salt Company has been operating about a year. Shafts have also been started at Ellsworth, Marquette and Little River, but



PLANT OF THE BEVIS ROCK SALT COMPANY, LYONS, KANSAS

*Lyons, Kansas.

all have been failures. At Ellsworth, an artesian flow of salt water was struck and the work had to be abandoned. At Marquette, lack of mining experience and funds caused a failure; at Little River, lack of capital and failure to handle water caused operations to stop when the shaft was only 100 ft. deep.

Geology

The salt marshes of northern Kansas probably obtained their salt from the salt-bearing shales of the Dakota formation. The first salt produced in Kansas was from this source. These shales were easily eroded and thus produced the low marshy areas found in northern Kansas. In the southern part of the State there is some doubt as to the origin of the marshes, but it is evident that the salt comes from the Red beds or the Dakota salt shale.

The large rock salt beds of Kansas are in the Permian formation, with the Marion group of limestones and shales below, and the Wellington above. Only the eastern limit of the bed is known and how far it extends west, north and south has never been ascertained. We know, however, that it extends across the State north and south and is at least 70 miles wide.

The salt bed is thicker in the southern portion of the State. At Kingman and Anthony it is over 400 ft. thick; at Hutchinson, it is 380 ft. thick; at Lyons, about 275 ft. and at Kanopolis, 230 ft. thick. The separate salt seams are thicker to the north of the field, however, and there is less shale in the bed than there is in the southern end. The inland sea from which the salt was deposited was evidently filled up at different periods by an inflow of water from the south. There is no water within several hundred feet of the salt bed and this fact shows that there has been no earth movements since the salt was deposited.

Bevis Rock Salt Company, Lyons, Kansas

The shaft of the Bevis Rock Salt Company was sunk and the plant constructed by Jesse Ainsworth, in 1890. The shaft is near three railroads, in about the center of 4000 acres of salt land controlled by the company. Permanent hoisting engines, air compressor, boilers and brick power buildings were erected before active sinking operations began.

Shaft Sinking—The shaft has two hoisting compartments, 6x7 ft., and one ventilating compartment, 3x7 ft., inside dimensions. To secure the shaft's mouth and to support the head frame, a stone and concrete foundation was first put down. The timbering in this shaft is the "skin to skin" method. The first 30 ft. were timbered with 6x6 in. timbers, the ground being hard clay free from water. The next 30 ft. were sandy clay, yielding a large amount of water. Since there were about 300 ft. of soluble material below, it was necessary to shut this water out of the shaft. At this point the shaft was enlarged to allow for an outer curbing, an inner curbing and puddling between the curbs. The outer curbing was carried down through the water stratum and held in place by temporary buntons. An inner curbing was then built up from the bottom of the shaft and the space between the outer and inner curbing filled with cement; in this way a water-tight wall was formed all around the shaft. During this work the water was led into the shaft by means of a number of pipes placed through the timbers, and pumped out of the shaft. No water has ever leaked into the shaft in the 19 years it has been in operation. There is some seepage water at the 300-ft. level and a water-ring was put in. This water-ring has to be pumped out about once or twice a week. When the shaft reached the salt bed it was enlarged, the inside dimensions being 17 ft. by 8 ft. 8 in. This was done to allow for an inner curbing and puddling, in case it should be found necessary to keep water away from the salt.

Mining—Fourteen workable seams of salt were passed through and the company decided to work an 18-ft. seam near the bottom of the deposit. The entire depth of the shaft as it now stands is 1075 ft. There is a 10-ft. sump, but no water has ever been hoisted from the mine. The shaft was constructed in 299 days counting all delays.

From the bottom of the shaft, two main headings are driven and rooms are driven from these. The regular room-and-pillar system of mining is used and the pillars are left permanently. The rooms are 50 ft. wide and 17 ft. high. These rooms are driven parallel to each other and crosscuts are driven every 75 ft., thus leaving a solid pillar 50 ft. wide and 75 ft. long. No timbering is necessary in this mine and the old workings, as well as the new, remain clear of falling rock.

In mining rock salt a heavy type of machine pick is used, and the salt is first undercut to a depth of 3½ ft. The drilling is done with compressed air auger-drills and 5 ft. holes are put in. A 20 per cent. nitroglycerin powder is used and all the holes in a room are fired simultaneously by electricity, often breaking 500 tons in one blast. The salt is then loaded into mine cars and hauled to the shaft by mules. The salt seam mined is uniform in thickness. A small amount of it is left as a floor and about one foot to eighteen inches is left as a roof. Thus the mine has a solid salt floor and roof and there is little chance for shale to get into the salt. About three acres are mined out each year.

Mills—The mine has duplicate mills, both being used only when trade demands a large output. These mills are set at right angles to each other, and a description of one will suffice. The salt is dumped into a hopper and passes through a set of 24x30-in. toothed rolls. There is a set of movable bars over these rolls and the large lumps can be sent over the crusher to a lump chute where it slides down to the ground floor of the mill ready for the railroad cars. The salt that passes through the first set of rolls falls on a shaker containing two screens. Three sizes of salt are obtained from this shaker; the oversize goes to a set of 34x20-in. corrugated rolls. After the salt passes through these rolls it goes to a pair of shakers and from these shakers it passes to bins by means of elevators and chutes. Fine salt is made by regrinding the coarse salt in a cyclone crusher. There are numerous sizes of screens in the mill and seven different sizes of salt can be made. This mine has a capacity of over 700 tons per day of ten hours, but at the present time the demand is small and about 250 tons are hoisted daily.

The Royal Rock Salt Company

The Royal Rock Salt shaft was constructed by James Cowie, Sr., in 1890. The shaft is near two railroads and is about a quarter of a mile from the town of Kanopolis. When the mine was opened it was well timbered but remained idle for a number of years, and during that time water was allowed to go down the shaft into the mine. The salt was dissolved from behind the timbers and for this reason the shaft had to be retimbered at a large expense. As the shaft now stands water is pumped from a water-ring on the 210-ft. level. No water runs down the shaft to the salt area. The present shaft has two hoisting compartments, 5½x6½ ft., inside dimensions and an air shaft 8x6½ ft. The mine is 805 ft. deep and the seam of salt mined is 9 ft. thick.

The main headings in this mine are driven north and south and are 40 ft. wide. The mine is worked similar to the Bevis Rock Salt Company's mine, but no undercutters are used and the salt is blasted off the solid. There is a dip to the northeast in one part of the mine but this dip is not great enough to hinder haulage.

Mill—The mill of the Royal Rock Salt Company is single, and seven sizes of salt are made. These grades are the same in size as those made in all Kansas rock salt mills. The salt, when hoisted, is dumped on a set of grizzlys and the fine salt passes through to a shaker. The large lumps are fed through a pair of 24x30-in. toothed rolls. From these rolls

it is fed directly to a second pair of toothed rolls, set closer together, and from these rolls it goes to three five-screen shakers. The shakers in this mill are narrower than those used by the Bevis Rock Salt Company. The salt from these shakers is stored in bins where it can be loaded directly into railroad cars. The mill has a capacity of about 250 tons per day.

THE CRYSTAL ROCK SALT COMPANY

The shaft of the Crystal Rock Salt Company was constructed by James and George Cowie. The mine is about ¼ mile southwest of the Royal mine. The shaft has three compartments, the inside dimensions being 6x18 ft. Two of the compartments are used for hoisting and the third is an air shaft. The shaft was timbered down to the water level with heavy timbers.

A large boiler-iron drum, the size and shape of the shaft, was driven down through the water-bearing sand. This drum has brackets on the inside and is timbered so that there is no danger of its collapsing. It was driven into an impervious seam of clay below the water. The shaft was carried down from the bottom of the drum and timbered with pine timbers set "skin to skin". Two other water-bearing strata were found and the water-ring was put in at 300 ft., where the water is collected and pumped out at intervals. The shaft is 800 ft. deep and the same seam of salt is mined that is worked by the Royal Salt Company. This mine has only been in operation about a year and the workings only extend a few hundred feet from the shaft.

The mining operations here are the same as in the Royal mine. Electric drills were tried but they did not prove satisfactory and compressed air auger-drills are now used.

The mill of the Crystal Rock Salt Company is double, but the mills are not separated as in the Bevis Rock Salt Company's plant. One mill can be run alone only when all the hoisting is done on one side, the other cage running empty. The two mills are both alike and are set side by side, the same engine running both. Each of the two mills are the same as the Bevis Rock Salt Company's mill, the only difference being that the machinery is more compact in general. The mine is equipped with self-dumping cages. About 600 tons of salt can be mined daily, with both sides running. At present only one mill is used and about 250 tons of salt are ground daily.

The growth of the Kansas rock salt industry is slow. At the time of the year is the demand so great that the present mines could not supply it. In fact two salt mines could not supply the demand. There are two local mines equipped for this salt and the rock salt companies had agreed each other the contracts. The Kansas rock salt is quite pure, samples taken from the bins of the various mills averaging over 98 per cent. sodium chloride. The impurities however are dark in color and for this reason rock salt is little used for domestic purposes. This salt is used largely by packing houses, creameries, in making freezing mixtures, by soap makers and by various other manufacturers. There is an unlimited supply of salt in the field and the probabilities are that the production of salt, in Kansas, will increase more rapidly in the future.

The Talc Industry of St. Lawrence County, N. Y.

SPECIAL CORRESPONDENCE.

The talc industry is one that is increasing very rapidly in this county. This is strongly manifested by the fact that nearly all of the working mines have been secured by the International Pulp Company. This company has six talc mills, the majority of which are in operation and have a combined output of approximately 300 tons per day. The largest mill has a capacity of 100 tons daily and was constructed at a cost of approximately $300,000. The building is a concrete-steel structure and is equipped with pebble mills for fine grinding.

The Uniform Fibre Talc Company is installing a mill but it will be several months before it is ready for operation. The only other company operating independently is the Ontario Talc Company, which has a mill equipped for 40 to 50 tons per day. The plant is operated by water power and has turbine wheels with a combined capacity of 500 h.p. when the water is at its normal stage. The talc deposits of this district were first discovered thirty years ago by S. C. Potter and D. Minthorn.

The Ontario Mine is eight miles southeast of Gouverneur, New York, while the mill is about nine miles, the additional distance being due to the necessity of locating the mill where water power would be available. The talc deposits occur in a series of gneiss and granitic rocks, the strike is approximately east and west with a dip to the north of about 45 deg. The talc is a white, pure variety, and free from grit. A number of drill holes have been put down which show the thickness of the deposit to be at least 175 ft. in many places. It has been opened by two shafts ¼ mile apart, the deepest one being 330 ft. The Ontario Company has been operating about ten years and is in direct charge of A. A. Potter, who is vice-president and manager.

GRINDING

The general scheme for grinding talc in this district is as follows: From the mine the raw material passes over a set of grizzlies. The coarse material is then passed through a jaw crusher set to ½ or ¾ in. The crusher product together with the fines from the grizzlies passes through a set of rolls and is further reduced by bar mills. From the bar mills the mineral is transferred by one-ton cars, or other conveying apparatus, to tube or pebble mills where it is reduced to 80 or 100 mesh. Two types of these mills are in use. The first installation was one with the intermittent discharge. A number of these mills are still in operation. They are charged with one ton of material which is ground for 3 to 5 hours and then discharged by removing a cap from one side of the mill. A grating is placed over this opening to prevent the pebbles from coming out. The other and last type is a continuous feed with a continuous discharge and it is claimed to be more satisfactory in every way. This mill is 6 ft. in diameter, 24 ft. long and is lined with porcelain brick. French pebbles are used for grinding.

The fine dust product from the tube mill is removed to a screen or bolting apparatus which is made of silk. This is constructed similar to an octagonal trommel 3 ft. in diameter and 20 ft. long. This yields a product all of which is finer than 100 mesh. The oversize goes back to the tube mills for regrinding. An 80-mesh product is also made by passing the material through a revolving wire screen. The finished product is then sacked in 100 or 200-lb. bags, as desired by the customers. The bulk of the talc is used by the paper manufacturers.

According to a recent consular report, the zinc mines in Hadeland and Hakedalen, Norway, have been undergoing development during 1908. The lead and zinc mines belonging to the Traag Mines, Limited, and the copper mines belonging to the Aamdal copper mines, have been further developed, but little has hitherto been shipped. However, both these companies are now obtaining more capital with a view to extending the output. As regards the former a new process for reducing zinc and lead is being developed, and at the Aamdal copper mines a new concentrating mill has been erected on the Elmore system.

The Holland budget for 1909, as submitted to the Dutch parliament, estimates the profit to the government from mining in the Netherlands East Indies at 21,700,000 fl., or $8,723,400. This includes 18,700,000 fl. from the tin mines of Banka, which are worked by the government, and 3,000,000 fl. from the coal mines of Ombilin, near Padang, on the south coast of Sumatra. In addition to these sources of revenue the government receives a percentage of the receipts of the company which operates the Billiton tin mines.

The Bonanza Ditch of the Yukon Gold Company

Water System Includes 38 Miles of Ditch, 19 Miles of Flume and 12 Miles of Pipe. Three Years Was Required to Complete the Work

BY E. JACOBS

The accompanying illustrations give an idea of the nature of the work the Yukon Gold Company had to do in constructing its ditch, flume and pipe line, known as the Bonanza ditch, from Twelvemile river to Bonanza creek, in the Canadian-Yukon. The Twelvemile is a tributary of the Yukon river. It takes its rise in the part of the Ogilvie mountains, named the Tombstone range, points in which are as high as 7000 feet.

INTAKE OF PIPE LINE ACROSS QUIGLEY VALLEY

The length of this water system is about 69 miles, including 38 miles of ditch, 19 miles of flume, and 12 miles of pipe, the last partly steel and partly stave pipe. The variation in the kind of conduit required was necessitated by the changing topographical conditions. The ditch varies in width, according to local requirements, from 9 to 20 ft. Its grade is generally 6 ft. per mile, but ranges from 4 to 7 ft., conditions necessitating changes from the prevailing grade in places. The depth of water in it is usually about 42 in.; its effective head on Bonanza creek is 375 feet.

Construction work, which included the erection of a steel bridge on concrete piers, to carry the steel pipe across the Klondike river, was extended over the outdoor working seasons of three years.

One photograph shows the steam points used in thawing the ground ahead of the dredges, the company being engaged in dredge mining, as well as hydraulicking, for gold. There are seven electrically operated dredges, the power being generated on Little Twelvemile and transmitted over 36 miles of main pole line and 18 miles of branches. In connection with the hydro-electric generating station, there has been constructed a water-supply system, flume, etc., about 28,000 ft. long, to deliver water to Pelton wheels operating three generators.

A feature of the company's plant is the three mechanical elevators on Bonanza creek, which are stated to be the first of the kind constructed in Yukon Territory.

In one of the prominent quartz gold mining camps of California recently, a business man failed for $70,000 and, on investigation it was found that a large portion of the indebtedness was to miners. This aroused suspicion, because these miners made no concerted or individual attempt to collect the indebtedness. The result is that these creditors are suspected as "high graders" though there seems to be no way as yet found to prove it. However, it bears out the assertion made some time since by the superintendent of the most prominent mine in the district referred to, that "the mines of that district were losing about $500,000 annually through the activities of the high graders."

RIVETING 48 INCH STEEL PIPE WITH AIR HAMMER

LAYING WOOD STAVE PIPE 46 INCHES IN DIAMETER

CONSTRUCTING 4X6-FOOT FLUME

STEAM POINTS THAWING GROUND TO BE DREDGED

The Mining Industry in Algeria and Tunisia

Iron, Lead, Zinc and Phosphates Principal Resources; Labor Low Priced; Little Machinery Used; Operation Handicapped by Governmental Opposition

BY M. CLÈRE*

The last fifteen years have seen the development of French North Africa into an important mining country. This brought about many improvements that would never have been made had the country remained only an agricultural one. Algeria, though much earlier opened to European civilization than its neighbor, seems to have been more handicapped in the race for progress as politics are not allowed to play such havoc in Tunisia as they do in Algeria. Tunisia, however, has been developed rapidly. Railroads are spreading out, new mines are heard of almost every day, and Tunis itself has become an attractive, modern and busy town of 200,000 inhabitants, headquarters for all the mining districts of the interior, and shipping point for most of the ores.

Mining Methods

Mining methods in North Africa are much in contrast with American methods and at first sight might appear antiquated, but generally there is a reason for this. The principal difference between American and Algerian conditions is to be found in the supply of labor. In Algeria and Tunisia labor is plentiful, cheap and efficient. It is composed of Arabs, Italians, Sardinians, and in some places of Spaniards. Wages for miners vary between 2 and 3.5 fr. (40 to 70c. gold), and in many mines the average wage is not higher than 2 fr. There is no danger of a rise in the wages as there is a continuous influx of laborers eager to get a job. This abundance of labor, together with the absence of water power and the high price of coal, explains to a certain extent why machinery is used here only when it is absolutely impossible to dispense with it, and why many surface plants are veritable beehives of men.

Freight rates on ore are generally low and teaming by horse wagons is very cheap as most of the roads are excellent and built after the French fashion. This permits the exploitation of small mines situated some distance from the railroad. In the central part of the country, where most of the mines are situated, hauls of more than 50 km. are seldom necessary to reach either a railroad or a seaport. Some examples and figures will be given later in this article.

A great deal of the concentrating machinery used is of Sardinian make. Sardinians have attained a high degree of efficiency in concentration, especially of lead-zinc ores. They have model plants at Montepom and Malfidano, and some mines in North Africa are efficiently managed by Sardinians. Crushing, steam and electric machinery is mostly French, American machinery being represented only by the Wilfley tables.

In Algeria and Tunisia, the geological formations begin with the upper Jurassic period. Some Cretaceous rocks are found but the sediments are mostly Teritary. The eruptive rocks are seldom found and only in small, isolated patches. The formations are not favorable to the existence of mineral combustibles except lignites of inferior quality. Copper is scarce, gold and silver are conspicuously absent, and the county is essentially one of iron, lead, zinc and, of course, phosphates.

Deposits of Iron in Tunisia

The exports of iron ore from Algeria in 1907 amounted to 921,441 tons. From Tunisia little was exported as the industry is still new. These exports will no doubt increase rapidly as Tunisia becomes further developed.

In the latter country the most important mine is the Djebel Djerissa, near the Algerian boundary. It belongs to the Company of Mokta-el-Hadid which controls the best part of the iron supplies of North Africa. The ore is a stratified deposit, 40 to 52 m. thick, and contains an average of 56 per cent. Fe. and 2 per cent Mn. The known reserves are about 15,000,000 tons. The ore is shipped by rail to Tunis and thence to La Goulette, as the harbor of Tunis, lacking wharfage capacity, is reserved for the phosphates. Near the Djebel Djerissa are the Dj. Slata and the Dj. Hameima

MAP OF ALGERIA AND TUNISIA SHOWING MINES

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belonging to the same company and adding about 11,000,000 tons to its reserves. The ore contains 58 per cent. Fe., 1.16 per cent. Mn, and 0.35 per cent. Pb.

Another iron region in Tunisia will in a short time produce iron ore at a high rate. It is called the Nefzas country and is situated between Byzerte and Tabarka. The iron of the Nefzas has been known for many years but difficulties with the government concerning the terms of the concession hampered its exploitation. Now, at last, a railroad is being pushed rapidly from Byzerte to open the country and the mines will be working before long. Some of them belong to Mokta-el-Hadid and others to the Societé des Nefzas. The ores are rich in iron with no sulphur, but some arsenic, varying from traces up to 0.31 per cent. The actual visible tonnage is about 4,000,000 tons. The company will have to pay to the government 5 per cent. of the net product.

Deposits of Iron in Algeria

In Algeria, the Ouenza country, just opposite the Dj. Djerissa on the other side of the frontier, is by far the most important iron region, though it does not yet contain any producers. All this region is highly mineralized, and from the high peak of Djebel Ouenza one may see in the distance the Dj. Djerissa, the phosphate mines of Kalaat es Senam and Kalaa Djerda, the phosphates of the Dj. Kouïf, near Tebessa, the immense iron mountain of Bou Khadra, and many smaller mines.

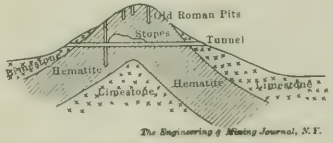
Ouenza is a high mountain, on one side of which outcrops an immense bluff of hematite, absolutely honeycombed by old Roman workings. The hematite is of the best quality, grades of 70 per cent. iron not being exceptional. In places the ore contains also malachite and carries from 2 to 8 per cent. copper. The deposit seems to be a stratified lode between beds of limestone. All the workings are in ore, but I am, however, inclined to the belief that the lode might be a saddle and have a cross section as is shown in the accompanying sketch. Ouenza belongs to the Societé de Ouenza, to Mokta-el-Hadid, and to the Creusot works affiliated with Krupp and other big European steel makers. The Ouenza deposit shows at least between 50,000,000 and 70,000,000 tons of hematite. About 15 miles farther south is the Dj. Bou Khadra, belonging to Mokta-el-Hadid, and those who have seen it are positive that it is as big as Ouenza, if not bigger. There are thus 100,000,000 to 150,000,000 tons of iron ore lying idle and unproductive though there is plenty of capital for its development, because through political influences the government delays the granting of the license necessary to build a railroad from the mines to the seaport of Bona. Such a state of affairs could never exist in Tunisia.

Other big iron mines in Algeria are Ghar El Baroud in the province of Oran, shipping its hematite by the harbor of Beni Saf; Ras el Maden, 21 km. east of Nemours, working manganiferous hematite near the contact between primitive schists and Lias limestones; the Djebel Hadid, near Tenés, working also hematite in lenses; and all the group of Aïn Mokra, near Bona, where the company of Mokta-el-Hadid began and still continues its operations.

Zinc

The exports of zinc ore from Algeria in 1907 were 78,951 tons and from Tunisia in 1906, 27,056 tons. The zinc mines are numerous in North Africa, but they are generally small, though good payers. Most of them produce calamine, only a few reaching the blende zone. The Société de la Vieille Montagne and the Compagnie Royale Asturienne, both Belgian concerns, are the principal zinc operators.

The biggest zinc producer is probably the Ouarsenis mine (Vieille Montagne) 42 km. southeast of Orleansville. It



PROBABLE SECTION OF THE OUENZA IRON DEPOSIT

works on a calamine deposit outcropping in patches of Lias limestone.

Near Setif are the important mines of Bou Thaleb, in the Lias, and 3 km. northwest of the same town are the mines of Guergour. This company has six mines working lenses of calamine between limestone and slate. A large part of the output comes from surface open cuts but the showing at depth is favorable. The mines produce about 12,000 tons of roasted calamine a year. The ore as it comes from the mines and after a rapid sorting assays about 40 per cent. Zn, and is roasted in ordinary shaft furnaces with 4 per cent. coal to 50 per cent. Zn. It is hauled by horse wagons to the seaport of Bougie, a distance of 90 km., for 22 fr. per ton. Only the lump ore is so treated; all the fines that could not be roasted in the shaft furnaces are stacked in heaps. There are now about 100,000 tons of such fine ore and the company is planning a central concentrator to treat it and also furnaces to roast the fines. Labor is plentiful and the average wage is about 2.5 fr.

Another interesting zinc mine is the Ain Arko property, between Constantine and Bona. It consists of large surface croppings of calamine between limestone and dolomite. At depth the ore narrows and seems gradually to pass into zinc blende. The Ain Arko calamine is especially high-grade, often completely white and sometimes crystallized. After roasting it contains an average of 57 to 60 per cent. Zn. The mine now ships 40 tons of roasted calamine per day, but as soon as the new concentrator is in commission the daily output should be in the neighborhood of 100 tons. The lump ore is roasted in shaft furnaces with 5 per cent. coal at a cost of 35 fr. a ton. A part of the fines is rich enough (4 per cent. Zn.) to be roasted direct without previous concentration. This roasting is done in the Spirrek furnaces which have been already described in the Journal. These furnaces, outside of the difficulty of their erection, are very economical and absolutely automatic, the ore being charged on top through a screen and leaving the furnace at the bottom after falling through the chicanes. The consumption of fuel is 200 kgs. of pine wood for each ton of ore. There is a reserve of over 100,000 tons of ore for the concentrator, assaying 15 to 20 per cent. Zn.

Concentrating at Ain Arko

The concentrator was to be started the day following my visit. It is built to treat 60 tons in ten hours with an expected recovery of 75 per cent. The machinery comes almost entirely from Sardinia and is well uptodate and adapted to its purpose. The ore is delivered from the mines into a large shed where it is to be sorted by boys. The picking belt and the sorting table seem absolutely unknown in this country and sorting and cobbing are done on the ground. The sorted ore is thrown on the grizzly. The oversize goes to the shaft furnaces. The undersize (1¼ in.) falls into a small hopper feeding a shaking perforated conveyer. This machine, of which there are many examples in this country, screens the ore to 12 mm., carries the oversize, and allows some sorting during the transport. The undersize goes to rolls and the oversize to a small crusher and thence to another set of rolls. The crushing is done dry, water being first introduced under the rolls. The ore is sized on horizontal shaking screens, the perforations having a diameter of 10, 7.5, 5, 3, 1.75, and 1 mm., respectively. The ore is jigged on ten 4-compartment Hartz jigs making only hutch products. The beds are made of iron punchings. The middlings are recrushed in a third set of rolls. The ore under 1 mm. is roughly classified by gravity in the pipes leading the stream to the tables. There are four Wilfleys treating the different sizes thus obtained. There is no slime plant. The consumption of water is expected not to

be above 2 tons of clear water per ton of ore. There is a central electric plant with direct-suction gas producers guaranteed to consume only 400 grams of hard anthracite per h.p.-hour, two Winterthur gas engines of 115 h.p. each producing a 220-volt continuous current.

The freight on the calamine is 6 fr. for a 30 km. haul in wagons to Oued Zenati, and thence to Bona by rail, 10 fr. for 151 km. The Ain Arko mine is one of the best payers in the country.

Lead

The exports of lead ore from Algeria were 20,981 tons in 1907, and from Tunisia in 1906, 17,281 tons. Very few mines are worked for lead alone, but many produce lead and zinc. Among them are the Mesloula mine, not far from Tebessa, belonging to the Compagnie Royale Asturienne and producing high-grade galena, and the Djebel Ressas mine, 28 km. southeast of Tunis. The Djebel Ressas mine is situated on a high, isolated, rugged mountain, rising abruptly from the Tunis plain. The deposit is formed by a long fracture in limestones. In this fracture are lenses where the limestone is partially replaced by galena, lead carbonates, calamine and smithsonite, intimately mixed. In other places are veins of solid galena. Almost all the present output comes from open cuts situated on the top of the mountain about 400 m. vertically above the plain and the concentrator. The ore is won by long shots in steps 12 to 15 m. high, is sorted on the spot and sent down in cars over a series of inclines, some of them sloping 45 deg. All this tramming requires a great deal of labor, and it is probable that in America mill holes or chutes would be resorted to, but owing to the abundance and cheapness of labor the cost of the operation is not too high and the ore arrives in the concentrator in a much better condition with a minimum of fines. Mining sorting and tramming cost less than 4 fr (80c.) per ton.

Concentrating at Djebel Ressas

The concentrator treats 180 tons of ore per day and in addition there is a production of about 10 tons of lump calamine and galena. The ore sent to the mill assays on an average of 5 per cent. Pb. and 10 per cent Zn, and contains no silver It is concentrated to 50 per cent. Pb and about 28 per cent Zn The tailings assay 0.30 to 0.40 per cent. Pb., and 5 per cent Zn The concentration is not an easy problem as the calamine is low grade and part of it is in the form of a light white hydrocarbonate floating away with the tailings The mill is [illegible] equipped and the operation is [illegible] the [illegible] the common [illegible] [illegible] [illegible] [illegible] [illegible] [illegible] [illegible] bins. This last feature is a characteristic of the mills here. Crushing is done with a strong jet of water playing between the jaws of the rock breaker. The largest size for jigging is 11 mm. and the smallest ½ mm. The jigs make a great amount of middlings to be recrushed and rejigged. Below ½ mm. the ore is treated by Wilfleys and James tables. The slimes generally do not undergo any treatment, though there is a round cement table for rich slimes. The settled water is repumped and the consumption is about 1½ tons of clear water per ton of ore.

Copper

There are a great number of copper prospects all over Algeria but very few mines are in operation and even these are small. The deposits do not seem to have any permanence and play out rapidly. A great number of these copper deposits have gray copper in veins where it is associated with iron carbonate, galena and blende. Such is the Mouzaia mine in the province of Algiers, formerly a regular copper producer and now about to be worked for its spathic iron. Other deposits contain copper sulphides associated with galena and blende. An example of these deposits is the Kef oum Teboul mine, 11 km. east of La Calle. The ledge cuts across the Ligurian slates. This once producing and paying mine is now abandoned, probably worked out.

The Ain Barbar mine, 22 km. west of Bona, works on a vein of cupriferous pyrites mixed with zinc blende. The ore is treated by magnetic separators and in the future will probably be smelted in a smeltery to be built near Marseilles.

Another small producing mine is the Djebel Chouichia in Tunisia near Souk El Arba. It works on copper carbonates in limestone near the contact with a bed of hematite. The ores are malachite and azurite and in some places pyrites and gray copper. Smelting is done in two small round water jackets of 30 tons capacity each. The consumption of coke is 13.5 per cent. of the charge. Coke costs 65 fr per ton. Generally silicious flux is used but sometimes the mixture of oxidized ores and pyrites smelts readily without fluxes. The slag assays 33 to 50 per cent SiO_2, and the matte 35 to 50 per cent Cu The antimony and arsenic of the gray copper produce a great deal of speiss. All these products are sold in Italy for the manufacture of copper sulphate

Among the iron mines was mentioned the Djebel Ouenza. This is also a copper mine The copper is found irregularly in different places in the mine as flakes or leads of malachite disseminated through the solid hematite The copper [illegible] seem to be near the contact between the hematite and the limestone and except in one place do not go down far. After a little sorting the ore assays between 2 and 8 per cent. copper. A lixiviation plant was started a few years ago on the banks of the Oued Mellégue, about 4 km. from the mine, but it has not been a complete success. The ore was not crushed sufficiently fine, fuel and acid had to be brought 35 km. from the railroad and were excessively high in price, and the general practice was rather awkward. The tailings assayed 0.75 per cent. copper on an average. It is probable that this plant after being remodeled will be started again when the proposed railroad is completed and the mines worked for their iron

Phosphates

The discovery of phosphates of lime in French North Africa has marked the beginning of a new era, especially for Tunisia. The exports from Algeria in 1907 were 344,575 tons, of which 78,814 tons went to France. From Tunisia the exports for 1907 were 1,065,343 metric tons. In Algeria the most important phosphate country lies around Tebessa, near the Tunisian border. The tricalcic phosphate is found in beds between shales as footwall and limestones as roof, all belonging to the lower Eocene period.

Three companies are working near Tebessa: the Societé Francaise des Phosphates de Tebessa, producing 40,000 tons a year; the Societé des Phosphates du Dyr, an English concern, with an output of 80,000 tons; and the Constantine Phosphate Co., Ltd., a French company under the same management as the Societé Francaise. This last one produces about 220,000 tons per year. Its mines are called the Djebel Kouif and are situated 28 km. east of Tebessa by rail

The phosphate beds have in Dj Kouif an average thickness of 3 m and a gentle slope of 5 to 8 deg The ore is won by open cuts when the overburden is not over 12 m The method of working the beds underground is to take them in two slices by retreating, and then allowing the roof to cave. A miner with three helpers produces 18 to 20 tons per day The company employs in all 800 to 1000 men for a daily output of 800 tons. The mines are so far completely dry and the ventilation is natural. The ore is hoisted in trains of 1 ton cars through an incline by an electric hoist. The Italian miners are paid by cars and make 8 to 15 fr. a day. Helpers are paid 2.5 fr. The mining cost is certainly under 5 fr. a ton The phosphate is dried when the weather permits by spreading over large areas When this is not possible the rock goes through revolving driers, thus reducing the moisture from 8 per cent. to under 4 per cent The freight to Tebessa over the company's railroad costs about 1.25 fr from Tebessa to Bona, over the Bone Guelma reduced the freight

is 7 fr., and from Bona to European ports by steamer, 8 francs.

In Tunisia the biggest producer is the Compagnie des Phosphates de Gafsa, shipping over 800,000 tons a year from its mines at Metlaoui to the port of Sfax over its own railroad. The company has a capitalization of 18,000,000 fr., and must pay, according to its contract with the government, a royalty of 1 fr. per ton with a minimum of 150,000 fr. per year. The ore assays 60 per cent. phosphoric acid.

Near Gafsa, and belonging to the same company, is the Redeyef property with an estimated reserve of 30,000,000 to 40,000,000 tons.

The Ain Moularés phosphate deposit, 25 km. northeast of Metlaoui, is also another property of the same group. It is not to be worked at present, but is developed and a railroad is built to Sousse for the shipping of the products. The beds are almost vertical and give an average assay of 63 per cent. Estimated reserves are 70,000,000 tons; royalty 1.52 fr. per ton, and export duty 0.50 fr. per ton. The Kalaat es Senam mine, belonging to the Dyr company (Glasgow), and the Kalaa Djerda mine in the same region near the Algerian border, add another 20,000,000 tons to the reserves of phosphate ore actually known. Other deposits are being prospected and some development work is going forward.

Pyrite Mining in New Hampshire

By Albert H. Fay

A promising pyrite deposit is being opened and worked by the Milan Mining and Milling Company, near West Milan, 12 miles west of Berlin, N. H. The mine is ¼ mile from the Grand Trunk railway, where there are loading bins connected with the mine by a tram line. The mine has been worked at intervals during the last 30 years. As the ore carries 2½ to 3 per cent. copper, a small furnace was built and operated several years ago. This, however, was abandoned, and the smeltery dismantled.

The orebody consists of lenses of pyrite overlapping each other, varying from 3 to 10 ft. in thickness. The footwall and hanging-wall are composed of micaceous schist. The orebody dips to the northwest with a strike approximately southwest and northeast. The mine is not thoroughly developed, having only about 400 ft. of work on the first level, and about 100 ft. on the second level, which is 215 ft. deep. A large portion of the ore from the first level to the surface has been taken out. How much farther the ore extends along the strike of the deposit has not been proved.

Equipment

The mine is equipped to produce from 50 to 75 tons of ore per day, yielding 25 tons of coarse ore containing 36 to 40 per cent. sulphur, and 20 tons of fines containing 42 per cent. sulphur. Air drills are used, and the mine is lighted by electricity, which is developed at the plant. The mill contains picking tables, crushers, rolls, a Richards' classifier, and all the concentration is made on two Wilfley and three Bartlett tables. The ore is trammed by hand from the mine in mine cars to the storage bin at the railroad station.

Hand Picking

As the ore comes from the mine it is dumped over a grizzly, which consists of 30-lb. rails set inverted, with a space of 3 in. between them. The oversize passes into one bin, and the undersize into a second bin. Hand-picking is conducted on two 24-in. Jeffrey belts. These belts are set parallel with each other, about 3 ft. apart, in order to give ample room for the men to work. As the coarse ore comes from the bin it passes beneath a jet of water, which washes the dust and dirt from it, thus facilitating the work of the pickers. This belt is about 25 ft. long, and travels 20 to 30 ft. per min. The waste material from this belt is thrown into one bin, while the ore is put in another bin. The second-class, low-grade material is placed on the other belt behind the men. The fine ore from the second bin is fed to the belt by an automatic feeder and shaking screen with ⅛ in. mesh. The oversize from this screen passes on to the belt where a small amount of the best ore is taken off by hand. The undersize goes with the crusher products. No water is used on this belt, as it would interfere with the crushing of the ore and the handling of it in the elevators. The remaining ore on the belt, together with the second class from the first belt, goes to a 11x15 in. Dodge crusher set to 1½ in. This installation has only been in operation a few days, and about 50 or 60 tons per day are being picked on these belts by six men. The larger part of the waste is taken out of the ore before it leaves the mine, so that most of the picking is on shipping and milling ores.

When the ore leaves the crusher it passes through dry rolls 14x36 in. set to ½ in. From here it goes direct to a vibrating Newaygo screen. The screen is double and gives three sizes: 3-mesh, 9 mesh and fine. The oversize from the 3-mesh passes to wet rolls and then back to the screen. The 9-mesh and undersize pass to the Richards' classifier, which yields five products. The largest and heaviest ore goes to the two Wilfley tables. The smaller products are concentrated on the Bartlett tables, each table working at all times on the product from one cell of the classifier. All the tables yield only two products, heads and tails.

PLANT OF MILAN MINING AND MILLING COMPANY, MILAN, N. H.

The production of sulphur ore in this vicinity where the pulp mill business is so large, should be a boon to both industries. At present the pulp mills import their sulphur from Louisiana and other places, and the sulphur ore from this mine is shipped to New York. There is room for a scheme whereby the sulphur in this ore could be utilized by the paper mills in the immediate vicinity.

Vice-Consul-General Carl C. Hansen, of Bangkok, reports that petroleum has been found in Kelantan and other ports of the Malay peninsula. In the north of Siam small quantities of the oil have come to the surface in Muang Pang and other places, but so far no attempt has been made to ascertain its commercial value. It is collected by skimming the water which collects in shallow pits dug for the purpose. The oil is black and viscous.

Colliery Notes

In firing a shot at a gaseous face, the depth of the hole should be carefully proportioned to the charge put in; moreover, the hole should be stemmed right up to the face of the coal.

It will result in advantage to a coal company if the management will provide a sufficient supply of proper clay, at the faces, for shot-stemming. This action on the part of a company does not entail any great expense and eliminates much danger.

It is difficult to understand why, at some mines where safety lamps are compulsory, the management permits the introduction of tumbler switches and ordinary open porcelain fuses. Either the lamps, or the electrical fittings, are entirely out of place.

It is of no avail to record a measurement of air passing at a point near the bottom of the downcast shaft. It would not be unfair for the rules or laws of all States to prescribe the point at which the air should be measured. At many mines, less than 20 per cent. of the air entering the downcast reaches the working faces.

The laxity that accompanies inquests into the cause of serious mine fatalities in the United States is notorious. It would seem advisable to supply the coroner with power to call in a disinterested mining engineer to advise him as to what questions he should put. Coroners at present rely largely upon the mine inspector. It is obvious why this is not always best.

It is advisable for a shot-firer always to prepare the cartridge for the insertion of the detonator, before withdrawing the latter from his case. He should then place the charge in the hole immediately. If a detonator is lost, search should be made at once, and no metal tool or instrument should be used in the search. If the detonator is not found, the fact should be reported at once to the superintendent.

In an effort to prevent a serious accident, a miner at an English colliery violated a rule of the mine, and was injured. The judge who heard the case remarked that the man showed courage in preventing what might have been a serious accident, but that in doing so, he was guilty of wilful misconduct, and consequently judgment was given in favor of the colliery company. It is probable no other fair decision could have been rendered, but it is to be hoped that the colliery company treated the miner fairly.

[illegible] be largely [illegible] by American and foreign engineers, and during the past year [illegible] cases our mining engineers have [illegible] to explore [illegible] to gather all possible information. Undoubtedly the [illegible] result of these investigations will be the more general introduction of the longwall system of working our 4-, 5- and 6-ft. seams. This system of working is almost universally used in Great Britain and on the Continent. Its advantage lies in the greater percentage extraction of coal at a probable less cost.

American coal operators are sure to be interested in the outcome or actual effect of the 8-hour act that has but recently become a law in Great Britain. The returns to date show that the first effect of the act has been to reduce the output at the different collieries from 10 to 25 per cent. It is also stated that the proportion of rise in the price of coal is greater than the increased cost of working. The miners' leaders are urging the men to keep up the output, asserting that to not do so will put a weapon in the hands of the employers when the wages agreement is revised.

It is a fact that natural coal dust will not ignite as readily as dust freshly ground from solid coal. This condition leads to the conclusion, that (considering the coal to be of equal fineness) dust nearest the freshly worked face is most explosive. Experiments are now being conducted to determine the increase in the violence of a dust explosion, when a specified increase in atmospheric pressure has occurred. Such an increase in the atmospheric pressure of a mine may result from various unnatural causes, such as a runaway trip of cars, an explosion of powder, or a fall of roof.

One of the most modern and compact types of coke oven is that known in Europe as the Huessener waste-heat oven, consisting of a rectangular chamber having a taper toward one end, and being about 32 ft. long, 7 ft. high, and 1 ft. 8 in. wide. The capacity of the oven chamber is 392 cu.ft. The analysis of 100 tons of coal put into these ovens showed: Fixed carbon, 62.81 per cent.; volatile matter, 29.47; sulphur, 1.30; ash, 6.42. The products obtained from the 100 tons charged were: 70 tons blast-furnace coke; 2½ tons breeze; 721 gal. tar; 1 ton 2 cwt. sulphate of ammonia; 152 gal. 90 per cent. benzole; 240,000 cu.ft. surplus gas—in gas engines to 9600 h.p.-hrs.; 90 tons of steam, of which 60 tons was surplus.

The increase in the value and demand for the by-products of coking coals is continuing at a rate that will soon brand any further waste of these products as the poorest kind of commercial policy. At frequent intervals our attention is being called to new uses for many products formerly not considered worthy of extended treatment. Besides its use for making aniline, benzoline, and other products of the coal tar dye industries, and for enriching water gas, benzol is now being used successfully for motor purposes. It has been discovered that its power in the internal combustion engine is greater than that of gasoline, and the difficulties which formerly existed owing to the formation of soot in the carbureter have been overcome by increasing the admission of air.

Mr. Dowling, of the Canadian Geological Survey, after investigation, says that coals formed under high static pressure are unstable; he points out that bituminous coals high in carbon content, which have required high pressures to produce them, on release from pressure have a tendency to give off gas and to coke when heated. On the other hand, coals low in carbon, such as lignites, or those whose alteration has been accomplished by heat and low pressure—among others, anthracite—will be stable. Mr. Dowling states that the occurrance of blow-outs in the "unstable" coals are not due to the liberation of pockets of compressed gas, but as following the same course as an explosion of dynamite, which is simply the re-arrangement of atoms. The substance of Mr. Dowling's belief is that the combined influences of heat and pressure have acted on vegetable remains in the form of peat, and thus made coal. He offers two formulas for producing coal from vegetable remains: (1) Extraction of CO_2, 30 to 40 parts; extraction of CH_4, 20 to 30 parts; extraction of NH_3, 1 part. (2) Extraction of H_2O, 7 to 9 parts; extraction of CO_2, 1 part. He concludes that both processes proceeded concurrently.

Not nearly enough care is exercised in the handling of powder, and the firing of shots in gaseous mines. At one colliery where this problem has been carefully studied, a few of the rules in force may be summarized as followed: (1) No explosive cartridge shall be cut or opened except by the shot-lighter for the purpose of inserting the detonator. If a cartridge of the proper weight is not available, the shot shall not be fired. (2) If a shot misses fire the shot-firer may, after disconnecting the cable from the battery, examine his cable and connections immediately, but if after this examination he is still unable to fire the shot, the working place shall be fenced off, and a danger signal fixed until after the lapse of one hour. (3) Unless special permission is given by the manager, no charge of explosive exceeding 10 oz. in weight shall be fired. (4) No shot shall be fired in a hole less than 20 in. in depth. Every shot-hole shall, when charged, be thoroughly stemmed throughout the length of the hole, and in no case shall the stemming be less than 15 in. in length. (5) No shot shall be fired in the intakes or main haulage roads except when within 100 yd. of the coal face, unless the permission of the manager is first obtained in writing. (6) Every shot-hole must be carefully cleansed before being charged. Where shot-holes in coal are made with a compressed air or electric drilling machine, the holes, if not a dusty wet, must be cleansed by the aid of water.

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The Nevada Consolidated

The directors of the Nevada Consolidated are making good their promise to render quarterly reports to their stockholders. Although these reports are not characterized by a desirable fullness of detail, they are nevertheless much better than no reports at all. We are therefore inclined to praise the management for telling something, rather than criticize it for not telling enough, but hope as time rolls on it will appreciate the wisdom of greater frankness. Certainly in this case the merits of the enterprise appear to be so good that there is no reason why the stockholders should not be granted all the information that they may desire to have.

With its report for the quarter ended June 30, 1909, this company completed what is practically its first year as a producer. Although it has not yet got its gait, i.e., construction has not been finished and production has not yet attained the contemplated rate, there has been a sufficient approach to the latter to enable us to form an idea as to how the original estimates of cost of production are going to be borne out. The estimates of Mr. Channing and some other engineers were in close agreement at about 7c. per lb., New York, on the basis of direct operating expense, with the probability that the real cost, including maintenance items that are frequently charged to capital account, might be in the neighborhood of 8c. per pound.

The report of the company for the quarter ended June 30 does not afford basis for any minute analysis. It says simply that the production was 9,721,873 lb. of copper, with net earnings of $514,945, or $639,244 if those of the company's interest in the smeltery and railway be included. We may assume that the company realized about 12⅞c. for its copper during this period (the quotational average having been 12.89c.). We may estimate the proceeds from gold and silver as amounting to 0.5c. per lb. of copper. On these bases the gross income for the period would have been $1,300,300, and the cost of production, $785,355, or 8.08c. per lb. of copper. The company realized, however, a profit of $124,209 from its share of the Steptoe Valley works and the Nevada Northern railway, in which a large part of its capital is invested, and that profit figures out to 1.28c. per lb. of copper, making the actual cost of the product only 6.8c. per lb. This is undoubtedly the best showing that has been made in working the disseminated porphyry ores and is a brilliant verification of the engineering estimates in connection with this company.

As we have previously remarked, it is impossible from this quarterly report to form any idea as to whether net earnings may have been improperly swelled by charges to capital account of construction that really belong to operation. However, inasmuch as the equipment and plant are still new, there ought not to have been any large charges for maintenance. On the other hand the results for the quarter were achieved from a production at the rate of only 38,000,000 lb. per annum, which is about 15,000,000 lb. less than what is estimated when the additions to plant that are now under way are completed. A particularly noteworthy feature of the report is the large income from the smeltery and railway. This will increase not only with the extension of the production of the Nevada Consolidated, but also with that of other companies in the district, all of which will pay tribute to the railway at least. When the Nevada Consolidated surrendered a half-interest in this railway to the Cumberland-Ely company it sacrificed a highly valuable asset. The manipulations of the majority interest in that connection excited some forebodings as to the fate of Nevada Consolidated when the operating stage should be reached. We are glad to say that none of the fears have materialized, and although the joint ownership in the smeltery by the Nevada Consolidated and Cumberland-Ely results in some complicated arrangements, the minority stockholders in the former have supreme confidence in their position so long as the general direction of both companies is in the hands of Pope Yeatman.

Aluminum

The break-up in the aluminum market in Europe, which followed the dissolution of the convention of producers some time ago, has had rather disastrous results. The British Aluminum Company is in bankruptcy and its affairs are reported to be in bad condition. On the Continent several of the makers are reported in

similar straits, and two or three have been forced to close down. The competition which has existed forced prices down below the cost of production, it is claimed; and these low prices do not seem to have extended the demand to any such extent as might have been anticipated, unitil quite recently, when some large lots are said to have been taken for electrical work. This has resulted in some advance in prices from the very low point reached at one time, and the various companies are unwilling to make quotations until the situation is further developed.

Meantime efforts are being made to renew the convention or syndicate, which formerly existed, but there are many difficulties in the way, and the success of this movement is still uncertain. The aluminum producers seem to be in a rather difficult position. They cannot induce an extension of production except at a very low profit to themselves; and if they maintain the former profitable prices, consumption does not increase.

In this country during the price war abroad foreign aluminum has been offered at prices as low as the duty would permit. It does not appear that these offers have resulted in any considerable sales or imports of the metal. They did, however, have the effect of reducing prices fully one-third, and thus establishing a new level, from which no great advance will be possible. The lower prices resulted in the placing of some good orders, notably for wire for the transmission of electric power, which are now being filled. Whether aluminum has found a permanent place as a competitor of copper for such work remains to be seen.

The New Almaden Mines

A recent change in the ownership of the stock of the old Quicksilver Mining Company, of California, and the changes in the board of directors have been reported in our columns. These changes have been followed by the retirement of the old manager and other officers of the mines at New Almaden, some of whom had been there over 40 years. The new owners have not announced their intentions, but presumably they intend to try new development and to work the mines more actively, believing that there is still some [illegible] from them.

New Almaden is an historic place in California. It was the first quicksilver mine in the State, and was for many years exceedingly profitable. In the days when amalgamation was universal and the demand for quicksilver good the mines were operated on a large scale, and without much regard to expenditure. New Almaden was one of the show places of California, and was noted for its buildings and for the lavish hospitality of its managers. A trip to the State was not complete without a visit to the place and its mines.

Gradually, however, the higher grade ore was worked out, the change being most fully felt when the demand for quicksilver began to fall off. The ore left was of very low grade and required careful working and close attention to costs of mining and reduction. Other quicksilver mines were opened and worked, and became of greater importance. For years past New Almaden has been almost forgotten.

Old Californians will be interested in the future of the mine under its new management; but it is hardly to be expected that it will regain its former importance. Certainly it will never hold its old spectacular position.

The so-called anti-dredging convention in California, to which reference has been made in our columns, was one of those movements started by the large class of people in that State who seem, for various, or unaccountable reasons, to be opposed to the mining industry. In this case the movement amounted to very little. The convention was not attended by any representative persons, and its sole outcome was the appointment of a committee to investigate dredging methods and to "expostulate" with the dredgemen should anything be found of a nature damaging to other interests. As the convention adjourned without day, this committee will have nobody to report to, and it is not likely to have much influence.

The agitation against the smelters in California has broken out again in a small way. The fruit growers in Happy Valley, in Shasta county, have formed an organization to force the smelting companies at Coram and Kennett to use smoke consuming devices. The farming community so [illegible] the nearest point 12 miles in an air line from one of the smelteries and [illegible] miles from the other. The claim is made that the fumes are of a more damaging nature than those from the Keswick smeltery were, since the two plants mentioned treat considerable quantities of Nevada ores carrying arsenic. It is thought that the trouble can be easily arranged.

In drilling for lead or zinc, either by churn drill or by diamond drill, it is advisable to assay the cuttings or core, because such a record is vastly superior to the indefinite record of "a few shines," or "specks of lead," etc. However, it must be recognized that no matter how carefully the cuttings or core be collected, the assay result is likely to be misleading through errors in assaying, the ordinary commercial methods being more or less dubious upon samples of ore containing very small percentages of these metals. If anyone is doubtful as to this, let him send the same sample to three or four assayers.

The zinc miners are rejoicing in the higher scale of prices for ore that the new tariff has conferred. The zinc-smelting industry is still all at sea and does not yet know where it will land. If price for spelter continues high, the smelters may resume importation of Mexican ore and pay the duty. Something will depend upon whether they will have to pay duty on the metal that is lost in smelting, and also upon the lead—a deleterious impurity—that occurs in some of the ore. We marvel that they do not also have to pay on the iron content, iron also being a protected substance.

California towns are receiving the first consignments of pig iron made on a commercial scale in the electric furnace in this country. The plant furnishing the iron is at Heroult, in Shasta county, and has a present capacity of 25 tons daily. The cost is not stated, but it is sold at a lower price than eastern iron brings in San Francisco.

The strike of the miners employed by the Pittsburg Coal Company, if not quickly settled, is likely to be embarrassing to the trade. September is the month when the heaviest shipments are made to the Lake ports to supply the northwestern demand, and if the strike continues, these must be made chiefly from other districts.

Chronology of Mining for August, 1909

Aug. 2—The United States Smelting, Refining and Mining Company obtained modified injunction permitting it to smelt copper and other ores in the Salt Lake valley, under certain restrictions, including the baghousing of the fumes and neutralizing of acid gases.

Aug. 3—Announcement of the purchase of the Tula iron properties in the state of Jalisco by the Mexican Iron and Steel Company, which is controlled by Boston capitalists.

Aug. 5—At Cordova, Alaska, a $50,000,000 mortgage was filed by the Copper River & Northwestern railroad, a Guggenheim corporation, in favor of the Standard Trust Company, of New York, this being the largest mortgage ever filed in Alaska.

Aug. 6—New United States tariff law became effective, having been signed on the preceding day by President Taft.

Aug. 7—Preliminary proceedings for foreclosure of mortgage on Newhouse Mines and Smelters Corporation property in Beaver county, Utah, in accordance with the plan of reorganization.

Aug. 10—Strike of United Mine Workers results in the closing of the Spring Hill coal mines in Nova Scotia.

Aug. 11—Title to the various powder mills of the Laflin & Rand Company passed to the E. I. Du Pont de Nemours Power Company, which has had a stock control since 1902.

Aug. 12—The timber and mineral lands of the Sierra Madre Land and Lumber Company, formerly owned by Col. W. C. Greene, were transferred to the F. S. Pearson Syndicate, the consideration being $2,000,000.

Aug. 21—During this week, zinc ore in the Joplin district touched $51.50 base, the highest price since the summer of 1907.

Aug. 23—The merger of the principal Canadian producers of portland cement completed by the organization of the Canadian Consolidated Cement Company with headquarters at Ottawa.

Aug. 25—Lake Superior Mining Institute convened at Ishpeming, Mich., for the fourteenth annual meeting, a 3-day session on the Marquette range.

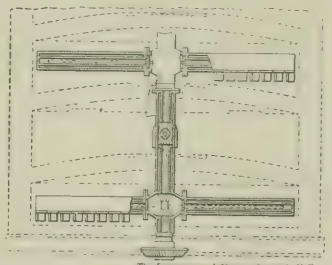
Aug. 28—Formal announcement of organization plans of the Black Lake Consolidated Asbestos Company, Ltd., consolidating a number of the leading producers in the Black Lake-Thetford district in the province of Quebec.

Aug. 29—Serious floods in the vicinity of Monterey, Mex., interfered with transport of ore.

The Union Railroad, the industrial road of the Carnegie Steel Company, has placed an order with the Pressed Steel Car Company for 400 steel underframed box cars.

Roasting Furnace

Frank E. Marcy, of Salt Lake, in U. S. Pat. 920,971, of May 11, 1909 (assigned to Frank Klepetko, of New York), describes a proposed improvement for roasting furnaces involving the air-jacketing of the rabble arms and shafts of McDougall or other types of roasting furnaces. The object of the invention is to prevent undue reduction of the furnace temperature by the cooling water. As shown in the accompanying illustration, Mr. Marcy's arrangement contemplates the interposition of a jacket of air between the part through which the water circulates and the furnace interior, so that the water-cooled walls will not come in direct contact with the charge. The air jacket is thus intended to keep the rabble apparatus at a sufficiently low temperature to resist the disintegrating and destructive effect of the heat of the furnace operations, to economize in the quantity of water necessary and to prevent undue abstraction of heat units from the charge by irregularities in the water supply.



MARCY ROASTING FURNACE

Smelter Fumes in California

SPECIAL CORRESPONDENCE

The farmers in Shasta county, California, who are organizing in all the school districts against "smelter fumes" say that they have no desire to see the smelting works closed down, but wish to force the companies to control the smoke and fumes. The units of the district associations are to form a county protective association. Meantime some of the Shasta county copper companies, notably the Mammoth, are purchasing easements from landholders, by which the latter relinquish all future claims against the companies for damage from fumes. The companies pay from $50 down and $50 per year to $200 down and $100 a year for these easements. A proviso is inserted in the agreements that the farmers are to receive a specific sum each year until the company constructs devices which put an end to the nuisance. Strange to say, a number of owners of mining claims five miles from the smeltery sold to the company easements of this character. Some men nine miles in an air line southeast or southwest from the smeltery have received $200. One man 13 miles southwest of the smeltery was paid $50. Most of the easements are from farmers close to, or within a few miles of the smeltery.

The contempt charges against the officials of the Selby Smelting and Lead Company were not heard at Fairfield, Aug. 20 as expected, the proceedings being delayed pending ruling on motion for a new trial. The attorneys of the company were prepared to show that they had not violated the injunction as charged. The company claims that very few farmers or residents of towns have made complaint and that damages have been greatly exaggerated. It has, however, endeavored to minimize smoke nuisance by the adoption of appliances to that end.

The organization of the Black Lake Consolidated Asbestos Company has been practically completed, the following mines situated in the serpentine belt of the Black Lake-Thetford district being included in the merger: Union Asbestos; Southwark; Black Lake Chrome and Asbestos Company, and a controlling interest in the Imperial Asbestos Company. These have a total area of 5385 acres. The company will have a capitalization of $3,000,000 common and $1,000,000 noncumulative 7 per cent. preferred stock, together with $1,500,000 bonds, of which $1,000,000 will be immediately issued and the remainder held in the treasury for future requirements. When the bond issue is placed the company will have $500,000 available for equipment and development. The merger includes nearly all the working asbestos mines not in the Consolidated Asbestos Company.

The trade of Germany in zinc and zinc material is reported as below for the half-year ended June 30, in metric tons:

	Imports		Exports	
	1908.	1909.	1908.	1909.
Spelter	14,391	17,753	29,907	32,658
Zinc scrap	190	42	2,894	2,778
Zinc sheets	795	1,186	8,057	8,859
Zinc dust	517	407	1,155	1,529
Zinc oxide, etc.	3,983	3,526	12,435	12,680
Zinc ores	91,574	93,049	8,047	8,924

The larger exports of spelter were 12,252 tons to Great Britain, 9480 to Austria, and 3096 to Russia. There were 1030 tons shipped to the United States.

The Gotthard works at Bodio, in the Canton Tessin in Switzerland will begin the production of ferrosilicon in the electric furnace in November. This is a new plant and has available 30,000 electric horsepower, developed by the Biaschina river. It is a new concern, and is independent of the ferrosilicon pool which has its headquarters in Paris.

Determination of the Velocity of Gas with the Pitot Tube

By O. E. Jager and Geo. C. Westly*

Since "smoke-farming" has become such a lucrative business the determination of the amount and nature of the gas passing out of a smelter stack has become proportionally more important. One of the main factors is the determination of the velocity, for which purpose an anemometer is quite unreliable. The present article deals with the determination of the velocity in a flue by means of the Pitot tube.

The Apparatus

The Pitot tube was first used for measuring the velocity of water, but of late years has been applied to the measurement of the velocity of gases. Beyond a few papers in the proceedings of various engineering societies, information on its use is scarce, though the work of Messrs. Klepinger and Burr at Great Falls, Mont., has done much to throw light on the subject of its use. Essentially it is a device for measuring the velocity of a stream of water or gas by means of the velocity head produced, and consists of two tubes, one of which is straight, and the other bent in the shape of an L. The straight tube measures static pressure only, while the bent tube (the horizontal part of the L being turned toward the flow of gas) measures both static and velocity pressure. By connecting these two tubes to the two ends of a U tube manometer the static pressure is neutralized, so that the manometer shows only the pressure due to velocity.

The tubes may be of any length to suit conditions, a handy form of instrument being shown in Fig. 1. Quarter-inch pipe is used, but light brass pipe is more easily handled, especially if the tubes have to be of greater length. *A* shows the static-pressure tube. There are several forms of pressure end, but this one has been chosen on account of its simple construction, and will be found reasonably accurate except for high velocities. Ordinary straight tubing will not do for the static-pressure tube as the pressure is affected by the velocity, the suction action increasing as the velocity increases. Any form of pressure tube, the end of which causes a deflection of the lines of the gaseous stream in passing it, will affect the results obtained.

The velocity tube *B* has its lower end turned up at right angles. The same result is obtained by threading the end and screwing on an elbow. The two tubes are generally bound together as shown at *C*, or screw clamps or collars may be used on each tube, a mark being placed on the tube so as to show when the end is in the proper position in the flue. The tubes must hang vertically when put in through holes in the roof of a flue.

The manometer is shown in Fig. 2. An ordinary U-tube makes accurate reading difficult owing to the continual oscillation of the liquid. The manometer shown in the sketch has two advantages. The end of the tube below the level of the liquid is drawn out to a fine point, thus steadying the variations of pressure and enabling an accurate reading to be taken; also the tube on which the readings are made, having a good diameter in comparison to the bottle (which is really the other leg of the U-tube), it is necessary to note only the deflection on the tube, the corresponding deflection in the bottle being negligible. The manometer thus reads direct. In this case the diameters of the tube and bottle are in the ratio of 0.0938 to 3, so that a rise of 1 in. in the tube would mean a fall of only 0.00098 in. in the bottle. A paper scale *A* is placed behind two strips of tin, *B* and *C*, which are screwed upon the board. This allows the scale to be moved up or down to adjust to zero. Good cross-section paper divided into tenths of an inch can be used for the scale. Each tenth is divided into halves, so that hundredths of an inch can be estimated by the eye.

Method of Operation

If the flue in which the velocity is required measures 15x12 ft., to get the average velocity it must be divided up into equal sections as shown in Fig. 3. The Pitot tube is then placed inside the flue and readings taken in each of the positions indicated by the numerals, thus giving 15 readings to be averaged. A place in which the flue has a good straight run should be selected so as to avoid eddy-current effects which may give minus readings. These must be rejected when making the average. The static-pressure tube need not be moved across the horizontal sections, but may be left hanging in positions 3, 8 and 13 while the velocity tube is placed at all the points, care being taken that the pressure tube does not get in front of, or otherwise interfere with the flow of gas to the velocity tube.

When using the tubes separately in this way, a collar or clamp is screwed on so that it holds the tubes at the prop-

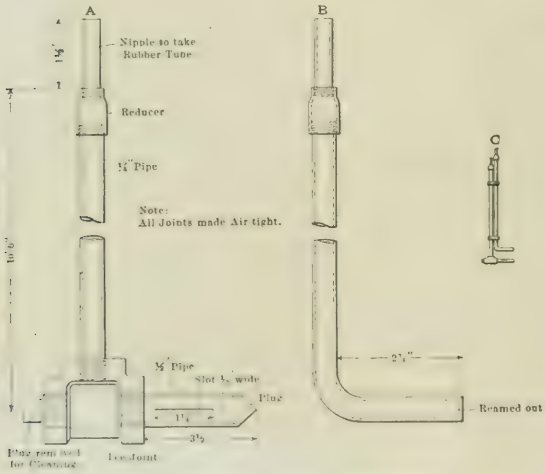


FIG. 1. SECTIONAL VIEWS OF PITOT TUBE

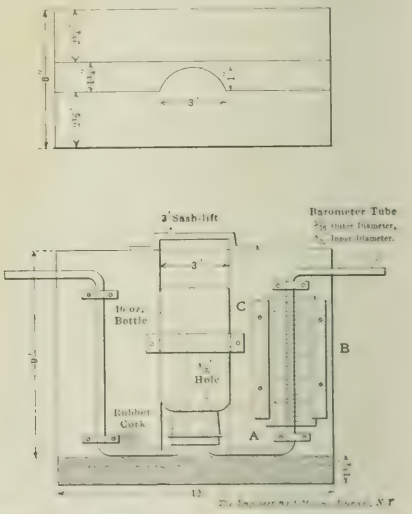


FIG. 2. MANOMETER ARRANGED FOR PRESSURE READINGS

*McGill University, Montreal.

er positions inside the flue. The holes in the roof need not be more than 3 or 4 in. square. Rubber tubes are used to connect the two members of the Pitot to the two glass tubes on the manometer. The temperature of the gases whose velocity is being determined must be obtained at the point where the Pitot readings are made. A thermometer or pyrometer is needed for this. A sample of flue-gas for anaylsis can be taken while the readings are being made. The barometric pressure must also be obtained at or near the same point, at the same time.

For ordinary purposes the best liquid to use in the manometer is grain alcohol, as it is less dense than water; thus giving a greater deflection on the scale. The specific gravity of the alcohol must be determined before using.

Calculation of Velocity

We are now in possession of sufficient data to apply the velocity formula $V^2 =$

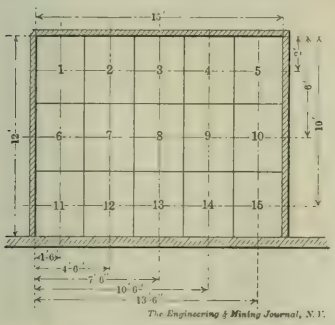


FIG. 3. METHOD OF DIVIDING UP FLUE FOR TAKING OBSERVATIONS

$2gh$, where: g=acceleration due to gravity = 32.16, and h = hight in ft. of the column of gas that produces the velocity V (expressed in ft. per sec.). From the manometer is found the hight of a column of alcohol due to the velocity. Therefore, knowing the specific gravities of both the alcohol and the flue-gas, the hight of a column of gas equivalent to the column of alcohol, h, can be calculated.

Suppose the following data: Temperature of flue-gas = 285 deg. C. Barometer = 27.95 in. = 710 mm.; average of manometer readings = 0.25 in. = 1/48 ft. of alcohol. Specific gravity of alcohol = 0.81. Analysis of flue-gas: CO_2, 9.8 per cent. by volume; N. 79; O, 10.5; SO_2, 0.7; total, 100. From the analysis of the gas we obtain its specific gravity thus:

Bringing volumes to weights:

$$9.8 \times 22 = 215.6$$
$$79 \times 14 = 1106.0$$
$$10.5 \times 16 = 168.0$$
$$0.7 \times 32 = 22.4$$

Dividing sum by 100 = 15.12 = sp.gr. relative to hydrogen. Hence molecular weight = 30.24. At zero deg. C. and 760 mm. pressure 22.3 liters of flue-gas will weigh 30.24 grams. At 285 deg. C. and 710 mm. 22.3 liters =

$$\frac{22.3 \times 558 \times 760}{273 \times 710} = 49 \text{ liters. Therefore:}$$

49 liters of gas weigh 30.24 grams or one liter weighs 0.617 gram.

But 1 liter of alcohol weighs 810 grams or is 1313 times as heavy as the gas. Therefore hight of column of gas equivalent to 1/48 ft. of alcohol = $\frac{1313}{48}$ = 27.34 ft. Applying the formula $V^2 = 2gh$ gives: The velocity of the flue-gas, $V = \sqrt{2 \times 32.16 \times 27.34} = 41.93$ ft. per sec. = 2515.8 ft. per min. This method of determination is applicable to any set of conditions.

The Lake Superior Mining Institute

Special Correspondence

The fourteenth annual meeting of the Lake Superior Mining Institute began at Ishpeming, Mich., Aug. 25. The morning of Aug. 25 was devoted to registering and distribution of badges. A short trip to the Maas mine at Negaunee was made before lunch. Upon returning from the mine the party went direct to the golf club house where the ladies of Grace Episcopal church served a lunch. In the afternoon all the members of the institute witnessed a baseball game, played by Ishpeming and Negaunee.

The evening session was held at the opera house. The meeting was called to order by M. M. Duncan, president of the institute, and in his address he called attention to the urgent necessity for a change in the laws governing liability for personal injury. He discussed briefly the German insurance system, and the English system as governed by the employers' liability act and the compensation act.

Committees for the nomination of officers and other purposes were appointed.

Papers

The following papers were presented at this meeting:

1. "How Reforestation May be Applied to the Mine Timber Industry," by Thomas B. Wyman, Munising.
2. "Mine Accidents," by John T. Quine, Ishpeming.
3. "The Sociological Side of the Mining Industry," by W. H. Moulton, Ishpeming.
4. "Biographical Notes," by J. H. Hearding, Duluth.
5. "Reminiscences of the Early Days on the Marquette Range," by George P. Cummings, Marquette.
6. "Historical Sketch of Copper Mining on Lake Superior," by Alfred Meads, Marquette.
7. "Code of Mine Signals, Cleveland-Cliffs Iron Company," by O. D. McClure, Ishpeming.
8. "Capillary Attractions in Diamond Drill Test Tubes," by J. E. Jopling, Ishpeming.
9. "Sinking Reinforced Concrete Shafts through Quicksand," by Frederick W. Adgate, Chicago.
10. "A Diamond Core Section of the Mesabi Rocks—No. 1," by N. H. Winchell, Minneapolis.
11. "Wood Preservation with Especial Reference to Mining Timbers," by John M. Nelson, Jr., U. S. Forest Service, Washington.
12. "Iron Ore and the Tariff," by H. Olin Young, Ishpeming.

The Meetings

The papers by Messrs. Jopling, Hearding and Cummings were read at the Wednesday evening session. A short talk was also given by William Kelly, general manager of the Penn Iron Mining Company, Vulcan, Mich., on the construction of the Bryer Hill concrete-lined shaft, now 700 ft. deep.

One of the principal features of this meeting was that the social side of life was not neglected. No business sessions were held during the day-time. In fact, it was a pleasure outing from start to finish. Two special trains left for Marquette early Thursday morning, and a short visit was made at the Queen mines of the Oliver Iron Mining Company. At Marquette the plants of the Pioneer Iron Company and the Lake Shore Engine Works received visits prior to a lunch served by the latter company on its grounds adjoining the lake. An opportunity was given all members to go by the steamer "Minnie M" to Munising. An enjoyable 40-mile lake ride ended at Munising, where supper in the dining cars was awaiting the members.

The evening session was held in the Alger county court house, at which the papers by Messrs. Wyman, Quine and Nelson were read. The others were presented by title only.

At the close of the session Thursday evening the election of officers took place, and the treasurer's report was read. The report shows that the expenses for the year were a little over $3000, while cash in treasury is $4510. The secretary's report showed that at the close of the year the institute had a membership of 511; new members received during the year, 72. Forty-one new members were elected at this meeting.

The following officers were elected: President, D. E. Sutherland, Ironwood, Mich.; vice-presidents, J. M. Bush, Ironwood, Mich.; F. W. Spurr, Houghton, Mich.; J. H. Rough, Negaunee, Mich.; managers, W. J. West, Hibbing, Minn.; C. F. Lawrence, Iron Mountain, Mich.; treasurer, E. W. Hopkins, Commonwealth, Wis.; secretary, A. J. Yungbluth, Ishpeming, Mich. After adjournment a reception for the members was given at the Beach inn by the Munising Business Men's Club.

Friday morning was spent in visiting the industrial plants of Munising, which included sawmills, pulp mill, tannery and veneering works. Launches were also provided and a number of the party went to Grand island to visit the game preserve maintained there by the Cleveland Cliffs Iron Company.

The afternoon was spent in making a hurried trip through the Swanzy district, where the Cleveland Cliffs Iron Company is doing a large amount of development work. The new model town of Gwinn entertained the party for a short time. The institute train returned to Ishpeming at 6 o'clock, and the meeting adjourned. About 300 members and guests were in attendance.

Conditions in the Transvaal

SPECIAL CORRESPONDENCE

At the annual meeting of the Central Mining and Investment Corporation held in London recently, the chairman, Sir Julius Wernher, after describing the operations of the company, made an interesting speech in which the general situation of the gold-mining industry of the Transvaal was reviewed. Although great progress has been made during the last few years, he is of the opinion that a further expansion of the industry and a further reduction in costs may be looked for. The organization into larger units than formerly has proved advantageous and it is expected that as time goes on the benefits derived from the amalgamation policy will be more marked. The change from steam to electric power which will be distributed to the mines from large central power stations will, it is hoped, decrease the cost of power.

The improved agricultural position of the colonies may also be expected to benefit the mines, as it will tend to reduce the cost of transportation. Up to the present, the exports of South Africa have been but a fraction of the imports and trains have come down empty from the interior and the ships have had to leave in ballast. If mealies, oats and coal can be exported and perhaps, in a few years, cattle and sheep, the high rates now charged by the railways and ships will no longer be justified.

With a reduction in the transport rates, a reduction in the cost of living may be confidently awaited, a result which should lead to increased immigration. A few years ago, owing to the high cost of living, many of the industrial population kept their families in Europe. With a reduction in the cost of living, the necessity for this undesirable state of things will cease. One of the dangers of South Africa is the swelling of the white population, as compared with black, and it is, therefore, of great importance that the cost of living, which affects so strongly the immigration of Europeans, should be reduced as much as possible.

The native labor question has again given rise to considerable apprehension, as there has been a falling off in the number of natives recruited. But on this important point, Sir Julius is not despondent, pointing out that at this time of the year the labor supply always shows a decrease and that the loss is, after all, only a small percentage of the total supply. A slight extra efficiency of the native would soon put the matter right and having regard to the fact that since the introduction of the Chinese, the standard of the work done by the native has improved, it does not seem unreasonable to count on some improvement in his efficiency in the future.

LABOR

According to the official record, the natives employed in the gold-mining industry in July, 1908, amounted to 149,000 plus 19,000 Chinese, total, 168,000. In May, 1909, the total was 189,000, and in June there were 176,000 natives and 5500 Chinese, total, 181,500, so that at the end of June the figures were not far below the maximum.

It has frequently been contended that any serious shortage of natives could be met by the increased use of machine drills to the improvement of which much attention has recently been paid. At the present time a competition is in progress for substantial prizes offered by the chamber of mines. But machine drilling, except in wide stopes, is more expensive than hand drilling and consequently a shortage of native labor cannot be met by the increased use of machine drills, without an increased cost of working.

Sir Julius' statement on this point, which must be founded on the advice given by his technical advisers, is important. It indicates that the small stope drill, which is so much wanted, has not yet been found. The numerous tests and competitions appear to have failed in evolving a satisfactory machine. There has undoubtedly been an improvement in this direction, but no satisfactory machine for replacing hand labor has as yet been produced.

New Dredges in California

SPECIAL CORRESPONDENCE

Boston capitalists have bonded about 2000 acres of land in the vicinity of Centerville, 10 miles from Chico, in Butte county, California, and are to finance the property as a dredging venture. The lands bonded go on Butte creek, and above the point where there is already a dredge in operation. Boring operations will at once commence.

L. G. Van Vector and associates, of Oakland, have been making surveys of the lower Klamath river with a view to making arrangements for putting a dredge at work. It is believed that the bed of the Klamath carries large quantities of fine gold washed down from the tributaries and by the cutting of the main river itself. Mining operations have been going on along the river for 60 years and much gold has been taken from the placers. More or less of the finer gold has doubtless been carried down in the freshets with the fine sands and gravels. No dredging has ever been done in the river to amount to much, the stream being torrential in the winter months. There is doubtless a good field for dredging operations at points on the river where the machines may be protected during flood periods.

James and Samuel Sample and L. Briscoe and associates, of Fresno, have acquired a large tract of land a short distance from Weitchpec in Humboldt county, on the Klamath river. Machinery is being put in and the operations are expected to be quite extensive. A number of men have already been set at work.

Ray Consolidated

According to the *Boston News Bureau*, a leading interest in Ray Consolidated has made the following statement:

"The Guggenheims and their immediate friends undoubtedly own a majority of the stock of the Nevada Consolidated and have a majority in the board of directors. The Guggenheims have about 35 per cent. ownership in the stock of the Utah Copper Company, and have a minority representation on the board. Their relations with the other directors, however, are most friendly and cooperative, and as they are in the copper smelting and copper-selling business and are willing to make fair terms, it is only natural that they should be the agency for a company in which they are a large shareholder.

"The Guggenheims have no interest, known to the directors, in either Ray Consolidated, Gila, or Chino, and while there might be a concealed interest, we have the best of reason to believe that such is not the case.

"The man who stands most prominent in the development of these low-grade porphyries is Daniel C. Jackling, who is the operating head of Utah Copper, Ray Consolidated, Gila and Chino. Associated with him, more particularly in the engineering end, are A. Chester Beatty, and, in the executive end, Charles M. MacNeill. In addition to a number of intimate personal associates these gentlemen are closely identified with the banking houses of Hayden, Stone & Co. in New York and Boston, and Shove, Aldrich & Co., in Colorado Springs. Sherwood Aldrich is president of both Ray and Gila, and his partner, Mr. Shove, is treasurer."

Details of Practical Mining

Notes of Interest to the Operators of Small Mines as Well as of Large Mines. The Things That Have to Be Done in Everyday Mining

REPORTS FROM EXPERIENCE

Readers of the JOURNAL are invited to contribute to this department. Articles should be brief, thoroughly practical, and preferably illustrated by drawings or sketches. Our draftsmen will prepare properly any kind of a pencil sketch that is intelligible. Something that is an old story in one district may be quite unknown in another. Articles accepted and published are suitably paid for.

Chute and Gate for an Ore Bin

The chute shown in Fig. 1 is one of six in the bottom of a 1000-ton bin, 30 ft. in diameter and 20 ft. deep, used by Witherbee, Sherman & Co. The chutes are placed in two rows of three each, and

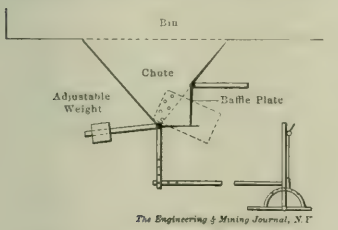


FIG. 1. CHUTE USED BY WITHERBEE, SHERMAN & CO.

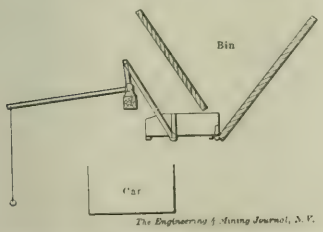


FIG. 2. CHUTE USED BY THE VERMONT COPPER COMPANY

are operated by levers, as shown. The six levers are on a small platform at one side of the bin and are operated by one man without changing his position. The gate proper, when closed, is in a horizontal position and is partially balanced by a weight on a piece of ½x2½-in. steel bar 2½ ft. long. The baffle plate is held in position by means of an iron bar, to which a weight may be attached if necessary. The baffle plate prevents the larger pieces of ore from scattering too much as they leave the bottom of the bin. The plate is about 16x30-in., and the gate is of like dimensions. With three of these chutes open it is possible to load a 40-ton car in 1½ minutes. The ore for which this chute is used has passed through a 3-in. grizzly, so there are no exceedingly large lumps to choke the gateway. Rectangular pieces of steel are riveted on the sides of the chute to form cheeks which prevent the ore from spreading too much as it leaves the bin. The chute shown in Fig. 2 is one that is used by the Vermont Copper Company, South Strafford, Vermont.

Device for Preventing Vibration of Assay Balance

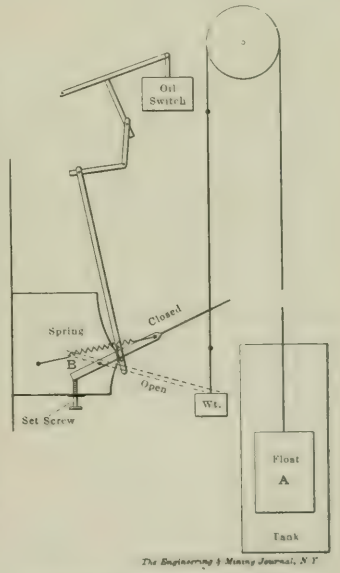
By GEORGE A. JAMES*

I have had in use a simple little device for preventing the vibration of chemical and assay balances, which has been so valuable to me that I think it will be of interest to other assayers and chemists. By placing a small piece of rubber under one leg of the balance, all ordinary vibration is overcome. We use a piece of rubber, cut from an ordinary rubber band, about ½ in. square, which is placed in the cup of the glass base, usually used under the legs of the balance. The balance thus represents an immovable body, as compared to the movements transmitted through the elastic medium, represented by the rubber.

It is important that the rubber be placed only under one leg. Our balances are on benches, resting on floors, with no degree of solidity, and yet cause as little trouble as would occur had we built brick pedestals to solid foundation. I have even used this method on floors over moving line shafting without any great inconvenience. It has occurred to me that a similar contrivance could be used to advantage for small telescopes, etc.

An Automatic Cut-off for Electric Pumps

The device shown in the accompanying illustration has been in use by Witherbee, Sherman & Co., at Mineville, N. Y., more than three years and has operated satisfactorily. It is used on a three-plunger electric pump for handling mine water intermittently from a large sump. A float A, an 18-in. cube, is constructed of sheet copper and is placed in a tank connected with the sump. A cord is attached to the float and operates over a pulley with a weight suspended on the other end. The cord has two clamps securely fastened, one above and the other below a slotted lever arm. As the water rises in the sump the float in the tank will also be elevated. The rope passing through the slotted lever arm will, when the clamp comes in contact with it, carry the arm down to a point past the center, when the tension spring *B* operates instantly, and thus closes the circuit, which starts the motor and pump. As the water is lowered, the cord is reversed and the



ARRANGEMENT OF AUTOMATIC CUT-OFF

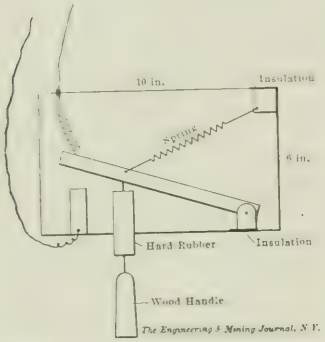
lever is driven past the center when the spring again acts automatically and opens the switch. The scheme here used is in connection with an oil switch, yet could be used with an air switch when using only a small current, or with carbon contacts. However, for heavy current the oil switch should be used. The levers are adjustable so that the desired motion is given. The advantage of this cut-off is that it acts automatically and very little attention other than an occasional oiling need be given the pump. The first cost of the equipment is much less than the solenoid type. The mechanism is simple

*Assayer and chemist, 28-32 Belden place, San Francisco, Cal.

and can be inclosed so that the little moisture that reaches the parts does not injure the apparatus.

Mine Signal Switch

The accompanying illustration shows a spring switch used in connection with an electric signal system. It is built in a metal box 6x10x5 in. deep with a hinged door on one side. When giving signals

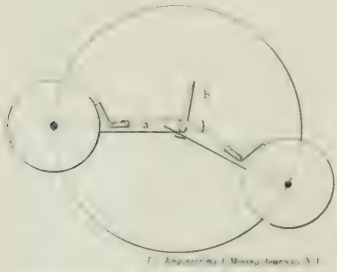


SPRING SWITCH FOR ELECTRIC MINE SIGNAL

the operator catches hold of the wooden handle that hangs below the box, pulls down, and the spring in the box breaks the circuit as soon as the operator releases his hold. The signal system, which is used in connection with this switch, flashes a light in addition to ringing the gong

Overwinding Bell Signal

A signal used by the Port Henry Iron Ore Company is shown in the accompanying illustration. The dial is 30 in. in diameter and has two 10-in. gongs at-

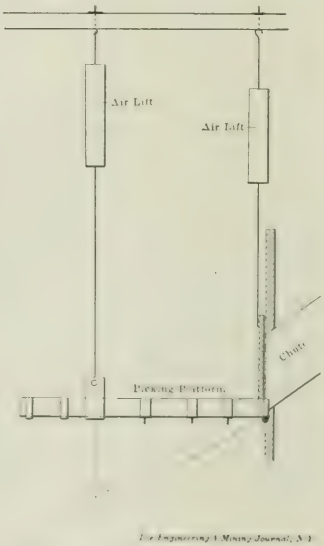


ARRANGEMENT OF GONGS FOR OVER-WINDING SIGNAL

tached to adjustable arms. The gongs are so adjusted that they will ring about 10 ft before the skip is ready to dump. The hammer a that strikes the gong is tripped by a pointer b which is operated by a worm gear, connected with the winding drum. The signal referred to is used on a balance bucket hoist, and when the movement of the drum is reversed the pointer turns backward and operates the other gong. The end of the hammer at *a* is attached to the main part of the hammer by a thin spring on the top which acts as a hinge to allow the pointer to pass the hammer on its return.

A Movable Picking Floor

A picking floor of the following description is used by Witherbee, Sherman & Co. for hand-picking large ore that will not pass through a 6-in. grizzley. It consists of a movable ore chute 5 ft. wide and 12 ft. long, built of heavy sheet iron, with sides 1 ft. high. One end is supported or hinged just below the chute from the ore bin. The platform is practically level, and a ton or more of lump ore is discharged upon it at a time, and



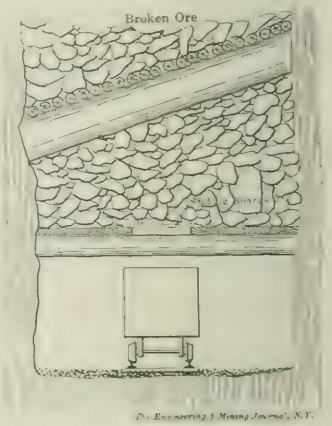
COMBINED CHUTE AND PICKING PLATFORM

two men pick out the barren rock. When the platform is full of ore, the outer end is lowered by an air-hoist and the ore slides directly into the car for shipment. The second-class ore is tossed to a car on an adjoining track, while the waste rock is disposed of by means of a bucket suspended from a carrier which operates on an I beam.

Chutes for Ore-filled Stopes

One of the drawbacks to the use of the shrinkage system of stoping is the trouble caused by large boulders obstructing the chutes. It is not always possible to break the boulders in the stope before they are covered with muck, and the history of an ore-filled stope is usually one of continuous blasting and barring at hung-up chutes. Further, in a stope of considerable width, the chute opening does not usually extend across the whole width of the stope and the withdrawal of ore causes unequal settling at the top of the pile.

A chute which overcomes these disadvantages is described in the *Aust. Min. Stand.* (June 23, 1909) by Percy Rolfe. It goes by the name of "chinaman," and is extremely simple in design, and effective in operation, consisting merely of a plat-



THE "CHINAMAN"

form erected beneath a hole in the lagging between two stulls. The lagging is open for the full distance between two adjacent stulls, and also from wall to wall. The ore, having a free passage through the aperture, forms a heap on the platform below in the rough shape of a truncated wedge, the sides taking up the angle of repose of the broken rock.

The platform allows the passage of a car underneath, and is constructed with loose boards in the center, as shown in the accompanying sketch.

It is an easy matter to fill a car from this platform by moving one of the loose boards, and the "chinaman" has the advantage that it never hangs up or gets choked, as is frequently the case with chutes possessing sliding doors. Any big rocks, which must inevitably get covered over sometimes in the stope, come through the "chinaman" quite freely, and when on the platform they can be broken with a hammer, or, if too big, they can be "popped" with dynamite without danger to the chute. This chute requires no repairs; its only defect is the necessary reduction in the height of the level at the point where it is erected. The "chinaman" possesses the advantage that the ore which is run into the car is not subjected to any pressure from the rock above, which makes the sliding door of the ordinary chute difficult to manipulate

Smelting Gold Precipitates and Bullion with Oil Fuel*

By Arthur Yates*

At the Redjang Lebong gold and silver mine, Sumatra, we have a 70-stamp battery with cyanide works, and our precipitation in the latter is done in the usual zinc boxes, the extractor-house equipment including an acid treatment tank for "shorts" only, a filter press, and a calciner, the latter dealing with both the nonacid-treated precipitate and the acid-treated "shorts." We find that good washing and good calcination materially affect the amount of matte produced in the smelting of the precipitate from the "shorts."

Tilting Furnaces Used

The smelting of both precipitates is carried out in two tilting furnaces, also called Balbach or Faber du Faur furnaces; these find an application in the metallurgy of zinc, and I believe were first used in connection with the gold precipitates of the cyanide process in Western Australia.

The inside measurements of a retort are: mouth, 6½ in.; greatest diameter, 13¾ in.; bottom diameter, 9½ in.; length, 30 in. The mouth is closed during smelting with the stand of a No. 50 salamander crucible. The retort sits in the furnace at an angle of 30 deg. to the horizontal.

The furnaces, as supplied by the maker, were bricked in on top and covered with a casting having a central fuel-feed door. This arrangement threatened us with considerable work and expense every time a retort had to be changed, also with bad distribution of the fuel and troublesome stoking, besides interfering with the partial turning of the retort, which is necessary every day of service, to prevent cutting through on the metal line. So we improved it by closing in the top with three loose arches of firebrick, the bricks of each arch being clamped together with a strap of 3x½-in. flat iron with a ring bolt over the center by which it may be lifted. We also placed a large, loose fireclay tile over the neck of the retort within the front plate casting. These adjustments enable the retorts to be changed quickly and without expense. In case a retort should crack or cut through, there is a 2-in. hole plugged with ore slimes in the center of the furnace bottom, through which the metal and slag can be run.

Coke at £15 per Ton

The furnaces are compact, handy and clean in operation; the retort, which projects through the front casting of the furnace, is charged from the outside, and there is none of the heat and trouble which are associated with the reverberatory and pot furnaces. The contents are always under control, and the removal of the charge, by turning a handwheel which tilts the furnace, is simple and safe. Until April, 1908, the furnaces had been worked with a mixture of coke and charcoal, charcoal alone not giving sufficient heat to melt the charge. The difficulties attending transport here made this fuel expensive, as coke costs up to £15 6s. per ton.

Four "Billow" atomizers, class "FM," made by the National Supply Company, of Chicago, and costing $20 each, were ordered and tried in April with excellent results, two being used with each furnace. The furnaces were filled in with firebricks until a space of only 2 in. was left around the sides and bottom of the retort. Sitting on the neck of the retort in front, and supported on a brick in the flue at the back, half of an old retort, cut longitudinally, was fixed as a hood. Just below the retort, and centrally placed in the sides of the furnace, two pieces of 3-in. pipe were built into the brickwork and in these the atomizers were placed, their brass shells being protected by a cover of 2-in. piping screwed over them and projecting 1 in. in front.

Kerosene Oil as Fuel

Kerosene oil is used, and each furnace has a 20-gal. oil-storage tank placed 18 ft. above the atomizers, with which they are connected by ¾-in. piping and flexible metallic (steel) tubing. Air at about 40 lb. pressure is delivered through a 2-in. main with ¾-in. branches fitted with ½-in. brass cocks and connected to the atomizers by ¾-in. flexible metallic tubing. To economize heat, and assist the vaporizing of the oil, the air-supply main enters the stack at the junction of the two furnace flues and about 14 ft. of its length is coiled therein, thus giving the air feed a high temperature and effecting a saving of oil.

The front casting of the furnace has a 2-in. sight hole, fitted with a mica plate, through which the working of the atomizers can be observed. The two flames are set so that they point slightly upward and converge and meet one another just below the retort, with the result that the force of the jet is broken, and the heat is distributed where most required. A white flame is used for a few minutes at the start until the atomizers and furnace are hot and vaporize the oil properly, after which more air is admitted and less oil, giving a blue flame, with complete combustion. With precipitate carrying only a small percentage of sands or ore slimes, 1200 lb. can be run down between 6 a.m. and 4 p.m., or 600 lb. per fire per day, this being made up of two pours of about 300 lb. each. The retort will take 150 lb. to 200 lb. precipitate and fluxes on starting, the rest being added as the charge melts down.

LOG RETURN OF TWO MONTHS CLEAN-UP.

	March		May	
	First Clean-up. %	Second Clean-up. %	First Clean-up. %	Second Clean-up. %
Precipitate:				
Gold	7.81	7.48	6.67	8.03
Silver	48.96	48.96	46.81	48.84
Selenium	2.10	3.20	3.86	2.94
Silica	10.34	8.74	12.64	10.12
Zinc oxide	8.07	7.23	12.35	12.04
Other oxides (as Fe_2O_3)	22.72	24.39	17.67	18.03
Roasted weight, lb	1,975	1,567	2,055	1,920
Shorts:				
Gold	7.58	6.98	7.35	6.43
Silver	47.87	40.25	41.21	43.06
Selenium	5.56	4.88	6.06	7.98
Silica	10.36	6.80	9.50	10.98
Zinc oxide	5.03	13.72	7.62	9.75
Other oxides (as Fe_2O_3)	23.60	27.27	25.26	21.88
Roasted weight, lb.	526	432	697	815

	March.	May.
Precipitate:		
Pressed weight, lb	6,356	8,294
Pressed weight, lb.	3,542	3,975
Per cent. loss	44.2	52.0
Ounces bullion	32,170	34,416
Ounces gold	3,883	4,207
Ounces silver	26,296	28,090
Ounces bullion per lb. roasted precipitate	9.08	8.61
Ounces gold per lb. roasted precipitate	1.09	1.05
Ounces silver per lb. roasted precipitate	7.42	7.06
Pound borax per lb. roasted precipitate	0.126	0.147
Pounds soda per lb. roasted precipitate	0.063	0.070
Pounds slag	1,600	1,740
Slag assay, per ton, gold dwt	5.6	7.7
Slag assay, per ton, silver dwt.	501.0	1917.2
Shorts:		
Pounds wet weight	3,232	3,600
Pounds pressed weight	1,712	2,735
Roasted weight, lb	958	1,512
Per cent. loss on wet weight	70.3	58.0
Ounces bullion	7,560	12,323
Ounces gold	954	1,676
Ounces silver	5,845	9,638
Ounces bullion per lb. roasted shorts	7.71	8.14
Ounces gold per lb. roasted shorts	1.00	1.17
Ounces silver per lb. roasted shorts	6.10	6.30
Pounds acid per lb. roasted shorts	2.08	1.32
Pounds borax per lb. roasted shorts	0.175	0.148
Pounds soda per lb. roasted shorts	0.058	0.037
Pounds iron per lb. roasted shorts	0.018	0.016
Pounds slag	740	740
Slag assay per ton, gold, dwt.	10.8	32.7
Slag assay per ton, silver, dwt.	1,260.2	2,785.1
Total weight of slag, lb.	2,340	2,480
Average oz. slag per oz. bullion	0.91	0.84
Retorts used	5	4
One retort = lb. precipitate and shorts	900	1,372
One retort = oz. bullion	7,946	11,685
One retort = oz. gold	967	1,470
Pounds precipitate and shorts, pressed	8,068	11,029
Pounds precipitate and shorts, roasted	4,500	5,487
Per cent. loss	44.2	50.2
Ounces bullion	39,730	46,739
Ounces gold	4,837	5,883
Ounces silver	32,142	37,728
Ounces bullion per lb. roasted	8.82	8.51
Ounces gold per lb. roasted	1.07	1.07
Ounces silver per lb. roasted	6.92	6.87
Average fineness, gold	121.17	112.3
Average fineness, silver	810.12	807.8
Fine metal	931.29	920.1
Oil used, gallons		140.0
One gallon oil = lb. precipitate and shorts		12.47
Smelting time, hours	140	60

On the 48 analyses of roasted precipitate and shorts made in 1907 the bullion obtained was 5 per cent. gold and 1.2 per cent. silver more than called for.

*Reprint of an article in *Journ.* Chem., Met. and Min. Soc. of South Africa, June, 1909.

†Lebong Donok, Benkoelen, Sumatra.

LARGE SAVING EFFECTED

The consumption of oil may be reckoned at 4 gal per hour for each fire, or 1 gal of oil for 15 lb. of roasted precipitate. In May the consumption of oil was 440 gal., which works out at 1 gal per 12.47 lb of roasted precipitate, but this includes the remelting of bars and matte, etc., also the melting of two mill bars.

With the oil our smelting occupies about 60 hours per month, as against 140 hours with mixed coke and charcoal on similar material, that is to say, a European smelter and four boys are working 6 days per month as against 14 days. Add to this advantage the easy control, the regular heat, and the cleanliness of the oil-fired plant, and I think its use will commend itself to men whose cyanide plants are situated in districts where oil can be obtained at moderate cost. The price of the complete castings for a tilting furnace is about £69 f.o.b. London, and the retorts cost £3 2s. 6d each, f.o.b. London.

Tabulated herewith is a copy of the log return of two months' clean-up.

Electric Smelting of Iron Ore in Sweden *

In order to test and develop a successful process for the smelting of iron ore by electricity a number of Swedish iron masters have organized a company under the name of the Trollhattans Elektricka Jernverk, to build a plant on a commercial scale. Upon the actual results obtained will depend a further extension of the plant. An additional object is to obtain practical experience in the working of the process. The capital subscribed is 600,000 kroner, or $160,800, which is believed to be sufficient to build the plant and provide working capital.

The estimated cost of the plant is $91,120, to which is added $6770 for patent licenses, making a total of $97,890, and leaving about $63,000 as working capital. The chief items of cost given reducing Swedish money to dollars are: electric furnace, motors, etc., $44,220; buildings, $[illegible]; transporting machinery, $7230; [illegible] machinery, $1020; superintendence and [illegible], $1112. Some of these items seem to have been figured on rather [illegible] basis.

The [illegible] will be situated near Trollhattan, where large [illegible] have been carried out by the Swedish government. The [illegible] is to contain an 10,000 h.p. at a price of $[illegible] per h.p. year for the first [illegible] and of $11.40 for the following [illegible]. Present plans cover the erection of three furnaces, two of which will be working while the remaining one will be held in reserve. Each furnace will have a capacity of 2500 h.p., and will produce 7500 tons of pig iron a year. The intention is to use coke as a reducing agent, because coke in this furnace gives a pig iron having qualities equal to that of the charcoal iron, and coke is cheaper than charcoal, which otherwise is used almost exclusively in Swedish blast furnaces. A suitable metallurgical coke can be obtained for $5.03 per ton. The ore used will be shipped from the mines at Grangesberg, situated about 200 miles from the furnace, part of which distance is covered by water transportation.

The ore will cost $1.87 per ton at the mine; transportation to Trollhättan, $1.29; total, $3.16 per metric ton at the works. On this basis, and with an output of 15,000 tons yearly, the cost per metric ton of pig iron is estimated as follows:

Ore, 1700 kg	$5.360
Coke, 300 kg	1.688
Limestone, 100 kg	0.161
Electric power, one-third horsepower year	2.466
Electrodes, 8 kg	0.536
Working expenses	2.466
Royalties on process	0.268
Interest and amortization	0.724
Total cost per ton	$13.669

Working expenses include maintenance, wages, laboratory and office costs. Taking current prices, the iron should sell at $15.50 per metric ton, which would leave a profit of $1.83 per ton. On a production of 15,000 tons yearly this would give a net return of $27,450, or about 17 per cent on the capital. Advance estimates of this kind, however, must be accepted with a good deal of caution.

The outcome of this enterprise will be watched with great interest by those acquainted with the development of the electric smelting of iron ore in places where conditions are favorable to such a process. So far the experimental furnace has been running only for a period to be measurd by days or weeks, and it remains to be seen whether the design will stand the crucial test of running commercially over long periods. A successful outcome of the enterprise will, in many cases, have an important bearing upon the iron industry.

* A [illegible] in *Electro-Chemical and Metallurgical Industry*, August, 1909.

The Canadian Cement Merger

SPECIAL CORRESPONDENCE

The merger of Canadian cement companies, of which mention has heretofore been made, has been completed, and a Dominion and a Canadian charter issued to the Canada Cement Company, Ltd., capitalized at $[illegible] of which $11,000,000 is cumulative preference and the balance common stock. An issue of $8,000,000 bonds is also authorized. It is stated that the present issues will be $[illegible] preference stock, $12,500,000 common stock and $[illegible] bonds. The incorporators are Sir Sandford Fleming, Joseph S. Irvin, Hon. Wm. C. Edwards, and John P. R. Booth, all of Ottawa; Hon. Robert Mackay, Rodolphe Forget and Wm. M. Aitken, all of Montreal; and Francis B. Dunsford, of London, England.

The following plants are included: Vulcan Portland Cement Company, Montreal; Belleville Portland Cement Company, Belleville, Ont.; Canadian Portland Cement Company, Marlbank and Port Colborne, Ont.; International Portland Cement Company, Hull, Quebec; Western Canada Portland Cement Company, Exshaw, Alberta; Lakefield Portland Cement Company, Lakefield, Ont.; Owen Sound Portland Cement Company, Owen Sound, Ont.; Alberta Portland Cement Company, of Calgary, Alberta. - Negotiations with the Lehigh Portland Cement Company of Belleville, Ont., are still in progress.

The company proposes to construct new plants immediately at Winnipeg, Manitoba and Victoria, B. C., where deposits of suitable material are available.

August Dividends

In the accompanying table are shown the amount per share and total amount of the dividends paid during August, 1909, by a number of mining and industrial companies in the United States, Canada and South and Central America.

AUGUST DIVIDENDS

U. S. MINING COMPANIES.	Location	Amt per Share	Amt Paid.
Amalgamated, c	Mont.	$0.50	$769,439
Bunker Hill & Sullivan	Ida.	0.50	45,000
Colorado, l & s	Utah	0.08	80,000
Elkton Con., g	Colo.	0.01½	37,500
Golden Star	Ariz.	0.05	20,000
Homestake, g	S. Dak.	0.50	109,200
National Mining	Nev.	0.01	7,000
Sioux Con., s l g	Utah	0.07	52,247
U. S. INDUSTRIALS.	**Location**	**Amt per Share**	**Amt Paid.**
Internat'l Nickel, pf	U. S.	$1.50	$133,689
Internat'l S. & R.	U. S.	1.50	
Jeff. & Clf. C. & I., pf	Penn.	2.50	37,500
Republic I. & S., pf	Ill.	6.75	1,378,140
U. S. Steel Corp., pf	U. S.	1.75	6,304,919
Va.-Carolina Ch., Com	U. S.	3.00	89,532
FOREIGN MINING COMPANIES.	**Location**	**Amt per Share**	**Amt Paid.**
Buffalo Mines, s	Ont.	$0.03	$27,000
Cobalt Central, s	Ont.	0.01	17,615
Dolores, g	Mex.	0.15	60,000
Lucky Tiger Com., g	Mex.	0.80	52,000
Mines Co. of Amer.	Mex.	0.03	60,000
N. Y. & Hond. Ros.	C. A.	0.10	15,000

According to the *Queensland Government Mining Journal*, May 15, 1909, the miners in Germany have been receiving an old-age pension of 11c per day since 1890. This pension is begun when the miner is 71 years of age.

New Publications

A Handbook for Field Geologists. By C. W. Hayes, Ph.D., chief geologist, U. S. Geological Survey. Pp. 154, illustrated, 4¾x7 in., leather, $1.50. New York, 1909: John Wiley & Sons.

Through the Yukon and Alaska. By T. A. Rickard. Pp. 392, illustrated. 6½x9¾ in., cloth, $2.50. San Francisco, 1909: Mining and Scientific Press.

This interesting book is written in the author's best style. It records observations made in a journey to Alaska in 1908, and is a nontechnical description of the region and its mining industry. It is a book that may be well recommended both to professional men and to laymen. Both will read it with pleasure.

History of the Clay-working Industry of the United States. By Heinrich Reis and Henry Leighton. Pp. 280; 5¾x9 in.; illustrated. Cloth, $2.50 net. New York; John Wiley & Sons.

The materials for this work were collected for the department of economics and sociology of the Carnegie Institution of Washington for use in a projected series of "Contributions to the Economic History of the United States." This advance publication is by the permission of the late Carroll D. Wright, who was the director of the department. Edward W. Parker, of the United States Geological Survey, a collaborator of Dr. Wright, has had the more immediate supervision of the present work and has approved the manuscript for this volume. In the preparation of this work the authors have consulted all available magazines, private publications and Government and State reports. Those which have served as sources of information are listed at the end of the work, but they do not represent more than one quarter of all the works consulted. The data obtained from these publications have been supplemented by inquiries addressed to the different State geologists, and a very large number of producers, as well as private individuals who it was thought might be able to supply any of the desired facts. In the arrangement of the volume the main treatment of the subject is by products, but as this leaves gaps here and there, it has been followed by a discussion by States. It has, of course, been impossible to refer to every deposit or factory in the country, only the more important ones being mentioned, and this chiefly for pointing out the development of the industry at different points. For this purpose it has also been necessary to mention some of the smaller plants as well. Developments in manufacturing methods are sometimes referred to, but it should be understood that the discussion of technologic details is not one of the main objects of the work. Since the primary object of the work is a discussion of the history of the industry, details relating to the mode of occurrence and distribution of the clays are omitted; moreover, such details have already been published elsewhere in Geological Survey and private publications.

Second Report on the Gold Deposits of Georgia. By S. P. Jones, Assistant State Geologist. Being Bulletin No. 19, Geological Survey of Georgia. Pp. 284; 6½x9½ in.; illustrated. Cloth. Atlanta, Ga.; State Printers.

The gold mines of Georgia are the oldest in this country, and prior to the discovery of gold in California, they, with the mines of North Carolina, furnished the entire gold output of the country. Though now of relatively small importance in comparison with the mines of the Rocky Mountain and Pacific Coast States, they are interesting geologically and historically, besides presenting opportunities for profitable exploitation in the future. That the mines worked have been chiefly small, does not prove that there are not still opportunities for success in the working of low-grade ores; especially as conditions as to labor, climate and fuel supply are exceptionally favorable. The report opens with a statistical and historical introduction, which is followed by a consideration of the different types of deposits; their geographical and geological distribution; their geology and probable genesis. Thus is followed by specific descriptions of the different gold-bearing belts, including many references to individual properties. The most important and best known of these is the Dahlonega belt in Lumpkin and adjoining counties. The production of this belt was so important that one of the earliest branches of the United States mint was placed at Dahlonega, where it was in operation for many years, up to the outbreak of the Civil War. The report is illustrated by a general map of the State and one of the Dahlonega district, and by a number of halftone engravings of different mines and mills.

Antimony: Its History, Chemistry, Mineralogy, Geology, Metallurgy, Uses, Preparations, Analysis, Production, and Valuation; with Complete Bibliographies. By Chung Yu Wang. Pp. 217, illustrated 5½x8½ in.; cloth, $4. London, 1909: Charles Griffin & Co., Ltd.; Philadelphia, J. B. Lippincott Company.

The author of this book states in his preface, "A metallurgical work in English by a Chinese author is unusual." However, in this case a long residence in America, and in Great Britain and other parts of Europe, besides much study of English literature have familiarized the author with the English language and encouraged him to make it the medium for the presentation of his work to the professional men of the world. It is particularly interesting to note that the author expresses his thanks to Professor Kemp, of Columbia, for his valuable guidance, and to Professor Kemp he dedicates his treatise.

As to the intrinsic value of his work, it is worth while to mention that Mr. Wang has had a good deal of practical experience in the metallurgy of antimony, particularly in connection with the volatilization process of Mr. Herrenschmidt and has previously been known for his technical contributions respecting this subject. At present he is engaged in the construction and operation of antimony smelting works in China.

Heretofore the literature as to the metallurgy of antimony has been scattered through the pages of the technical periodicals and the transactions of the societies. It is, therefore, particularly gratifying now to have in concise book form an up-to-date treatise upon the metallurgy of this interesting metal.

The Mining Law of Canada. By Alfred B. Morine. Pages, 740; 6¼x9¼ in., sheep. Toronto, Ont.; the Canada Law Book Company, Ltd., and Philadelphia; the Cromarty Law Book Company.

This book furnishes a summary of the mining law which was much needed, and which will be exceedingly useful to miners and mineowners in the Dominion. It is now over 10 years since any general work on the mining law was published; and in that time new laws have been passed in nearly all the Provinces, new regulations have been made, and many decisions have been made by the courts. The author reviews the general law, treating in successive chapters, of mining terms; laws now in force; Crown titles; rights of owners, individuals, partnerships and corporations; contracts, licenses and leases; leasements and fixtures; taxation and registration; wrongful abstraction and criminal offenses; and employer's liability. An appendix gives the mining laws of British Columbia, Ontario and Quebec; the mining laws and regulations of the Dominion, including those of a general character and those specially relating to the Yukon territory and to Indian lands. The book is completed by a glossary of terms, a full index to subjects and a separate index to cases to which references are made in the text. Like our United States law, the laws of Canada relate in large part to titles and the methods of locating and acquiring mining lands, though the Ontario and British Columbia acts provide rules as to ventilation and to methods of operation to secure safety to persons and property. The author has provided an excellent summary of the law as it exists at present, in general written clearly and in such a way as to be readily understood by the layman as well as the lawyer.

Personal

Mining and metallurgical engineers are invited to keep THE ENGINEERING AND MINING JOURNAL informed of their movements and appointments.

J. M. Clements has returned from a Western trip.

W. M. Brewer has returned to Victoria, B. C., from Valdez, Alaska.

Dr. James Douglas is expected home about the middle of September.

J. Parke Channing has returned from Europe and has gone to the West.

R. G. Edwards Leckie, of Sudbury, Ont., was at Vancouver, B. C., lately.

O. H. Bergstrom, of Butte, Mont., has been examining some mines in Idaho.

Sir Sandford Fleming, of Ottawa, is at the head of the new Canadian cement combination.

James A. Cunningham has returned to Salt Lake City, Utah, from an extended trip to Mexico.

Henry F. Lefevre is making a study of the territory tributary to the Guatemala railroad in Guatemala.

F. F. Sharpless has gone to the West on professional business that will occupy him for several weeks.

E. P. Arthur, Jr., of Cripple Creek, Colo., has been examining mines in Gunnison county in Colorado.

James Hoatson, president of the North Butte Mining Company, is at Butte, Mont., looking over the property.

A. W. Constans is manager for a syndicate which lately purchased the Athabasca gold mine, near Nelson, B. C.

Albert Miller, who has traveled extensively in search of pitchblende, has been visiting the Cobalt district in Ontario.

Floyd Harmon has resigned the management of the Cochrane mine, Cobalt, Ont., to take charge of the Harmon syndicate mines.

Prof. E. C. Holden, of the University of Wisconsin, who has been spending the summer at White Plains, N. Y., has returned to Madison, Wis.

C. L. Hower, of Vintondale, Penn., after visiting coal mines in the Crow's Nest Pass district, British Columbia, has gone to Kananaskis, Alberta.

Louis Pratt, of Nelson, B. C., and W. H. Bassick, of San Francisco, are examining a dredging prospect in the Cariboo district of British Columbia.

H. W. DuBois is in Cariboo district, British Columbia, in connection with the construction of a 15-mile ditch to a placer gold property on Quesnel river.

Geo. H. Gadsby, formerly mining engineer for the International and Royal Collieries companies, in Alberta, has returned [illegible] from a visit to Nova Scotia.

Charles Graham has been appointed [illegible] manager for the Vermilion Forks Mining and Development Company, which is opening a coal mine at Princeton, Similkameen, B. C.

Hallet R. Robbins is in charge of the development work the Colonial Gold Mining Company, of Manchester, N. H., is doing on the Apex group, Hedley camp, Similkameen, B. C.

Frederick H. Morley left Denver, Colo., Aug. 24, for Chihuahua, Mexico, to make examinations of some mines in that State. He expects to return to Denver about the middle of September.

Walter Harvey Weed has severed his connection with the General Development Company. At present he is in Washington completing his Butte report for the U. S. Geological Survey.

Kirby Thomas, secretary of the Mexican Institute of Mining and Metallurgy, who has been correspondent for the JOURNAL in the City of Mexico, is to join the regular editorial staff in New York.

C. T. Fairbairn, Duluth, Minn., has been appointed manager of the mining division of the Republic Iron and Steel Company. He was formerly manager of mines for that company in the Lake Superior district.

Howland Bancroft, of the U. S. Geological Survey, has been engaged during the summer in obtaining data relative to the geology and mineralogy of mining districts in the northeastern part of Washington.

William Dempster, of Jas. McGregor & Co., Glasgow, Scotland, has been looking over mines on Texada island, B. C. Accompanied by his son, G. P. Dempster, who is also a mining engineer, he has gone to Yukon Territory.

C. L. Constant, Walter Harvey Weed, C. L. Constant, Jr., R. B. Lamb, and Frank H. Probert have united in the C. L. Constant Company as consulting specialists in geology, mining and metallurgy, with offices at 42 Broadway, New York.

George D. Harrington, who, for over two years past represented the J. Geo. Leyner Engineering Works Company, of Denver, in Mexico, is now associated with the Aguacate Mining Company, and sailed, Aug. 26, for San Mateo, Costa Rica, by way of Port Limon.

George R. Wood and Harry F. Randolph have incorporated the Wood-Randolph Company, electrical mining engineers, with office in the Park building, Pittsburg, Penn. Both have had much experience, having been connected with the General Electric Company, the Pittsburg Coal Company and other coal companies.

Obituary

Morgan Tillinghast, a mining engineer, died suddenly at Islip, N. Y., Aug. 30. He was 30 years old and a resident of Philadelphia.

William S. Morrow died in Westfield, N. J., Aug. 27, aged 79 years. He was born in Maryland and for many years practised as a mining engineer. He had worked at different times in nearly all the States of the West, and was one of the first American engineers to conduct explorations in Mexico.

John Moorhead died at his home near Gas City, Venango county, Penn., Aug. 29, aged 77 years. He was one of the earliest oil operators in the district and was active for a number of years, but retired some years ago.

Norman Buck died at Spokane, Wash., Aug. 25, aged 76 years. He was born in New York, but went West as a young man and practised as a lawyer in several States. He was known to mining men for his decision on the ownership of the claims now owned by the Bunker Hill & Sullivan Company, given in 1885, when he was a judge of the Supreme Court of Idaho.

Societies and Technical Schools

University of Tennessee—During the summer vacation a number of alterations and additions have been made to the building and equipment in the mining department of this university. This department was established only two years ago, and has been assigned the exclusive use of the first floor and basement of the building formerly occupied by the department of agriculture and now known as Carrick Hall. The entire building has been thoroughly overhauled in order to fit it for its new uses. The aggregate floor area on the first floor is about 3600 sq.ft., divided into nine rooms: a large lecture room, drafting room, museum, library, general metallurgical laboratory, store room, dark room, private laboratory and office. The basement, having an area about 1800 sq.ft., contains the assaying and ore-dressing laboratory. The assay laboratory is provided with the usual equipment of coal, coke and gas furnaces, balances, etc. The ore-dressing laboratory contains the following pieces of apparatus: A Braun laboratory crusher, a 3x6-in. Sturtevant roll-jaw crusher, a set of 5x8-in. Sturtevant rolls, an 8x12-in. adjustable laboratory jig, and a Card table of intermediate size. The Card table is intended to be run in connection with an Allis-Chalmers hydraulic classifier, Callow dewatering cone, Hodge centrifugal sand pump and settling tank. Thus equipped, a small quantity of ore can be tested upon the table under varied conditions and for any length of time. Space is reserved for a Frue vanner or another machine of similar type, and the same adjuncts used in connection with the Card table are intended to serve the second machine. All machines are driven by electric motors. Facilities are provided for making experiments with small sized laboratory apparatus in the sorting and classification of ores.

Special Correspondence from Mining Centers

News of the Industry Reported by Special Representatives at Butte, Denver, Salt Lake City, Goldfield, Cobalt and Toronto

REVIEWS OF IMPORTANT EVENTS

San Francisco

Aug. 27—Considerable old-fashioned rocker mining is being done on the middle and north forks of the American river this season. A number of the old bars which paid well years ago are again being worked. In some cases the men are getting from $7 to $9 per day but generally the pay is less. The floods in the river have been concentrating the river sands for some years, so that a time has come when these old bars could be made to pay again with the old-time rocker. A great deal of gold is still taken out in this State with this primitive appliance.

The Standard Consolidated Mining Company at Bodie, Mono county, is enlarging its power plant on Green creek so that sufficient power may be generated to operate large electric pumps in the proposed deep mining operations. On the Standard mines there are two shafts, each 1200 ft. deep, but the Standard has not been worked below the 600-ft. level for some years on account of the volume of water encountered. Now large electric pumps are to be installed to handle this water and permit deeper mining to be done than at present.

It is understood in Nevada City that work will soon be resumed on the old Murchie mine. While there has been no underground work done since the financial entanglements of the company, the mine has been kept free of water and could readily be reopened. It was closed down last January for lack of money to continue operations.

The Phoenix mine at Hurleton has a narrow vein, but the quartz is exceedingly rich. A little three-stamp mill is turning out about $1000 per day. The pay shoot has been worked for some months and still continues.

There are now prospects that the famous Utica mine at Angels Camp in Calaveras county may shortly change ownership. With the Utica will go the water system of reservoirs, ditches, flumes, pipe lines, etc., the most extensive connected with any quartz mine in the State. These water-power plants are now becoming more and more valuable every year. Water power was of the greatest importance to the mines in Calaveras county, and particularly to those at Angels. There are also reports that the Lightner and the Etna King will change hands.

The Trinity River Mining Company will not turn the river through the new tunnel this month, as expected. It is found necessary to strengthen the banks of the ditch at the inlet of the tunnel. Operations on the old river bed will commence next month.

Butte

Aug. 26—Within the last month there have been persistent rumors that the Amalgamated company was planning to bring suits against several mining companies in the Butte district, which it is thought have encroached upon the orebodies of the big company. While these rumors have gained in strength, nothing authentic can be learned, and it is only to be expected that no statement will be given out until the suits are actually instituted. Since Heinze sold out there has been very little litigation of this character in the Butte courts and its revival may bring some interesting complications.

In the case of Mohr Brothers, Charles Kinshall and Jacob Baur against the Whitlatch Mining Company, a judgment has been rendered against the company for $216,973, together with $4500 attorney's fees. The suit was brought on the company's bonds held by the plaintiffs.

The activity in the Corbin camp in Jefferson county increases from day to day. The Boston & Alta company is building a large boarding house to relieve its force of the long climb to Corbin. The gallows frame is in position and the two-compartment shaft is sunk about 35 ft. A pole line is being erected to connect with the main Missouri River-Butte line, and it is the intention, on its completion, to provide electric light for the mine and camp, and power for the air compressor and the proposed new hoist. A good body of ore was recently discovered on the Minnesota mine, owned by the Calumet & Corbin Copper Company, in sinking to the 200-ft. level at which crosscuts will be run. The Bluebird continues to ship two cars of ore a week and expects to appreciably increase its output when the rope tramway, now under construction, is finished.

In the Radersburg district in Broadwater county, the Black Friday and Keating are shipping regularly. The Edda is installing a second boiler and preparing to continue sinking. The Ohio is not producing at present, but is expected to ship when repairs on the engine are finished.

Experiments made up to date with the Dwight & Lloyd sintering furnace at East Helena are very satisfactory; the ore mixture, however, has been selected. The results would indicate that the introduction and use of the furnace would reduce smelting costs very materially. Engineers from the Boston & Montana company's smeltery at Great Falls, have been carrying on a test to determine the feasibility of using the furnace for agglomerating copper-ore concentrates.

Denver

Aug. 27—There is considerable "radioactivity" in Colorado, chiefly due to the energy and money of Thomas F. Walsh, who has just sent his check to Dr. Victor C. Alderson, president of the State School of Mines, to help in the search for, and tests of, radium-producing ores. Mr. Walsh has also addressed an open letter to prospectors and mine owners of Colorado, urging them to look for such ores, and send them to the School of Mines, where tests will be made free of charge. This is on a line with similar research in Cornwall, where streets of St. Ives and Levant are being dug up to recover the pitchblende thrown on dumps from the tin mines, and from which, according to report, ¼ oz. of radium has actually been recovered.

It is stated that ground is being broken for a custom tungsten-concentration mill of 50 tons capacity in the Nederland district of Boulder county, and that the Primos Chemical Company, which uses 120 tons of tungsten concentrates monthly, is back of the enterprise. This mill will compete for ore with the Wolf Tongue mill at Nederland.

In the Cripple Creek district, good progress is being made with the deep drainage tunnel, and it is stated by the tunnel committee that all the necessary capital has been subscribed except about $12,000, which it is expected will be raised shortly.

The Waldorf Consolidated Company's group of mines, on Mount McClelland, in the East Argentine district, and which are now developed by the Wilcox tunnel over 5000 ft. in length, at a depth of about 2000 ft. below the surface, are being put in shape for steady production, the 250-ton mill being now in operation. The Stevens mine, now practically worked out, was among the first discovered on Mount McClelland as early as 1868, and worked at that time at the top of what looks like an inaccessible cliff at 12,000 ft. elevation, and was a heavy producer for 20 years. The Belmont and International mines, on McClelland mountain, turned out $100,000 in 1870-1. The Tobin and Commonwealth groups of the Waldorf company have large bodies of silver-lead ores, and cop-

per ores carrying gold and silver, which, under scientific and economic management, are capable of producing a large tonnage at a profit.

Goldfield

Aug. 26—James F. Callbreath, Jr., secretary of the American Mining Congress, has arrived and has opened headquarters for the publicity bureau. Elaborate preparations are being made for the entertainment of the members of the congress who will be in Goldfield for the week following Sept. 27. Discussions of vital interest to mining men will occupy most of the time. Senator Heyburn, of Idaho, it is expected, will criticize the policy of the Forestry Bureau, which will be defended by Senator Smoot. The larger commercial use of silver and other equally important matters will receive attention.

A possible year-end dividend for stockholders of the Goldfield Consolidated Mines Company and the advisability of increasing the capacity of the Consolidated mill are two of the important matters to be considered at the quarterly meeting of the board of directors which will be held the latter part of November. Shipments of high-grade ore to the smelters are to be resumed from the Hampton stope, and will be continued until enough of the high grade core is removed to enable the management to maintain an even grade of ore at the mill.

Thus far the above oreshoot has been developed for a distance of 150 feet in length, and 75 ft. wide. It is predicted by some that the Combination vein from the Hampton stope to the old Reilly lease, a distance of about 2000 ft., will develop into an immense glory hole to a depth of at least 50 ft. from the surface.

The oreshoot recently encountered on the 733 ft. level of the Clermont shaft, has been penetrated for about 90 ft., and the average value has held close to $30 per ton. As far as developed the ore contains less copper than in the levels above and is more susceptible to the form of treatment used at the Consolidated mill. At the 826 ft. level of the shaft a crosscut is being driven to encounter the same shoot.

Salt Lake City

Aug. 27—Speaking of the rumors that have been current that there were serious cave-ins in the Sioux Consolidated mine in the Tintic district, General Manager C. F. Loose recently said that the caving was in stope No. 1, a part of the mine from which the ore has been extracted. Colonel Loose said that dividends were suspended for the remaining months of the year. Further than that he could not say. He stated that there was still of 150 ft. on each end of the orebody. The 100 stamp mill of the Eureka Hill Mining Company in this district is to be torn down and the machinery sold. The reason for its dismantling is that transportation and smelting facilities have become so good in the Tintic district that the mill is no longer necessary.

A cloudburst at Bingham recently caused considerable damage. The creek left its channel and flowed through the streets depositing several inches of mud in a number of buildings. Four piers of the Boston Consolidated tramway were undermined and the roads from the Highland Boy to the New England mill destroyed. One of the reverberatory furnaces at the Yampa smeltery was sufficiently damaged to put the furnace out of commission temporarily.

The ore shipments from Tintic during the week ended August 21 were: Dragon Iron, 7 cars; Iron Blossom, 48; Swansea, 2; Colorado, 40; Beck Tunnel, 4; Sioux Consolidated, 16; Beatrice, 1; Chief Consolidated, 1; Eagle & Blue Bell, 2; May Day (crude), 2; May Day (concentrates), 2; Victoria, 2; Grand Central, 2; Ajax, 2; Centennial Eureka, 40; Uncle Sam, 8; Gemini, 2. Park City ore shipments during the week were: Silver King, 1,783,680 lb.; Daly-West, 1,355,000; Daly-Judge, 658,000; Daly-Judge (zinc), 691,350 pounds.

Duluth

Aug. 25—The prospect for a large output of iron ore on the ranges this year is encouraging. At the port of Two Harbors, over 5,000,000 tons have been shipped this season, being 2,000,000 tons in excess of the corresponding period of last year. The same condition is reported from other places and mining men now estimate this year's output as equal to or greater than 1907. At Hibbing, the Oliver Iron Mining Company is operating twenty-eight 2½ yard steam shovels, one-half of which are stripping while the other half are taking out ore. The milling system of mining has been practically discontinued in the district and replaced by the steam shovel.

The town of Chisholm, five miles northeast of Hibbing, is being rapidly rebuilt with substantial buildings and shows little effect from the fire which destroyed the place last fall. Here the Oliver company is operating 10 mines, the majority of which are underground workings, in which the sloping-caving system is used. The Croft Mining Company at Hibbing is still using the milling system, but has one shovel stripping and one shovel taking out ore round the rim of the pit in which the milling is now being done. A number of the old mines that have been idle for the last two or three years are preparing to resume work this fall. The Nassau mine, two miles northeast of Hibbing, is unwatering its old workings and within three months it will employ about 300 men. This mine is operated by the Pittsburg Iron Ore Company. The Scranton Mining Company has let a contract to the Foundation Company of New York to sink a concrete shaft 100 ft. deep. Work on the shaft has already begun. This is preparatory to active mining operations next spring when underground mining will be conducted. At the Morton mine 1½ miles southwest of Hibbing, the work of sinking the concrete shaft is progressing rapidly. The shaft is now down 160 ft. and it is expected to be completed to 190-ft. level within the next month. This shaft is being sunk through quicksand and it is accomplished by building on concrete from the top and sinking the solid structure by dredging the sand from beneath.

Cobalt

Aug. 27—The results of the diamond drilling on the Alexandria property show that the Huronian slates underlie the diabase at a depth of 250 ft. The shaft is at present down 160 ft., and in a short time sinking will be continued to the 250-ft. level. The good results obtained in this formation by the Cobalt Central has decided the management of the Alexandria to continue the work on the deeper level.

The drift being run on the No. 6 vein of the Cobalt Lake is showing very good results. At the present time the vein is from 6 to 8 in. wide, and carries high-grade ore. Where the vein was first cut it was only about 2 in. wide.

During the week two more veins have been discovered on the Nipissing by surface prospecting. They are known as No. 129 and No. 130. The former is from 1 to 2 in. wide and carries high grade ore. The latter was found about 300 ft. to the north of 129, and has been stripped for about 50 ft. It varies in width from 2 to 6 in. of high grade ore. Both these veins carry considerable argentite.

The Waldman property on the Gillies Limit and the Goulds Consolidated at Cart lake will lease air from the Provincial mine until that property is sold. On the Waldman vein a shaft has been started, and is now down a little over 10 ft. On the Martel claim in the limit twenty men are engaged in trenching, and a narrow smaltite vein has been located.

The dispute between the Peterson Lake and Nova Scotia companies has culminated in a writ being issued against E. & D. M. Stendler, in which the Peterson Lake people claim: (1) $1,000,000 as the amount of plaintiff's stock wrongfully issued to the defendants; (2) $50,000, being money of the plaintiff wrongfully appropriated by the defendants; (3) in the alternative, like sums by way of damages for misfeasance and breach of trust on the part of the defendants, as trustees for, and directors and officers of the plaintiff. The company further asks for the

delivery and cancelation of stock certificates held by the defendants, and an injunction restraining them from voting or marketing their shares, or acting as directors of the plaintiff company.

Contracts have been let for supplying all the necessary electrical equipment for doubling the concentrator at the Coniagas Mines. A short time ago work was started on the White Silver property, which lies to the south of the Nova Scotia, and twenty men are at work doing development. A small vein has been discovered near the boundary of the Michigan Cobalt. A general shareholders' meeting of the Floyd Mining Company was called for August 25 to authorize the sale of the company's property to the Temagami Reserve Mines, Ltd., in consideration of 800,000 shares of the capital stock.

During the last week the following mining companies have obtained charters: Blind River Exploration and Mining Company, Ltd.; headquarters, Blind River; capital, $25,000. Harman Mining and Leasing Company, Ltd.; headquarters, Cobalt; capital, $500,000. Wealthy Mines, Ltd.; headquarters, North Bay; capital, $1,000,000. Prospectors Exploration and Development Company; headquarters, Toronto; capital, $300,000. Brewster Mining Company, Ltd.; headquarters, Toronto; capital, $10,000. Atlantic Silver Mines, Ltd.; headquarters, Cobalt; capital $40,000. Hamilton Febre Mining Company, Ltd.; capital, $2,000,000. The Silver Cross Cobalt Mining Company has been authorized to change its corporate name to the Silver Cross Mines, Ltd., and to increase its capital from $500,000 to $1,000,000.

Toronto

Aug. 27—Two coal-mining companies, both controlled by Mackenzie & Mann, of the Canadian Northern railway, have been incorporated at Ottawa, the Brazeau Collieries, Ltd., and the Rocky Mountain Collieries, Ltd., each capitalized at $1,000,000 The Brazeau Collieries will operate an area of coal lands, about 4000 acres in extent, on the Brazeau and Macleod rivers in Alberta, about 175 miles west of Edmonton Surveys are being made with a view of connecting the mines with the Canadian Northern system, which now extends some distance west of Edmonton The Rocky Mountain Collieries owns a tract of several thousand acres on the Kananakis river, Alberta, in which Mackenzie & Mann are acquiring an interest Both fields will supply bituminous coal, of good grade, and will be worked mainly, or altogether, as a source of supply for the Canadian Northern system as soon as connection can be made. Both companies will be close corporations with William Mackenzie as president.

Mexico

Aug. 24—The political situation in Mexico is reaching an acute stage, but everybody feels that the government has a firm hand on affairs, and that there will be no disturbance that will endanger life or property, although the principal agitators of the Revistas are finding themselves in more or less trouble in all parts of the republic. The situation is watched with a good deal of interest by the foreign investors, and it is known that some large deals have been waiting the outcome of the present program. However, the general situation is quite satisfactory, and there are considerable negotiations in connection with land and mining business, principally from American and English sources. The uncertainty and doubt of the Mexican situation will continue for some time. The election is not held until a year from September. President Diaz in September will be 80 years old. He is hale and vigorous, and has demonstrated that he has a firm hold of the governmental affairs.

Mexican congress will convene September 16, and the new mining law will come up for action in the senate. It is not expected that there will be any radical changes in the law as passed by the chamber of deputies. A movement is on foot to have included in the mining law a provision for tunnel-exploration companies. The old law, and likewise the pending measure, are lacking provisions granting rights to tunnel companies, either the right of way, or the right of assess benefits on property in the course of the tunnel. The tunnel law of 1884 contained favorable provisions in this respect, and it is planned to enact a similar law if possible. This movement has the support of strong interests, and it is considered a very desirable one in connection with the development of some of the big camps.

The deal for the sale of La Blanca mine at Pachuca is apparently off. The owners say that the reason is the exorbitant commissions demanded by the intermediary parties in the deal. It is claimed that one party concerned in the contract wanted one million of the six million pesos purchase price. The work of a detailed examination and survey of the Santa Gertrudis is still being carried on by engineers for the purchasing parties, which is the reason for the expectation that the Santa Gertrudis sale may go through independent of La Blanca The Santa Gertrudis company has officially authorized the acceptance of earnest money on the deal but as far as is known here, none has been put up, although the purchasers were ready some time ago to make a substantial deposit

The El Oro mining companies in the state of Mexico are installing steam-turbine equipments as auxiliary power The district is provided with electric power from the Necaxa plant in the state of Puebla, which also supplies Mexico City. During the past season there have occurred some accidents at the power plant and the new power plants at El Oro are to provide against a repetition of such contingencies. The companies are guaranteed regular power under a contract which provides a heavy penalty to the power company for any stoppage.

The concession for a railroad from some point in Michoacan, probably a connection with the National lines to the Pacific port of Sihuatanejo in Guerrero, has been acquired by English interests and it is said the road will now be built. It will pass through Uruapan, where are the important copper mines belonging to the French Rothschilds, and will cross the Balsas river, passing near the Pacific Copper Company's mines at La Union. The Pacific terminus is a very good harbor. The road will serve a rich agricultural country and afford facilities for a mining section of large possibilities.

London

Aug. 18—With regard to the diamond industry in which the Central Mining and Investment Corporation has an interest, Sir Julius Wernher, the chairman of the company, gave some interesting information at the recent general meeting. He informed the shareholders that both De Beers and Jagersfontein had at the present time not a single unsold diamond, and that he was informed that other producers, of which the Premier is the most important, have also no stocks of consequence. The diamond trade is now recovering from the collapse in 1907, due to the American business crisis, when there was almost complete and quite unprecedented stoppage of sales. The exports to America, which during the first 10 months of 1907 had averaged about £520,000 per month for rough and cut diamonds, fell in November to £170,000, and the average for the next seven months up to June, 1908, was £67,000 per month, the lowest month being only £35,000 Since July, 1908, a steady improvement has been noted, and for the last three months the sales have averaged over £400,000 per month, and trade is becoming normal.

The Central Mining and Investment Corporation made a profit for the year of £553,500, out of which a dividend of £1 per £12 share was declared, absorbing £300,000 The sum of £100,000 was allotted to a reserve fund, and £63,342 was carried forward to next year's accounts The managers and French directors take about £60,000 under certain agreements, a handsome remuneration which is out of proportion to the amount distributed to the shareholders and shows that the Rand financiers are well able to take care of themselves. Apparently, if the company does not pay a dividend the directors are not paid, but if it does and the chances are all that way they profit to an extent seemingly out of all proportion to the services rendered, and certainly out of proportion to what the shareholders receive.

Mining News from All Parts of the World

New Enterprises, Installations of New Machinery, Development of Mines and Transfers of Property Reported by Special Correspondents

THE CURRENT HISTORY OF MINING

Alaska

Nome—The heavy rains of the first part of August will prevent the threatened failure of the season in this section. Many have now returned to the creeks and the city is almost deserted by the throngs of idle men recently gathered here as a result of the enforced idleness caused by lack of water.

Cordova—Great progress is being made in this district, and word just received relative to the work done this summer shows that some valuable ground is being opened up. Among the successful operations are the Tammany bench claim, owned by Peter Monahan, Carlson and Nealy, the Oregon & Susitana Mining Company, at the head of which is Dan Kain, and William Grogg and partners, who are working on Valdez creek with excellent results. This year promises to be a good one for this entire district.

Arizona

COCHISE COUNTY—TOMBSTONE

Tombstone Consolidated—Work of installing the new 7000-cu.ft. compressor is rapidly nearing completion. At the 800 level preliminary work in cutting the 40x100-ft. station is being done. Two 1200-gal.-per-min. pumps will be installed at this point. Three or four cars of ore are being shipped to El Paso smeltery each week.

Hershall—This property, managed by Douglas Grey, is shipping regularly.

GILA COUNTY

Arizona Commercial—The new copper smelting plant is nearing completion, and, it is expected, will be blown in about the middle of October. The ore and coke bins are practically finished and the machine shop, power house and warehouse are already completed.

Inspiration—The Joe Bush shaft is now down about 390 ft. and continues in good ore.

Superior & Boston—About 70 men are engaged in development and a force is also at work installing the new equipment. The hoist is now in place at the McGraw shaft, and as soon as the new compressor is installed, sinking will be resumed at this shaft, now bottomed at 480 feet.

PINAL COUNTY

Lake Superior & Arizona—Development work at the Superior is advancing the incline shaft having reached a depth of 1250 ft. Twenty-five men are being worked three shifts. Work will be resumed in the Silver King as soon as control can be bought by Fisk and associates in Globe.

California

BUTTE COUNTY

Oro Light, Power and Water Company—The Empire dredge of this company at Oroville sunk, last week, and considerable damage was done to it.

INYO COUNTY

Inyo Mines Syndicate—The company is sinking two shafts on the Phonolite claim in Hummer district, seven miles east of Olancha. The ore so far found is of high grade carrying both gold and silver.

KERN COUNTY

Butte—This Randsburg mine is being worked under lease by Ed. Shipsey, who recently cleaned up $3702 from 36 tons crushed and has now recovered $2350 from 27 tons of ore.

MADERA COUNTY

Fresno Flats—The gold excitement at this place continues and upward of 50 locations have been made. These are all quartz claims though the district has heretofore been known mainly as a placer camp.

NAPA COUNTY

Napa Consolidated—The annual report just issued for the year ended Dec. 31, 1908, shows a production of 2320 flasks of quicksilver. Prospecting during the year failed to disclose any new orebodies of importance.

NEVADA COUNTY

Eagle Bird—The 30-stamp mill on this property, four miles from Washington, has been entirely destroyed by fire. The property is owned by W. M. Wilson of Cherokee, Butte county.

North Star Mines—This Grass Valley company has purchased the old Hermosa mine adjoining its holdings. The Hermosa has been idle many years.

Fairview—The contract for the new 20-stamp mill of this mine at Relief hill has been awarded to the Miners' Foundry and Supply Company, of Nevada City. George A. Nihell has charge of construction work.

SHASTA COUNTY

Mammoth Copper—The company has 99 men at work in the Quartz Hill mine and 300 tons of quartz are daily shipped to the smeltery.

Calumet—The mine in Old Diggings district is being worked under bond by the Balaklala interests. Henry Bush, superintendent.

SIERRA COUNTY

Twenty-One—At this property, Alleghany, F. M. Phelps, manager, the force has been increased and a drift will be run on the vein to the south. The old shaft is to be unwatered.

Oriflamme—At this mine on the Chipp's Flat ridge, a bedrock tunnel has been started for the gravel channel under the lava-capping.

Four Hills—Manager Van Fleet has a large crew of men reopening this mine at Downieville, and the power house is being rebuilt. The mine was formerly a producer.

SOLANO COUNTY

St. Johns Quicksilver Mining Company—This company, near Vallejo, of which A. A. Tregidgo is manager, is planning to do away with its two coarse-ore furnaces and bench of 24 retorts and install a large furnace of the type in use at the New Idria quicksilver mines, San Benito county, which is very successful.

Colorado

CLEAR CREEK COUNTY

Joplin—Manager B. J. O'Connell states that this property on Republican mountain will soon start shipments of both smelting and milling ore. High-grade lead ore was recently encountered in the east drift of the Gambetta vein.

LAKE COUNTY—LEADVILLE

Garbutt—The mine on Breece hill is continuing its excellent record. Improvements in machinery have been completed and an air compressor and electric hoist are in operation. Several bodies of good-grade copper sulphide are exposed from which shipments are being made and the shaft will be sunk, following the trend of the ore.

Tenderfoot—Lessees on the property in South Evans gulch continue to output a small quantity of desirable lead ore. While shipments have been somewhat curtailed from this mine, there is every prospect of again reopening the old chute on a different level.

Corinne—A force of men are now employed on this and adjoining claims on Corinne mountain, which were recently taken under lease by Thomas F. Walsh, of Denver. The ground will be thoroughly prospected.

OURAY COUNTY

Camp Bird—The monthly report from London states that, during July, the mill ran 29 days and crushed 6187 tons, yielding 10,697 oz. of bullion and 640 tons of concentrates. Sales of product brought $318,291 and $53,544 was expended in operating the property. About 692 ft. of development was done during the month.

TELLER COUNTY

Pride of Cripple Creek—The leasing company operating on this mine has encountered a streak of rich quartz covered with calaverite while drifting in ore of fair value at the 620-ft. level. Fred Johnson, manager.

Twin Sisters—The mine on Raven hill has been leased by R. P. Russell and associates, of Colorado Springs. It has been idle for some time.

South Burns—A station is being cut at a depth of 1100 ft., preparatory to driving to catch the Shurtloff vein. Two cars per week are being shipped. Charles Crowder, manager.

Idaho

COEUR D'ALENE DISTRICT

Monarch—As a result of extensive development, carried on while awaiting railroad connections for the north side of the Coeur d'Alenes, the tonnage now exposed has warranted the company in planning to double the concentrating mill on the property, east of Murray.

LATAH COUNTY

Hoodoo—A discovery of rich placer ground is reported from this old mining district east of Palouse, Wash. The strike was made along the Palouse river at the mouth of White Pine creek.

Indiana

GREENE COUNTY

Big Vein Coal Company—Work has been resumed at the mine near Coalmount. This mine was closed down for several months owing to the tipple being blown down during a heavy storm.

GIBSON COUNTY

Knox Coal Company—A serious dispute has arisen at the mine because the miners are not permitted to clear up coal which they have left, or obtain payment for their work. It is alleged that the mineowners recently discharged several miners and refused to let them load the coal out or pay the scale for mining it. The Mine Workers' officials are investigating the complaint, and it is said that conditions are such as to demand an immediate settlement.

Kentucky

HARLAN COUNTY

A tract of 14,000 acres of coal land has been sold to the Keokee Consolidated Coke Company, which expects to open coal mines and build coke ovens.

Maryland

ALLEGANY COUNTY

Consolidation Coal Company—An opening has been made through the drainage tunnel between Ocean No. 1 and No. 2 mines. This tunnel, which is five miles long, is being cleaned out and timbered. It is the largest of a system of drains, and will open into the drainage tunnel at Hoffman mine, which empties into a run at Clarysville, and by the way of Braddock run comes to Wills creek a few miles above Cumberland, flowing on down to the river at Cumberland. The tunnels are 8x8 ft., and the entire system will be about 8½ miles long. When completed it will do away with an expensive pumping system that has been maintained at the mines of this company for years. It will bring down past Cumberland a quantity of water that has been heretofore pumped into Georges creek and has emptied into the Potomac at Westport.

Michigan

COPPER

Franklin—The company has discontinued operations at No. 2 Conglomerate shaft and is directing its attention to the Pewabic lode on the Junior property. No. 1 Pewabic shaft is down below the 26th level and from that level the crosscut has cut the lode and drifting is now in progress. Drifts are being extended from various levels from the 20th down and good rock is being exposed, with an occasional streak of poor ground.

New Arcadian — The company has started diamond-drill work under the supervision of Herman Fesing. The first drill hole will be put down in close proximity to the exploratory shaft that was started a few years ago. This drill will go down at an angle of about 60 deg., and it is calculated that the formation, the northern extension of the Baltic lode, will be encountered at a depth of about 1200 ft. The property to be explored covers about 2½ miles of virgin ground.

Ahmeek—A mill test of about 500 tons daily is being made at the Calumet & Hecla mills on this company's rock. This is a part of the test that is being carried out by the Calumet & Hecla company on the treating of rock from the various companies now under its control.

LaSalle—The new shaft that this company is sinking on the Kearsarge lode, known as No. 2 Tecumseh, is down about 85 ft. The hoisting equipment from the abandoned No. 2 Caldwell shaft has been delivered to this shaft and is being assembled. No. 1 Tecumseh shaft is opening rich ground at the 11th level.

New Baltic—The company is experiencing a great deal of difficulty in getting the sand pipe, through which the drill operates, down to bed rock, owing to the presence of large boulders. This hole, No. 2, will go down at an angle of about 45 deg., or approximately perpendicular to the formation. The first hole was put down about 325 ft., but passed out of the mineralized zone.

North Lake—The management has abandoned the No. 3 drill hole, as the ground is so broken that a core cannot be extracted. This hole was drilled to strike the Conglomerate and Adventure lodes and continued with an idea of cutting the Lake lode.

IRON—MESABI RANGE

Higgins—The property of the Higgins estate has been put in charge of M. E. Richards to be thoroughly prospected by drilling. The work will extend over all the lands which are not already leased to the Oliver Iron Mining Company.

Minnesota

IRON—VERMILION RANGE

Vermilion Iron and Steel Company—This company has begun extensive exploration and development work on section 5-62-14, near Tower. Drilling is said to have indicated the existence of a large orebody, and two shafts are to be sunk.

Montana

BUTTE DISTRICT

Amalgamated Copper—After a shutdown of over two weeks, owing to a broken driving shaft in the hoist, the Boston & Montana company's Mountain View mine has resumed operations and is now hoisting its usual tonnage. At the Badger State mine, the station on the 1300-ft. level is not quite finished. The company now plans to open up the old Moose mine, just west of the Badger State. The property was formerly worked to a depth of 400 ft., as a silver mine. It will be operated through the Badger State, and with this end in view a 100-ft. raise has been run from the 200-ft. level of the latter mine to connect with the 300-ft. level of the Moose.

Davis-Daly—Sinking on the 4-compartment shaft of the Colorado mine has recently been resumed. A depth of 1630 ft. has been reached and sinking will be continued at least to the 2000 ft. mark. About 150 tons of ore, all from the 1400 level, are being shipped to Anaconda, daily. Two hundred men are employed.

Butte & Superior—At a recent directors' meeting it was decided to construct the proposed 300 ton zinc concentrator at

the mine. The contract calls for the completion of the plant within five months. This action was taken after consideration of the report of R. M. Atwater, Jr., of Duluth.

East Butte—The management states that during the month of July, the company produced 525,000 lb. of blister copper, and this, together with 16,000 oz. of gold and silver, gave a slight net profit for the month.

Nevada

ESMERALDA COUNTY—GOLDFIELD

Goldfield Consolidated—At the quarterly meeting of the board of directors, held at Chicago, Aug. 26, A. H. Howe, of Goldfield, Nev., was elected director to succeed Charles Hayden, resigned. Vice-president Hubbard stated that no action had been taken concerning the throwing open of some of the company's undeveloped acreage to leasers. The quarterly dividend of 30c. per share, about $1,067,500, was declared payable Oct. 31, to stockholders of record Sept. 30.

ESMERALDA COUNTY—LUCKY BOY

The local union of the Western Federation of Miners is trying to cause friction between miners and operators in this camp. The miners have been receiving a minimum of $4.50 per shift, and are now demanding $5. The operators refuse to consent to the increase.

McCormick Lease—A carload of the highest-grade silver ore ever shipped from the camp was made during the past week from the Broken Hills property.

ESMERALDA COUNTY—RAWHIDE

It is reported that Dr. E. A. Wheeler, S. Canman and I. H. Cook have acquired the Murray 10-stamp mill, full control of the Victor lease on the Coalition estate and a portion of the ground covered by the Proskey No. 1 lease.

King-Hersome—The newly completed mill and sampling works have been purchased by the Coalition and Queen Mines companies. E. W. King, president of the purchasing companies, was elected vice-president of the National Ore Purchasing Agency.

Black Eagle—This group of 12 claims has lately been bought by E. W. Heward. It is understood that the purchase price was $57,000. The main shaft is now down 200 ft. and ore is being shipped to the mills.

Coalition Lease—On this lease, crosscutting for the main vein on the 250-ft. level is in progress.

NYE COUNTY—TONOPAH

Ore Shipments—For the week ending Aug. 21 ore shipments to the mills were: Tonopah Mining, 1500 tons; Belmont, 950 tons; Montana-Tonopah, 612 tons; MacNamara, 150 tons; West End, 150 tons; Midway, 100 tons; total, 6062 tons, of an estimated value of $151,550.

Montana-Tonopah—The semi-monthly melt of cyanide precipitate returned 29 bars of bullion. While repairs were being made to the compressor and hoist, the old steam equipment has been used.

Tonopah Mining—A new compressor has been installed. The Mizpah shaft is to be continued 18 ft. below the 1500 in order to make a sump. A pump station is to be cut on the 1500-ft. level.

WHITE PINE COUNTY—ELY

Giroux—It is reported that a 1000-ton smeltery will be built to treat the high-grade ore of the Alpha shaft.

Nevada Consolidated—The output of ore from the steam shovel pit at Copper Flat for the past week has averaged close to 7000 tons per day. During the first 16 days of August, the smeltery produced 3,000,000 lb. of blister copper.

WHITE PINE COUNTY—OSCEOLA

Tungsten—A group of 25 contiguous claims on the west slope of Mount Wheeling about 12 miles south of Osceola, have been purchased by O. A. Turner, president of the Ely Central Copper Company.

Oregon

JOSEPHINE COUNTY

Waldo Copper—About 50 men are reported to be employed about the mine and camp. Development work is in progress, and ore is being put on the dump.

Buckeye Mining and Smelting—This and the National Copper Company, together holding over 40 claims, have two diamond drills at work prospecting their property.

Pennsylvania

BITUMINOUS COAL

Pittsburg Coal Company—The negotiations with the miners over the question of mining the new explosives adopted by the company have failed to secure any agreement, and on Aug. 28 over 6000 men stopped work. All the mines along the Monongahela and in the Youghiogheny district are stopped. The trouble is complicated by a demand from the miners that, if the new explosives are to be used, they shall be paid on a run of mine basis, and not on the screened coal, as at present.

Rhode Island

Rhode Island Coal Company—This company has acquired the old coal mine at Cranston in the town of Portsmouth, and announces its intention of working on a large scale. The mine has been worked at varying intervals for many years past, the uniform result being failure, owing to the quality of the product. The promoters of the new concern claim that the difficulty, heretofore insurmountable, of making the coal burn will be overcome through treating it at a cost of a few cents per ton with crude Chile saltpeter, or crude calcium chloride by a patented process developed by Newell W. Bloss, of Brookline, and now controlled by the Coal Treating Company, of Arizona, a company with $5,000,000 capital stock, and C. O. Draper as president. The officers of the Rhode Island company are: Henry M. Whitney, president; J. W. Dennis, vice-president; W. M. Cameron, treasurer; Richard Hay, secretary; Nathaniel B. Wales, J. P. Gardner, Eugene N. Foss, directors. The capital stock of the Rhode Island company is $5,000,000 in $10 shares.

Tennessee

HAMILTON COUNTY

New Soddy Coal Company—The mines at Rathburn, which have been partially closed for several months, have been started up on full time, and the coke ovens have been lighted. It is understood that the company will supply coke to Citico furnace at Chattanooga, which is soon to go into blast.

Utah

BEAVER COUNTY

Moscow—During last month, the mine shipped six cars of fine silver-lead ore. Practically all this ore came from the 500-ft. level where drifting is being done from the shaft and the Red Warrior workings. A large area of virgin ground lies between these points. The company is installing a new boiler which will permit increased development.

Nip and Tuck—A company is being organized to acquire the holdings of this company. The tunnel has just broken into a body of rich ore. The group consists of eight claims and has had little development below the surface.

Bradshaw—Samuel Scott and associates of Columbus, Ohio, have acquired control of this group of eight claims near the Cave mine and will develop the property at depth.

IUAR COUNTY

Tintic Standard—The new shaft is 20 ft. below the 400-ft. level and everything is now in condition to make rapid progress in sinking to the 600-ft. level.

East Tintic Development—A new strike of considerable importance has been made in the east drift on the 230-ft. level. The product is almost identical with that encountered in the first strike, running about 60 per cent. lead with some silver.

SUMMIT COUNTY

Little Bell—The company has begun active work of blocking out the orebody opened from the 700-ft. level to a depth of 240 ft. in the inclined winze. The ore

is of shipping grade and the company plans an output of 600 to 700 tons monthly. A test run of the dump ore was recently made at the Daly-West mill and indicated this ore to be worth about $6 per ton to the company. The old dump contains from 20,000 to 25,000 tons. Solon Spiro, manager, McCormick Building, Salt Lake.

Virginia

LEE COUNTY

Black Mountain Coal Company—This new company has bought the Dulaney tract in the Little Mountain coalfield, and is arranging to develop the property, enlarge the mine and build a number of coke ovens.

Keokee Consolidated—This company has acquired the mines and lands of the Keokee Coal and the Imboden Coal companies. It is arranging to increase the output and build coke ovens at Imboden.

Washington

KITTITAS COUNTY

Ellensburg—Twenty-eight claims, extending for six miles along the Yakima river, have been located by W. T. Lewis, who expects to commence sluicing as soon as the necessary equipment can be installed.

West Virginia

New River Company—This holding company has executed a mortgage for $4,000,000 to the Federal Trust Company, of Boston, covering all the property of the New River Company in Raleigh, Fayette, Summers and Mercer counties, West Virginia, and its holdings in 20 subsidiary companies, together with other interests. The mineral lands of the company embrace about 11,500 acres, and it is understood that a large portion of the funds secured from the mortgage will be used to increase the output of the mines already in operation and to open new ones. The headquarters of the company are at Macdonald, W. Va.; Samuel Dixon, of Boston, is president.

MARION COUNTY

Fairmont & Lincoln Coal Company—This company has begun work on a mining plant at Kingmont, which will have a capacity of 1000 tons per day, when completed. O. R. Brownfield, Fairchance, Penn., is president; George S. Price, Fairmont, W. Va., general manager.

Wisconsin

ZINC-LEAD DISTRICT

Chicago Zinc Company—This company has been formed to prospect the Miller land, adjoining the Board of Trade mine on the west.

Platteville—The Lyght mine and mill equipment was bid in by James Jeffrey for mortgagees, at $5200; the property is now under consideration by New York and Buffalo men, represented in the field by B. W. Logan; the Weigle, at Platteville, the Red Jacket, at Centerville, and the Pittsburg, at Cuba City, are also held under option.

Trego—Mining and milling has been begun by the Big Four Mining Company, which recently assumed control of the property.

Jarrett Lead and Zinc—This company, of Cuba City, has started its new mill at St. Rose Crossing.

Dickson-Oettiker—The company is in the market for a 50-ton mill; the lease adjoins the St. Rose mine on the east.

Grant County—The company has developed rich lead and jack since resuming operations early in August.

Hodge—The mine is being unwatered, under option to buy, by Uling & Blumenfeld, of Watertown, and Fred Howe, of Janesville, Wis., who recently purchased the mill equipment for removal to the Forcite mine.

IRON—GOGEBIC RANGE

Davis—The new shaft is now down 1250 ft., and work is being pushed. The shaft is 12x19⅔ ft. in section, being one of the largest on the range.

Montreal Mining Company—The Ottawa mine is being operated steadily. An adjoining 40 acres has been added to the property.

Canada

ALBERTA—LETHBRIDGE

Alberta Railway and Irrigation Company—Completion of new tipple and commencement of production at No. 6 shaft will add 300 to 400 tons to this company's daily output.

ALBERTA—BLAIRMORE

McGillivray Creek Coal and Coke—The No. 2 seam, averaging 12 ft. of clean coal, is being opened by a slope, now in about 200 ft. Equipment of the mine with a power plant, steel tipple, and other surface improvements has been begun. J. F. Povah, Coleman, is general manager.

BRITISH COLUMBIA—AINSWORTH

United—J. S. Airheart, who is operating the Highland-Buckeye properties, has bonded the United, one of the oldest mines in this camp. A tramway is to be constructed from the mine to the Highland mill, on Kootenay lake.

BRITISH COLUMBIA—ATLIN

Ruby Creek Syndicate—Seattle men are arranging to construct a concrete dam to cost about $75,000 to conserve the water for hydraulicking at this property.

BRITISH COLUMBIA—NELSON

Fern Gold Mines, Ltd.—Henry Skoning and J. C. Moen have taken a lease on the Fern gold mine, 11 miles south of Nelson. There is on the property a 10-stamp mill connected with the mine by an aërial ropeway about 2300 ft. long.

BRITISH COLUMBIA—PHOENIX

Shipments from the boundary for the week ending Aug. 21 amounted to 30,862 tons; the Snowshoe shipped 4430 tons to the Trail smeltery; Granby mines, 19,592 tons to Granby smeltery; Mother Lode, 6840 to Greenwood; British Columbia Copper smeltery, total, 8768.

BRITISH COLUMBIA—ROSSLAND

Le Roi—Work has been resumed at the Le Roi, preparatory to deepening the main five-compartment shaft, now down 1650 ft.; extensive prospecting will be done with diamond drills to about 1000 ft. below present lowest workings.

BRITISH COLUMBIA—SIMILKAMEEN

Tracklayers on the V. V. & E. branch the Great Northern railway is building from Oroville, Wash., to Princeton, B. C., have reached Hedley, where is situated the Daly Reduction Company's 40-stamp mill and cyanide plant, for treating ore from the Nickel Plate mine.

Vermilion Forks Mining and Development—Manager Ernest Waterman is obtaining a plant for this company's coal property, near Princeton. Shipments will commence soon after the Great Northern branch reaches Princeton.

ONTARIO—COBALT

Ore Shipments—During the week ended Aug. 21, there were shipped a total of 16 cars, aggregating 488 tons. The shipments were as follows: La Rose, 206,600 lb.; Nipissing, 190,120; Kerr Lake, 123,880; Crown Reserve, 187,840; Temiskaming, 60,000; Right of Way, 61,990; O'Brien, 64,020; Buffalo, 42,350; Cobalt Central, 39,310; total, 976,110 pounds.

Townsite—The shaft at this property, near the Buffalo, is being pumped out and operations will be resumed with English capital. J. Redington, consulting engineer.

Trethewey—Work has been started on the concrete foundations for the new mill.

ONTARIO—MILLER LAKE

Northern Mining—On the Morrison claim a vein 14 to 24 in. wide, carrying calcite and native silver has been exposed and three nuggets, two of them weighing 8 lb. each, and the other 6 lb., have been taken out. The same vein has been exposed 75 ft. further west. Col. F. W. B. Morrison, Ottawa, is president.

NOVA SCOTIA—GLACE BAY

Dominion Coal—Conditions are becoming more normal each day. Shipments for the week ending Aug. 21 were the largest since the strike began, totaling 60,011 tons.

YUKON TERRITORY

Dawson, Y. T.—Rich pay dirt has been found on No. 12 Canyon creek, a tributary to Quartz creek. The dirt is in line with that found along the right limit of Quartz, and is thought to be in the same channel. The Ididerat river is the scene of the latest stampede in the lower Yukon country. Many prospectors are going in. George W. Butler has just returned from the Innoko, and reports great activity in that section. The paying streams in the Innoko are the Ophir, Little, Gaines and Yankee. Four hundred men are in the camp, many of them from Nome. The town which is the heart of the camp is Ophir.

Mexico

CHIHUAHUA

San Toy—The report for the six months, ended June 30, 1909, states that exploratory work has greatly extended the productive area of the old stopes. The tramway terminal, destroyed by fire, has been rebuilt and a three-compartment shaft to be known as La Central, about 1000 ft. north of Juarez No. 1 shaft, has been sunk about 100 ft. A 235-h.p. gas-engine power plant has been shipped from Germany, and is to be ready for use in November. Net earnings of $205,787 are shown for the period.

Manta Mining Company, Ltd—This company, operating the Carmen-Negrita properties, in the Santa Eulalia camp, is reported to have made a good strike of lead-silver ore at a depth of 150 ft. A hoisting plant has been ordered.

New Year Mining Company—This property, of which D. M. Evans of Chihuahua is manager, has begun ore shipments from its Naica mine. The installation of heavier hoisting machinery is contemplated.

Candelaria—Shipments from this company's mines, situated in the San Pedro camp in the northern part of the state, are being made to the El Paso smeltery at the rate of about 150 tons daily.

Bolsamera—These mines in the Ocampo camp, formerly controlled by the Colonel Greene interests, are, according to reports, to be shortly operated by the Cole-Ryan interests.

La Fortuna—The silver mine in the Nuevas Casas Grandes camp, in the northern part of the state, is said to be showing up well.

Bullion Shipments—Recent bullion shipments passing through Chihuahua are: Batopilas, 38 bars of silver, value 25,000 pesos; Santa Brigida, one bar gold, value 3000 pesos; Martinez & Larriva, Batopilas, two bars gold-silver, value 1800 pesos.

Ore Shipments—Shipments and production of zinc ores have fallen off since the Payne-Aldrich bill went into effect. The Columbia and the Potosi mining companies, the two largest shippers in the Santa Eulalia camp, discontinued zinc shipments about August 15, but are sending out their regular tonnage of lead-silver ore. On Aug. 18, the Calera Mining Company, operating near San Isidro on the Chihuahua & Pacific railway, suspended both mining and milling operations. It is not anticipated that these conditions will be of long duration. Many of the smaller shippers, such as Jose Lago and Henri Faivre, operating to the east of Chihuahua, are accumulating ores in the hope of an early improvement in United States prices, or for making satisfactory arrangements for marketing their high-grade product in Germany.

Parral Production—The output during July was about 41,700 tons, an increase of nearly 8000 tons over that of the preceding month. The production for the week ending August 13 was 10,500 tons, of which 73,000 tons were of milling grade and treated locally.

JALISCO

Mexican Iron and Steel Company—This company, capital $5,000,000, will take over and operate the Ferreria de Tula property situated on the Colima branch of the National Railways of Mexico, about 75 miles west of Guadalajara. There are said to be over 400 sq.m. of oak and pine forests on the lands. The iron ore is free from injurious impurities, and it is expected that the company will erect a new blast furnace, modern steel plant and by-product kilns for the manufacture of charcoal. It will be necessary to build 40 miles of railroad to exploit the lands, but in the meantime traction engines will be used. Manzanillo, on the Pacific coast, is the most accessible seaport.

NUEVO LEON

Monterey—It has been decided that hereafter native coke will be used exclusively for fuel; this steel company buys about 7000 tons of coke per month. The Sabinas Coal Company, operating at Rosita, Coahuila, has, as a consequence, let a contract for the purchase of $300,000 worth of retort coke ovens in Belgium. The Sampacitos Company recently installed 30 such ovens.

SONORA

Barranca Mines, Ltd.—A 10-stamp mill and cyanide plant has been ordered for this property, near Torres.

Santa Fe—A small force of men is at work cleaning out and putting in shape this property, which is about 20 miles south of Cananea. The mine is one of the high-grade antiguas worked for silver and is now being handled by P. S. Tehaney, of Cananea.

Santa Rosalia—Clancy Bros. are financing the company preparatory to sinking a double compartment shaft on the property in the Arizpe district. Rich ore has been encountered in the mine at various times.

Picacho—A development tunnel is being driven to explore the vein at some depth. The property is near Bocoachi and is owned by the Phelps-Dodge interests. There is reported developed and on the dump about 60,000 tons of milling ore.

San Lorenzo—John A. Rice and associates, of El Paso are pushing development work on the property near Cumpas in the Moctezuma district. The ore runs well in copper and silver and carries an excess of iron. Work is being done by tunnels.

Belen—L. H. Van Dusen, manager, reports the company to be still awaiting the completion of the Southern Pacific extension into Cumpas before work on the mine will be resumed.

Africa

WEST AFRICA

Gold production of the Gold Coast and Ashanti in July is reported at 17,331 oz., being substantially the same as in June. For the seven months ended July 31 the total reported was 174,206 oz. bullion in 1908, and 148,672 oz. in 1909; a decrease of 25,534 oz. The bullion reported this year was equal to $2,920,433, or 141,289 oz. fine gold.

Asia

INDIA—MYSORE

Kolar Goldfield—Gold production in July was 46,700 oz., or 225 oz. more than in June. For the seven months ended July 31 the total was 317,668 oz. bullion in 1908, and 320,825 oz. in 1909; an increase of 3157 oz. The bullion reported this year was equal to $5,968,318, or 288,743 oz. fine gold.

New Caledonia

Shipments of ore from the colony for May and the five months, ended May 31, are reported by the *Bulletin du Commerce*, of Noumea as follows, in metric tons:

	May.	Five Months.
Nickel ore	6,490	21,748
Cobalt ore	35	379
Iron ore		10
Chrome ore	1,027	5,641

Nickel ore shipments in May were heavy, but other shipments were light.

New Zealand

Gold production in July was 42,220 oz. in 1908, and 53,710 oz. bullion in 1909; an increase of 11,490 oz. The bullion reported this year was equal to $1,047,195, or 50,603 oz. fine gold. Silver production was 119,402 oz. in 1908, and 120,106 oz. in 1909; an increase of 614 oz. this year.

Metal, Mineral, Coal and Stock Markets

Current Prices, Market Conditions and Commercial Statistics of the Metals, Minerals and Mining Stocks

QUOTATIONS FROM IMPORTANT CENTERS

Coal Trade Review

New York, Sept. 1—Coal trade in the West continues to gain in volume, but prices at all the large distributing centers remain very low. The explanation of this is that at every advance in demand mines begin to ship more. No advance can be looked for as long as the capacity for producing coal is so far in excess of consumption as at present.

In the East the bituminous trade is in very much the same condition. Demand is steadily increasing, but prices remain low, and are likely to do so as long as the present competition exists. The trouble in the seaboard trade this year has come mainly from the large shipments of the West Virginia mines. New River and Pocahontas coals have been put on the market almost regardless of price. In fact, New River has been sold as low as $3 per ton, delivered on cars at Boston, and with such prices prevailing, the trade is necessarily demoralized. The New River and Pocahontas shippers are now making an effort to come together, in order to regulate shipments and obtain better prices. There is some prospect of success in this movement.

The anthracite market is generally quiet and steady. Some collieries are still running short time, while others are suffering from short water supply.

Coal Traffic Notes

Coal and coke tonnages originating on Pennsylvania Railroad lines east of Pittsburg and Erie, year from Jan. 1 to Aug. 21, short tons:

	1908.	1909.	Changes.
Anthracite	3,263,180	3,056,443	D. 206,737
Bituminous	20,763,863	22,818,982	I. 2,055,119
Coke	4,330,501	6,568,324	I. 2,237,823
Total	28,357,544	32,443,749	I. 4,086,205

The total increase this year to date was 14.4 per cent.

New York

Anthracite

Sept. 1—The short rush to get coal on the August discount is over; it did not amount to very much. The trade continues quiet and steady with about the usual deliveries.

Today the summer discounts end and coal must now be quoted at full schedule price, which is $4.75 for lump and $5 for egg, stove and chestnut, f.o.b. New York harbor. For steam sizes prices are unchanged; quotations are: Pea, $3.15@3.25; buckwheat, $2.35@2.50; No. 2 buckwheat or rice, $1.70@2; barley, $1.35@1.50; all f.o.b., New York harbor.

Bituminous

The volume of trade continues to increase, though somewhat irregularly. As for some time past, orders come in waves. It is still a consumers' market and buyers are hunting for bargains. The influence of West Virginia coal is felt too strongly to admit of any advance in prices.

The Far East is buying rather freely. The Sound is doing fairly well, but is not quite up to the eastern ports. New York harbor is doing a little better business at the current low prices.

Quotations are unchanged. Good Miller vein steam coal can be had at a delivered price which nets $1.30@1.35 at mines, while lower grades bring 90@95c. per ton at mines, and gas coal can be had at 60@65c. per ton at mine for run-of-mine.

Transportation is about up to schedule, coal coming through on time. There is beginning to be talk of car shortage, but none has actually developed so far.

The coastwise vessel market is in bad shape. There is an oversupply of vessels, so that brokers and captains are showing a readiness to take almost anything they can get. From Philadelphia to Massachusetts and Maine ports rates are 60c. for large vessels, and 75@90c. for small boats which can reach the shoal-water ports. From New York charters can be had at 50c. to points around Cape Cod and 25@35c. to Providence, New Bedford and the Sound.

Birmingham

Aug. 31—Coal production in this State is still improving, and more mines are going into commission, while others are increasing their working forces. More contracts have been placed for fall and winter delivery. It looks as if the output would soon be up to the 1907 level.

Coke demand continues good and more ovens will soon be fired.

Chicago

Aug. 31—The coal trade continues good, in practically every line, with supplies fairly well regulated to the demand and consequently a general maintenance of prices. Steam coals continue to be more and more in demand and the call for domestic grades is beginning to be felt, though yet light. It is the fear of many dealers that the market will again be flooded with shipments of the coals most in demand, and they urge operators to beware of increasing the amount sent to this market. The trouble is that there is no means through which concerted regulation of shipments can be obtained. In Illinois and Indiana coals, the great supply for the Chicago market, something of regulation is accomplished through railroad aid. Lump sizes of these coals are coming into better demand, while the falling off in the demand for screenings shows the passing of the summer. Domestic supplies are being laid in by many retailers, but cool weather alone will make most dealers and consumers buy freely. The anthracite market has seen a slight increase of sales at the August discount, but the demand for anthracite is not large and is not expected to become large until weather conditions encourage it.

Quotations on Illinois and Indiana are, for car-lots: Lump and egg, $1.75@$2.25; run-of-mine, $1.65@$1.75; screenings, $1.25@$1.45. Eastern coals show occasionally low prices due to demurrage, but the situation is much improved. Standard quotations on smokeless are: $3.45 for lump and egg and $2.95 on run-of-mine, for Pocahontas and New River. Hocking is in good condition and fair demand at $3@$3.15 and there is a steady tone to the market for other eastern coals.

Cleveland

Aug. 31—Lake shipments are increasing, and shippers expect a livelier business in September than has been the case so far this season.

Demand locally continues good both for steam and domestic coals. Prices continue about the same. No. 8 district steam brings $1.90@2.05 for lump; $1.70@1.80 for run-of-mine; $1.30@1.35 for slack. Middle district steam is quoted at $1.85@2 for lump; $1.65@1.75 for run-of-mine; $1.15@1.20 for slack. Massillon coal for domestic use is $2.70 for lump. Pittsburg coal is $2.15@2.25 for lump, and $2@2.05 for run-of-mine.

Indianapolis

Aug. 30—The improvement in industrial and general business conditions is reflected in the increasing demand of coal from Indiana mines. Operators on the Clay and Vigo county fields report large orders received, and many of the mines

that have been working part time will soon be on full time.

In consequence of an appeal from the consul at Chicago, the foreign miners in the Greene-Sullivan county fields will be protected by the local authorities from further attack by the American miners who drove them from their homes and threatened to drive them from the coal-fields of the State. The labor situation at Carlisle, where this trouble arose, is assuming grave aspects. More trouble is expected if the foreigners are put to work again, as the American miners have threatened to lynch them. Governor Marshall has taken the matter in hand.

Pittsburg

Aug. 31—The consumption of coal by manufacturing interests continues to increase slowly but steadily. Lake shipments have probably reached their hight for the season, and do not promise a very heavy total. Prices continue more or less irregular, mine-run frequently selling down to $1, nominal prices remaining at $1.20 to retail dealers and $1.10 to manufacturers. Slack is nominally 65c. but has been sold down to 50@55c. The market is not active.

Connellsville Coke—Prices have advanced rather sharply, as consumption is heavy and the scarcity of labor prevents full operation. The Steel Corporation has picked up a little coke in the market, but has made no large purchases. A sale of 50 cars of standard Connellsville furnace coke for shipment this week was made yesterday at $2. There is little inquiry for contract coke, as consumers generally are covered for this year and are not actively canvassing the market for next year. We quote prices higher on both furnace and foundry coke for prompt shipment as follows: Furnace, $1.90@2; 72-hour foundry, $2.15@2.40, contract coke being nominally at about the same range.

The *Courier* reports the production in the Connellsville and lower Connellsville region in the week ending Aug. 21 at 307,[illegible]79 tons, a gain of nearly 3000 tons in the week; shipments, 4913 cars to Pittsburg, 7358 cars to points west of Pittsburg and 843 cars to points east of Connellsville, a total of 12,114 cars.

St. Louis

Aug. 28—The coal market as a whole shows an improving tendency. A larger tonnage is now moving than at any time this [illegible] but prices are unchanged. The mines could still produce twice the demand on the market; consequently it will be some time before any advance in prices can be expected. Lump coal is a little bit higher than it has been, while screenings and slack coal are easing off. Demand is being supplied principally by the mines in the Carterville, Franklin county and southern Illinois fields. Prices are low. Carterville 6-in. lump and egg is going around $1.20 per ton at mine, or $1.87 f.o.b. St. Louis; 3-in. nut coal is bringing about $1.10 at mine, or $1.67 St. Louis. Carterville screenings are 50@55c. at mine. Coal from Franklin county at present brings the best price. This is a coal that has sprung into popularity within the last three years. Prices on this have advanced 15 or 20c. per ton in the last three weeks and 6-in. Franklin county lump is quoted at $1.40 per ton at mine, or $2.07 St. Louis; while 6-in. egg is selling at the same and nut 10 or 15c. less.

The Standard or Central Illinois field has been practically lying idle all summer. This field produces a low-grade coal and during the extremely dull period through which we have just passed Standard coal has been supplanted largely by Carterville and other high-grade coal. Standard 6-in. lump is 90c. per ton f.o.b. mine, or $1.47 St. Louis; 2-in. lump has been as low as 75c. per ton at mine, or $1.27 St. Louis. Standard screenings bring about 35c. per ton f.o.b. mine and 87c. St. Louis.

Large quantities of anthracite have been shipped to this market, but not sold until it had incurred demurrage charges. The circular price on hard coal is $6.85 per ton f.o.b. St. Louis, but during the past month very little coal has changed hands at that figure.

Foreign Coal Trade

Russian Coal—Shipments from Donetz basin in Russia for the year 1908 were: Bituminous coal, 10,194,600; anthracite, 2,180,400; coke, 1,415,400; total 13,790,400 metric tons, an increase of 488,600 tons over the previous year.

Spanish Fuel Imports—Imports of coal into Spain, six months ended June 30, were 1,085,764 metric tons, an increase of 130,030 tons over last year. Imports of coke were 143,308 tons, a decrease of 6528 tons. Nearly all these imports were from Great Britain.

Welsh Coal Prices—Messrs. Hull, Blyth & Co., London and Cardiff, report current prices of coal as follows, on Aug. 21: Best Welsh steam, $4.38; seconds, $4.08; thirds, $3.90; dry coals, $4.08; best Monmouthshire, $3.60; seconds, $3.48; best small steam, $2.28; seconds, $1.92. All per long ton, f.o.b. shipping port.

Iron Trade Review

New York, Sept. 1—The iron and steel markets cannot be said to show any special change from last week, although business generally continues active.

The demand for pig iron continues good in the Central West, and prices still have an upward tendency. Although most of the steel companies have put more furnaces in blast there is still a demand for bessemer from outside sources, and $16.50 is about the lowest price that is offered for such iron. In Eastern territory the demand is chiefly for foundry and basic, good contracts for both having been placed. There also the tendency is upward, and furnaces are again asking 25 or 50c. more on deliveries running over into next year. Southern iron is firm at $14, Birmingham, and makers are talking about $14.50 for first quarter.

In finished material the demand is now pretty well distributed and all kinds of steel are finding a ready market on new orders, while specifications on running contracts are coming in very freely. A few large orders for structural steel are noted, besides a number of small contracts. The demand for nails and other small building material continues good.

An unusual feature is that sales of iron ore are still being made to merchant furnaces, which is very unusual so late in the season. The explanation is that a number of stacks which did not expect to go into blast are finding that demand warrants them in starting up and that they must be looking after supplies.

Baltimore

Aug. 31—Exports for the week included 4,956,200 lb. steel billets to Great Britain; 540,187 lb. structural steel to Port Limon, Costa Rica; 1,144,535 lb. structural steel to Panama; 4452 tons steel rails and 298 tons rail fastenings to Guaymas, Mexico; 337,055 lb. tin scrap to Rotterdam. Imports included 264 casks ferrosilicon from Rotterdam; 14,700 tons iron ore from Cuba.

Birmingham

Aug. 31—Prices remain firm; nothing is being sold right now under $13.50 for No. 2 foundry, and $14 is asked for later deliveries. None of the selling companies is seeking business for next year, being confident that prices will be on a higher basis. Many inquiries are being received, but no large sales have been closed.

The make of iron keeps up well, and this month has seen a larger production than for many months past. Cast-iron pipe makers and other local industries are using more iron. The steel works at Ensley continue active.

Chicago

Aug. 31—Strength continues in the iron market, with sales in general well distributed and a few large contracts closed in Chicago territory. The selling element is very diffident about 1910 contracts, considering the strong tendency upward, it prefers to await developments. Melters, on the contrary, are eager to contract and some of them have closed agreements for large tonnage at good prices. Northern is especially strong in view of recent contracts at $18@18.50 for No. 2, and $18.50 may be considered

the standard price for last-quarter and first-quarter sales. Southern sales agents are less conservative; $14 Birmingham ($18.35 Chicago) holds, with sales of increasing size and well distributed. The market is strengthening from day to day. In every line of finished products the market is strong. Sales of railroad supplies and structural materials continue large. Coke is in better demand, but good supply, and has advanced 15c., the best Connellsville now selling at $4.85, Chicago.

Cleveland

Aug. 31—Buying of ore continues at a rate unprecedented so late in the season. Prices are unchanged at $4.50 for Old Range bessemer, and $4.25 for Mesabi; $3.70 for Old Range and $3.50 for Mesabi nonbessemers; all f.o.b. Lake Erie docks, with guarantee of 55 per cent. iron on bessemers and 51.5 on nonbessemers.

Pig Iron—There is more inquiry for iron, and business is active. Some large sales are reported of iron on analysis for special purposes. Bessemer is quoted $16.25@16.50; No. 2 foundry, $16.50@16.75; gray forge, $15@15.50; Jackson county silvery, $20, Cleveland delivery.

Finished Materials—Mills are full of orders, especially on bars. Makers have some trouble in meeting demands on time, and there is already some talk of premiums on early deliveries, especially of plates and structural steel.

Philadelphia

Sept. 1—The past week has been active in all grades of iron. The most active is basic and after long parleying several big orders have been placed. Makers of basic, it is reported, today are about to quote a higher price. It is threatened with a speculative advance. Foundry has been bought more freely also, and for still later delivery, though no orders call for delivery after the end of the year, as yet. The undertone of the entire pig-iron market is stronger.

Special brands of foundry have been advanced to $18; basic is strong at $17.50; forge is quiet.

Steel Billets—The market is strong under an expanding consumption. Forging billets have been sold at a 50c. advance.

Bars—Refined bars are in active demand in small lots. Stores are adding assorted lots. Common iron is quiet at 1.50c., but a heavy business is in sight.

Sheets—The sheet mills are booking business with renewed activity. Local distribution is more active than for months.

Pipes and Tubes—No new developments have appeared in the market. Consumption is increasing.

Plates—But little new business was placed this week. Carbuilders, shipbuilders and other large consumers have asked quotations for 1910 delivery. Offices report a steady influx of small orders for early delivery.

Structural Material—Apart from the usual run of bridge-building orders, there has been an increase of orders for ordinary construction. Building operations calling for structural steel are about double what they were last year in this territory. An advance of about $2 a ton on orders under 100 tons is practically assured this month.

Scrap—All kinds of scrap are moving but in small quantities. Heavy cast and No. 1 yard scrap are practically cleaned up and dealers are today asking 50c. more for deliveries to be made within 30 days. Yard stocks are not heavy and dealers are holding to firm prices.

Pittsburg

Aug. 31—The progress of the iron and steel trade, with continued increase in production and advancing prices, is bringing the situation to an interesting juncture. New buying of finished steel products has been decreasing slightly during August while specifications on old contracts seem to have increased; at any rate, the mills report that they are falling farther behind in deliveries in many important lines, so that new specifications must take their turn farther and farther ahead. At the same time prices continue to harden, although there have been no striking advances in the past week, so that when present contracts run out buyers will have to face higher prices than ruled when these contracts were made. The advancing tendency in finished steel products, while quite discernible, has been less strong than that in crude materials, with the result that the spread is decreasing, and one class or the other must yield. Plates and shapes, for instance, are selling at 1.40c., or $28 a net ton, while bessemer billets are $24.50 and open-hearth billets $25@26; bessemer pig is $16.75, Valley, or $17.65, Pittsburg, and heavy melting scrap is all of $17, delivered, with very little to be had at that price. The spread between pig iron and scrap on the one hand and finished steel on the other is altogether too small according to the precedents of the trade.

Scrap is very tightly held, holders professing to expect $18 or $19. Pig iron has been steadily advancing, and on rather light sales. There is, however a total of more than 100,000 tons of bessemer held by merchants and merchant furnaces which is likely to begin coming out shortly.

Pig Iron—The Youngstown Sheet and Tube Company has bought 5000 tons of bessemer in addition to purchases mentioned in last report, at $16.50, furnace, securing 1000 tons from a merchant furnace and 4000 tons from a merchant firm which holds considerable iron. Sellers claim the market has practically advanced to $16.75, Valley, for any delivery, but this is not established. A sale of 1000 tons has been made at $17 for first quarter of next year, and a sale (yesterday) of a single carload at $16.90, Valley. We quote the market at $16.75, Valley, for this year, and $17 for next year. The last sales of basic were made at $15.25, Valley, but with the advance in bessemer and in the absence of recent sales of basic the market can fairly be quoted at $15.50@15.75. Foundry iron is $15.50@15.75 for this year and $16 and higher for next year, with forge at $14.50@15 and malleable at about $16, all at Valley furnace, Pittsburg prices being 90c. higher.

Ferromanganese—The market continues strong at $42, Baltimore, or $43.95, Pittsburg, for prompt, extended deliveries commanding $43@44, seaboard.

Steel—Bessemer billets are quotable 50c. higher at a minimum of $24.50, Valley, while open-hearth billets remain at $25@26, Pittsburg, and sheet-bars at $25.50@26, Pittsburg.

Sheets—The market shows further strength, with most of the mills sold up for 60 days or more and refusing to quote for delivery late in the year. Regular prices of 2.20c. for black and 3.25c. for galvanized, with $1.55 for painted corrugated roofing and $2.80 for galvanized, are strictly observed. The American Rolling Mill Company, Middletown, O., has about decided to install 10 additional sheet-mills, at the same time increasing its open-hearth steel making capacity in proportion.

St. Louis

Aug. 30—Pig iron is active. Southern No. 2 foundry brings $13.50 Birmingham, or $16.50 St. Louis. Inquiries are comming in from all quarters and foundries are asking for rush shipments on stuff already ordered.

Metal Markets

New York, Sept. 1—The metal markets have been fairly active during the week, but show no changes of importance.

Gold, Silver and Platinum

UNITED STATES GOLD AND SILVER MOVEMENT

Metal.	Exports.	Imports.	Excess.
Gold:			
July 1909..	$16,641,782	$ 3,269,885	Exp. $13,391,897
" 1908.	4,845,272	2,949,179	Exp. 1,896,093
Year 1909..	80,496,119	23,406,477	Exp. 57,089,642
" 1908..	58,363,098	29,357,075	Exp. 29,006,172
Silver			
July 1909..	5,049,366	3,926,117	Exp. 1,123,249
" 1908..	4,930,746	3,029,581	" 1,891,165
Year 1909..	34,409,952	26,798,145	" 7,610,887
" 1908..	30,445,291	24,180,929	" 6,264,362

Exports from the port of New York, week ended Aug. 28: Gold, $538,890; silver, $839,056, chiefly to London. Imports: Gold $82,106; silver, $67,759; both from the West Indies, Mexico and South America.

Gold—There has been no special demand and prices on the open market in London remain 77s. 9d. per oz. for bars and 76s. 4d. per oz. for American coin. In New York no exports are reported during the week.

Platinum—Dealers are quoting $24@24.50 per oz. for refined platinum; $28.25 for hard metal, and $19@21 for good scrap. The tendency of prices seems to be upward, and if the consumption improves this fall, manufacturers look for still higher quotations.

Our St. Petersburg correspondent writes under date of Aug. 20 that a considerable advance is to be noted. In Ekaterinburg quotations are 5 rubles per zolotnik for crude platinum, 83 per cent.—equivalent to $18.80 per oz. In St. Petersburg the price advanced during the week from 19,200 rubles per pood to 20,500 rubles, 5 poods being sold. The prices named are equivalent to $18.82 and $20.09 per oz., respectively. The advance is explained by the expected agreement between the two largest producers in Russia, the Société Anonyme de l'Industrie du Platine and the Estate of Prince Demidoff.

Silver—Silver has shown some tendency to improvement in price. This advance is not owing to any scarcity of bullion, but is due to the fact that the crop outlook of the East is considered up to date very favorable. If this condition is maintained with moderate imports, silver will likely advance still higher.

SILVER AND STERLING EXCHANGE

Aug.-Sept.	26	27	28	30	31	1
New York ...	51⅝	51⅝	51½	51¾	52	51¾
London.....	23 1/16	23¼	23⅛	23⅛	24	23⅞
Sterling Ex..	4.8700	4.8690	4.8685	4.8680	4.8660	4.8655

New York quotations, cents per ounce troy, fine silver; London, pence per ounce sterling silver, 0.925 fine.

Exports of silver from London to the East, Jan. 1 to Aug. 19, as reported by Messrs. Pixley & Abell:

	1908.	1909.	Changes.
India...	£ 6,144,163	£4,240,000	D. £1,904,163
China.	516,400	1,555,200	I. 1,038,800
Straits	90,510	82,800	D. 7,710
Total.....	£ 6,750,073	£5,878,000	D. £ 872,073

Copper, Tin, Lead and Zinc

	Copper			Tin	Lead		Zinc
Aug.	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]
26	13⅛	14⅛	[illegible]	[illegible]	4 45	[illegible]	[illegible]
27	13⅛@13⅛	14⅛	[illegible]	[illegible]	4 42½	[illegible]	[illegible]
28	[illegible]	14⅛	[illegible]	[illegible]	4 40	[illegible]	[illegible]
30	13⅛@13⅛	[illegible]	[illegible]	[illegible]	4 42½	[illegible]	[illegible]
31	[illegible]	14⅛	[illegible]	[illegible]	4 40	[illegible]	[illegible]
1	13⅛@13⅛	[illegible]	[illegible]	[illegible]	4 42½	[illegible]	[illegible]

London quotations are per long ton (2240 lb.) standard copper. The New York quotations for electrolytic copper are for cakes, of the transactions made with consumers, ingots and wirebars, and represent the bulk basis, New York, cash. The price of cathodes is usually 0.125c. below that of electrolytic. The quotations for lead represent wholesale transactions in the open market. The quotations on spelter are for ordinary Western brands; special brands command a premium.

Copper—The market has been an uninteresting affair throughout the week of Aug. 26-Sept. 1. The demand from consumers was light and to all appearances there is more copper for sale at current quotations than can be placed. About all of the agencies are now offering electrolytic up to the end of the year at 13¼c., delivered, 30 days, equivalent to a little less than 13⅛c., cash, New York, and concessions are made to consummate desirable business, particularly for prompt and nearby deliveries. There is more or less difference in the attitude of the various agencies, some being rather reserved and stiffish, at least ostensibly, at their asking price, while certain are more aggressive in their offerings and efforts to secure business. The latter attitude puts a damper upon any ideas for a bull movement. Transactions in Lake during the last week were comparatively small. Some small lots of special brands sold at 13⅝@13¾c., and the latter figure is still the nominal asking price of the Calumet & Hecla. Prime Lake copper is offered by other first-hands at 13⅜c., delivered, 30 days, equivalent to about 13.3c., cash, New York, and as low as 13¼c. Some considerable transactions by second-hands were reported as made at 13⅛c. Right at the close some good-sized sales of Lake were made at 13½c. The market closes at 13¼@13½c. for Lake, and 12⅞@13⅛c. for electrolytic in cakes, ingots and wirebars. The average for casting has been 12¾@12⅞ cents.

Copper sheets are 17@18c., base for large lots. Full extras are charged, and higher prices for small quantities. Copper wire is 15c. base, carload lots at mill. Business continues on a good scale.

The standard market held fairly steady until the publication of the statistics on Sept. 1, when it became known that there was an increase of 7400 tons. A selling movement ensued, which depressed the quotations at the close to £59 2s. 6d. for spot and £60 1s. 3d. for three months. For refined and manufactured sorts we quote English tough, £63; best selected, £62@63; strong sheets, £74@75.

The copper market was relatively dull up to Aug. 19, when the publication of the American statistics showing a decrease of about 2,000,000 lb. in visible supply induced general buying from European consumers and a considerable business from domestic refining centers, prices advancing 50 points for Lake and 12½@13c. for electrolytic. Later on the conviction became general that the statistics for the end of July were not really as good as they looked, and consumers having supplied themselves liberally became disposed to await developments before entering into new commitments. The natural result was that the selling agencies, which still had an abundant supply to sell, became once more pressing in their competition and willing to make concessions in order to obtain business. August closed with Lake copper at 13¼@13½c., and electrolytic at 12⅞@13⅛ cents.

Exports of copper from New York and Philadelphia for the week were 2814 long tons. Our special correspondent gives the exports from Baltimore at 1648 tons.

Tin—The upward movement in the London market continued until Monday of this week. Subsequently a reaction set in which carried prices down over £2, the close being cabled as weak at £137 7s. 6d. for spot and £138 7s. 6d. for three months. Statistics for the month of August show a decrease of 600 tons.

The market here followed closely the fluctuations in London, as far as near-by deliveries are concerned, but there have been some evidences of profit-taking on futures, which carried prices below the importation point. Business currently is taking place at 30⅛@30¼ cents.

Lead—There has been little buying on the part of consumers and offerings, particularly from Missouri, are more liberal. As a result, the market has an easier tone and closes at 4.22½@4.25c. St. Louis and 4.37½@4.40c. New York.

The London market is somewhat higher at £12 11s. 3d. for Spanish and £12 13s. 9d. for English lead.

Spelter—In the absence of buying on the part of consumers the market is inclined to droop and sales, particularly of speculative lots, are reported to have taken place at considerably below current quotations, which are 5.60@5.62½ St. Louis and 5.75@5.77½c. New York.

New York quotations for spelter Aug. 26-28, inclusive, were 5.75@5.80c.; Aug. 30-Sept. 1, inclusive, 5.75@5.77½ cents.

Base price of sheet zinc is now 7½c. per lb., f.o.b. La Salle-Peru, Ill., less 8 per cent. discount.

London closes at £22 10s. for good ordinaries and £22 15s. for specials.

Other Metals

Antimony—Quotations are 8¾c. for Cookson's, 8c. for U. S.; 7½@7¾c. for outside brands. Business is better than it has been and inquiries are coming in well.

Aluminum—There is no change in the market. No. 1 ingots can be had at 20@23c. per lb. in large lots. The higher price is that asked by the American maker.

Quicksilver—Business is fair, but prices are unchanged at $43.50@44 per flask of 75 lb., New York. San Francisco is $42@43 for domestic orders, and $40@

41 for export. London is £8 5s. per flask, but as low as £8 is quoted by jobbers.

Nickel—Large lots, contract business, 40@45c. per lb. Retail, spot, from 50c. for 2000-lb. lots, up to 55c. for 500-lb. lots. The price for electrolytic is 5c. higher.

Magnesium—Quotations for this metal are $1.25 per lb., New York, in 100-lb. lots; for 5-lb. lots, $1.40 per pound.

Cadmium—Current quotations are 75c. per lb. in 100-lb. lots at Cleveland, Ohio. In Germany 450@475 marks per 100 kg., at factory in Silesia.

Spanish Metal Exports

Exports of metals and minerals from Spain, five months ended May 31; reported by *Revista Minera*, in metric tons:

Metals.	1908.	1909.	Changes.
Pig and manuf. iron	13,428	25,466	I. 12,038
Copper	5,192	8,168	I. 2,976
Copper precipitate	8,789	6,146	D. 2,643
Lead	75,230	71,139	D. 4,091
Zinc	411	830	I. 419
Quicksilver	1,262	1,250	D. 12
Minerals.			
Iron ore	3,249,858	3,125,306	D. 124,552
Manganese ore	9,997	4,587	D. 5,410
Copper ore	516,127	488,972	D. 27,155
Lead ore	1,596	1,342	D. 254
Zinc ore	38,792	53,733	I. 14,941
Pyrites	645,634	551,424	D. 94,210
Salt	301,582	290,180	D. 11,402

Imports of phosphate rock, 34,774 tons in 1908, and 38,955 in 1909; increase, 4181 tons.

German Metal Imports and Exports

Import and exports of metals—other than iron—in Germany, half-year ended June 30, in metric tons:

	Imports.	Exports.	Excess.
Copper	86,462	31,190	Imp. 55,272
Copper, 1908	90,979	35,570	Imp. 55,409
Tin	6,492	3,452	Imp. 3,040
Tin, 1908	7,685	2,930	Imp. 4,755
Lead	33,741	18,608	Imp. 15,133
Lead, 1908	35,962	21,228	Imp. 14,734
Zinc	19,079	45,690	Exp. 26,611
Zinc, 1908	18,482	42,177	Exp. 26,695
Nickel	1,415	965	Imp. 450
Nickel, 1908	1,572	979	Imp. 593
Aluminum	3,214	794	Imp. 2,420
Aluminum, '08	1,248	545	Imp. 703
Miscellaneous	979	4,651	Exp. 3,672
Miscellan's, '08	965	4,738	Exp. 3,773

The figures include alloys and manufactures of the several metals. Imports and exports of ores—other than iron—for the half-year, were, in metric tons:

	Imports.	Exports.	Excess.
Gold ore	26	.....	Imp. 26
Gold ore, 1908	22	.....	Imp. 22
Silver ore	560	.....	Imp. 560
Silver ore, '08	920	.....	Imp. 920
Copper ore	10,250	10,033	Imp. 217
Copp'r ore, '08	7,092	15,016	Exp. 7,982
Tin ore	6,936	12	Imp. 6,924
Tin ore, 1908	4,902	25	Imp. 4,877
Lead ore	52,324	955	Imp. 51,369
Lead ore, '08	66,804	505	Imp. 66,299
Zinc ore	93,094	17,648	Imp. 75,446
Zinc ore, 1908	91,574	13,145	Imp. 78,429
Nickel ore	6,576	.....	Imp. 6,576
Nickel ore, '08	6,082	.....	Imp. 6,082
Miscellaneous	2,057	129	Imp. 1,928
Mis., 1908	2,482	165	Imp. 2,317

Imports of chrome ore were 9651 tons in 1908, and 9674 in 1909. Imports of pyrites were 298,778 tons in 1908, and 303,432 in 1909; exports, 6357 and 5739 tons for the respective years. Miscellaneous ores include uranium, molybdenum, tungsten and other minor metals, with some mixed or complex ores.

Zinc and Lead Ore Markets

Joplin, Mo., Aug. 28—The highest price paid for zinc sulphide ore was $52.50, the assay base price ranging from $48 to $50 per ton of 60 per cent. zinc. Zinc silicate ore sold as high as $35.50, the assay base ranging from $23.50 to $27.50 per ton of 40 per cent. zinc. The average price, all grades, was $46.70 per ton. Lead ore sold as high as $60 without regard to any base price. Some ore averaging under 80 per cent. lead and some as high as 81 per cent. lead sold at the same figure. The average price, all grades, was $59.70 per ton.

The excitement of last week and the week before has given way to more rational buying, and zinc-ore prices are settling back toward the value of the metal contents compared with the market value of the metal. A further decline is anticipated until an equilibrium has been reached.

SHIPMENTS, WEEK ENDED AUG. 28.

	Zinc, lb.	Lead, lb.	Value.
Webb City-Carterville	3,490,010	1,225,110	$124,003
Joplin	1,923,540	541,020	63,642
Duenweg	630,400	313,120	24,679
Granby	1,048,140	13,500	17,345
Badger	564,070	44,820	15,323
Galena	503,060	63,250	14,189
Aurora	432,070	167,560	12,558
Miami	421,070	63,720	11,111
Oronogo	387,420	2,970	9,255
Prosperity	303,350	34,340	8,612
Jackson	234,710	82,740	8,034
Spurgeon	246,720	73,970	7,319
Alba-Neck	253,220	6,220	6,516
Quapaw	255,070	7,690	6,345
Carl Junction	93,030	.....	3,317
Shoalsburg	108,140	.....	2,465
Cave Springs	62,590	.....	1,730
Carthage	61,940	.....	1,565
Sarcoxie	62,750	.....	1,548
Wentworth	74,740	.....	1,291
Totals	11,289,330	2,640,020	$342,165
35 weeks	395,685,890	60,662,150	$9,239,393

Zinc value, the week, $263,602; 35 weeks, $7,590,899
Lead value, the week, 78,563; 35 weeks, 1,648,494

MONTHLY AVERAGE PRICES

Month.	Zinc Ore. Base Price. 1908.	1909.	Zinc Ore. All Ores. 1908.	1909.	Lead Ore. All Ores. 1908.	1909.
January	$37.60	$41.25	$35.56	$38.46	$46.88	$52.17
February	36.63	36.94	34.92	34.37	49.72	50.50
March	36.19	37.40	34.19	34.71	49.90	50.82
April	35.40	38.63	34.08	37.01	52.47	55.63
May	34.19	40.06	33.39	37.42	56.06	56.59
June	33.06	44.15	32.07	40.35	60.48	57.52
July	34.55	43.06	31.67	41.11	59.90	59.74
August	36.53	48.23	33.42	44.54	60.34	57.60
September	37.63	.....	34.44	.....	54.59	.....
October	35.95	.....	33.28	.....	52.63	.....
November	39.13	.....	35.02	.....	54.63	.....
December	42.75	.....	39.63	.....	49.68	.....
Year	$36.63	.....	$34.31	.....	$53.93	.....

NOTE.—Under zinc ore the first two columns give base prices for 60 per cent. zinc ore; the second two the average for all ores sold. Lead ore prices are the average for all ores sold.

Platteville, Wis., Aug. 28—The highest price paid this week for zinc ore was $52; the base price of 60 per cent. zinc was $50 per ton. The top price paid for lead ore was $60; the base price, 80 per cent., was $58 per ton.

Competition was keen for ore, especially lower grades of zinc, and bids were made beyond the usual ratio. A number of smaller companies helped to keep up the shipment; several big producers which have been temporarily closed are running again, which will increase the weekly shipment to 4,000,000 lb. of zinc ore.

SHIPMENTS, WEEK ENDED AUG. 28.

Camps.	Zinc ore, lb.	Lead ore, lb.	Sulphur ore, lb.
Cuba City	492,480	138,830	...
Highland	458,550	81,800	.....
Platteville	397,245	.....	184,200
Days Siding	350,000	.....	.....
Hazel Green	325,900	.....	.....
Benton	312,580	73,000	.....
Harker	220,020	.....	.....
Livingston	160,000	.....	.....
Galena	160,000	.....	.....
Shullsburg	160,000	.....	.....
Strawbridge	88,000	.....	.....
Rewey	65,000	.....	.....
Mineral Point	64,500	.....	.....
Linden	62,740	.....	.....
Dodgeville	60,000	.....	.....
Total	3,357,115	293,630	184,200
Year to Aug. 28	87,944,674	5,259,450	7,891,940

In addition to the above there was shipped to the American Zinc Ore Separating Company, 437,860 lb., and to the Joplin Separator Works, 259,200 lb. zinc concentrates.

Chemicals

New York, Sept. 1—The market continues steady and spot business is improving. Deliveries on contracts are good.

Copper Sulphate—Prices are unchanged at $4.22½ per 100 lb. for carloads or over, and $4.32½@4.47½ per 100 lb. for smaller orders. Business is rather quiet.

Arsenic—Sales have been fair and prices are a little firmer at 2¾c. per lb. for white arsenic.

Nitrate of Soda—Business is quiet. Prices continue 2.12½c. per lb. for spot and 2.10c. for all positions next year.

The Nitrate Development Association, of Iquique, Chile, reports that the production of nitrate of soda in Chile for the seven months ended July 31 was 1,500,000 quintals less than in the corresponding period of 1908. On the other hand there has been an increase of 2,500,000 quintals in shipments and estimated consumption.

Mining Stocks

New York, Sept. 1—The general stock markets have shown some degree of recovery this week, though in rather irregular fashion. Prices have advanced generally, but in some cases have receded also. The movement is still chiefly inside, and the public is not much in evidence. Upon the whole, however, there has been rather a stronger tendency.

On the Curb there was liquidation in some of the copper stocks, with some evidences of an attempted bear raid. The movement was not general, and some stocks showed higher quotations. The

Curb as a whole was rather irregular. The Nevada gold stocks were rather slow, and there were few changes. The Cobalt stocks were quiet, but not weak, holding their prices fairly well. Industrials suffered a little, and Southern Iron and Steel especially was lower.

Boston, Aug. 31—Mining stocks had sharp setbacks last week in sympathy with the declining market in New York. Lake Copper broke over $5 to $29.75, but sharp recovery followed which put the price to $37.50 today. The advance to $38 some ten days ago was rapid, and the pace did not meet with the approval of inside interests. North Lake in the meantime broke to below $9.

U. S. Smelting has risen steadily in the face of an otherwise weak market, and records a $3.75 advance for the week to $57.50. North Butte did not react much, and seems to be in demand, which holds the price firm around $61. Centennial has been quietly picked up at $38.75. The floating supply of the stock is not very large. The so-called Amster stocks show a hardening tendency due to the expected arrival of Mr. Amster this week. These include the Arizona Commercial, Boston & Corbin and Shannon Copper. Copper Range directors have declared the usual $1 quarterly dividend.

Curb business has been quiet, and for a spell prices were weak, but now show a hardening tendency. National Mining and Exploration has risen from 45 to 68c. on heavy trading the last day or two.

STOCK QUOTATIONS

NEW YORK Sept. 1 Name of Comp.	Clg.	BOSTON Sept. 1 Name of Comp.	Clg.
Alaska Mine	‡.11	Adventure	7
Amalgamated	83⅝	Allouez	48
Anaconda	48⅝	Am. Zinc	31¼
Balaklala	2½	Arcadian	‡3⅞
British Col. Cop.	6⅞	Arizona Com.	43¾
Buffalo Mines	3½	Atlantic	10¾
Butte Coalition	25½	Boston Con.	15
Colonial Silver	‡1⅛	Calumet & Ariz.	105½
Cum. Ely Mining	7⅝	Calumet & Hecla	680
Davis Daly	6⅞	Centennial	38¾
Dominion Cop.	7	Copper Range	82½
Douglas Copper	1¼	Daly West	8
El Rayo	2¾	East Butte	12
Florence	3 1/16	Franklin	16½
Foster Cobalt	‡.32	Greene-Can.	9½
Furnace Creek	‡.05	Hancock	[illegible]
Giroux	10	Isle Royal	28
Gold Hill	‡½	Keweenaw	‡3⅞
Goldfield Con.	6⅞	La Salle	‡14¼
Granby	‡101	Mass	8⅝
Greene Gold	‡½	Michigan	[illegible]
Greene G. S.	[illegible]	Mohawk	63½
Guanajuato	1⅜	Nevada	24⅝
Guggen. Exp.	[illegible]	North Butte	61¼
Hanapah	‡15	Ojibway	10½
Kerr Lake	[illegible]	Old Colony	‡60
McKinley Dar.	[illegible]	Old Dominion	57
Miami Copper	[illegible]	Osceola	146
Micmac	[illegible]	Parrot	33¼
Mines Co. of Am.	[illegible]	Quincy	90
Montezuma of C. R.	[illegible]	Rhode Island	‡4¾
Mont. Sho. C.	[illegible]	Shannon	16⅝
Nev. Utah M. & S.	[illegible]	Superior	50
Newhouse M. & S.	[illegible]	Superior & Bost.	15⅞
Nipissing Mines	10¾	Superior & Pitts	16
Old Hundred	[illegible]	Tamarack	‡65
Silver Queen	[illegible]	Trinity	11
Stewart	[illegible]	U. S. Sm'g & Ref.	[illegible]
Tennessee Copper	[illegible]	U. S. Sm. & Re. pd.	52¼
Tri-Bullion	[illegible]	[illegible]	[illegible]
United Copper	[illegible]	Victoria	4
Utah Apex	4¼	Winona	6
Utah Copper	[illegible]	Wolverine	158
Yukon Gold	[illegible]	Wyandotte	[illegible]

‡Last quotation. ‡Last quotation.

N. Y. INDUSTRIAL	
Am. Agri. Chem.	49
Am. Smelt. & Ref.	99⅝
Am. Sm. & Ref., pf.	114¼
Colo. Fuel & Iron.	45
Federal M. & S., pf.	‡91½
National Lead	91⅞
National Lead, pf.	112
Pittsburg Coal	22¼
Republic I. & S.	38
Republic I. & S., pf.	105
Sloss-Sheffield	85
Standard Oil	‡685
U. S. Steel	77¼
U. S. Steel, pf.	125½
Va. Car. Chem.	48½

BOSTON CURB	Low.
Ahmeek	195
Chemung	15
Chino	7¾
Globe Con.	4½
Gila	9¼
Mason Valley	2
Ray Central	2 11/16
Ray Con.	19
San Antonio	8⅛
Yuma	2

Furnished by Hornblower & Weeks, N. Y.

ST. LOUIS Aug. 28

N. of Com.	High.	Low.
Adams	.40	.30
Am. Nettie	.10	.07
Center Cr'k	2.00	1.75
Cent. C. & C.	84.00	82.00
C. C. & C. pf.	82.00	81.00
Cent. Oil	115.00	100.00
Columbia	9.00	7.00
Con. Coal	20.00	19 00
Doe Run	115.00	110.00
Gra. Bimet.	.25	.22
St. Joe	12.50	11.00

LONDON Sept. 1

Name of Com.	Clg.		
Dolores	£1	5s	0d
Stratton's Ind.	0	3	3
Camp Bird	1	7	9
Esperanza	2	18	9
Tomboy	1	1	3
El Oro	1	6	0
Oroville	0	12	6

Cabled through Wm. P. Bonbright & Co., N. Y.

NEVADA STOCKS. Sept. 1.
Furnished by Weir Bros. & Co., New York.

Name of Comp.	Clg.
COMSTOCK STOCKS	
Belcher	1.25
Best & Belcher	.62
Caledonia	.31
Chollar	.28
Comstock	.28
Con. Cal. & Va.	1.47
Crown Point	.95
Exchequer	.41
Gould & Curry	.32
Hale & Norcross	.42
Mexican	1 10
Ophir	1 27
Overman	.40
Potosi	52
Savage	.49
Sierra Nevada	.49
Union	.54
Utah	09
Yellow Jacket	1 15
TONOPAH STOCKS	
Belmont	84
Extension	60
Golden Anchor	...
Jim Butler	16
MacNamara	32
Midway	20
Montana	98
North Star	02
Tonop'h Mine of N	6.87½
West End Con.	30
GOLDFIELD STOCKS	
Adams	01
Atlanta	.15
Blue Bell	.04
Booth	.14
C. O. D. Con.	.10
Columbia Mt.	.11
Comb. Frac.	.70
Con. Red Top	.
Cracker Jack	02
Diamfield B. B. C.	.02
Goldfield Belmont	.04
Goldfield Daisy	19
Great Bend	07
Jumbo Extension	18
Kendall	02
Lone Star	03
May Queen	04
Oro	07
Red Hill	08
Sandstorm	06

Name of Comp.	Clg.
Silver Pick	.15
St. Ives	.06
Triangle	.01
BULLFROG STOCKS	
Gibraltar	.02
Homestake King	...
Mont. Shoshone C.	2 00
Tramp Cons.	.04
MISCELLANEOUS	
Cumberland Ely	7.12½
Giroux	9.50
Greenwa'r Copper	.04½
Nevada Con.	24.00
Nevada Hills	.70
Nevada Smelting	1 00
Nevada Wonder	.60
Nevada-Utah	1 87½
Penn-Wyoming	...
Pittsburgh S. Pk.	48
Ray Central	2.68¾
Ray Con.	18.75
Round Mt. Sphinx	05

COLO SPRINGS Aug. 27

Name of Comp.	Clg.
Acacia	.08¼
C. C. Con.	03¼
Dante	.07
Doctor	.10½
Elkton	.75⅛
El Paso	.66¼
Findlay	.11
Gold Dollar	.13
Gold Sovereign	.04⅛
Isabella	.23⅛
Jack Pot	‡ 08½
Jennie Sample	‡ 07½
Jerry Johnson	.06¼
Lexington	‡.02
Mary McKinney	‡ 49
Pharmacist	.03⅛
Portland	‡ 82
U. G. M.	07
Vindicator	70
Work	08½

Assessments

Company.	Delinq.	Sale.	Amt.
Alta Consolidated, Utah	Sept 15	Oct 20	$0.00
Arcadian, Mich.	Sept 1	Sept 31	0 50
Boulder Con. M. & M., Wash	Aug. 31	Sept 30	0 01
Con. Virginia, Nev	Aug 16	Sept 7	0 25
Copper M. M. & D., Ida	Sept 7	Oct 4	0 003
Crown Point, Nev	Aug 21	Sept 17	0.10
East Buffalo, Ida	Sept 10	Oct 10	0 005
Exchequer, Nev	Aug 16	Sept 13	0.05
Golden Anchor Tungsten [illegible]	Aug 23	Sept 15	0 001
Hancock Con., Mich	Oct 10		1 00
Hypotheek M. & M., Ida	Aug 26	Sept 25	0 005
[illegible], Ida	Aug 24	Sept 21	0 003
Lady Washington, Nev	Aug 31	Sept 20	0.05
[illegible], Utah	Aug 21	Sept 14	0 005
[illegible], Ida	July 15	Sept 25	0 002
[illegible], Utah	Aug 20	Sept 17	0 01
Seven Troughs M. [illegible], Nev	Aug 18	Sept 8	0 005
[illegible], Ida	Aug 13	Sept 13	0 002
[illegible] M. & M., Utah	Aug 31	Sept 17	0 01
[illegible], Mich	Sept 14		1 00
Utah Con. M. & M.	Aug 25	Sept 7	0 003

Monthly Average Prices of Metals

SILVER

Month.	New York. 1908.	New York. 1909.	London. 1908.	London. 1909.
January	55.678	51.750	25.738	23.884
February	56.000	51.472	25.855	23.706
March	55.365	50.468	25.570	23.227
April	55.505	51.428	25.133	23.708
May	52.795	52.905	24.377	24.349
June	53.663	52.538	24.760	24.166
July	53.115	51.043	24.514	23.619
August	51.683	51.125	23.858	23.588
September	51.720	......	23.877	......
October	51.431	......	23.725	......
November	49.647	......	22.933	......
December	48.766	......	22.493	......
Total	52.864	......	24.402	......

New York, cents per fine ounce; London, pence per standard ounce.

COPPER

	NEW YORK.				LONDON.	
	Electrolytic		Lake.			
	1908.	1909.	1908.	1909.	1908.	1909.
January	13.726	13.893	13.901	14.280	62.386	57.688
February	12.905	12.949	13.098	13.295	58.786	61.198
March	12.704	12.387	12.875	12.826	58.761	56.231
April	12.743	12.56¼	12.928	12.93¾	58.331	57.388
May	12.598	12.893	12.788	13.238	57.387	59.338
June	12.675	13.214	12.877	13.548	57.842	59.627
July	12.702	12.880	12.933	13.363	57.989	58.556
August	13 462	13.007	13.639	13.296	60.500	59.393
September	13.388	......	13.600	......	60.338	......
October	13.354	......	13.646	......	60.139	......
November	14.130	......	14.386	......	63.417	......
December	14.111	......	14.411	......	62.943	......
Year	13.208	......	13.424	......	59.902	......

New York, cents per pound. Electrolytic is for cakes, ingots or wirebars. London, pounds sterling, per long ton, standard copper.

TIN AT NEW YORK

Month.	1908.	1909.	Month.	1908.	1909.
January	27.380	28.060	July	29.207	29.125
February	28.978	28.290	August	29.942	29.966
March	30.577	28.727	September	28.815	......
April	31.702	29.445	October	29.444	......
May	30.015	29.225	November	30.348	......
June	28.024	29 322	December	29.154	......
			Av. Year	29.465	......

Prices are in cents per pound.

LEAD

Month.	New York. 1908.	New York. 1909.	St. Louis 1909.	London. 1908.	London. 1909.
January	3.691	4.175	4.025	14.469	13 118
February	3.725	4.018	3.868	14.250	13 313
March	3.838	3.986	3 835	13.975	13 438
April	3 993	4.168	4.051	13.469	13.297
May	4.253	4.287	4.214	12 938	13 225
June	4.466	4 350	4 291	12.600	13 031
July	4.744	4 321	4.188	13.000	12 563
August	4 580	4 363	4 227	13.375	12 475
September	4.515	......	......	13.125	......
October	4.351	......	......	13 375	......
November	4.330	......	......	13.538	......
December	4.213	......	......	13.156	......
Year	4.200	......	......	13.439	......

New York and St. Louis, cents per pound. London, pounds sterling per long ton.

SPELTER

Month.	New York 1908.	New York 1909.	St. Louis. 1908.	St. Louis. 1909.	London. 1908.	London. 1909.
January	4 513	5.141	4 363	4 991	20.563	21.425
February	4 788	4 889	4.638	4.739	20.875	21 569
March	4.665	4 757	4.527	4.607	21.075	21.4??
April	4 645	4.965	4.495	4.815	21.344	21.531
May	4.608	5 124	4 458	4.974	19 906	21 975
June	4 543	5 402	4 393	5 252	19 000	22 000
July	4 485	5 402	4 338	5.252	19 031	21.969
August	4.702	5 729	4.556	5 579	19 350	22 125
September	4 769	......	4.619	......	19 563	......
October	4 801	......	4.651	......	19.750	......
November	5 059	......	4.909	......	20.875	......
December	5.137	......	4.987	......	20 625	......
Year	4 726	......	4.578	......	20 163	......

New York and St. Louis, cents per pound. London, pounds sterling per long ton.

THE MINING INDEX

The editors of this paper read all the important publications of the world that relate to mining and the treatment of minerals. This index is published as a reference for all interested and to make it impossible for readers of the ENGINEERING AND MINING JOURNAL to miss any important article published anywhere.

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10159—PREPARATION OF ALUMINUM in the Laboratory. S. A. Tucker. (Electrochem. and Met. Ind., July, 1909; ¾ p., illustrated.) 40c.

BARYTES.

10160—OCCURRENCE AND USES. Barium (Ba). E. B. Wilson. (Mines and Minerals, July, 1909; 2 pp.) 20c.

10161—PRODUCTION of Barytes and Strontium in 1908. Ernest F. Burchard. (Advance chapter from Mineral Resources of the U. S., Calendar Year 1908; 4½ pp.)

BORAX.

10162—ARGENTINA—The Borate Deposits of the Atacama Desert, Argentine Republic. (Min. Journ., June 12, 1909; 1 p.) 40c.

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10163—CEMENT INDUSTRY in the United States in 1908. Edwin C. Eckel. (Advance chapter from Mineral Resources of the U. S., Calendar Year 1908; 14½ pp.)

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COAL AND COKE.

10164a—ACCIDENTS—The Prevention of Accidents in Coal Mines. E. H. Coxe. (Eng. and Min. Journ., Aug. 28, 1909; 3 pp.) Abstract of paper before a meeting of the Alabama Coal Operators Assn. 20c.

10165—AFRICA—The South Rand Colliery. (So. Afr. Min. Journ., July 17, 1909; 1½ pp., illustrated.) 20c.

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through its Committee on Science and the Arts, investigating the dry air blast for furnaces invented by James Gayley. 60c.

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10279—FOUNDRY SANDS. Heinrich Ries and J. A. Rosen. (Mich. Geol. Surv., 1908; 85 pp., illustrated.)

10280—GEORGIA—Review of Fossil Iron Ore Deposits of Georgia. S. Mays Ball. (Eng. and Min. Journ., July 31, 1909; 4½ pp.) 20c.

10281—HIGH SPEED STEEL—The Manufacture of High-Speed Steel. O. M. Becker. (Cassier's Mag., July, 1909; 26 pp., illustrated.) Last of a series of articles treating of the grinding of high-speed tools. 40c.

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Crushed Steel, f.o.b. Pittsburg "	.05¾@.06
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Grains "	.03½@.04
Naxos flour "	.01¾@.02
Grains "	.03½@.04
Chester flour "	.01½@.02
Grains "	.03½@.04
Peekskill flour, f.o.b. Easton, Pa "	.01¼@.01½
Grains, in kegs "	.02¾@.03
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Lump, per quality "	.05@.30
Rottenstone, ground "	.02@.04
Lump, per quality "	.05@.30
Rogue, per quality "	.05@.30
Steel Emery, f.o.b. Pittsburg "	.07½@.07¾
ACIDS—	
Acetic 28% ......lb.	.02⅜ up
Boric "	.07
Hydrofluoric, 30% "	.02¾@.03¼
" 48% "	.06
" 60% "	.10
Hydrochloric acid, 20°, per lb.	1.25@1.50
Nitric acid, 38° ......per lb.	.04¼@.04½
Sulphuric acid, 50°, bulk per ton.	$12 up
60°, 100 lb. in carboys.	.85@1.12½
60°, bulk, ton	16.00@18.00
66°, 100 lb. in carboys.	1.00@1.10
66°, bulk, ton	18.00
Oxalic ......per lb.	.07½@.08⅜
ALCOHOL—Grain 95% ....gal.	2.64½
Denatured "	.45@.47
Refined wood, 95@97% "	.50@.55
ALUM—Lump ......100 lb.	$1.75
Ground "	1.85
Chrome Alum "	.03¾@.05
ALUMINUM—Sulphate, com'l. lb.	1.50@1.75
AMMONIA—24 deg. lb. "	.04½@.05½
" 26 deg. lb. "	.04¾@.05¾
AMMONIUM—	
Bromide ......lb.	.28
Carbonate "	.07¾@.09¼
Muriate grain "	.05⅝@.06¼
Lump "	.09½@.09¾
Sulphate, 100 lb.	2.75@2.90
Sulpho-cyanide com	.30
" " chem. pure	.40
ANTIMONY—needle, lump "	.04@.04½
ARSENIC—white "	.02¾@.03
Red, Hoboken "	.07
Saxony "	.07½@.08
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California "	25.00@30.00
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Chloride com'l ......ton.	36.00@39.00
Nitrate powdered, in casks..lb.	.05@.06½
Blanc Fixe, dry, bbl....per lb.	.02¾@.04
BARYTES—	
Am. Ground ......sh. ton.	12.00@17.00
Floated "	17.00@20.00
Foreign floated "	20.00@22.00
BISMUTH—Sub-nitrate ....lb.	1.40@1.45
BLEACHING POWDER—35% 100 lb.	1.25@1.50
BLUE VITRIOL—(copper sulphate), carload, per 100 lb.	3⅞@4.50
BONE ASH ......lb.	.02¾@.04
BORAX, sacks "	.04½@.05
CALCIUM—Acetate, gray, 100 lb.	1.75@1.80
Carbide, ton lots f.o.b. Niagara Falls, N. Y., for Jersey City, N. J. ......sh. ton.	65.00
Chloride, f.o.b. N. Y. "	11.00@14.10
CEMENT—	
Portland, Am. 500 lb. ....bbl.	1.50@1.60
Foreign "	2.25@2.90
"Rosendale," 300 lb "	.85
(in sacks) "	.65
Slag cement "	.75@1.25
CHROME ORE—	
New Caledonia 50% ex ship N. Y. ....per lg. ton.	14.00@16.00
Bricks, f.o.b. Pittsburg, per M	175.00
CLAY, CHINA—Am. common ex-dock N. Y. ....ton.	7.00@10.00
Foreign "	10.00@17.50
COBALT—Oxide ....lb.	1.10@1.70

COPPERAS—Bulk .....100 lb.	$0.55
In bbls "	.65@.75
In bags "	.60@.70
CRYOLITE (carload) ......lb.	.06½@.07½
FELDSPAR—Ground ..sh. ton.	12.50@14.00
FIRE BRICK—	
American ......per M.	30.00@40.00
Imported "	30.00@45.00
St. Louis "	16.00
Extra "	20.00@23.00
Special extra "	30.00@35.00
FIRE CLAY—F.o.b. St. Louis.	
St. Louis, extra quality per ton.	5.00
" ordinary "	2.50
FLUORSPAR—	
Domestic f.o.b. shipping port:	
Lump ......lg. ton.	8.00@10.00
Ground "	12.00@14.00
Foreign crude ex. dock	8.00@10.00
FULLER'S EARTH—Lump, 100 lb.	.80@.85
Powdered "	.80@.85
GRAPHITE—Ceylon.	
Flying dust, finest to best..lb.	.02¼@.04
Dust "	.02½@.05
Chip "	.04@.08
Lump "	.05½@.12
Large lump "	.08½@.10½
GYPSUM—	
Fertilizer ......sh. ton.	5.00
Ground "	4.00@7.00
INFUSORIAL EARTH—	
Ground Am. Best ......lb.	.01¾@.02¼
German "	.02½@.02⅝
LEAD—Acetate (sugar of) brown, ...lb.	.07¾@.08
Nitrate, com'l "	.07⅞@.08½
MAGNESITE—Greece.	
Crude (95%) ......lg. ton.	7.50@8.50
Calcined, powdered ....sh. ton.	26.00@37.00
Bricks, domes, per qual. f.o.b. Pittsburg ......M.	160@200
MAGNESIUM—	
Chloride, com'l ......100 lb.	.90@1.25
Sulphate (Epsom salt) 100 lb.	.90@1.00
MANGANESE—	
Foreign, crude, powdered:	
70@75% binoxide ......lb.	.01@.01½
75@85% binoxide "	.01¼@.01½
85@90% binoxide "	.01½@.04
90@95% binoxide "	.06½
Ore, 80%-85% ......sh. ton.	16.00@32.50
MARBLE—Flour ......sh. ton.	8.50@9.00
MINERAL WOOL—	
Slag, ordinary ......sh. ton.	19.00
Selected "	25.00
Rock, ordinary "	32.00
MONAZITE SAND—	
Guar. 97%, with 5% Thorium oxide, normal ......lb.	.08 and up
NICKEL—	
Oxide, crude, lb. (77%) for fine metal contained	.47
Sulphate, single ......lb.	.09@.11
Sulphate, double "	.06½@.08
NITRATE OF SODA—	
100 lb. 95%	2.12½
95% for 1910	2.10
96% is 2½@7½c. higher per 100 lb.	
OZOKERITE—best ......lb.	.14@.17
PAINTS AND COLORS—	
Litharge, Am. powdered ....lb.	.05½@.06½
English glassmakers' "	.08¼@.09¼
Lithopone "	.03½@.07
Metallic, brown ......sh. ton.	16.50@22.00
Red "	14.00@18.00
Ocher, Am. common "	8.50@9.00
Best "	16.00
Dutch, washed ......lb.	.02¾@.03
French, washed "	.01¼@.02
Paris green, pure, bulk "	.17½@.20½
Red lead, American "	.06@.06½
Foreign "	.08¼@.09¼
Turpentine, spirits bbl., per gal.	.58@.60
White lead, Am., dry ....lb	.05⅜@.05¾
American, in oil "	.06½@.07
Foreign, in oil "	.09½@.09¾
Zinc white, Am. extra dry "	.05½@.05⅝
French, proc's, red seal, dry "	.06⅞@.07½
French, process, green seal, dry "	.07¼@.10¼
PHOSPHATES—Acid	.55@.60c per unit
*Fla., hard rock 77%	6.50@9.00
land pebble 68%	3.75@4.00
†Tenn., 78@80%	5.00@5.50
75%	4.75@5.00
68@72%	4.25@4.50
‡So. Car. land rock 60%	3.50@4.00

*F.o.b. Florida or Georgia ports. †F.o.b. Mt. Pleasant. ‡On vessel Ashley River, S. C.

POTASSIUM—	
Bicarbonate crystal ....lb.	$.07½
Powdered or granulated "	.08
Bichromate, Am. "	.08⅝@.08¾
Scotch "	.10¾
Bromide "	.20
Carbonate (80@85%) "	.03⅝@.04
Caustic, ordinary "	.06½@.06⅝
Elect. (90% KOH) "	.05½@.06
Chloride (muriate), 100 lb.	1.90
Chlorate, powdered "	.09¼@.09¾
Crystals "	.09@.09⅛
Cyanide (98@99%)	
Carloads (30,000 lb.) "	18c.
5-ton lots	18½c.
Less than 5 tons	.20@.22½
Kainite, long ton, bulk, 8.50; bags,	9.50
Permanganate ......lb.	.09¼@.10½
Prussiate, yellow "	.13@.13¾
Red "	.30@.33
Sulphate (basis 90%) ..100 lb.	2.18@2.21
PYRITE—	
Domestic, non-arsenical, furnace size, f.o.b. mines....per unit.	11@11½c.
Domestic, non-arsenical, fines, per unit, f.o.b. mines	10@10½c.
Imported, non-arsenical, furnace size, ex-ship, per unit	.12@.12½
Imported, arsenical, furnace size, ex-ship, per unit	.11½@.12
Imported fines, arsenical, ex-ship, per unit	.09
Imported fines, non-arsenical, ex-ship, per unit	10½@11c.

Pyrite prices are per unit of sulphur. A deduction of 25c. per ton is made when ore for furnace is delivered in large lumps.

SALT—N. Y. com. fine 280 lb. bbl.	.72@1.13
N. Y. agricultural .....sh. ton.	3.80@4.50
SALTPETER—Crude...100 lb.	4.00@4.50
Refined, crystals "	5.50@6.00
SILICA—	
Ground quartz, ord'ry..lg. ton.	10.00@15.00
Silex, ground "	13.00@15.00
Silex, floated "	35.00@40.00
Lump quartz "	5.00@5.50
Glass sand "	2.75
SILVER—Nitrate, crystals..oz.	.33½@.36¾
SODIUM—Acetate ......lb.	.04½@.05
"Alkali," per 100 lb., 58/48	.80@.87½
Bicarb. soda, per 100 lb.	1.00@1.30c.
Soda, caustic, per 100 lb., 78/60	1.90@2.00
Soda, caustic, powdered	.02¾@.03½
Salt cake, per 100 lb., bulk	.40 up
Salt cake, bbl	.65@.85
Soda, monohydrate, per lb.	1.40@1.75
Bichromate ......lb.	.06⅝@.06¾
Bromide "	.20
Chlorate, com'l "	.08½@.09½
Cyanide ("100% KCN")	
Carloads (30,000 lb.) "	18c.
5-ton lots "	18½c.
Less than 5 tons "	19c.
Hyposulphite, Am. "	1.30@1.50
Phosphate ......100 lb.	2.20@2.50
Prussiate "	.08½@.09
Sal soda, f.o.b. N. Y. "	.65@.75
Foreign, f.o.b. N. Y. "	.80@1.00
Silicate, com'l "	.65@1.50
Sulphate, com'l (Glauber's salt) ......100 lb.	.60@.80
Sulphate, com'l, calcined	.65@.85
STRONTIUM—Nitrate ......lb.	.07½@.08
SULPHUR—Louisiana (prime) to New York ......lg. ton.	22.00 up
To Boston, Philadelphia or Baltimore "	22.50 up
Roll ......100 lb.	1.85@2.15
Flour "	2.00@2.40
Flowers, sublimed "	2.20@2.60
Sicilian, extra qual., unmixed seconds, crude brimstone to New York ......lg. ton.	$22.00
Other ports "	22.50
TERRA ALBA—Fr. & Eng. 100 lb.	.80@1.00
TALC—Domestic ....sh. ton.	15.00@20.00
French "	18.00@25.00
Italian, best "	30.00@40.00
TIN—Bi-chloride, 50° ....lb.	.09½
Crystals "	.21½@.22
Oxide, lb "	.32½@.35
URANIUM—Oxide "	3.50@4.25
ZINC—Chloride sol., com. 20° "	.02¼
Chloride, granular "	.05@.06
Dust "	.05¼@.06⅝
Sulphate "	.02¼@.02¾

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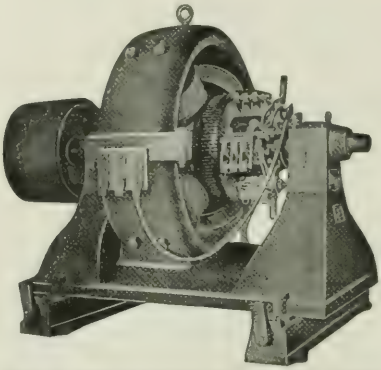

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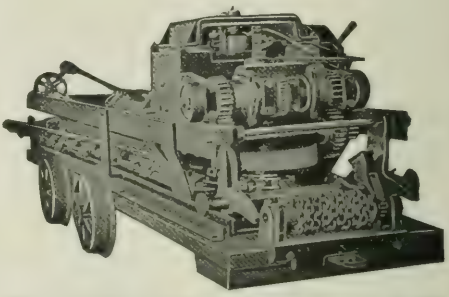

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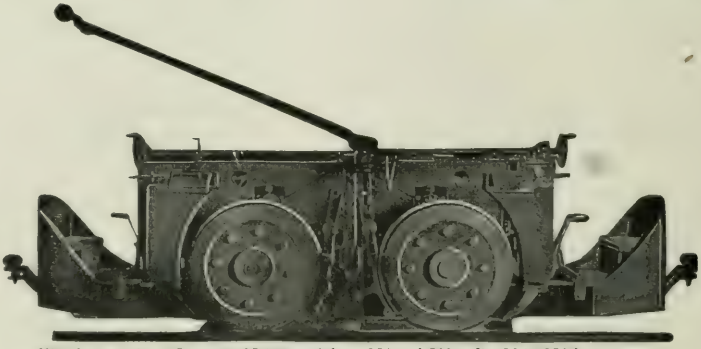

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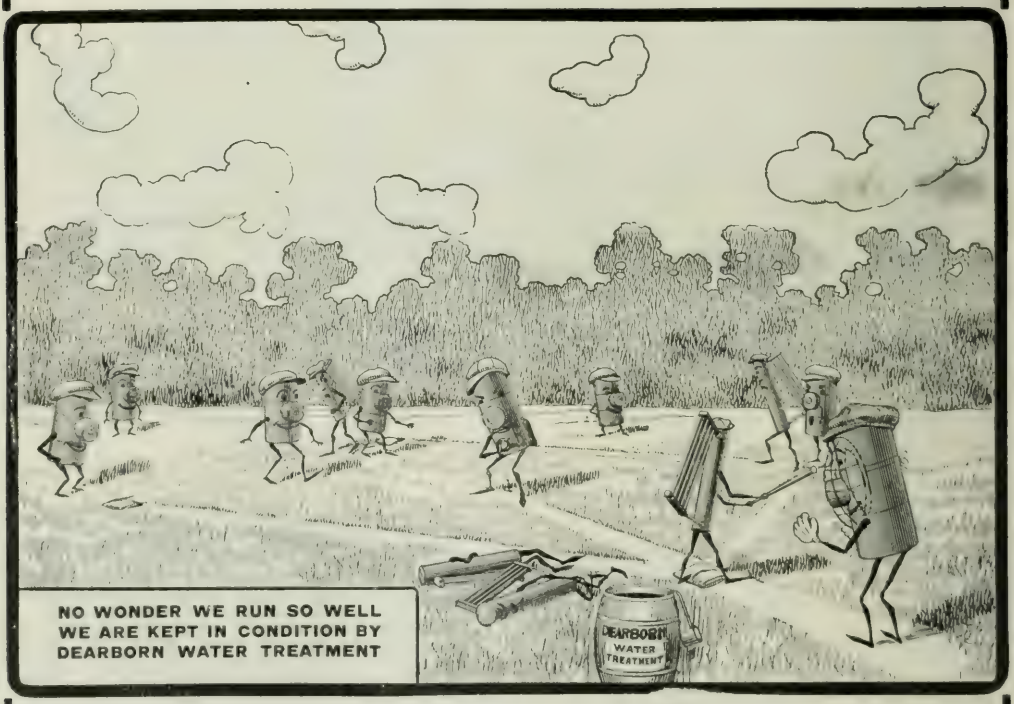

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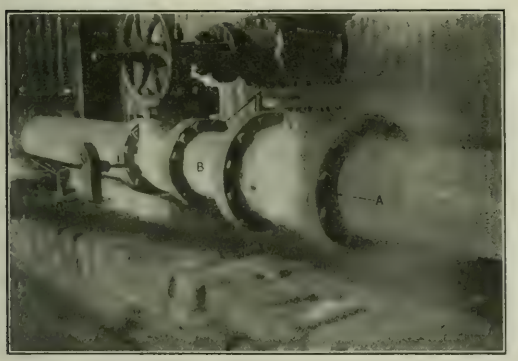

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The Engineering and Mining Journal

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Brief Notes on European Coal Mines

Labor Abroad Is More Thoroughly Organized, and Taxes Are Higher; However, the Coal Industry There Is on a More Profitable Basis

BY FLOYD W. PARSONS

It is customary for American engineers to think of European coal-mining practice, as being so far ahead of methods at home, that the attainment of a similar standard of efficiency is the great goal beyond which nothing is to be expected. This view is largely caused, if not confirmed, by annual statistics showing that we kill more than two men in our mines, to one similar fatality in Europe. To be more precise, the death rate of the United Kingdom is 1.31; Austria, 1.27; Belgium, 1.04; France, 1.10; Germany, 2.55, and for the United States, 4.66. Reasoning from such facts, the natural conclusion follows that we are more careless, and as a consequence less efficient.

We attempt to console and excuse ourselves by calling attention to the double quantity of coal each of our miners produces. We further declare that our growth has been so rapid, we have not had time to organize carefully and perfect our methods. We proudly explain to our English cousin that in 1800, Britain produced 10,000,000 tons of coal, Belgium, 2,500,000 tons, and Germany and France each under a million tons. In 1850, Great Britain produced 50,000,000, Belgium, 6,000,000, Germany 6,000,000 and France, 4,500,000 tons. At this time the United States produced less than 4,000,000 tons of coal. In 1900 the United States produced 40 per cent. of all the coal output of the world, while at present we are producing approximately one-half of the world's supply, or nearly 500,000,000 tons.

Notwithstanding such self-satisfying figures, the controlling interests in America's coal industry must eventually come to recognize that our boasted success is only on the surface. Eliminating our shocking death rate, and not contemplating the criminal waste that has occurred, we have, in this industry, made but small progress toward commercial success. Even the foreign engineer, who views with scorn our recklessness, little understands how trifling has been our monetary return for the great effort put forth, and the natural resources used up. It is true

SHOWING SURFACE PLANT AT MAYPOLE COLLIERY, NEAR WIGAN, ENGLAND, AFTER EXPLOSION WHEN ALL MEN UNDERGROUND WERE KILLED

that immense profits have been made in coal-land speculation, but the real industry lies in the employment of thousands of men in the production of coal, and not the exchange of coal lands. It can be argued that our cheap fuel supply has redounded to the benefit of all our other great industries, but that is small consolation to the man who is devoting time and money to the unprofitable exhaustion of a limited resource.

Optimism is the only popular sentiment at present, and the pessimist is regarded with suspicion. Such cheerful philosophy, however, does not justify a disregard of actual conditions. It requires some argument to explain why the total value of the coal output for Great Britain in 1907, should increase nearly $40,000,000 more than did the value of the coal produced in the United States during the same period, although in the latter country, the increase in the quantity produced was nearly four times as great. Competition is said to be the life of business, but it is often accompanied by disaster when allowed to continue unrestrained. The application of the survival of the fittest sometimes results in the destruction of all, and most always in the crippling of the victor. The man who has lived on plain food, does not have the appetite and tastes of an epicure; likewise, coal operators in America are glad to barely pull through, and have not been trained to expect much. (I am referring to our bituminous industry.)

COLLIERY LASSIES PICKING COAL AT ASPULL COLLIERY IN LANCASHIRE

VIEW INSIDE SCREENING AND TIPPLE PLANT AT NO. 4 PIT OF THE ASPULL COLLIERY NEAR WIGAN

Conditions Existing in Great Britain

The coal seams in England, Scotland and Wales do not differ materially in position, thickness or quality from coal beds in America. Most of the development abroad is done through shafts, but whole districts in America are being worked in the same way, and at a corresponding depth. The foreign miner receives on an average about [illegible] for each ton mined, and the miner in America receives practically [illegible] [illegible] mine as much coal and, therefore, receives a smaller monthly income, but his reduced expenses practically balance this loss. Royalties in Europe compare quite favorably with such payments in America, so that practically the only apparent difference is in the taxes, and the expenditures due to the employer's liability act, which expenses are somewhat greater abroad than in America. The difference, however, is only a matter of cents per ton and is partly offset by reduced management costs, and the cheaper skilled labor.

The American operator producing the best grades of eastern bituminous coal receives from 60c. to $1.10 per ton at the mines. A close average price is about 90c. per ton. The British coal producer receives from $3 to $3.75 per ton at the mines with $3.25 as a low average estimate. It is, therefore, evident that the foreign operator receives $2.35 more for each ton of coal produced than does the American operator for an equally good product.

What Accounts for the Difference in Price Received

If I were trying to account for a difference of a few cents a ton in the price received by European operators as compared with prices paid producers at home, no such general analysis as the foregoing would be accepted; however, it is certain that the most carefully detailed examination will add but immaterially to the foreign cost of production. It can be argued that timber costs considerably more in Europe, but on the other hand, it is true that this timber expense is largely repaid by an increased percentage of extraction. The powder cost in the average European mine is less per ton than in the American mine. This is due to the superior method of mining (generally longwall) and to the fact that no shots are fired from the solid. At a mine in Lancashire, where normal conditions existed, the cost of powder per ton of coal over a period of two years was about 3.75c. At one Scottish mine, where the coal breaks down easily after being undercut, the cost of powder last year averaged less than ½c. per ton.

The Advantage of Undercutting

A visit to European coal mines leaves the observer with two impressions stronger than any others; (1) the advantage of working longwall where possible; (2) the conviction that shooting from the solid is a crime, of which America alone is guilty.

In some of our greatest coal-producing States, 75 per cent. of the total output is secured by shooting from the solid. How can we, therefore, expect to do away with the horrible disasters due to blown-out shots? Safer explosives will help slightly, but the cure lies in undercutting the face.

I firmly believe that American operators generally fail to realize the commercial advantages of undercutting, aside from the consideration of safety. If even 5 per cent. more round coal is produced by shooting after undercutting, and if slack brings only one-half the price of round coal, then it is plain to be seen that there alone is one great compensation for the cost incurred in undercutting.

American operators have come to believe that longwall work is only applicable to an exceptional seam, where the bed is very thin. European operators reverse this belief, and consider pillar-and-stall (room-and-pillar) as only adapted to special cases where the coal is rather thick (certainly above 6 ft.), and where the roof is exceedingly strong, and the seam so clean that no material for gobbing is available. In this connection it may be stated that some mines on the Continent are working longwall, where the seams average considerably more than 6 ft., and where all the exceptional conditions just mentioned exist. In these cases, material for gobbing purposes is flushed in from the surface.

What Have We to Learn From Europe?

We can teach European operators how

to hustle, and we can show them a way to double their output in a decade, but they can teach us how to mine profitably, efficiently and safely. America is a synonym for hurry, and our foreign competitors view our growth with astonishment. It is practically certain, however, that even should labor conditions here and abroad be brought to a common basis, ages would pass before Europeans could be imbued with the spirit of hustle now so characteristic of America.

Our phenomenal growth in coal mining has worked to our own disadvantage. We lack the organization common to the industry abroad. It is really better, from the standpoint of the operator, to mine 100 tons of coal at a profit of $1 per ton, than 1000 tons at a profit of 10c. per ton. This theory may be disputed, in general, on the grounds of the greater stimulation, the greater good; but such an idea is absurd when applied to the development and exhaustion of a limited natural resource.

by a referee or by arbitration, the decision being accepted as final.

The most recent important act relating to mining in England is the "Eight-Hours Act." The first results of this law have been to reduce output and raise coal prices. The condition of absolute control under which the industry in England exists, cannot be more forcibly shown than by calling attention to the flexibility of prices, which so quickly discount adverse conditions.

The greatest danger to mining in Europe lies in the possibility of too much government regulation. In America we have too little inspection, and in addition only indifferent enforcement. With indifferent regulation, the danger comes from the miner being left to his own resources and disaster results. With too much government inspection, responsibility is shifted to federal officers, and the danger then comes from the management becoming careless through relying on the government inspectors.

revision of the State mining law should be made. The revision was reported at the recent session of the legislature, but failed to pass. Recently Chief J. E. Roderick of the Department of Mines issued the following instructions to the mine inspector in charge of the district.

"I desire to call your attention to the mutual agreement or understanding arrived at some time ago between the Department of Mines, a few of the inspectors and several of the operators or managers of the coking-coal region, viz: That blasting coal from the solid could be continued temporarily, providing that the blasting was done by shot firers at night, when employees were out of the mine." It was also understood "that any one of the parties could terminate this agreement at any time on reasonable notice."

"This mutual agreement, so far as the Department of Mines is concerned, will terminate on the 15th day of August, 1909, and you are directed to govern yourself accordingly. On and after

THE SURFACE ARRANGEMENT AT AN ENGLISH COLLIERY IS GENERALLY FAR AHEAD OF THE AMERICAN INSTALLATION

SURFACE PLANT AT ONE OF THE WIGAN COAL AND IRON COMPANY COLLIERIES IN LANCASHIRE

Conditions in Europe and America are not so dissimilar that we can afford to ignore the lessons experience has taught our foreign competitors. Only a cursory glance at samples of our mine laws, and a brief investigation of laws governing coal mining abroad, is necessary to prove the superiority of the foreign rules.

The Employer's Liability

Outside of direct laws governing actual mine development, the most important act with reference to coal mining in England is what is known as "The Employer's Liability Act." This law requires the employer to pay a pension to any employee injured in the regular performance of his duty. No other law has ever acted so speedily and efficiently to curb reckless mining and reduce accidents, as this measure. It has placed a considerable burden in the way of expense on mine operators, but this has not occurred without some compensating advantages. English mine law is administered most fairly, and practically all questions in dispute are settled

Female labor is no longer permitted underground in Great Britain, but is used largely on the tipples and about the surface plants. This labor is paid from 35c. to 75c. per day, and will be further discussed in a subsequent article.

Shooting Off the Solid

A little over three years ago the Pennsylvania mine inspectors charged a number of superintendents and mine foremen in the Connellsville district with violation of the mining law, in permiting shooting from the solid and a number of cases were put into court. The operators insisted that the practice was an old one and was safe, pointing out the few accidents in the coke region mines, and insisted that to undercut the coal before blasting would mean a considerable loss of time, and increased labor and expense. A temporary agreement was then made, suspending the cases until the proposed

August 16, 1909, you are notified that part of Rule 4 of Article 20 is to be considered in full force as if no understanding had ever existed. Said part of Rule 4 reads as follows:

"He (the mine foreman) shall direct that all miners undermine coal properly before blasting it, and that blasting shall be done at only such hours as he (the mine foreman) shall direct. * * * "

It is altogether probable that a conference between the operators of the district and the State Mine Inspectors in the coking-coal region will be held in the near future at which the phases of the mining laws applying to the region will be discussed and an effort made to arrive at an equitable arrangement by which the law will be observed in all its details without friction.

In underground work, the unskilled should be taught to consider all electrical apparatus as "live," for in this way only can security from shock be attained.

The Phenomena Preceding Gas Explosions

The Dangerous Periods for Working Gassy Mines May Perhaps Be Foretold; the Relation of Sidereal Influences to Gas Explosions

BY FRANCIS LAUR

I have already had the honor to develop before the Société de l'Industrie Minérale my favorite theme, viz., the relations which exist between barometric depressions and explosions of gas. Since my communication to the Academy, about 1879, I have had the happiness to see, little by little, this theory almost universally adopted. In order to prevent a too easy generalization from it, I am now obliged to state it with more precision and to say that not all abrupt barometric falls lead to gas explosions, for it is necessary that these falls be preceded by a prolonged period of high pressure, i.e., of compression; and that after having once halted, the fall may proceed with no danger of an explosion. After periods of high pressure it is only the first barometric drops that are to be apprehended. Prolonged pleasant weather is one of the most certain warnings, but there are others no less interesting which I desire to set in the light. These are earthquakes and perhaps other sidereal phenomena.

Already an idea has been suggested, one of whose promoters was M. de Saintignon, that sidereal influences may act upon the central liquid core of the earth as they do upon the ocean, producing internal tides, movements in the crust, and consequently earthquakes. Against sun spots also strong accusations have been brought.

An interesting problem is, therefore, presented to my mind. In what order of sequence do these phenomena—conjunction of stars, sun spots, earthquakes, periods of high pressure, barometric drops, gas explosions—follow each other? Are their manifestations governed by chance, or on the contrary, is there a chronology in their succession? And then is it not possible to foresee long in advance the periods that are dangerous for the working of gassy mines?

It is evident that such a study should offer some interest and perhaps complete the theory of abrupt barometric falls. That is why we have undertaken it for the Industrie Minérale.

Three Relations Noted in 1875

It was about 1875 that public attention was first attracted in England by a sequence of coincidences which took place at that period between a succession of earthquakes and violent gas discharges which dominated certain collieries of Outre-Manche [upper Manchester]. The author of these observations, who remains unknown, published them in an English mining journal.

As early as 1874 S. de Rossi called attention to periods of activity inside the earth (varying from a few days to a week at most) during which lively agitation of the pendulums coincided with series of terrestrial shocks—earthquakes, volcanic eruptions, barometric falls and the like.

At the end of 1880, when the Anderlues disaster occurred, M. de Rossi renewed his campaign for applied study of endogenous meteorology, and in a conference at Amsterdam, 1883, he demanded the addition of instruments for internal auscultation to those for giving atmospheric and other warnings of gaseous discharges. Unfortunately this appeal was not listened to, and implacable routine prevailed.

Many years ago I demonstrated the relations which exist between abrupt barometric falls and gas explosions. In 1879, while studying the eruptions at the unusually gassy mineral spring of Montromd, I demonstrated in numerous communications to the Academy the relations existing between frequency of gaseous eruptions, barometric depression and seismic movements. Thus, the earthquake at Ischia was indicated by a violent discharge of gas at the Montromd spring. From that time I established a system for predicting gaseous discharges which has given results sometimes remarkably precise, as has been shown by the Geological Society of Belgium in its bulletins.

Academy of Sciences, Paris, Interested

In 1883, that eminent geologist and French mining inspector, M. de Chancourtois, from the lofty tribune of the Academy of Sciences, Paris, advised an investigation of the possible correlations which he suspected to exist between the data of terrestrial seismology and gaseous discharges.

The following year, in 1884, Japan outstripped Europe, and Mr. Miller, the learned English seismologist, was commissioned to organize a program for the protection of gassy Japanese mines. Some steps were taken toward the execution of his plans. In England, Walter Brown entered the same field, and, impelled by him, since 1885 the English commission on gas, assuming certain gaseo-seismic relations to be probable, has also concerned itself with the question.

In France, meanwhile, the seed planted by M. de Chancourtois and myself had sprouted, and in 1886 there appeared in *Ann. des Mines* an interesting report by MM. de Chancourtois, Chesneau and Lallemand who had been officially sent to Italy and Switzerland to study the organization of the geodynamic and microseismic stations of those countries where earthquakes are frequent. This research by the learned French specialists resulted in the establishment in the northern coal basin of a double investigating station comprising the Douai observatory and the Hérin shaft, one of the Compagnie d'Anzin's most gassy mines. Unfortunately the instruments used were not of a kind most favorable to this sort of study and, further, the gaseous manifestations in those quarters did not belong to that type of discharge (only too well known in Belgium under the name of "instantaneous disengagement") which demands careful study by this new method of gaseo-seismic relations.

Forel's Law

The idea gained ground in spite of unfavorable circumstances, and in consequence of the great earthquake of Feb. 23, 1887, felt on the Mediterranean coast at Nice and in Italy, Professor Forel, as the conclusion of a study published by the Academy of Sciences, Paris, made the following announcement which is known by the name of Forel's Law: "It is necessary to take double precautions against gas on days following an earthquake whose seismic area reaches the territory of the mines in question."

The *Ann. des Mines*, 1888, contained a study by M. Chesneau, analyzing the information supplied during 11 months of 1886 by the Hérin station. The diagrams obtained established, in spite of the unfavorable conditions already noted, interesting and repeated agreements between the micro-seismic disturbances observed during this period and the phases of intensity of gaseous discharge. M. Chesneau, as a conclusion, was led to recognize a certain relation between the micro-seismic movements and the discharges of the gas. The published diagrams show, on their part, that the maxima of gaseous discharges are found to be very regularly preceded or accompanied by strong seismic agitations. There is even a case where, in the diagrams taken by M. Chesneau, the precedence of the maximum effect of the seismic phenomenon to the gaseous phenomenon appears in a striking manner.

Note.—Abstract of a communication in the *Bull.* de la Société de l'Industrie Minérale, June, 1909.

Nine Hours' Warning

To fix these ideas it is well to give a few examples: During the period from Dec. 7 to 10, 1886, a veritable tempest in the earth coincided, in western Europe, with an intense barometric depression and with the appearance of decided gas discharges. Now, the lines of the diagram which give the parallelism between the barometric changes, the gas liberation at Hérin and the micro-seismic movement noted at the Douai observatory, clearly show that the maximum and truly abnormal period of seismic agitation (which therefore constituted a true warning) preceded by nine hours the dangerous (3 per cent.) maximum of gas discharge in the air of the mine.

We find in one of the works of Mr. Van den Broeck[1] an exposition of the gaseous phenomena which, during the same troubled period, were manifested in France, Belgium and England, showing that there was no possibility whatever of a simple coincidence. Various writers, such as Messrs. Canu, Doneux, Laur, Milne and Zenger, have defended the gaseo-seismic relations and it was for the purpose of practically explaining the problem thus presented—based upon the precise observations made at the Hérin shaft and elsewhere—that the Belgian Geological Society, impelled by its general secretary, E. Van den Broeck, decided to take up the question, submitting it to direct, systematic experimentation.

Permanent Committee Established

The statement of reasons presented by Van den Broeck, at the special meeting of the aforesaid society, June 14, 1898, brought forth valuable encouragement from M. Nyssens, then Minister of Labor and Industry, and led the Belgian Geological Society to express a desire for the establishment, with a view to gas investigation, of stations for endogenous meteorology in the Hainaut coal basin, correlatively to the creation of a geophysical station in the same region, called for by the Belgian Astronomical Society. In order to accomplish this end the society decided to create a permanent section charged with the study of the question.

At the meeting of Aug. 2, 1898, a program formulated by Léon Gérard and E. Van den Broeck for studying the phenomena of gas discharge was tentatively adopted. Long and interesting discussions conducted by M. Harzé, on one part, led to the elucidation of various technical points and to the elimination of some misapprehensions from the question. A subsidy of 1000 fr. was allotted for the studies in prospect, thus bringing the question into active consideration.

The permanent section on gas, established by the Belgian Geological Society, definitely adopted, at its meeting of Nov. 14, 1898, the program of inquiry for the study of gaseous phenomena.

Widening Field of Research

But the researches made by the promoters of the enterprise showed a broadening field for investigation. Thus, to the data of a micro seismic nature, it was necessary to add that furnished by the variations of the magnetic elements, which in turn led to the necessity of increasing the scientific equipment of the stations that were to be established. This was demonstrated by E. Van den Broeck in a study entitled "The Gaseous Predictions. Preliminary Researches Occasioned by the 'Warnings' of M. Francis Laur," and with the subtitle, "Analysis of Complementary Facts and Observations Relative to the Exposition of the Data Furnished by the Magnetic Elements."

The inevitable period of incubation and material difficulties encountered by every new enterprise, prolonged here by researches on avoidance of danger from electric lighting in a very gassy mine and also by the quest for indispensable financial resources, brings us to Mar. 27, 1901, the date of the meeting of the Belgian Geological Society, at which M. Eugène La Grange presented his "Report Relative to the Creation of Seismic Stations for Study of the Conditions of Discharge of Gas."

Deep-level Experimental Stations

The first thing to do, as has already been mentioned, was to organize—thanks particularly to the friendly coöperation of I. Isaac, manager of the Agrappe colliery—the first deep or especially gaseo-seismic geophysical station. This was to be established at a depth of 819 m. in the heart of one of the most gassy collieries in the country. A committee of 12 persons, including various specialists, was nominated by the society to aid Eugène La Grange in his difficult task.

At the meeting of June 21, 1901, M. Van den Broeck, in explaining the state of the question at that time, announced the practical possibility of putting it definitely into execution, thanks to the subsidy of Hainaut province (1000 fr.) and to the generous gift of Messrs. Montefiore-Levy, Ad. Urban and Aug. Beernaert. The organization of the two stations decided upon by the society at Frameries and Quenast was thus assured.

Further Ad. Greiner, general manager of the Cockerill company, announced that, aided by some friends, colliery operators of the Liège basin, he placed it in the committee's power to organize also, at the cost of this local group, a gaseo-seismic underground station identical with that of Agrappe to be installed in a gassy mine of the Liège basin, and at the same time perhaps a complementary outside comparison station. The installation of the two seismic stations of Quenast and Frameries occupied much time but it has been completed. The Hibernia mine has established an observatory of this sort.

The Question at Present

Such are the ideas that have, so to speak, placed the question on the order of the day. Minds in all countries have united their efforts to solve the problem. Very recently, in the Engineering and Mining Journal, Feb. 20, 1909, W. A. Spalding has furnished striking statistics which reply to doubts that the new theory has raised in many intelligent minds. (Here follows a translation of Mr. Spalding's article, practically in full. M. Laur then proceeds as follows:)

It now seems established that the chronology of the phenomena preceding gas explosions is as follows: (1) A period of high barometric pressure; (2) earthquakes; (3) abrupt barometric depression; (4) explosion of gas. But today there are being added to the terrestrial phenomena aforesaid, extra-terrestrial phenomena. To the actions and reactions of the internal atmosphere upon the external atmosphere, and reciprocally, are added sidereal and astral actions. Let us examine them.

Seismic Activity Periodical

The Abbé Moreux, director of the Bourges Observatory, has thus summed up this theory:

"That there are periods around which are grouped volcanic and seismic activity, can no longer be doubted. To be convinced of this truth, it is enough to read the newspapers. The report of an earthquake is never an isolated fact. I could cite a hundred examples to that effect. Let us confine ourselves to recent facts.

"Nov. 12, 1908, earthquakes in Belgium, Germany, Westphalia, etc., lasting all the month." (We here interpolate says M. Laur the gas explosions in the Marianna mine, at Pittsburg, 125 killed); "Nov. 19, disturbances at Leipzig, in western Saxony, in Thuringia, etc. . . . ; Dec. 2, earthquakes at Reggio; Dec. 7, at Galati." (We interpolate here, says M. Laur, the terrible explosion of Dec. 11 in a colliery of Benavon, in Monmouth); "Dec. 20, earthquakes in Maine-et-Loire." Then the manifestation became general. Disturbances were noted in America, and several days later came the horrible news of the catastrophe in Sicily and Calabria.

Sun Spots Before Mine Disasters

In support of his theory on the relations between mine explosions and sun spots, M. Moreux recalls that "In November last, the sun presented two enormous spots with magnetic deviation, and on Nov. 12 the mining disaster of Hamm, Westphalia, occurred. April 20, 1896, violent earthquakes were produced at the same time as the disaster in the Ciphy mine, and at Micklefield. July 3, 1908, earth-

[1] Van den Broeck, "La Météorologie en dogène et le Grisou." Address made, July 3, 1898, on the occasion of the extraordinary session at Béthune of the Société Géologique du Nord. *Ann. de la Société Géologique du Nord*. Vol. 27, 1898; pages 150-174.

quakes in Italy and Austria accompanied a gas explosion in a Belgian mine where hitherto no gas has been detected. The disaster of Courrières, March, 1906, occurred at a time when the sun was in an intensely critical period.

"It is the periodical repetition of the troubles observed in September, 1905, March, 1906, and August, 1908; and we would be able, by going back to earlier years, to extend the list indefinitely. Who, then, will pretend that it was a current of molten lava which, through underground ways of several thousand kilometers, acted at the same time at points often 4000 to 5000 km. apart?

Old Hypotheses Discountenanced

"That hypothesis is as puerile as one which requires the ocean water to enter by appropriate crevasses as far as the incandescent core, situated 70 km. deep and at 200 km. from the coast. I here refer to the equatorial volcano of Sangay, whose activity has not varied within human memory.

"Does not the water wash at all times those coasts most devastated by earthquakes?* And if it is an important factor, there is yet to be explained how, in certain periods, the tremors are felt simultaneously at widely remote points. There is certainly a periodicity in the phenomenon, but if this periodicity exists, we are led to seek the law by which it is governed.

"Although statistics seem to indicate that the earth quakes continually, they permit a deduction that though the phenomenon takes place more often in winter than in summer (this is true also of gas explosions), the intensity of it is 3½ times greater in the hot season. Further, earthquakes come oftener in the night than in the day, and in the morning than in the evening.

Solar Activity and Seismic Disturbances

"Of all phenomena, atmospheric electricity agrees best with the distribution of seismic disturbances. We know, moreover, that great electric and magnetic manifestations are due to the sun. I have, therefore, been brought to the conclusion that the cause of the phenomena has a source outside of the earth, and that the sun plays an important role in the periodicity of volcanic phenomena and earthquakes.

"We know that the solar activity passes through a maximum every 11 years, and, indeed, [illegible] most frequently in the [illegible] when the activity of the sun is feebler. This law is almost without exception since the date when observation of solar spots began. Earthquakes [illegible] especially in the years when the solar activity [illegible] increasing or decreasing. This theory has already allowed me to predict several seismic manifestations.

1912 an Earthquake Year

"In 1905 the solar activity, then at its maximum, abruptly diminished and violent earthquakes occurred. It will continue to decrease until 1912, the period at which it will reach its minimum, and thereafter will ascend. The volcanic disturbances will group themselves around that fatidical year.

"But the solar activity does not decrease abruptly nor according to a regular curve; it often turns very noticeable somersaults like the pulses in a disease. The most striking somersault generally takes place three years after the maximum. We are now at the full crisis of earthquakes, and present phenomena only too sadly justify this general law. We have, therefore, to expect further seismic disturbances, which will not decrease until the end of 1909. Alas, we shall fall into the minimum phase of the solar crises, and eruptions will resume their fresh vigor.

"Thus marches the history of the world. When will come the day in which humanity will be persuaded that the science for them to hold closest to heart is the science of the sun?"

Conclusion

Gentlemen, behold how we are connected with the phenomena of that marvelous star around which we roll. Solar spots evoke the seismic disturbance and that evokes the abrupt barometric fall and the gas explosion. And all this is governed by a star.

Behold how we are compelled, we engineers, to become not only meteorologists but astronomers. Thus ever the horizon is widening around us, and to be at the top of our profession there are constantly required of us new efforts and new studies. It is the law of human labor.

I have desired only to outline before you the relation and chronology of the phenomena with which our workmen's lives and our own lives are bound up. True enough, many objections will present themselves to your minds, many doubts will have their day, but you will admit, like myself, that the grand scientific liberality of our Industrie Minerale ought to take up all ventures, all theories, at their inception. Who knows, in fact, but that they may be able to lead us in the way of progress?

The Hoopes electric furnace installation which the Steel Corporation is making at Worcester, Mass., will probably not be ready for operation before Oct. 1. The furnace will be operated on electric current secured from an outside source, and considerable delay has arisen in this connection.

Colliery Notes

It is customary to consider 1000 amperes per square inch as the carrying capacity of cables, however, it has been proved that the carrying capacity increases beyond 1000 amperes per square inch for the smaller sizes, and decreases for the larger sizes. Similarly, the insulation resistance increases with the lessened diameter of the wire.

The deliveries of anthracite by regions for the year 1908 are reported by the Bureau of Anthracite Statistics as below, in long tons:

Region	Domestic.	Steam.	Total.	Per Ct.
Wyoming	24,061,955	14,810,340	38,872,295	60.1
Lehigh.....	4,544,588	3,241,667	7,786,255	12.0
Schuylkill	9,712,782	8,293,682	18,006,464	27.9
Total.	38,319,325	26,345,689	64,665,014	100.0

Domestic sizes include chestnut and all over; steam sizes, pea and all smaller.

The following table, prepared by the Bureau of Anthracite Statistics, shows the percentages of the different sizes of anthracite made and shipped during 1908, by regions:

	Wyoming.	Lehigh.	Schuylkill	Total.
Lump....	0.8	1.5	1.5	1.1
Broken.....	5.2	8.1	5.7	5.6
Egg	12.6	12.5	11.0	12.1
Stove	20.8	16.6	17.8	19.5
Chestnut.	22.5	19.7	18.0	20.9
Total domestic...	61.9	58.4	54.0	59.2
Pea	12.0	13.6	13.2	12.7
Buckwheat.....	12.5	16.2	18.6	14.7
Rice and barley	13.6	11.8	13.5	13.4
Total steam...	38.1	41.6	46.0	40.8
Total	100.0	100.0	100.0	100.0

The Schuylkill region shows much the highest proportion of small sizes made.

In the year 1800, the countries which produced coal were Great Britain, Belgium, France and Germany; the outputs were: Britain 10,000,000 tons, Belgium 2,500,000, France and Germany about 1,000,000 each. At this time Watt's steam engine was in use and coal was used for steam raising, for iron smelting and other metallurgical processes, as well as for domestic purposes. In 1850, Britain produced 50,000,000 tons, Belgium 6,000,000, France 4,500,000 and Germany about 6,000,000 tons. At this time the United States had a production of about 3,500,000 tons, and the world's coal output was under 75,000,000 tons. The real coal era began about 1860, when the world's combined output was 130,000,000 tons, with Britain producing about two-thirds of the total. As American operators now produce upward of one-half billion tons annually, or approximately one-half the world's total output, it would appear that we have little cause for complaint if we view the industry from a standpoint of comparative or superior growth.

Free and Hindered Settling of Mineral Grains

Theory and Principles Discussed. New Equations Derived Theoretically, Worked out from Experiments and Applied to the Classification of Ores

BY ARTHUR O. CHRISTENSEN*

At the meeting of The American Institute of Mining Engineers, held in New York, April, 1907, Prof. Robert H. Richards, of the Massachusetts Institute of Technology, presented a paper entitled, "Velocity of galena and quartz falling in water," in which he described a series of experiments carried out under his directions. Since that time his interest has been drawn to work on the laws of hindered-settling. He has invented a hindered-settling classifier, and has done considerable experimental work to find the hindered-settling ratio of quartz and galena.

While working in Professor Richard's employ on this classifier I became interested to work out this ratio mathematically, and, if possible, the theoretical, i.e., mathematical, explanation of this hindered-settling action.

This paper first gives in plotted form—Plates I to IV—data taken from the paper by Professor Richards on the velocities of galena and quartz grains settling freely in water; along with a discussion of free-settling, and the derivation of formulas to express these velocities. With these as a basis, a method is given for working out the hindered-settling velocities and general conditions for quartz and galena, or incidentally any two minerals.

Free-settling

By the term, velocity of a grain, is meant the velocity which a grain attains when falling in water. It is the same thing as the velocity of the rising current necessary to keep the grain from either sinking or being carried up. This maximum velocity of the sinking grain is attained after a fall of about 2 ft., depending on the size of the grain.

In Plates I to IV, inclusive, the little cross marks (x) represent the average diameter corresponding to the horizontal position of the cross. To judge the reliability of these averages, or any law derived from this data, it seems necessary to know the average deviation of the individual velocities from these averages as given. Therefore, in Plate III, in each case the average deviation of the 100 grains is denoted by a dot and circle on each side of the cross. This deviation in velocity is due largely to the differing shapes of the grains, but also is due in part to the range in the size of the grains taken. For example, the grains plotted as having an average diameter of 11.93 mm. are, in fact, anywhere from 11 to 12.9 mm. in size. A closer sizing would give a smaller deviation in velocities. As it is impossible to calibrate the screens used for sieving precisely, variations of averages from the curve are, in part, due to this error.

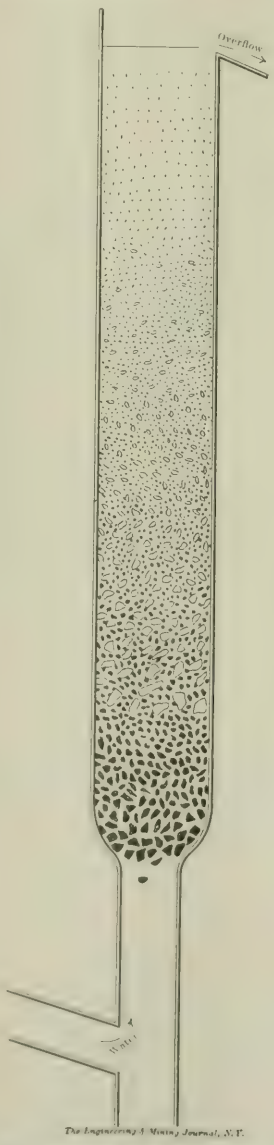

FIG. 1. CONDITION IN HINDERED SETTLING

In the case of the four largest sizes of galena grains in Plate III vertical lines represent by their length the number of grains having velocities corresponding to the horizontal position of these lines. An examination of these shows how the bulk of the grains have velocities greater than the average. It is a question whether to plot the velocities from the mass of grains in each case, or to take the average velocities, which are dragged down by some odd shaped grains lagging behind the rest. An upright cross (+) represents the velocity of the bulk of the grains. The curves plotted are compromises between this and the average.

In making Plate III especial pains were taken to show that the velocity of any size of quartz or galena grain can be stated quite accurately from its diameter. The mathematical curves representing the velocities as plotted on Plates I and III are seen to lie well within the average deviations of the velocity in each case, and in most cases between the average velocity and velocity of the bulk of the grains.

Rittinger is still often quoted as having established the law for the velocities of grains of mineral falling freely in water. He assumed the grain to be a cube, falling with faces horizontal and vertical, in which case, falling at maximum velocity, the weight of the grain in water is equal to the area of a face, multiplied by the head of water required to hold it up. This head is here a velocity head, being known from the formula:—

$$V = \sqrt{2gh},\ h = \frac{V^2}{2g}.$$

Thus

$$D^3(G-1) = \frac{V^2}{2g}D^2;\ 2gD(G-1) = V^2;$$

$$V = 140\sqrt{D(G-1)}$$

D = diameter of the grain in mm., in this case the length of an edge of the cube. G = sp.gr. of the mineral. Therefore $(G-1)$ is its specific weight in water. V = velocity attained in mm. per sec., or the current necessary to support the grain. g = acceleration due to gravity: i.e., 9800 mm. per sec. As this equation gives velocities far too high Rittinger substitutes for the 140 a factor k which varies from 61 to 87, according to the shape of the grains. In any case, whether we assume the grain a cube falling with one corner down, as it would naturally fall, or a sphere, or an ellipse, his formula, be-

*Mining engineer, Dorchester, Colo.

rived from a purely theoretical consideration, is the equation for a parabola. No parabola, however, can be plotted which will even lie between the average deviations of the velocities of the grains. In other words, the experimental precision

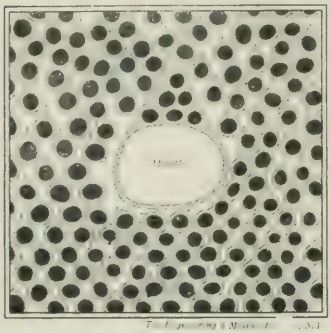

FIG. 2. GALENA AND QUARTZ GRAINS SHOWING STILL WATER

warrants an equation much more precise than any of Rittinger's.

If we sieve a crushed mineral through a series of seives and weigh a known number of the different sizes of grains we would probably expect that the weights would vary as the cube of the diameter varied, and would follow the equation $W = \frac{\pi D^3}{6} G$, where W is the weight of the grain, D the mean between the diameter of the last sieve which the grain passed and that of the sieve which it was caught on, and G is the sp.gr. of the mineral in question. This, however, is not the case. Here the cleavage of the mineral comes into play. The weight of a cube is almost twice that of a sphere of given diameter. The weight of an ellipsoid is greater or less than that of a sphere depending on which axis of the ellipsoid we take as its diameter.

If we take a mineral sized through a series of sieves, and weigh a definite number of each size grains, a plot showing the weight of the sizes will vary as the cube of the diameter of the grains, but will not coincide with the formula

$W = \frac{\pi D^3}{6} G$, which assumes the grains spheres. Of course the curve will depend, in part, on how the mineral was sieved. By the gentlest sieving the weight of the grains will be lower than if rough and repeated sieving was done. By using comparatively gentle sieving it has been found that for quartz, $W = 1.15 D^3$, expressing the weight of the grains in terms of its diameter, the quantities being in millimeters and milligrams. For galena the weight is $W = 4.8 D^3$. The weight of the galena grains is above, and of the quartz below the values expressed by the equation $W = \frac{\pi D^3}{6} G$, which are 3.93 and 1.39 respectively. This is what we should expect, as galena tends to break into cubes and quartz into ellipsoids and lath-shaped pieces of all manner of irregular shapes, which, when sieved gently, have a weight, in proportion to their diameters, less than what spheres of quartz would have. The same is the case with pyrite grains, or crushed slag.

If, from these equations for the weights of quartz and galena grains, we should derive equations for the velocities of the grains falling in water we might claim to have the most accurate equations which could be derived from purely theoretical considerations. If $W = 1.15\ D^3$ is the weight of the quartz grain in air its weight in water (W_w) would be:—

$W_w = 1.15 D^3 \frac{G-1}{G} = 0.716 D^3$. Equating the weight of the grain to the head of water impinging against its horizontal cross section we get

$$0.716\ D^3 = \frac{\pi}{4} D^2 \frac{V^2}{2g}$$

$$V = 133.6 \sqrt{D}$$

Similarly for galena we can derive the equation $V = 322 \sqrt{D}$ from the formula $W_w = 4.8 D^3$.

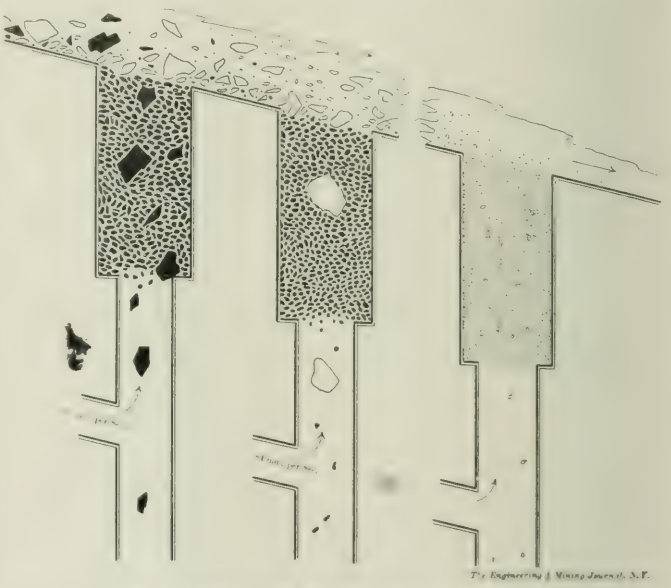

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FIG. 3. APPARATUS FOR HINDERED SETTLING CLASSIFYING

Factors Effecting Velocity of Falling Grain

Going further into the consideration of the factors acting when a grain is falling in water we see there are at least two more elements which enter. On the one hand, the weight of the grain in water is the only element forcing it down, so on the one side of the equation we may feel secure in placing W_w, or its equivalent 0.716 D^3 for quartz, and 4.16 D^3 for galena. On the other side there is the impact of the rising water against the horizontal section of the grain. This is an uncertain quantity. In fact it varies constantly as the grain revolves and twists while sinking. Here this section has been assumed a circle, which for the present seems as accurate as can be stated, although probably, as with the weight, the cleavage again enters.

Then, every grain is known to retain a film of water about it. This film may not be sharply defined, but the water immediately next to the grain stays with it; that not so close tends to stay with it, but may be dragged away; and the water outside of this may merely be dragged along for a short distance with the grain. The effect is that of a film of a definite thickness.

This action is well illustrated by beach sand. It is to be observed that beach sand does not wear down indefinitely, but after a certain fineness the grains are protected from further wear by a film of water. This film tends, in the case of grains sinking in water, to increase the diameter, and consequently the horizontal cross section without increasing the weight. In the case of the larger sized

grains this effect may be small, but in the case of the smaller ones it is an important factor.

Another influence seems to enter into the sinking ability of the finest grains. The water seems to have a power of cohesion which must be overcome by the grains. The smallest ones seem to be almost entirely unable to force the water apart. This is illustrated in the case of slimes which will hardly settle at all unless some salt, such as soda-alum, be added to the solution. This salt seems to destroy the water's power of cohesion. For example, grains of galena 0.03 mm. in size have the velocity which a grain of that weight and 0.5 mm. in size would have if it was merely a case of the weight acting against the impact of rising current. Grains of quartz 0.03 mm. in diameter have the velocities which would be expected of grains 1 mm. diameter and of that weight.

For the larger grains the viscosity of the water enters into account. There is a resistance offered by the water, which increases as the velocity of the grains increases. This effect acting on the larger grains, and the effect of cohesion, and a film adhering to the grain, acting on the smaller ones, is found to cause a nearly constant loss in velocity for all grains having a velocity above 5mm. per sec., according to the results obtained by Professor Richards.

$$V = \sqrt{\frac{W(G-1)8g}{D^2G\pi}} - \left(0.1115\sqrt{\frac{W(G-1)8g}{D^2G\pi}} \div D + 21.10\right) = 158\sqrt{\frac{W_w}{D^2}} - \left(17.6\sqrt{\frac{W_w}{D}} \div D + 21.10\right)$$

An attempt was made to derive formulas which should be more exact than these. The equations $V_q = 147\sqrt{D_q} - 55\sqrt[6]{D}$ and $V_g = 380\sqrt{D_g} - 125\sqrt[4]{D_g}$ were found to be about the best empirical formulas which could be derived for the velocities of quartz and galena sinking in water. They are plotted on Plates III and IV and are seen to hold very well for all grains above 0.1 mm diameter. The equation $V = 147\sqrt{D}$ is what would be derived, assuming the quartz grains to be spheres with no adhesion, cohesion, friction, etc., entering into consideration.

For the smallest grains both of the

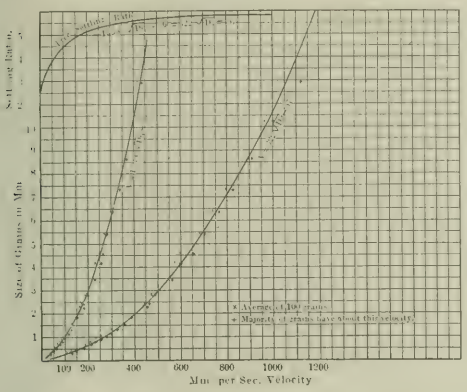

PLATE I. VELOCITIES OF QUARTZ AND GALENA GRAINS FALLING FREELY IN WATER

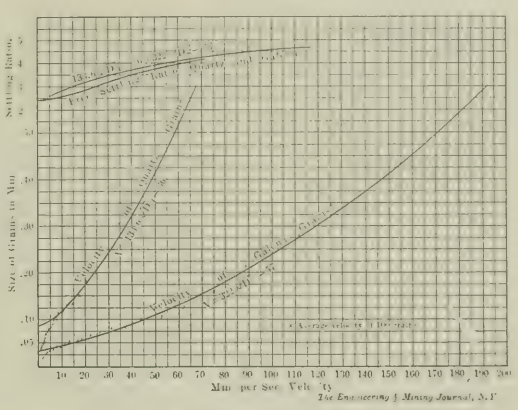

PLATE II. VELOCITIES FOR GRAINS OF SMALLEST SIZE SHOWING DEVIATION FROM FORMULAS

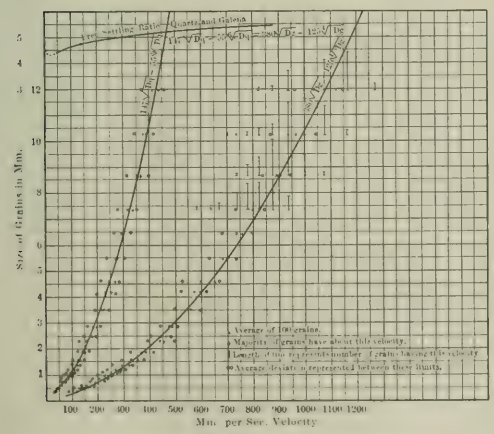

PLATE III. VELOCITIES OF QUARTZ AND GALENA GRAINS FALLING FREELY IN WATER

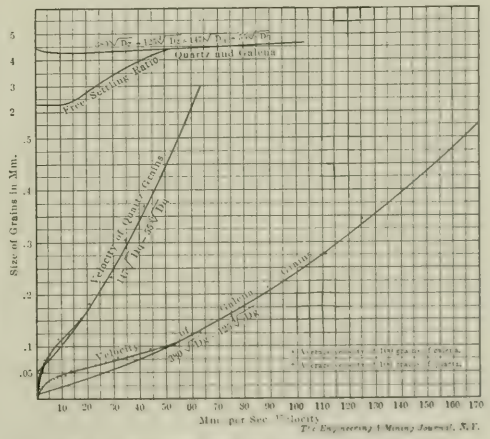

PLATE IV. VELOCITIES FOR GRAINS SMALLER THAN 0.5 MM. SHOWING DEVIATION FROM FORMULAS

Equations Derived for Free-settling Velocity of Grains

Thus if we subtract 36 from the equation which we derived from quartz, and 57 from that for galena we get the equations: $V_q = 133.6\sqrt{D_q} - 36$ and $V_g = 322\sqrt{D_g} - 57$. As seen on Plates I and II these equations fit the results found from experiment admirably well. Generalizing these equations so as to have an equation to hold for all minerals we get:

above sets of formulas fail, and we must use the formulas $V = 700\ D^2$ for quartz, and $V = 4000\ D^2$ for galena.

For grains of quartz and galena having equal settling velocities the equations may be combined thus:

$$133.6 \sqrt{D_q} - 36 = 322 \sqrt{D_g} - 57.$$

Substituting values for D_g we get corresponding values for D_q. D_qD_g is the free-settling ratio of quartz and galena. This ratio is plotted on Plates I and II. In the case of the smaller grains, Plate II also gives the ratio as computed from the plotted values, thus showing the variance of the actual ratio from that derived from the formulas. Plates III and IV show the same as Plates I and II using the more exact formulas.

In the case of the smallest grains the ratio figures out

$$700\ D_q^2 = 4000\ D_g^2;\ D_q^2 = \frac{4000}{700}\ D_g^2 = 5.71\ D_g^2;$$

$$D_q = 2.39\ D_g;\ \frac{D_q}{D_g} = 2.39 = R.$$

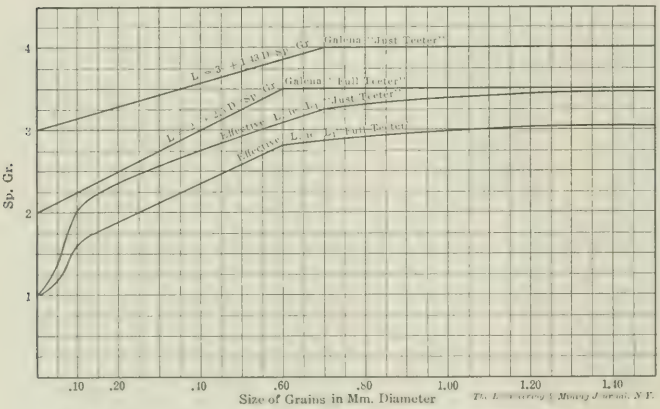

PLATE VI. SPECIFIC GRAVITIES AND EFFECTIVE SPECIFIC GRAVITIES FOR COLUMNS OF TEETERING GALENA

The free-settling ratio for the smallest grains seems to be a constant, i. e., 2.4.

Hindered Settling

In Fig. 1 is represented, diagrammatically, a tube having a constriction at the lower end. The area of this constricted end is about one-quarter the area of the cross section of the rest of the tube. A current of water runs from the bottom and overflows over the top. A mixture of crushed quartz and galena, for example, below, say, 2 mm. diameter, has been put into the tube. The velocity of the current rising through the constricted area of the tube is such that the heaviest grains just cannot fall through it. From Plate I or Plate III we see that this velocity, since the largest galena grains are 2 mm. diameter, [illegible] per second.

In the tube the larger and heavier grains [illegible] the bottom, the lighter [illegible] up. A state of equilibrium is reached where the actual velocity rising through any section of the tube is just sufficient to support the grains which are occupying that section. Thus we notice that toward the bottom of the column the grains are more compact than higher up. Perhaps the condition of the grains near the bottom could be described by the term, "just not teeter;" those a little higher up "just teeter;" and still higher as "full teeter," whereas the grains at the top of the tube would be so widely separated from one another as to be called "free-settling."

The point to be noticed in this condition is that the grains of quartz which find their place at a certain hight of the tube are of such a size that their free-settling velocity is very much greater than that of the galena grains which occupy the same position in the tube, when the system is in equilibrium. It might be supposed that grains having the same settling velocities would occupy the same portion of the tube. Such is not the case, and it is in this action that hindered-settling obeys different laws from free-settling. The larger grains of the lighter mineral are forced up by the smaller grains of the heavier mineral.

The effect of maintaining a column of teetering grains is that of establishing a liquid whose specific gravity is equal to the total specific gravity of this teetering column, with modifications which will be considered below, and whose viscosity is that of water, as it is a case of the current rising against the grain which is trying to sink through it, rather than that of the grain falling freely through a quiet liquid.

Experiments carried out especially for this paper give data as shown on Plate VI. If a column of teetering grains of galena is maintained so that each grain seems to be supported [illegible] by the current, and not at all resting on any grains below it, [illegible] which is here called, full teeter. For grains below 0.6 mm. diameter the specific gravity of such teetering columns, which is symbolized as L, varies directly from 2 to 3.5 as the diameter of the grain increases. Therefore $L = 2 + 2.5\ D$. For teetering columns of grains larger than 0.6 mm. the specific gravity, under these conditions, is 3.5. The increase in specific gravity of the teetering column due to the galena thus varies from 1 to 2.5.

For purposes of hindered-settling it does not seem necessary to keep the grains so actively teetering. If they can be kept at just enough of a teeter so that any large grain can readily find its way through the column we have the state of highest efficiency of the teetering column, for then it has the highest possible specific gravity, and yet is capable of doing its work, which is, in part, to allow all grains of a higher hindered-settling velocity than those of which it is composed, to pass through. This condition is called, just teeter. For lack of time this state was not thoroughly tried out. Further experiment may show that a still higher specific gravity may be maintained in the teetering column, without destroying its efficiency. The condition of just teeter seems to have a specific gravity varying from 3 to 4 as the grains vary from 0 to 0.70 mm., in $L = 3 + 1.43\ D$. For larger grains the specific gravity remains at 4.

The effect of the increase in the specific gravity of the teetering column, due to the galena in it, is diminished by the fact that the velocity of these grains is less than their theoretical velocity. If their actual velocity is only a half of their theoretical, the increased specific gravity due to their presence will be only half available.

Let us imagine a tube containing granulated iron suspended in water. If it were possible, imagine a magnet held above this column at just such a position that the grains have no tendency to sink. In this case would the presence of the iron in the water have any power to force a grain of quartz, for example, up? Certainly not. Any non-magnetic substance which could sink in water could sink with the iron present. If, however, the magnet were removed, and a current of water passed up through the tube, just sufficient to keep the iron in suspension, it would be found that grains of quartz which might be able to sink through this current of water were the iron not present are now unable to penetrate this bed of teetering grains, and if they should get into it, would be forced up again.

In the case of galena, or any other mineral, there is an action similar to that of the imaginary magnet, which keeps the grains from sinking as rapidly as we might expect. This action is the combination of all the forces described above as adhesion, cohesion, internal friction, etc. The power of the grain of galena to force up the larger grain of quartz is measured

by its ability to sink. Thus the increase in the specific gravity of the teetering column due to the presence of teetering grains is not wholly available for keeping other grains from settling. The available increase of specific gravity is proportional to the available velocity of the grains forming the teetering column. By the available velocity of a grain is meant the actual velocity in contrast to the theoretical velocity. On Plate V is shown what per cent. the available velocities of quartz and galena grains are to their theoretical velocities. It is seen that the actual velocities range from practically nothing for the smallest grains to 83 per cent. for the largest galena grains plotted there.

If these percentages be applied to the equations for the specific gravity of teetering columns as plotted on Plate VI, we get the other curves which show the effective specific gravities of these teetering columns under the conditions of "full teeter and just teeter.

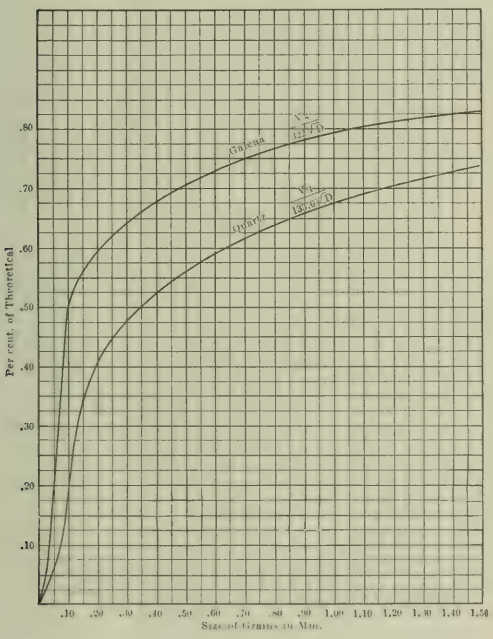

PLATE V. PER CENT. OF THEORETICAL VELOCITY ATTAINED BY GRAINS FALLING FREELY IN WATER

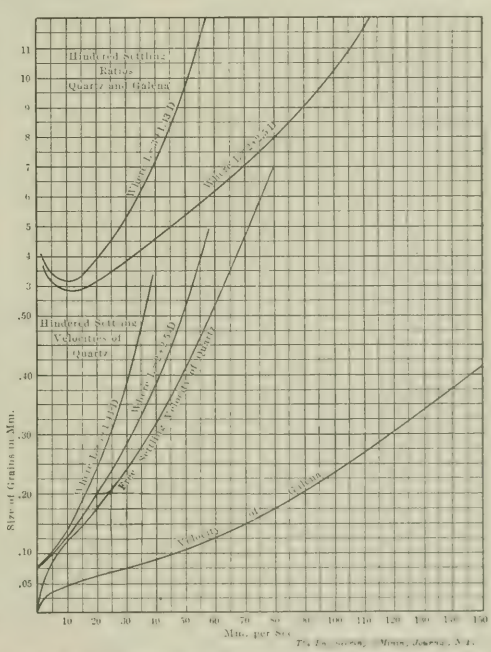

PLATE VII. HINDERED SETTLING RATIOS FOR QUARTZ AND GALENA AND SETTLING VELOCITIES

Equations for Hindered Settling

The general equation for the free-settling velocity of any mineral has been found. For hindered-settling the only difference is that the specific gravity of the liquid, through which the grains are to fall, has been increased. Instead of its being unity it has become L_1, which varies with the size of the grains forming the teetering column, and with the condition of teeter used, as plotted on Plate VI. Thus we may write the general hindered-settling equation:

$$V = \sqrt{\frac{W(G-L_1)8g}{D^2G\pi}} - \left(0.1115\sqrt{\frac{W(G-L_1)8g}{D^2G\pi}} \div D + 21.1\right)$$

or calling the term

$$\sqrt{\frac{W(G-L_1)8g}{D^2G\pi}} \div D,\ a;$$

$$V = 158\sqrt{\frac{W(G-L_1)}{D^2G}} - (0.1115a + 21.1).$$

For quartz, where $W = 1.15D^3$, the equation becomes:

$$V = 104\sqrt{(G-L_1)D_q} - (0.1115a + 21.1),$$

a being $104\sqrt{G-L_1}$.

Consider the case of quartz and galena. For any value of V we find the corresponding size of the galena grain having that free-settling velocity, or *vice versa*. Thus where quartz is the lighter mineral the equation for hindered settling becomes:

$$V = 104\sqrt{(G-L_1)D_q} - (0.1115 \times 104\sqrt{G-L_1} + 21.1).$$

From the size of the galena grain and the condition of teetering we wish to consider, we find the corresponding value of L_1 from Plate VI. All the terms of the above equation are now known except D_q. By solving the equation we get D_q corresponding to L_1 and D_q from which we can plot the hindered-settling velocities of quartz and galena corresponding to the conditions of teeter, as done in Plate VII.

In finding the specific gravity of a mixture of water and a mineral we can use the formula $L = (G-1)P + 1$, where P is the proportion of the mixture occupied by the mineral. In the case of galena this becomes $L = 6.5\,P + 1$. For the condition of full teeter we have found that for grains under 0.6 mm. $L = 2 + 2.5\,D$, therefore $2 + 2.5\,D = 6.5\,P + 1$; $P = \frac{1 + 2.5\,D}{6.5}$. Likewise for the condition of just teeter in the case of grains under 0.7 mm. $P = \frac{2 + 1.43\,D}{6.5}$. If P_w represents the proportion of the mixture occupied by water $P + P_w = 1$, or $P_w = 1 - P$.

Application to Classification

To figure the ratio of the size of the constriction to that of the tube containing the teetering column so that the velocity of water in both cases would be the same, let us call A the area of cross-section of the tube containing the teetering column and C that of the constriction. Then

$$\frac{C}{A} = P_w$$

Here again we find that the practical and the theoretical conditions do not match, so we must consider the working conditions. Fig. 2 represents a vertical section of a teetering column. The galena

grains are represented in solid black. The areas cross-hatched represent water which is practically still. The unshaded spaces between the grains represent the portion of the water which is moving. From experiments it is found that in the case of fine teeter, about half of the water has the effect of being still. For larger grains it is slightly more than half and for smaller ones less, but for practical purposes we may consider half of the water as moving and half as still for all size grains. Under this consideration our formula becomes $\frac{C}{A} = \frac{P_w}{2} = \frac{1 - P}{2} = \frac{6.5 - 1 - 2.5D}{13} = \frac{5.5 - 2.5D}{13} = 0.423 - 0.192\,D$, where the teetering galena grains are below 0.6 mm. Where they are above that $L = 3.5$; $P = \frac{2.5}{6.5}$; $\frac{C}{A} = \frac{1 - P}{2} = \frac{6.5 - 2.5}{6.5 \times 2} = 0.308$. In the case of just teeter the active water is more nearly a third of all the water and the ratio works out

$$\frac{C}{A} = \frac{1 - P}{3} = \frac{6.5 - 2 - 1.43D}{6.5 \times 3} = \frac{4.5 - 1.43D}{19.5} = 0.231 - 0.073\,D.$$

Hindered Settling Classifying

From the equations for the ratio of size of constriction to that of teetering column it is seen that to maintain a given condition, such as full teeter, the apparatus used for every size grain must be different. The smaller the grain the smaller must be the ratio C to A, in the apparatus If a tube, as in Fig. 1, is used and the current cut off by degrees we will have grains of galena and quartz coming down together which have the same hindered-settling ratios, but each time the condition of teeter will be different. If the ratio of size of constriction to teetering column is such that the larger grains are in a state of full teeter when the current is just enough so they cannot fall through the constriction, then by the time the smaller grains begin to come down a state of less teeter is maintained. The grains are not at full teeter, thus the specific gravity of the column is increased above what it would be if they were, and we are approaching the state of just teeter. Experiments carried out with such an apparatus have thus been known to give, within narrow limits, a higher hindered-settling ratio for the smaller grains than for the larger ones.

It may be difficult to change the ratio of size of constriction to size of teetering column as the size of grains changes, so an apparatus designed on the principle of Professor Richard's hindered-settling classifier may be of interest as it can be made to regulate this difficulty automatically. In Fig. 2 there are a series of tubes through which a teetering series of currents are rising. The currents are so regulated that the first tube will maintain a bed of galena of a desired size. The other tubes maintain beds of galena of decreasing size. In this way each tube is made of such a size, in proportion to that of the constriction, that the desired condition of teetering is maintained.

Suppose we are treating a product of galena and quartz below 2 mm. diameter, and decide to maintain the condition of full teeter, (this condition is higher than desirable in practice). We wish to get only galena in the first product. From Plate VII we see that if we use a current of 95 mm. per sec. in the constriction we will maintain a column of galena 0.22 mm. diameter and that the quartz which has an equal settling velocity with this is 9.6 times as large, i.e., is 2.11 mm. diameter. The ratio of cross-section of constriction to the upper tube is

$$0.423 - 0.192 \times 0.22 = 0.381,$$

and the ratio of their diameters is

$$\sqrt{0.381} = 0.617.$$

In the second tube we wish to catch all quartz above 1.6 mm., for example. If we use a current in the constriction of 84 mm. per sec. we see from Plate VII that a column of galena 0.19 mm. in diameter will be maintained and quartz 8.4 times as large, or 1.60 mm. will have an equal settling velocity. Thus we will catch here quartz between 1.60 and 2 mm. and galena between 0.19 and 0.22 mm. The ratio of area of constriction to that of the upper tube is again figured to be $0.423 - 0.192 \times 0.19 = 0.387$ and the ratio of their diameters

$$\sqrt{0.387} = 0.623.$$

The same method of calculation can be applied to each tube.

In practice it may be well to have velocities slightly above those calculated, and the ratio C to A slightly larger because of the imperfect action of the teetering grains. By reason of their odd shapes they are constantly bobbing up and down. Unless this precaution is taken a grain at the bottom of the teetering column which, because of this bobbing effect, is moving down, is met by a rising current only sufficient to support it. The downward momentum of the grain may be enough to carry it through the constriction and it will be found that the size of the grains finally left in the teetering column is slightly below what we calculated on. The longer the constriction the less will this effect enter in.

The object in hindered settling is to effect a higher ratio in the sizes of the grains of the heavier and the lighter minerals than can be done by simple free settling. This is accomplished by establishing a teetering column of the heavier mineral, which acts toward the lighter mineral as though it were a liquid of greater specific gravity than water, and at the same time allows the heavier mineral to act under free settling conditions.

The efficiency of the system depends on how high an effective specific gravity can be maintained in the teetering column. This can be done by keeping as low a state of teeter as the efficient working of the apparatus will stand; and then by bringing the effective specific gravity of the column up as near as possible to the actual. This latter state can be helped by using for the teetering grains those approaching spheres; for spheres, having the same cross-section for all positions, can be made to teeter quietly, thus keeping the teetering column of even texture. Odd shaped grains, having widely differing cross-sections, depending on the position they are in, will be either rising or sinking all the time. This constant movement of the grain spoils the effect of the column. It can be largely overcome, however, by lengthening the column. In a system as shown in Fig. 3 this difficulty soon remedies itself, for the more spherical grains will by degrees take the place of the odd-shaped ones, and in time the teetering column will be composed of all the most spherical grains of the size which just cannot sink in the constriction.

Where galena is to be separated in practice from a gangue it would greatly increase the efficiency of a hindered-settling classifier if columns of granulated lead were first established by running a lot of it through the system. In this way the specific gravity of the teetering columns would be increased, and the spheres of lead could be depended on to teeter much more uniformly than the odd-shaped grains of galena which might happen to form the columns.

In the case of the finest grains the effective specific gravity of the columns can be increased by increasing the actual, as related to the theoretical, velocities of the grains. This can be done by using water charged with a salt, such as soda-alum, which, by breaking down the cohesion of the water, will allow these small grains to have a higher settling velocity.

Before a hindered-settling classifier, or other such apparatus, can be relied upon to give best results a thorough understanding of the laws of hindered-settling must be had and applied to the apparatus Once this is done the hindered-settling apparatus is destined to supersede, in certain classes of work, the free-settling one; especially where fine results are desired, or minerals of nearly the same specific gravity are to be separated.

By following the procedure given above for galena and quartz, a typical ore and gangue, similar results can be worked out for any minerals, the only data required being an equation for the weight of the grains of the minerals in question in respect to their diameters. As yet not enough experimental work has been carried out to warrant any claim as to the ultimate accuracy of all the equations

given. Yet, I feel that they cannot be far from correct, especially as they correspond, to a reasonable degree, with results obtained in such experimental work as has been performed up to the present time.

An Urgent Pumping Problem and How It Was Solved

By James A. Seager*

The breaking out of water during mining and sinking operations is, unfortunately, a contingency that has always to be reckoned with, and sinking pumps have been devised to meet such demands. Occasionally, however, these outbreaks come upon the engineer unexpectedly and require prompt handling if delay and expense are to be avoided. On such occasions the ingenuity of the officials in utilizing the materials at hand and adapting them to circumstances, is frequently the means of saving the situation and avoiding the complete stoppage of work. The following is a description of a pumping problem of this character and its successful treatment.

Sudden Flow of Water

In Fig. 1, is a shaft which was originally used for ventilating a part of a mine through the drive *m*. At a later date it was decided to sink the shaft past *m* to another seam, and sinking operations were proceeding at *s* when a feeder broke through just below *m*. This, together with the usual intake of water above *m*, was too much for the small pump then in use and the shaft was found to be quickly filling.

As the flooding of the drive *m* involved the stoppage of another mine in addition to damage to roads and plant, the water was held partly by constant winding with the barrel *b*, and partly with the small pump previously working. As, however, this latter was in bad condition and in constant danger of breakdown, it was necessary to make arrangements to get a larger pump to work as quickly as possible.

There was available a 3-throw horizontal electric pump purchased for another mine but not at the time put to work, and, as the colliery was somewhat inaccessible and the pump makers would not guarantee delivery of a new pump in less than three weeks, it was decided to alter this horizontal pump for vertical working and to sling it in the pit.

The valve boxes were removed and a fitter was instructed to alter them for vertical working. At the same time the bedplate was strengthened by means of a steel frame *f*, Fig. 2, made up of joists and channels, so that the whole arrangement could be conveniently suspended by a rope. The motor end-plates were also removed and turned through an angle of 90 deg. so that the oil wells should be vertical in their new position, and the pump bearings, which were not capable of this treatment, were instead fitted with spring grease lubricators. A wooden shed was also fitted over the sling chains as shown to keep the motor dry.

Motor to be Started from Surface

A difficulty arose at this stage of the work as to the starting of the motor. This was a 25-horsepower 3-phase machine with wound rotor and requiring a starting resistance in the rotor circuit. A starting resistance could have been placed at *m*, but there were several reasons why the motor should be started from the surface. Among other reasons the management strongly objected to any more cables being slung in the pit than were absolutely necessary.

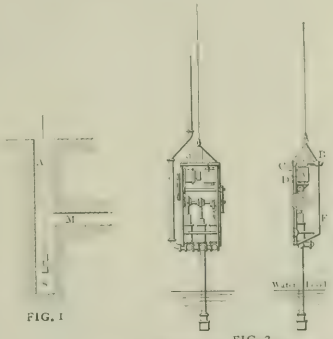

FIG. 1

FIG. 2

The Engineering & Mining Journal, N.Y.

ARRANGEMENT OF PUMP

Now, if the slip rings were shortcircuited, the motor would run perfectly when once started, but with this type of winding it would start only when the rotor was in certain positions. It was necessary, therefore, to have some resistance in the rotor circuit to insure its starting in any position when switched on the surface.

This was done by means of the liquid resistance *a* (Fig. 2), fixed on the pump itself. *A* is an iron tank fitted with 3 wrought-iron plates, each having an area of 2 sq.ft. and rigidly supported from the top by porcelain insulators. These electrodes were connected by short pieces of cable to their respective slip rings on the motors corresponding to the three phases of the windings. A small water-trough was then fixed round the base of the wooden shed and a small pipe *b* was fixed to lead the water which fell upon the shed into the tank *a*. This insured that water would be continually flowing into the tank.

The next step was to lead the water out of the tank at such a hight there would be just sufficient area of the plates covered to give a resistance at which the motor would start, and, at the same time, not too much resistance to slow the motor speed much below its ordinary running speed. The level of water required to start the motor against full load was found by experiment and an overflow pipe *c* was then tapped into the box at this hight.

In this case there was ample water falling upon the shed to keep the tank cool, but much the same result could have been obtained by taking the supply *b* from the rising main. Moreover, with a 25-horsepower motor, supplied from a large generating plant, there would be no excessive voltage drops when the motor was switched on, but the motor could be started slowly by fixing an additional pipe *d* at a lower level and fitting in it a simple valve controlled by a solenoid. The solenoid would be energized when current was switched on and would close its valve. The tank would then fill gradually until it reached the overflow point. Also the pipe *c* could be fixed on the surface at a lower level, and, with the pump in position, could later be bent upward until the correct overflow was found. These points may be of interest to an engineer who may have occasion to adapt the above idea to his own requirements.

The supply from the surface was a 3-core simple wire-armored cable supported at intervals by clamps on the rope, and the current was first switched on through an auto-starter giving about 65 per cent. of the full voltage on the starting side. This auto-starter was not big enough for a 25-h.p. machine and it was afterward discarded, the full voltage being switched direct to the machine. The pump ran perfectly for some months until the sinking operations were completed and it was then reconverted for working in its original horizontal position and permanently fixed at the shaft bottom.

*Civil engineer, Blackett street, Newcastle-on-Tyne, Eng.

At Central City, in Gilpin county, Colo., the Rocky Mountain National Bank reports that it has shipped gold bullion to the Denver mint since Jan. 1, 1909, amounting to $12,000 more than was shipped during the whole of the year 1908. The Penelope tunnel, in the same county, is now in 1000 ft., and if continued will cut the Perigo vein 500 ft. below the adit level, above which to the surface (600 ft.) has been extracted gold ore of a gross value of $3,000,000. The experience of other Gilpin county mines down to as deep as 2300 ft. indicates that favorable results may be expected.

A miners' right for South Africa costs 5s. It is in force for one year from date of issue.

Novel Spoil Transporter for Stripping Operations

Handles All Sorts of Material without Clogging; Capacity 500 Cubic Yards per Hour; Power Requirements Low; Distributes Material Evenly

BY FRED A. TALBOT*

A new and novel type of transporter has been devised by A. R. Grossmith, of Kettering, Northamptonshire, England. The machine was evolved in order to cope with the peculiar conditions prevailing in iron-ore beds of Northamptonshire, where a thick layer of top soil, or callow, has to be removed in order to expose the ore-beds. In removing this callow it was necessary that it should be redumped behind the machine in such a manner that the land covered with the spoil could be used for agricultural purposes. In order to accomplish this it was essential that the waste should be distributed evenly. With the ordinary types of traveling belt or tray conveyers fed from a steam excavator this was not possible. Moreover, although possessing a certain amount of transporting efficiency, the tray type is of low capacity, and the belt conveyer, while superior in this respect, is expensive to install and maintain.

At the Corby iron works experience showed that the best results in the removal of the callow were formerly obtainable by manual labor, the spoil being dumped into wheelbarrows and wheeled across temporary laid planks to the opposite side of the cut where it was discharged and leveled off as work proceeded. This, though slow, insured the bottom of the cut being kept quite open for the passage of railroad cars receiving the loads of ore.

Construction of the Conveyer

In order to expedite this operation, Mr Grossmith devised the type of rotary conveyer shown in the accompanying illustrations. The first machine was constructed and erected at the Corby iron works nearly three years ago. It comprises a wheel 80 ft. in diameter, erected horizontally, but capable of inclination as desired. This wheel is fitted around its periphery with an annular table 42 in. wide, secured to the upper edge of the vertical rim of the wheel, and stayed on its under side at regular intervals with diagonal steel bracing so as to insure its absolute rigidity. The table is built up of ⅜-in. steel plates.

The rim, which is also built up of ⅜-in. steel plate, is entirely supported by two hundred and twenty-four 5/16-in. steel wire spokes radiating from a hub built of light steel work, 112 spokes stretching tangent fashion from the upper and lower extremities of the hub, respectively. The spokes are secured to the rim by means of ½-in. eye-bolts and the wheel can always be maintained in a perfectly taut condition. The inner edge of the rim is surmounted by a 2x2-in. T-bar with which the discharging apparatus engages as will be described later. The hub is mounted upon roller bearings on a small platform, which in turn is carried on the end of a cantilever arm. The wheel, however, is completely free, its only support being the central hub, and without any roller bearing on the outer end of the cantilever arm to take the weight of the load as the conveyer is charged from the hopper, which is also carried on the outer extremity of the cantilever beam. This insures the wheel being extremely flexible. The wheel, together with its hub and platform, weighs about 7 tons, but so perfectly is it balanced that without load it can be easily rotated in either direction by hand. Around the lower face of the vertical rim is placed a small groove which carries a 1½-in. cotton rope by which the necessary drive is furnished from the mechanism housed below the conveyer.

The cantilever arm is carried on trunnions which enable the beam to be inclined to any angle, according to the working position of the steam excavator, and so permit the passage of railroad cars along the track beneath the apparatus. The superstructure is mounted on a pedestal frame carried on a turntable on the deck of the wheeled trolley, by which the conveyer is propelled backward and forward along its track. This arrangement is a distinct advantage since it enables the machine to be brought to work in a narrow cut and to stand obliquely to the cutting irrespective of its direction of travel without impairing its efficiency in any way. In the pedestal mounting are housed the steam boiler and requisite mechanism for operating the wheel conveyer, loading hopper, the inclination of the cantilever beam, the revolution of the whole upon its turntable, and also, through clutches, the forward and backward propulsion of the appliance along its track in the cut.

SIDE VIEW OF APPARATUS TAKEN DURING ERECTION

TOP VIEW SHOWING RIM AND CHARGING HOPPER

The Loading Hopper

The loading hopper possesses some novel features. It is mounted on a pivot at the outer extremity of the cantilever arm and is revolved through bevel gearing and rope drive from the pedestal engine house. It is of circular form and comprises a disk of ⅝-in. mild-steel plate 8 ft. in diameter. It is entirely surrounded, except at the point where it comes opposite to the main conveyer

*[illegible] Wilbury Crescent, Hove, England

wheel, by a rim 2 ft. high, built up of ½-in. steel plate, disposed vertically and held firmly in position by means of substantial brackets secured to the cantilever arm. Around the axis of this plate is disposed another circular ring 3 ft. 6 in. in diameter and 4 in. in hight. This ring is inserted merely to take the pressure or thrust of the plow or scraper by means of which the earth dumped into the hopper is shot onto the revolving conveyer wheel. This plow is a section of steel plate 6 in. in hight, the outer extremity of which is fixed to the end of the stationary wall of the hopper, and is placed across the space between that and the inner circular thrust ring at an easy angle.

CONVEYER AT WORK SHOWING HOPPER CHARGED FROM STEAM SHOVEL

The spoil is dumped into the hopper from the bucket of the steam shovel and is carried around by the revolving base-plate until it comes into contact with the obstructing plow which deflects it through the opening in the hopper wall onto the rotating conveyer wheel. Should a greater volume of material collect at the opening than the conveyer is capable of handling, the excess passes over the top of the plow and is carried around again and then shot through the discharge opening.

Experience with this hopper has demonstrated its many advantages. In the first place it is capable of dealing efficiently with any description of material, whether loose fine sand or lumpy sticky clay, with equal success. In fact, the absence of clogging or blocking, no matter what is the character of the material handled, is one of its chief advantages. It also takes the full shock of the dump from the steam shovel so that no vibration is transmitted to the main wheel conveyer. This system also insures a steady feed from the hopper to the conveyer. The machine requires no cleaning by hand as this can be effected merely by centrifugal force.

Owing to the success that has attended the utilization of this hopper with the rotary conveyer, it was fitted to a rubber band conveyer to ascertain its capability with such a system. The results were completely successful. The conveyer was 100 ft. in length, fitted with a 30-in. belt, and the hopper was found capable of dealing with the maximum output of an American steam shovel of the Robinson class (38x16x2½) with ease. The only difficulty experienced was in connection with the conveyer itself, for the belt gave considerable trouble in dealing with the large masses of wet clay which broke the idlers or pitched overboard in transit owing to the jolting of the idlers. In the case of the rotary wheel conveyer no such difficulties are experienced. There is nothing to disturb the load, as the shock of the shovel dump is entirely taken up by the hopper and no rolling off the revolving table is experienced until an angle exceeding one in four is reached. Moreover it is easily capable of handling masses of sticky material aggregating half a ton or so in weight.

PATENT HOPPER ATTACHED TO BAND CONVEYER

Discharging Apparatus

At the point where it is desired to dump the spoil another plow is placed. This comprises an angular framework mounted on horizontal and vertical rollers. The former engage with the T-bar of the rim while the latter travel upon the moving surface of the annular table to minimize friction to the utmost. The plow is built up of 5/16-in. steel plate and is 12 in. in hight, being disposed vertically, and set at an easy angle across the transverse section of the revolving table. The point of the plow holds itself in position against the rim T-bar, while the opposite end stretches across to the outer edge of the wheel, being held there by one member of the plow framing mounted on a horizontal wheel which takes up the back thrust.

The wheel in revolving brings round the material with which it is laden until it reaches this plow, when the débris is deflected off the table and falls in a steady stream onto the dump heap. The plow can be set at any point of the wheel even well beyond a point opposite the hopper, that is, in excess of 180 deg., and adjustment can be effected while the wheel is revolving with its load. This is effected in a simple manner. Disposed around the rim of the wheel are a number of carriages, which may be multiplied as desired. These carriages are fitted with hardened rollers which engage with the rim T-bar. Each carriage has a pulley over which passes a ⅛ in. cotton or steel-wire cord one end of which is attached to the point of the discharge plow and the other leading to the driving station around the wheel rim in a series of short tangents so that there is no fouling of the

spokes. By paying out the cord or pulling it in the plow can be set to any position on the traveling table. The result is that, in dumping, the spoil is distributed uniformly over the dump heap so that when it is required to reclaim the land no preliminary leveling is necessary. Owing to the method of mounting the discharge plow, wear and frictional resistance are reduced to a minimum. In fact after about six months' continuous handling of from 400 to 500 yd. of sandy material per day one of these conveyers still retained noticeable bloom on the table plates.

Manipulation and Capacity of Machine

The transporter can always travel level with the excavator, along its track through the cut. When the end of the travel is reached it is only necessary to reverse the rotating direction of the wheel conveyer and reset the plow (a matter of a few seconds) to meet the opposite direction and the return journey through the cut can be made to the opposite limit of travel. As the steam shovel eats into the bank the machine can be moved laterally to keep the hopper within the acting range of the steam shovel.

These conveyers have not been tested to their full capacity as yet, but that they are capable of dealing with a greater volume of material than can be dug by any ordinary type of shovel has been proved. Their designed handling capacity is 112 lb. per lineal foot of table and as a speed of 6 r.p.m. can be attained without the load being influenced by the centrifugal force, this gives a practical capacity of about 500 cu.yd. of material per hour. The power necessary to drive the apparatus is small, a small boiler and low power steam engine being all that is required.

These machines are well adapted for use in mining areas far removed from civilization as they are easily erected and repairs amount to little. For instance one of these machines was built *in situ* by agricultural laborers under the supervision of the inventor and with no other tools than are usually found in ordinary repair shops. The wheel was built, launched into position along the cantilever arm and joined up. Maintenance expenses are reduced to the minimum, the only outlay of repair incurred on the machine in use at Cobar during its 2½ years' work being $10. Owing to the success that has attended the use of a conveying wheel 86 ft. in diameter, arrangements are now being made for the erection of a 120 ft. one to meet the requirements of special conditions under which it is to be used.

The total number of men employed in mining and general work in South Australia on Dec. 31, 1908 was 6150. Of this number 3450 were working in copper mines and smelters.

Condensation in Steam Pipes*

In the accompanying chart the radiation loss has been taken as 2.75 B.t.u. per square foot of heating surface of bare pipe per hour for each Fahrenheit degree of difference between the temperature of the steam in the pipe and that of the air outside it. This figure is probably a minimum; it particularly refers to pressures of less than 100 lb. and has been arrived at after carefully considering available data. A steam gage pressure of 100 lb. and an average air temperature of 77 deg. F. have been taken.

The equivalent condensation per square foot of bare pipe per hour = 0.82 lb. of steam arrived at as follows: Steam gage pressure, 100 lb. per sq.in.; temperature of steam at above pressure, 338 deg. F.; average temperature of air, 77 deg. F.; difference, 261 deg. F.; loss per square foot per hour = 261 × 2.75 = 717 B.t.u.

To change one pound of water at a temperature of 338 deg. F. into steam at 338 deg. F. requires 877 B.t.u. Therefore, the loss by condensation per square foot of bare pipe per hour is $\frac{717}{877} = 0.82$ lb. The result forms the basis for constructing the full line plottings in the chart.

With asbestos-covered steam pipes the loss by condensation may be taken as one-tenth that of a similar uncovered surface, and with this as a basis the dotted line plottings have been made.

By taking one of the sizes of steam pipe shown and following the ordinates for length to the corresponding abscissas for pounds of steam lost per hour, the difference in loss between bare and asbestos-covered piping is seen. The plottings can be taken only as approximate, but should serve to indicate in any particular line of steam piping, whether a closer investigation would be justified.

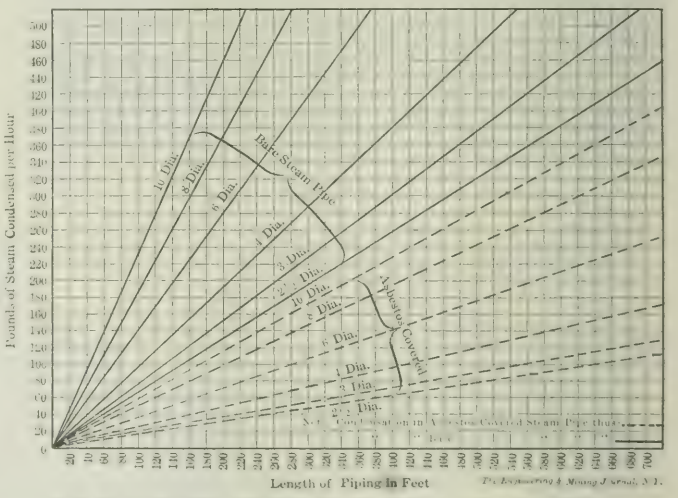

CHART FOR CALCULATING DIFFERENCE IN LOSS BETWEEN BARE AND ASBESTOS-COVERED PIPE

The Malheur Oilfields of Oregon

Special Correspondence

The Malheur oilfields are being developed as rapidly as machinery will put down the wells. At the present time there are five companies at work. The Mammoth Oil and Gas Company has its well sunk to a depth of about 900 ft., and expects oil in commercial quantities within the next 100 ft. This company is one of the best equipped on the ground. The Baker & Malheur Oil Company is drilling two wells, one of which is now 385 ft. deep and the other about 90 ft. The Oil and Gas Company has reached a depth of 1700 ft., but has not yet struck oil. The Columbia Oil and Gas Company's well is down 830 ft. The Eastern Oregon Oil Company has contracted to sink 3000 ft., or until oil is struck in paying quantities. Its equipment is on the ground.

Large bodies of oil sands and shales are exposed in this district, and some of the wells have brought up water carrying bubbles of gas and globules of a dark colored oil. The oilfields are 300 miles from tidewater, and an easy grade is offered for a pipe line. As compared to other oilfields in this country, the problem of delivery to a port of export will be a simple one.

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* Abstract of an article by W. R. Degenhardt in the *Western Miner* of the Chamber of Mines of Western Australia, June 30, 1909.

Gold Mining Industry in the Dutch East Indies

Poor Management and Many Wild-Cats Have Retarded Development. Radjang Lebong and Totok Chief Mines. Activity in Prospecting

BY E. A. WINTON

Few people outside of the Dutch East Indies are aware of the extent to which the mining industry has progressed in these islands. Probably 50 companies have been promoted and at present there are about 15 operating mines. Redjang Lebong, in Sumatra, is the largest producer and for a number of years has been a dividend payer. Shares in this company now stand at a premium of 900 per cent. The localities in which active mining operations are being carried on are the following: Redjang Lebong, Sumatra; Dutch Borneo and both coasts of North Celebes.

The story of the mining enterprises in these regions makes sorry reading for it presents a woeful picture of foolish speculation, misapplied energy and gross incapacity, all of which have naturally kept the industry back so that it is still in an undeveloped condition in spite of 20 years' work. The failure of a large percentage of the undertakings must not, however, be taken as proof that few or no workable mines exist. The circumstances hinted at above are enough to account for failures and moreover a big percentage of the enterprises were merely wildcats, anything being good enough to float when there was a boom on. Then too, in many cases shareholders and directors alike have been absolutely ignorant of all matters pertaining to the mining industry, the latter being for the most part commercial men, so that there has been a good deal of "the blind leading the blind." Unavoidable disadvantages, circumstances which nearly all the companies have been handicapped with, arise from the peculiar nature of the country, the difficulties of transport and from the nature of the deposits. However, the regions above mentioned do show promise and a few mines are at the present time successfully operating.

Redjang Lebong District, Sumatra

Redjang Lebong may fairly claim to rank among the notable mines of the world. Its monthly output averages about 400,000 fl. (£33,000). The mine is situated about 90 miles from the coast a little west of north from Benkoelen. Steam traction engines have lately been introduced to facilitate transport. The ore mined averages about 1 oz. gold per ton and carries from 7 to 8 times as much silver as gold by weight. The ore is reduced by stamps and tube mills, and practically the whole extraction made at the cyanide plant.

The Lebong Siman and Lebong Soelip companies operate in the same region and may be regarded as offshoots from Redjang Lebong. Both appear to have excellent prospects; the former has just reached the crushing stage, while the latter has been producing for over a year and in May, 1909, returned 114,000 fl. (£9500).

Operations in Dutch Borneo

The gold region of Dutch Borneo is indicated on the map accompanying this article. Mining operations have not advanced beyond the prospecting stage and appear highly speculative. Work is being carried on at Empalai, Behe, Landak Tajang and Sintoeroe, and a new Amsterdam syndicate is just starting up in this region. Diamonds are found in this district and are worked for by the Chinese.

The North Celebes Region

After many vicissitudes the Totok, which has been paying its way for quite a while, now appears to be entering upon a prosperous career, the grade of ore having lately improved. The average output for 1908 was 45,000 fl. (£3750) per month. The average value of the ore crushed has for a long time been just over 4 dwt. per ton varying between 2 dwt. and 1 oz.; the average value has lately risen to over 5 dwt. The ore is free-milling and contains some magnetite and traces of chalcopyrite. The best grade ore is at present being obtained from a quartz orebody in contact with limestone and calcite, the country rock being impregnated to a considerable extent. The ore is mined in open cuts, in part with the assistance of monitors; little tunneling is carried on. The mine is situated about 5 miles from the coast, transport being by bullock cart.

The mill equipment at the Totok comprises 40 stamps in two mills of 20 heads each, 2 Huntingtons and a puddler plant for washing clay from such rock as requires this treatment. Cyaniding was formerly tried but the peculiar adaptability of this ore to amalgamation makes this treatment unnecessary. Mercury is fed into the mortars and each stamp is operated at a duty of 4½ tons per 24 hours, crushing through a 30-mesh screen. The amalgam, after squeezing, contains from 30 to as high as 53 per cent. gold. The bullion, too, varies, and runs high in silver, the average content being about gold 697 fine and silver 280.

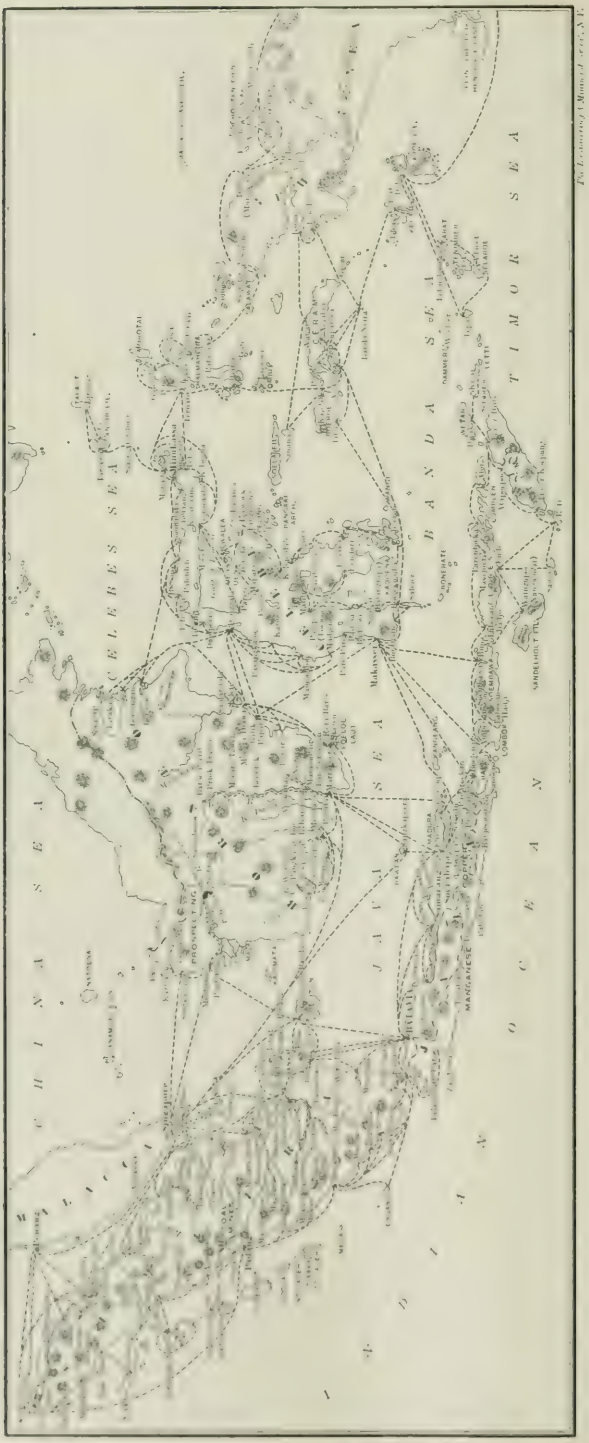
The workings are situated at the summit of a limestone mountain having an elevation of 1600 ft. The deposits are in the nature of stockwerks in crystalline limestone. There are intrusions of much decomposed andesite and basalt in close proximity to the orebody. The limestone dips about 30 degrees.

Waterpower generated by Pelton wheels is used to run nearly all of the machinery at both mills and at the mine. The water is conveyed to the mine through difficult country by a very fine piece of ditching. The total length of the ditch is over 25 kilometers and inverted siphons are used at four places in the line. The ditch was constructed very cheaply by native labor and is now maintained with little trouble or expense by the same labor under the charge of native foremen. At present four streams are diverted into the ditch and the system is shortly to be still further extended.

At Totok native workings were very extensive and an early inspector reported that they extended for many hundred feet down the mountainside and at one point a long irregular cavern, 80 meters long by about 10 meters high, in places having many branches, had been excavated. The method employed, as in British India, was to crack the rock by fire and water and then bar it down. The quartz was ground by hand between basalt stones and the sand panned. There is an outcrop of stibnite running over 60 per cent. antimony on this property but the company has never considered it worth developing. Some ore has been taken out and stacked.

The Palehleh mine is another one which has had a very hard existence. The money wasted there at the outset was enormous and quantities of expensive machinery which will never be used is still lying on an island in the harbor, and some at the bottom of the sea. It is problematical whether this mine will ever be able to pay dividends during the present decade whatever developments are made. The production, however, has been steadily, though slowly, improving, the figures for 1904, 1905 and 1906 respectively being, 273,707 fl., 324,545 fl. and 360,707 fl. Last May the production amounted to 40,000 fl. By all accounts steady and judicious development work is now in progress.

The workings are situated on a hill immediately above the sea. A large quantity of concentrates are produced and



MAP OF THE DUTCH EAST INDIES SHOWING MINING LOCALITIES

these were formerly smelted by the Soemalata company, but since that company suspended operations these are now being collected and will presumably be treated on the spot in the future. The Soemalata, which recently closed down, is situated not far from the Pelehleh property. The ore is exceedingly refractory, smelting being the only possible treatment and this apparently was not very successful, and the mine is very wet. Copper mining was started at Bwool but soon discontinued, and I am unable to find out anything regarding the particulars of this operation.

Other Localities

Extensive prospecting has been carried on along the coast southward of Totok. A mine was opened at Kotagoena, 8 miles from Totok in the low country, but has been abandoned. The ore at this mine, unlike that at Totok, is highly charged with pyrites and open cut work is not possible. Near here the natives are at present engaged in breaking rock which they treat by hand grinding and panning. I have assayed samples of this ore obtained from the natives which showed about 18 dwt. to the ton and did not carry much pyrites. The gold as at Totok is only about 700 fine. Two Dutch mining men have just commenced prospecting at a spot about 18 miles further to the south.

At Pagnat on the Gulf of Tomini considerable work, both mining and dredging, has been carried on, but abandoned in spite of the fact that both Europeans and natives who have worked there declare the place to be very rich. There are also persistent rumors that there is gold in south and middle Celebes and in Dutch New Guinea, but the Dutch have only a very limited hold on these areas and will not allow them to be opened to the public. I have a very rich specimen of rather impure gold, apparently roughly melted dust, brought from middle and south Celebes. As far as I am aware the only other important mining operations being carried on in the Dutch East Indies are, tin mining on the islands of Banka and Billiton (the Banka enterprise is a government undertaking and both are very successful), coal mining in the Ombilien coalfields on the west coast of Sumatra (principally by convict labor), copper mining in the Madjoen residency, Java, and manganese mining at Tjilatjap, Java.

General Conditions

The government is adverse to granting concessions to foreigners, and every syndicate must have a certain number of Dutch members. It appears that the government is desirous of developing the mining industry and all mining machinery is allowed in free of duty. There is a government royalty of 10 per cent

on the gross output of gold and a tax on land of about 5 d. per vuow (4046 square meters). There is a Government Mines Department but it appears to concern itself only with mines worked by the government.

The climate in the Dutch East Indies is remarkably healthy as soon as one leaves sea level. Rainfall is of course very heavy. Skilled and unskilled labor is cheap but not as cheap as in British India and the Straits, living costs being higher. The supply, too, is not very abundant, because the country is fertile and the native is hardly under the necessity of working more than he pleases and as a consequence is rather independent. There is a good deal of sickness among the natives due to fever and epidemics of berri-berri and smallpox.

The islands being for the most part hilly and the rainfall heavy, water power will generally be available at least to some extent for mining ventures. Wood for fuel is generally plentiful but coal and coke are dear, coke costing as much as £7 per ton. Cardiff coal costs about 30s. per ton. Charcoal made on the spot is cheap. Timber for rough work is plentiful, but it is liable to rapid rot and good timber for special requirements is not plentiful. The islands are not thickly populated and government roads are scarce. Most companies have to go to the expense of making and maintaining their own roads, but the coasts are very well served by a large fleet controlled by the Packet company. The difficulties of transportation, as mentioned before, are the worst hardships encountered by mining companies operating in these islands.

Profits of the Rand Mines in 1908

At the annual meeting of the Transvaal Chamber of Mines, Feb. 25, 1909, the chairman, Lionel Phillips, made the following remarks:

I now propose to refer especially to the Witwatersrand, where, on account of the regularity of the yield comparisons are of greater value than they would be if they included the mines of the outside districts, although the latter, on account of their small relative production, would not make a great difference in the general result. On the Witwatersrand then, the profits earned were as follows: The Bonanza company distributed a final liquidation dividend, which I am not including. Forty-seven producing companies contributed £8,536,771. The market value of the shares of these companies on Dec. 31, 1908, was £83,352,448. Besides these, 22 more companies, with a market value at the same date of £13,663,416, were in the producing stage, but did not contribute to the dividends. It is interesting to note that adding together the amounts at which the market valued these dividend and non-dividend paying companies, the amount distributed is equal to 8.79 per cent. upon the whole of them.

Turning to the subject of yield and cost some instructive points arise. I am not in a position to give absolutely accurate figures per ton, because certain small items are not included in the ordinary results, but I may say that the profit per ton milled in 1908 exceeded that of 1907 by about 2d., this result having been achieved notwithstanding the value of the rock milled was less about 2s. 7d., owing to our having adopted the deliberate policy, for reasons which I shall explain later, of milling larger quantities of low-grade rock which, in former years, would have been left untouched. This shows that the working costs fell by 2s. 9d. per ton. According to our working-cost figures the approximate cost in 1908 was 18s. per ton, as against an approximate cost of 20s. 10d. in 1907, a reduction of 2s. 10d. per ton. The figures do not tally exactly, but as the difference is only 1d. per ton, they may be taken as accurate to all intents and purposes.

These figures have a great bearing upon the life of the mines. The following calculation, which it was possible to make with a very close approach to accuracy, demonstrates the effect of reduced working costs upon the quantity of ore that can be profitably treated. The calculation applies to 67 of the principal producing mines, whose working costs in January, 1908, averaged 19s. 5d. per ton, and in December, 1908, 17s. 1d. per ton. These companies had 60,000,000 tons of payable and unpayable ore developed. Owing to the fall of 2s. 4d. per ton in working expenses they were able to include in their total reserves of payable ore an additional 5,400,000 tons, being an increase of 9 per cent. I am not able to say what increase of tonnage this fall of 2s. 4d. per ton in working costs represents if applied to the whole Witwatersrand, but I need only call attention to the hundreds of millions of tons *in situ* to convey its significance.

Vidler Tunnel, Colorado

Special Correspondence

Notices continue to appear in the local press to the effect that the Vidler tunnel will be "rapidly rushed to completion," in order that it may be used by the trains of the Argentine Central Railway for the transportation of the ores and other traffic of the silver-lead-zinc Montezuma mining district, Colorado. The facts are that the Vidler tunnel under Argentine pass, west of Georgetown and Silver Plume, was driven 3800 ft. on this side of the Continental divide, and 700 ft. on the other side, and together with the mill and other surface improvements connected with the alleged rich veins intersected, cost a Christian Science coterie in London somewhere in the neighborhood of $250,000.

The tunnel and works were closed down about a year and a half ago, and the property was subsequently acquired by certain London creditors for about the cost of the surface improvements. There is now, we are informed, a contract out for the sale of the Argentine Central Railway. The matter of completing the tunnel is simply under consideration by those interested in the promotion, though, of course, it would be the making of the Montezuma district if such a railway connection were made, and the camp would send out a large tonnage. Meanwhile the tunnel, being about 7x8 ft. in size, would have to be enlarged its entire length for railroad purposes; and there remains one-half mile to drive to make connection between the two portals, the total distance being 7500 feet.

Borax Mining in California

Special Correspondence

It is expected that some of the borax mines on Frazier mountain on the northern edge of Ventura county, near the Kern county boundary, will soon start up again after an idleness of about two years. Russell Brothers, who have a mine between the Sterling and Columbus mines, have set miners at work on their property. Formerly the Sterling mine shipped to Bakersfield and the Columbus mine to Lancaster. When the price of borax suddenly dropped about two years ago these mines, like others in California, with the exception of the Lila C. mine of the Pacific Coast Borax Company, closed down. With the exception of the new mine of Stauffer Brothers in Los Angeles county, all these mines have since remained closed. The Ventura county properties, with a long haul to the railroad to pay for, could not be operated at a profit with prevailing prices of borax.

The developments on the South Eureka mine at Sutter creek, Amador county, Cal., are such as to again attract attention to big mines on the Mother Lode. The crosscut on the 200 level opened a splendid body of high-grade ore which averages two or three times as much as the general run of ore in that locality. Though the Mother Lode properties are always considered as carrying large bodies of low-grade ore, yet in most of the mines they occasionally come across exceptionally rich bunches. Dozens of instances of this might be cited. The Gwin in Cavaleras county, the Rawhide in Tuolumne and the Kennedy in Amador have found such places on several occasions. The South Eureka now comes in its turn.

Electrical Wiring for Deep Mining Work

By Carl L. C. Fichtel*

The successful and economical operation of any electrical apparatus underground in deep mining work, and particularly in the Lake Superior copper mines, which are low-grade properties requiring the handling of large rock tonnage, depends primarily upon the wiring. In laying out an installation in this field, where the current has to be transmitted to great depths, the problem resolves itself into two factors, mechanical and electrical.

Mechanical Features of Design

The mechanical features consist of installing and protecting the wire from outside interference (such as falling rock, crushing of timbering, etc.), the anchorage of the wires and the designing and placing of anchor and junction boxes and connectors.

After the size of wire and the thickness of the dielectric has been determined to meet the electrical requirements, and carefully considered from a mechanical standpoint that it may withstand all possible strains and the necessary hard usage in installing, ample allowance should be made in selecting the size of pipe or conduits (this being the only feasible method of construction) so that the wires can be easily drawn through without injury to the insulation, and also to afford ample ventilating space.

All pipe work must be done in such a manner that it is accessible at all points, out of the way of the skip road, and so placed and held that it will not interfere with, or be affected by the replacing or removing of timbers. The pipe line must be provided with drains so that there can be no accumulation of water at any point and a free circulation of air maintained throughout. This is done to eliminate the fungus growth that would take place if the line were practically air or water tight.

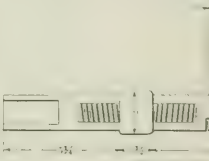
At points to be determined by the specific conditions, anchor or junction boxes are placed. These boxes are constructed so they can be readily opened, and of such size and shape as to take care of the anchor block or connectors and any excess gage that may come in through splicing.

All connectors should be designed so they can be taken apart without disturbing the electrical connection with the wire on either end. Designing connectors for underground work is done from a mechanical standpoint, making them large enough to be easily handled where no solid dielectric is required for all electrical requirements.

The anchorage, or holding of the wires in the pipe, is of prime importance and great care must be exercised in the selection of the method to be employed, as there are several points that must be taken into consideration, viz.: weight of wire, angle or pitch of shaft, kind of pipe, nature and thickness of the insulation, temperature of the shaft and material and design of the holding device. The anchors should securely hold the wires without excessive pressure on the dielectric, which would cause a weakness of its insulating qualities at these points, and be so constructed as not to cause any short bends in the wire. As these points of anchorage are a possible menace to the reliability of any system, the least possible number consistent with a good margin of safety should be used.

Electrical Considerations

Electrically the wire must have carrying capacity to meet all the requirements for which it was intended without any heating or deterioration, and its dielectric must be of such character as to withstand changing temperature (ranging from 20 deg. below zero to 100 deg. F.), continuous moisture



CONNECTOR

and the action of mine water. The insulation of joints and connections must be done in such a manner that its insulating qualities will be equal to that of the wire in every respect.

No specific rules can be given for laying out this branch of electrical work as each property, or, in fact, each shaft has its own peculiar conditions and must be studied accordingly.

The Calumet & Hecla Mining Company was the pioneer of the Superior district in using electric power for underground work, starting in 1890 with a series of mine pumps geared to direct-current motors which operated at 1000 volts. These pumps were placed at intervals of 1200 ft. down the shaft to a depth of 4800 ft. This work has been under the supervision of F. N. Busse, the company's electrical engineer, who has made a specialty of this branch of the profession and through whose efforts the company has a method of underground construction that is entirely successful.

A description of one of its recent installations is given herewith to show how conditions were met. The wiring carries current (1 phase, 60 cycle at 2300 volts) to a series of motors operating pumps, placed about 1500 ft. apart along the pitch of the shaft, which is about 52 deg. from the horizontal, to a depth of 4900 feet.

Specifications for Wire

The wire used is 500,000 cm made by the Okonite Company, of New York, to meet the following specifications:

"All wires to be furnished to exact measurements; all wires to be tinned separately; all wires to have three braids, one regular and two outside of heavy jute; all wires to have not less than 7/32-in. wall; all wires to have three layers of insulation, joints broken 120 deg. apart; all wires to be stranded; all wires to stand an insulation test of 2000 megohms after three days soak, then a 6600-volt disruptive discharge after a further soak of three days, and to show no weakness or deterioration between the first and last test." The wire furnished has an outside diameter of 1½ in. and weighs nearly 25 lb. per foot.

Pipe Work

Plain wrought-iron pipe is used throughout to contain the wires, as it has been found the most economical under the conditions. Each length of pipe was carefully gone over and a large chain drawn through it so as to rid it of all possible burrs or projecting edges that would be injurious to the insulation. The pipe is 5 in. in diameter, which allows an easy passage of the wires through it and affords ample ventilating space around the wires. The pipes are laid in the ladderway, upon the base timber and the dividing piece upon which the ladders rest. They are held from slipping by means of yokes that are securely clamped around the pipe and have their ends resting against an iron plate fastened to these timbers. As these yokes are not fastened to the timbering, they allow of considerable settling or shifting without affecting the line. These yokes are placed 100 ft. apart. At intervals of 300 ft. anchor boxes are placed and at the stations junction boxes.

Anchor and Junction Boxes

The junction box used in this installation is shown on an accompanying sketch, the anchor boxes being the same with the exception of not having the side flange for the take-off pipe. They are made of cast iron and left in the rough, the cover being bolted on without gaskets to allow the circulation of air through it. In each corner of the box is a ¾-in. cored hole to allow any water to drain out, each box taking care of the pipe above it. Thus the line acts as a ventilating duct, a free circulation of air being maintained throughout.

Installing the Wires

To expedite the handling and installation, the wires were made in lengths equal to the distance between stations, with an additional 20 ft. for testing purposes. This made each run equivalent to about

*Electrical department, Calumet & Hecla Mining Company, Calumet, Mich.

3700 ft. of wire and weighing nearly 4½ tons. The reels holding the wire were set up underground at the top of each run (starting with the lowest), the ends of the wire were fastened to the bottom of a timber car, which was attached to the hoisting rope, and in this manner the wire was slowly unwound from the reels into the shaft and held suspended there while the bottom ends were placed in a long cone-shape sleeve which prevents the ends from fraying and eliminates the possibility of any of the wires in the strand catching. These ends were then attached to a 1¼-in. hemp rope that had been previously drawn through the pipe.

The wires were started down the ladderway at a point about 75 ft. above the junction box at the top of the run, thus eliminating any short turns and giving the wire a smooth run for this distance. The ladderway was covered with plank and a piece of round timber was set up in the shaft to deflect the wire from the shaft into the ladderway. After the wire was well entered in the pipe, very little pulling was necessary by the men at the lower end as its own weight and stiffness forced it through.

Men were stationed at each box to see that it did not catch at any of these points, causing temporary slacks that would give a jerking motion and subject the wire to unnecessary strains.

After the wire was thus installed it was securely clamped at the bottom anchor box, about 300 ft. from the end of the run, then slackened just a little and the remaining blocks fastened.

Another Way of Handling the Wire

This method of installing was used on the two bottom runs, but on the third (from the 12½ to the 25th level) the distance from the point where the wires entered the ladderway to surface was less by about 100 ft. than the wire run, so it was necessary to loop the wire in the shaft. This was accomplished by the aid of a second timber car operating on the other side of the shaft, the shaft being a two-compartment one with the ladderway between the compartments.

The wire was unwound from the reels and held suspended in the shaft, a clamp was placed on it about 150 ft. from the end, and this was attached to the other car by means of a hemp rope which was run between the dividing timbers through single pulley blocks. This car hoisted the wire up the shaft a sufficient distance to allow it to enter the ladderway, taking a long turn in the form of an *S*. The car was then lowered until all the weight came on the first car, when the clamp was removed and the first car lowered it through the pipe.

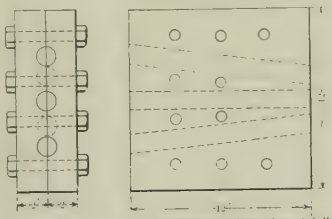
The top run, from surface to the 12½ level, was handled by a 50-ton locomotive. The wire was laid on the surface beside the railroad track which makes a right angle with the mouth of the shaft. A framework of timber was set up to form a turn sheave for the wire.

Men carried the wire, a few feet at a time, until enough was entered in the pipe to carry the weight of the portion remaining on surface, the pull then coming on the locomotive which backed slowly, allowing the wire to slide through the pipe.

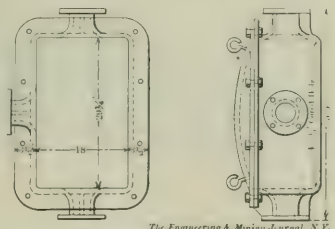
In lowering the wire into pipe in this manner it assumes a long, easy twist, causing the transposition of the phases in such a manner that it practically eliminates all inductive effects.

Anchoring

The anchor blocks are made of well-seasoned oak, and are boiled in a mixture of paraffin and beeswax for 36 hours, thus making them as nearly waterproof as is possible, and thereby avoiding practically all swelling or warping. The holes are bored ¼ in. smaller in diameter than the outside diameter of the wire and the two outside holes are made slanting so as to spread the wires and make room for the connectors. The two halves of the blocks are bolted together by ten ¾-in. bolts, and great care is used in putting them together so that they are absolutely tight, wood to wood at every point, to avoid the possibility of water accumulating between the halves.



ANCHOR BLOCK



JUNCTION BOX

These blocks are placed in the anchor boxes with the end of the block at which the wires are closer together resting against the bottom. The over-all distance between the two outside wires is then less than the inside diameter of the pipe, thus giving a straight run and avoiding any chance of squeezing the wire between the anchor block and the box.

Connectors

The connectors are made of cast copper and of such dimensions as to withstand the necessary mechanical strain that come upon them in making and breaking connections. An accompanying drawing shows the design of the connectors used. The two ends are soldered to the wire and held together by the right- and left-hand threaded connecting piece. One of these ends is made longer than the other to allow for the take-off connection. The take-off connector consists of a copper bar, drilled at one end to take the wire, and the other turned down and threaded for a regular nut, being fastened to the main connector as shown.

Great care is observed in taping the connections, several layers of rubber tape being used. The tape is softened by means of a blow torch as it is being applied and worked until it becomes a solid mass. This is done until a thickness a little larger than the insulation of the wire is reached, when it is thoroughly covered with friction tape. Each one of these connections required ten ½-lb. rolls of Okonite tape and two of Manson.

During the electrical reconstruction at the mine about six years ago, the wire that was put in to operate the first series of pumps was taken out of the shaft where it had been for nearly 13 years, and the installation was found to be in first-class condition. The wire, with the exception of the outer braiding, which had become fastened to the pipe through corrosion and was badly torn in pulling it out, was found to be in such good shape that it was used again in various other places. All joints and points of anchorage were practically the same, thus showing that this method of installation meets the local conditions in the best possible manner.

Pig Iron from the Electric Furnace

Special Correspondence

The first pig iron made in the electric furnace, which has been put on the market commercially comes from the plant at Heroult, in Shasta county, California. This plant uses furnaces of the Heroult type, and electric power is furnished by the Pit river. The first regular shipment was 20 tons of pig iron delivered in Redding. The electric furnace in operation is turning out about 25 tons of iron daily and delivering it at a cost less than the price at tidewater in California. Some few changes have still to be made before the process will be considered completely successful.

Wages paid at the Hanyang Iron works in China are 10c a day for ordinary labor; 24 to 30c for mechanics and furnace men of ordinary grade, and from $1 to $1.20 per day for boss furnace men and rolling-mill men.

Notes on Some Ore Deposits of Porto Rico

By S. Harbert Hamilton*

Having spent a few months in making an economic geologic survey along a proposed railroad line in Porto Rico, I offer the following notes, not as a complete report, but only as a small contribution to the economic geology of the Island.

Topography and Geology

The topographic development of Porto Rico consists of a main mountain mass known as the Luquillo range, mostly composed of syenitic rocks. This is flanked by hills of porphyry which, in turn, pass into a dissected peneplain of limestone and sedimentary rocks going to local base level and often ending in alluvial flood plains and littoral swamps

All the mineral deposits seen by me were in the flanking hills, or "chuchittas," which are composed of a basic diorite-porphyry. Where any pseudo-stratification has taken place, the strike appears northwest and southeast with a steep dip. Very little local folding was observed. The most notable structural feature is crushed or brecciated zones which have been ascribed to earthquake cracks.

The exceedingly mountainous character of Porto Rico and its many deeply cut river gorges not only make railroad building difficult and expensive, but also tend to prevent profitable operation, owing to the comparatively small valleys to be served and the relative shortness of the haul. Porto Rico is a small island, and with its diversified surface is destined always to be "the land of the bull cart."

Iron Ores in the Vicinity of Juncos

The occurrence of iron ores in the West Indies has long been known. Those on the south coast of Cuba are the best developed. At a number of places in Porto Rico outcrops and talus apparently similar to the Cuban "south coast" ores occur. The deposits most thoroughly studied by me are the claims in the vicinity of Juncos, of which the following notes were written:

The chief mountains of Porto Rico are composed of syenite. They trend north of west and rise to heights of almost 4000 ft. in the Luquillo mountains, in which is El Yunque the dominant but not the highest peak. Paralleling them are the chuchittas or hills of less than 1000 ft., in which the orebodies are situated. At the foot of the chuchittas is an old dissected peneplain through which a changing river system is cutting its way. Road and railroad construction through this sort of country is exceedingly difficult, as the ridges are a series of knife edges and hog backs, and the valleys are steep and narrow. The streams have started meanderings over the old peneplain and these irregular lines of drainage have been maintained.

The surface is practically all under cultivation and there is no timber of any account to be found near at hand for mine purposes. The rainfall appears to be heavy and the country is well watered with small streams, although it may be necessary to store some water for large power plants. The country side is all well settled, and probably mining camps can be easily be supplied with food from the neighborhood. There is nothing especially unhealthy in the climate.

Geological Features of Iron Deposits

The country rock is of igneous origin. Tomlinson, having made a petrological analysis of samples sent by us, calls it "diorite-porphyrite." It consists of phenocrysts of pyroxene and feldspar in a base of feldspar and chlorite. Magnetite occurs in the base in small, but frequent grains. He says, "I would suggest that these grains were probably formed during the alteration of the rock. They do not look like original constituents." In this rock occur the orebodies in association with the vesuvianite. There are no garnets, micas, hornblende, nor any of the platy minerals that are often associated with magnetite orebodies. The vesuvianite and quartz, with which the ore is sometimes associated, separate easily from it in crushing. The decomposition of this rock produces a very sticky, fat clay which resists erosion remarkably well. The magnetite remains in large irregular talus blocks.

Since their formation, these blocks have been subjected to mountain making forces, which have changed them in some rare instances into a slate. They then have a trend northwest and a nearly perpendicular dip. In their most frequent phase, however, they occur in irregular rhomboids, parallelopipeds and similar forms, which, owing to their small size and chloritized condition, will make a very bad hanging and footwall. The same seismic disturbances that fractured the wall rock also divided the ore so that diamond drilling is found to be difficult, and churn drills are better suited to prospecting in areas where earthquakes have disturbed the rocks.

Iron Ore an Igneous Segregation

In origin, I consider the ore to be an igneous segregation from a ferric-dioritic magma which has come in contact with limestone. Traces of such limestone are to be seen. It may be assumed that these intrusions had a genesis in what has been called "magmatic stoping;" i.e., the original magma ate its way by assimilating the limestone and freeing the iron. The magma would then separate by gravitative adjustment, with the lighter vesuvianite material on top. Thus the eutectic balance would be disturbed and fractional crystallization be set up, each crystal, especially the magnetite, tending to segregate about previously formed ones.

This hypothesis accounts for all the phenomena observed, and in all probability no movement of magnitude has taken place since these deposits were formed. The fact that where extensive erosion has taken place there is no vesuvianite present would indicate only that the ore would become better with depth in places where it is now mixed with silicate at the surface of the outcrops.

OUTCROP OF IRON ORE EAST OF JUNUS

Minor faults have unquestionably occurred and slicken-sided surfaces are frequently seen. There do not seem to be any faults of the "offset" type so frequent in iron orebodies. Dikes of granite occur, but none were observed in or near the orebodies.

Copper Ores

The West Indies have long been known to have deposits of copper, the mines at El Cobre, in Cuba, being the oldest and best known. In Porto Rico, traces of copper minerals are found at widely separated localities. The following notes were made after a brief visit to a prospect near Mororis:

The deposit apparently consists of an impregnated breccia forming a sort of

*Mining geologist with Hamilton & Hansell, [illegible] 29 Broadway, New York.

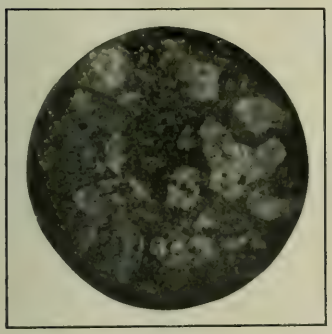
stockwork. The extent of this breccia is unknown, as all workings are very shallow, and its origin is obscure so that it is impossible to say whether it is the result of a giant tort, as certain features of the topography indicate, or only a small earthquake crack that has offered easy means of impregnation.

The minerals are of the usual gossan type; chalcocite, chryscolla, malachite, limonite, quartz, kaolinized feldspars and chloritized ferro-magnesian silicates passing into sticky (tosca) clay. Sampling over a considerable area showed the whole mass to average about 4 per cent. copper.

Other Minerals

Gold—Placer gold has been found in many places in Porto Rico, and a small amount of washings is sent into San Juan in trade. Some attempts have been made at serious mining near Corazal, but the equipment seems to have been ill advised.

Lignite—A matter of considerable importance to Porto Rico is the fuel supply. Wood and charcoal, with bagasse, have been the only local fuels. The supply of wood and charcoal is rapidly becoming exhausted, and the sugar centrals do not produce sufficient bagasse to fully supply their own wants. The lignite, of which I have seen only samples, is too heavily charged with pyrite to yield an available fuel, but if the deposit, on exploration, proved of any considerable size, it might pay to refine and briquet the material.



MICRO-SECTION OF DIORITE-PORPHYRITE

Pyrite and Phosphate—Both these minerals, so important to an agricultural community, exist in Porto Rico, but efforts to determine their quality and quantity have not been made.

An important gold discovery is reported (*So. Afr. Min. Journ.*, July 31, 1909) on the Grootrivier No. 2321 farm to the southwest of and adjoining Solomon's Temple, in the Waterberg district of the Transvaal. The gold occurs in a contact zone between conglomerates and felsites.

Compensation to Workmen for Accidental Injuries

By M. M. Duncan*

I desire this evening to call your attention briefly to the urgent necessity for a change in the laws governing personal injuries. At present, workmen have no protection or remedy for accidental injuries. Employers are only liable for negligent injuries, that is, such as from the neglect on the part of the employer of some duty the law imposes upon him. This leaves out of consideration, all injuries growing out of the momentary thoughtlessness or carelessness of the employee or of his fellow workmen. A large proportion, estimated as high as 75 per cent., of all the injuries received by workmen in this State are due to causes for which the employer is not legally liable. The entire burden growing out of such accidents is thus placed upon the injured family, except as relieved by charitable of philanthropic contributions on the part of the employer.

Necessity of Compensation Laws

As civilization advances and human needs increase, we find that the hazards incurred by the workman become greater. This is noticeable in every industry. The construction of skyscrapers in the cities, of great bridges and tunnels, the operation of enormous furnaces and steel plants, of deeper mines, the application of electricity and the ever increasing volume of traffic on our railroads, present more numerous and greater hazards than were known to the workman of 25 years ago. The effect of this is shown in the great number of accidental deaths and injuries constantly occurring.

Public sentiment demands and public policy requires the adoption of laws which will give employees adequate compensation in case of accidental injuries, as well as for those which I have called negligent injuries. Our present system is unjust from an economic standpoint and has been discarded in every industrial country in the world except our own and Canada. Under our form of Government, Federal laws governing this question, except possibly as applied to interstate commerce, are not constitutional and therefore each state must act independently. Up to this time nothing has been done, except that some states have enacted laws removing or modifying certain legal defenses which were heretofore available against employees in personal-injury suits.

This has not proved to be a satisfactory way of helping injured workmen or their families. On the contrary it seems rather to be a system devised to help energetic and unscrupulous lawyers. In such states a class of practitioners has grown up to prey upon both the injured employee and the employer. They demand from the injured workman or his family a large compensation, usually one-half, of all that is recovered, for their alleged legal services and on the other hand they seek by every means, often not hesitating at fraud or perjury, to secure large verdicts against the employer regardless of the merits of the case. Such a system is thoroughly bad, legally and morally. It creates distrust of the courts and constant irritation between employer and employee.

Employers of labor are beginning to understand the economic value of human life, and the importance from a business standpoint of protecting and caring for their employees. This is shown by the adoption of new appliances and safeguards to prevent injuries. It is shown in the erection of club rooms, libraries, and in the maintenance of hospitals and the employment of nurses and physicians. But it is time to go a step farther and make each industry provide suitable compensation to the injured workman, and in case of death to his family, and to do this in a way which will insure their getting it, also promoting better relations between the workman and his employer.

This question is a public one, whether we would have it so or not. The care of orphan children and indigent relatives is an expense borne by the State. The maintenance of courts, the payment of judges, jurors, and court officials engaged in the trial of these cases is not by general taxation. And finally, the general welfare of the laboring class is intimately related to the best interests of the State.

I will not attempt to do more than to suggest a remedy. I think that in order to enact laws which will be just to both employer and employee, a careful investigation should be made of the systems adopted in other great industrial countries, and the results obtained therefrom, as well as the collection of data in respect to accidents, and the various methods of dealing with them in this country.

At the last session of the Minnesota legislature, a commission was created to make such an investigation, and submit a written report with its recommendations to the legislature of 1911. Its members serve without pay but an appropriation of $5000 was made to cover their expenses. It is interesting to note that this commission was created at the request of representatives of both employers and employees. This is unquestionably a step in the right direction, and our own State of Michigan might well follow its example.

English Employers' Liability and Compensation Laws

In our states, liability for personal injuries rests upon the principles of the common law of England, supplemented

Note—An address delivered to the Lake Superior Mining Institute, Aug. 25, 1909.

*General manager, Cleveland-Cliffs Iron Company, Ishpeming, Mich.

somewhat by statutes and court decisions, yet as long ago as 1880, England concluded that this system was insufficient and adopted a stringent Employers' Liability Act. Even this proved unsatisfactory and in 1897 Parliment adopted the Compensation Law based on the entirely new principle that every business must make measured compensation to workmen injured in any way in the ordinary course of employment, unless there was gross fault on the part of the employee. The workman is not required to prove negligence in the employer, in order to secure indemnity, but only the fact that he was injured in the course of employment. The amount of indemnity paid in case of injury or death is based upon the wages earned, and ranges from $750 to $1500 in case of death, with lesser amount for injuries. I mention these rates only by way of illustration. The proper rates to be adopted here must obviously be a matter for careful investigation. Under the English system, the injured workmen may choose whether to bring a suit for damages under the common law and employers' liability act, or to take the indemnity given under the compensation act. He cannot collect under both acts, but if he brings a suit for damages and fails, he may still proceed under the compensation act, although the employer may offset the costs incurred in the first suit.

Experience has shown that injured workmen much prefer the compensation law. The obtain their indemnity without the delay and expense incident to litigation and without any controversy with their employers.

Whether it is desirable for us to adopt the English system, or some modification of that and the German system, I will not here stop to discuss, but I wish to emphasize the point that compensation to the employee, rather than punishment of the employer, is the correct basis for whatever system is adopted. I know that the large employers of labor are earnestly striving to protect and safeguard their employees from injuries. The theory of negligence upon which verdicts are rendered, is in most cases a mere legal fiction. Juries act upon sympathetic motives rather than because of any conviction that the employer has been really negligent. In fact, I think that the average juror takes this method of showing his disapproval of our entire system, through which only a small proportion of injured men get any redress whatever. But in spite of all precautions, accidents and even deaths are unavoidable in every industry. The principle of compensation is that each industry should pay in such cases some just and adequate amount, not as damages collected from some alleged negligent employer, but as a method of fairly distributing the extraordinary risk of civilization. Such payments become a part of the cost of production, like expenditures for broken-down or worn-out machinery, and if required by law, so as to place all producers on the same basis, would not be detrimental to the employer.

The German Benefits Scheme

In Germany, this result is accomplished by a system of industrial insurance. This system has been so developed as to include not only accidents, but sickness and old-age pensions. Accident insurance is compulsory for all workmen and foremen earning less than $720 per year. The premiums are paid entirely by the employer, and are collected in assessments based upon the wages paid, and the scale of risk in the business. Insurance is carried in associations of employers, regulated by the government, and these associations insure those in the same or similar trades, thus practically placing each industry by itself. The benefits paid during disability, or after death to dependent relatives, are based upon the scale of wages. The death benefit is an amount 20 times the daily wages, and a pension to dependent relatives up to 60 per cent. of the daily wages. The benefits during disability range up to two-thirds of the annual earnings, or free hospital treatment with a pension to dependent relatives up to 60 per cent. of earnings.

These benefits, though small, are paid without any litigation over questions of negligence, and in case of controversey the dispute is settled without expense to the parties by an arbitration court.

Under this system, there was paid in 1906 the sum of $34,368,000 to 354,680 injured and to 73,099 widows, 103,504 children, and 3882 parents of those killed. Yet this result was accomplished at an average cost of only $2.18 per insured. These associations covered 19,209,000 workmen, and the premiums collected amounted to $40,080,000.

If we compare the German system with our own method of casualty insurance, the contrast is startling. It was recently estimated by a careful and painstaking writer that not over 35c of each dollar paid as premiums to casualty companies ever reaches the injured employee or his family. The balance is absorbed in fixed charges, operating expenses, attorney fees and the payment of dividends to stockholders in the casualty company. In Germany, almost the entire amount of premiums paid goes to the proper beneficiaries.

I will not follow in detail the various features of the German system, but after a trial of more than 25 years, all parties are agreed as to its advantages. And during this same period Germany has advanced to a high position in manufacture and commerce and the condition of its workingmen has so improved that emigration has materially decreased.

The German industrial insurance is undoubtedly more effective than the English compensation act, but both systems are worthy of the most careful consideration and should enable us to prepare suitable laws for our own State.

While I have referred to these two systems at length as affording the most conspicuous examples of desirable legislation, it is also worthy of notice that France, Austria, and Sweden, and practically all the industrial countries in Europe have adopted some system for the protection of their workmen. The British colonies with the exception of Canada have followed the example set by England. Our own country, so progressive in other respects, is a laggard in legislation of this character.

An Economic Question

I regard this as an economic question, and I am expressing these views from that standpoint. The payment of such indemnities or insurance to injured men or their families is a matter of common justice, and our laws ought to be changed so as to require it. Such a system would be infinitely better for both employer and employee than to have the same amount distributed from charitable or philanthropic motives. I firmly believe that the representatives of employers and employees should unite in asking the next legislature of Michigan to create a commission, following the example of Minnesota, to give this subject careful consideration and draft a suitable law. I feel sure that the adoption of some such system as I have discussed will be of the greatest benefit to both employer and employee as well as being for the best interests of the State.

The government has just issued the half yearly figures of production of diamonds in the Transvaal. The output for the half year was valued at £580,807, as against £714,409 in the previous half-year, a decrease of £133,682. The number of loads washed fell from 3,858,180 to 3,689,200 and the number of carats from 1,002,754 to 926,738. The value per carat during the past six months was just below 12s 6d ($3.04). Five companies and 18 individual diggers contributed to the output.

A. M. Bilsky, of Cobalt, and J. A. Jacobs, of Montreal, are to construct the first concrete building to be seen in Cobalt. It will be erected on the site formerly owned by the Royal bank, and is to be an office building six stories in hight. It will be fireproof, being constructed of reinforced concrete throughout. It is understood that four floors have already been engaged. Work has been started tearing down the old buildings to make ready for construction.

Three oil wells have been opened on the island of Trinidad, in the West Indies. The wells are near the coast and not far from the famous Asphalt lake. They are owned by the New Trinidad Asphalt Lake Company.

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Protection of Mine Investors

The Mining and Metallurgical Society of America, after a discussion of nearly a year, has adopted the following resolutions:

"Whereas, the over-valuation of mining properties by investors and the public, due to ignorance of mining conditions and a lack of appreciation of the real nature of the investment, tends to increase unduly the profits of mine promoters and speculators, and to increase unnecessarily the financial risks taken by mine investors, to the ultimate disadvantage of the mining industry,

"Resolved, that it is the opinion of the Mining and Metallurgical Society of America that, for the protection of shareholders and investors, every mining company should publish an annual report within 90 days of the close of its fiscal year, and such report should incorporate the following information:

"1. A brief review of the past history of the property, the work accomplished and the results obtained, with tabulated statement of expenditures and receipts from the beginning, marketable products made each year, and the sums received from the sale of same, the annual net earnings and the disposition made of such earnings.

"2. A similar review, but in more detail, of the work of the year, with statements of the assets and liabilities (these statements to show all details as to capitalization of the company; the number and classes of shares outstanding at date of the report; the respective rights of these shares; the number of shares remaining in the treasury; any options or contracts on such shares; any bonded indebtedness), receipts and disbursements, cost sheet and other information as to work accomplished and results obtained.

"3. A statement of ore reserves at the date of the report, compared with the reserves of the previous year, with an estimate, by competent authority, of the probable life of the mine."

The Mining and Metallurgical Society, although comparatively small in membership, is representative of the mining engineering profession, and its expression of views as to what the investors in the shares of mining companies ought to have should be of some weight as the consensus of excellent professional opinion respecting this matter.

Taking up the resolutions, article by article, we conceive that the purpose of the first article is to throw light upon the actual cost of production. It may be argued that data of the past are no criteria as to the prospects for the future. They afford, nevertheless, the best possible basis for making estimates as to the future, which may be reduced or increased according as the latest knowledge as to the mine indicates ought to be done. On the other hand, it is well recognized that the report of a mining company for any single year is likely to be misleading—because maintenance and development expense may be temporarily neglected, etc.—while the average for a reasonable series of years will tell the story. This appears to be the principle of the first article, and as such we consider it to be wise.

The second article specifies simple data that every shareholder is certainly entitled to, and ought to have. Many mining companies—perhaps the majority—fail to communicate all of this information. If the purposes of the management of the companies are perfectly straightforward, there is no reason, however, why there should be concealment or reticence as to any of these particulars.

If every mining company should comply with the specifications of article 3, there would be fewer scandals and less deception of unwary investors in mining shares. In the discussion of these resolutions, this article excited more argument than either of the others. It was urged, among other things, that it is impossible, in the majority of mines, to estimate the probable life, and any engineer who attempted it would generally be playing into the hands of illegitimate finance. We think that the members of the society who voted for these resolutions by a large majority recognized fully the impossibility of forecasting absolutely the life of any but the exceptional mines and do not expect infallibility even from competent authorities; but they indicate that the stockholders of a mining company should have such a frank and honest statement of conditions and prospects as one partner in charge of the operation of a property would make to another who was absent. Certainly, the investing public has been benefited by such frank statements as to the probable life of the mines as have been made in the cases of the Calumet & Hecla and Broken Hill Proprietary.

The resolutions adopted by the Mining

and Metallurgical Society are certainly conservative inasmuch as they ask nothing more than is done already by a good many of the substantial and well managed mining companies. Inasmuch as so many of such companies can do these things, there does not appear to be any good reason why all companies should not. It is to be hoped that the public will learn to discriminate between those that comply with the standard that is now established by the Mining and Metallurgical Society and those that fail to do so.

New Explorations in the Lake Superior Region

Although iron mining has been carried on in the Lake Superior region for half a century, no limit seems to be yet set to its possibilities. The extension of the district beyond the "Old Ranges"—the Marquette, the Menominee and the Gogebic—by the opening of the Vermilion range in Minnesota, and later by that of the Mesabi range, turned exploration to the north and west and the older ranges for a time ceased to be the scene of much active prospecting work. The rapid extension of the Mesabi to the westward and northward for a time satisfied the demand for new sources of ore supply. The limits of that range have not been set, but most of its deposits of proved or probable value have been taken up, and are now being worked or explored by the owners.

A limit having been set in this direction, a new wave of exploration was started on the older ranges of Michigan and Wisconsin, which has resulted so far in the discovery of a number of orebodies formerly unknown, some of these constituting new mines while others promise valuable additions to the lives of older mines. The [illegible] so far met with on these ranges has stimulated exploration, which is just now especially active on the Menominee range, with very good prospects of success. This work is going on not only in the vicinity of some old mines, but also in several districts which had been supposed to be comparatively barren and unprofitable and had been neglected.

The Vermilion range has been comparatively neglected of late, especially since the partial closing of the Chandler and the [illegible] mines, once two of its largest producers. Now, however, it has again come forward, and has been accepted as a possible ground for new discoveries. Exploration on this range is slower and more expensive than on the Mesabi, where it has been possible to determine the position and approximate size of many of the orebodies by the diamond drill alone. On the Vermilion drilling has proved uncertain and sometimes untrustworthy and the slower process of sinking test shafts is required. Preliminary boring, however, has given such promising results that several of these shafts are to be sunk, work on some of them having already been begun. It is too soon to predict the results, but there is certainly promise enough to warrant the expenditure of the capital required.

The Lake district since its first discovery has shipped 430,000,000 tons of iron ore. Estimates of its probable reserves and future life have been various. It is evident in the light of recent discoveries that such estimates need to be radically revised, as compared with those of two or three years ago; and it looks as if such a revision would be required periodically for some time to come.

Estimating Grade of Ore

In sizing up a mine there are two factors that are apt to be misconceived, viz., the cost of mining and the grade of the ore. As to the latter it happens generally that in spite of all refinements in sampling, there is an over estimate. This is due to several reasons. The sampling of the pay streak may be correct, but the pay streak can seldom be extracted cleanly. Often it is necessary to take out more of the wall rock than was contemplated in order to get at the ore and it is impracticable to separate the lean or barren material. In the mining of great masses of ore, as in the porphyry copper mines, it may prove essential to take out lean portions in order to get at the better upon which the estimates were based. A block of moderate size showing good ore on four sides may prove to have a barren core.

Nature sometimes plays queer pranks and deception may arise from the very perversity of things. We recollect a case of an exploring drift on the strike of a lode which cut a streak of good ore for 100 ft. or so, ore showing in roof and floor all the way without a break. When the ore was stoped it was found to be an elongated body, lying horizontally, that in no place was more than 30 ft. high and for much of its length only 10 or 12 ft. The drift had happened to go through it like the lead through the wood of a pencil.

The conservative diagnostician is bound to regard every orebody with some spirit of pessimism. But, says the optimist, may not the converse sometimes happen? May we not in the extraction of a body of low-grade ore find unexpected pockets of rich ore within it when we take out the whole? Yes, this may happen. We have known such cases. But they are less common than the other experience. Pockets of good ore are apt to throw out stringers, leaders, or some sort of clue, which cause miners to follow them to their heart. On the other hand, no prospector follows a leader of lean ore.

After the sampling of a mine has been done with the utmost care; after it has been checked and rechecked; and after it is thought that the grade of the ore is really known, it is advisable to discount the belief by some moderate percentage to allow for such adverse contingencies as we have sketchily indicated. Perhaps this ought not to be necessary, but experience seems to manifest that it is.

The statement that the New River and Pocahontas coal operators are concerting measures to regulate shipments will be welcome news to the other districts which furnish bituminous coal to the seaboard. The unrestricted competition of West Virginia coal and its sale in Eastern territory, apparently without regard to price, has deprived the trade of all profit for many months past.

Without considering the Ballinger-Pinchot controversy and without deprecating the basic idea of conservation—grand in itself—what a relief it would be if the calamity howlers could be calmed, and if the army of Government scientists and publicity seekers, who spill so much ink in heralding new discoveries of old things, could be asphyxiated.

Many mine managers fool themselves as to their cost of mining. Many metallurgists are honestly deceived as to their percentage of metal extraction. Although we are pleased to think that we are saving 95 per cent. there seems always to be upward of 5 per cent. more to yield to improvements in the art.

Smeltery Smoke Agitation in California

SPECIAL CORRESPONDENCE

The agitation in the different school districts of Shasta county with reference to damage to farms, orchards, etc., by smeltery smoke, has resulted in the formation of the Shasta County Farmers' Protective Association. This new association has held a meeting at the town of Anderson and has decided to take a determined stand on the smoke question. A committee which had conferred with the smeltery managers at Coram, Kennett and Winthrop reported that these managers had made no definite promises of improvement, whereupon the following resolution was adopted:

"That the Shasta County Farmers' Protective Association do hereby absolutely demand that the infliction of damages by smeltery smoke and fumes must cease. That said smelters be sent a copy of this resolution with the demand that, on or before Oct. 1, next, some tangible proof shall be submitted to this association that immediate steps are to be taken to stop said smoke and fume nuisance."

The smelting companies are already taking such remedial measures as seem best to them in this connection and have in numerous instances also obtained easements from farmers whose crops have been, or may be, damaged. Still further preventive measures will be taken if possible. The smelting industry of the county is now of the greatest importance and many millions of dollars have been invested in mines and plants.

Some years ago, when the agitation against the operations of the Mountain Copper Company, Ltd., at Keswick, began almost to amount to persecution that company closed down its smeltery and mine and built a new smeltery on the bay shore of Contra Costa county. The company was the largest tax-payer and largest employer of labor in the county and its cessation of operations was a severe blow to the mining and other industries of Shasta. Mine work was subsequently resumed and the ore shipped to the bay smeltery, all of which was bad for the county. Until these smelteries came into Shasta county, the mining industry languished, but their presence made a market for the ore the miners got out and started mines up in all directions. It would be a great blow now if affairs got into such a shape that the smelters had to close down even for a short time.

Copper Refining in Australia

B. Magnus, manager of the works of the Electrolytic Refining and Smelting Company of Australia, at Port Kembla, New South Wales, has sent us the accompanying photograph, which illustrates an historic event in the metallurgical industry of Australia, namely the inauguration of electrolytic copper refining in that Commonwealth. The engraving shows the first charge of blister copper being put into the anode furnace of these works by the Hon. C. G. Wade, the premier of New South Wales.

HON. C. G. WADE PLACING FIRST CHARGE IN FURNACE

Developments at the Dolcoath Mine

SPECIAL CORRESPONDENCE

The report for the six months, ended June 30, 1909, records a substantial improvement in the earnings of this Cornish mine as compared with the two previous half-years. This is mainly due to an increase in the grade of ore mined, the yield per long ton during the last six months, having risen to 48.85 lb. of black tin from an average of about 40 lb., at which the grade has stood during the last five years.

The development at the bottom of the mine has been of a satisfactory nature, two of the deeper winzes, or "winds," as the report gives it, having exposed ore of an average grade of 110 and 80 lb. respectively of black tin per ton of ore. The use of "winds" for the modern winze explains to some extent the origin of the word, though opinions differ whether the word was derived from the meaning of winding (hoisting) or from wind (ventilation). The use of this old-fashioned term is characteristic of Cornwall, which in methods of mining is far behind the times.

The new vertical shaft, called the Williams shaft, which in the future will be of much assistance in reducing the cost of working, has reached a depth of 2541 ft. from the surface, leaving 43 ft. to reach the 440-fathom level which is the depth measured on the incline from the deep adit. A crosscut has been driven from the 440-fathom level toward the shaft and at the date of the report there were only 25 fathoms more to drive to make this important connection.

The company has made a contract with a local electric power company for electric power for pumping, in which direction a considerable saving in costs may be expected. To meet the proposed increased production when the Williams shaft is put into commission, 12 heads of pneumatic stamps have been ordered and these, also, will be driven by electric power. Owing to the antiquity of the shafts, Dolcoath has hitherto been operated under great disadvantage and a considerable improvement in working costs may be looked for when the new equipment is in working order.

From the upper levels of the mine a considerable tonnage is being raised and when working on the larger scale, the mine may be expected to yield large quantities of ore hitherto unpayable but which under the altered conditions may be profitably handled. The bottom of the mine has been contributing about 28 per cent. of the tin stuff raised and 53 per cent. of the tin sold, which demonstrate the importance of the new developments.

For the half year, the profit on 45,880 tons crushed was £14,827, which was reduced to £10,459 by deductions for income tax and depreciation. The dividend declared for the period absorbed £8500. Working costs averaged 26s 10¾d. ($6.54) per ton, which is exclusive of 2s 4d per ton paid as royalty to the owners of the ground.

According to a recent British consular report, the export of copper from Japan in 1908 was 35,700 long tons against 31,800 in 1907.

Views, Suggestions and Experiences of Readers

Comments on Questions Arising in Technical Practice and Debatable Points Suggested by Articles in the Journal

CORRESPONDENCE AND DISCUSSION

The Vermont Copper Company

Being to some degree familiar with the copper properties at Strafford, Vt., I read with interest the article by Albert H. Fay, on the Vermont Copper Company, in the JOURNAL of Aug. 21, 1909. In stating that "between 1820 and 1830 at least 300 men were employed at the mines in the production of copperas," Mr. Fay was wrongly informed as to the period when the old Vermont Copperas Company was operating with great energy, for in the decade stated the enterprise seems to have been getting started and had attained no great importance. Among many other citations to the same import, the following sentences from an article by James Pierce, in the *American Journal of Arts and Sciences*, Vol. VIII, 1824, effectually disposes of the matter, viz.: "I passed a day at the copperas works in Strafford, Vt. Eleven men are employed, who calculated to make per annum 100 hogshead of copperas of 1500 weight each." Mr. Pierce's estimate indicates a yearly output of 300 tons of copperas, containing only 60 tons of iron.

However, thanks to the high price of copperas, the industry prospered and, though the bonanza period was long subsequent to the decade mentioned, was quite profitable during a considerable term of years, and handsome returns were made to the shareholders of the Copperas Company. From an early day scrap iron was used to reduce the ferric sulphate and to precipitate such copper as might be in the copperas solution, and later when, with the gradual opening of the mine, it was found possible to pick out more or less copper ore of a fair grade, such selected ore was roasted and smelted. Still, though the contrary might be inferred from Mr. Fay's statement, the production of copper was never more than an incident to the manufacture of copperas, during the whole period of operation of the Vermont Copperas Company's property. In this respect the Strafford property differed from those at Versailles and Cornwall, which were worked solely for their copper content.

The smelting of the selected ore was being carried on with some degree of success in 1817, when Isaac Tyson, Jr., of Baltimore, a prominent metallurgist, visited Strafford in a consulting capacity. He had occasion to visit the orebeds and observe during that visit a northerly vein, dipping from a half plane, which dipped in the east, had penetrated in 1813 the adjoining lands to the north, although they did not show an ore outcrop. Many years later, in this land, the Tyson heirs developed the extension of the original ore body known as the Elizabeth mine. Excepting to the slight extent that the Copperas company's workings entered their neighbor's territory, the Elizabeth ore was not used for making copperas, as the profits thereon had disappeared before the Tyson property had been opened. However, attempts were made to select and smelt the ore and on the Elizabeth mine dumps there are about 50,000 tons of rejected ore, of which a large part must average: Copper, 1.75; iron, 40, and sulphur, 24 per cent. This rejected ore is in addition to the several thousand tons of heap-roasted ore mentioned by Mr. Fay as having laid in the roast yard for a number of years. The properties of both the Vermont Copperas and the Elizabeth companies are now held by the Vermont Copper Company.

Naturally, one's information does not extend to every stray shipment made from the property 50 years ago, but I am disposed to question the accuracy of the statement that, "about 1800 some of the oxidized surface ores were mined and sold for paint," for the erosive action of the glacier period in that section was most marked, and the sulphide ores on the Copperas company's property began practically at the grass roots along the whole extension of the outcrop, and there never was any oxidized ore on the property worthy of mention, so there was but a slight possibility of there being even a vestige of such ore remaining 67 years after mining was begun. The copperas produced was in part used in the manufacture of rouge and Venetian red, and I have heard of the experimental shipment of some lots of the old oxidized residuum from the leached and spent copperas ore, which may explain the statement.

What has preceded relates to the history of the consolidated property and, after all, to relatively trivial matters, but more important are Mr. Fay's statements respecting the ore and the manner in which it is to be worked. The gentleman continued: "An average analysis of the ore is as follows: Fe, 40, Al_2O_3, 6, CaO, 2.3; CaO and MgO, 2, and SiO_2, 13 to 20 per cent. . . . of the silica is free and . . . is combined. . . . It is the intention to use the smaller ore, 8 ft x 11 in., furnace experimentally on pyritic smelting. . . . No concentration of the ore will be attempted prior to smelting."

In my opinion, the reported analysis and statement that only one-third of the silica is free are unfair to the property. Unquestionably, in the southern portion of the Elizabeth workings, which was the only property in which any great quantity of ore was opened up in 1906, the ore is exceedingly ferruginous, in places running as high as 35 to 40 per cent. iron, but in the northern and deeper workings are less so, sometimes dropping to 16, 20 and 24 per cent., so that the general average of the mine is considerably under 40 per cent., as stated by Mr. Fay.

Neither limestone nor silicious flux, with any considerable amount of free silica, are convenient, nor are they to be had at reasonable prices, while the location of the property in northern New England, 10 miles from a railroad, makes coke expensive. In pyritic smelting the silicate gangue minerals simply dissolve in the ferrous silicate formed in the process and enter into the slag with their constitutions unaltered, so may here be neglected, especially in this case where the gangue minerals are singulo-silicates. The Elizabeth ore usually has about three units of iron as ferrous oxide in the biotite which, with ore of the analysis stated by Mr. Fay, leaves 37 per cent. of iron in the sulphides, which must be oxidized and slagged with silica to produce metallic copper. It makes no difference in what steps the smelting may be carried on; the 6.67 per cent. of free silica (⅓ of 20 per cent. the maximum amount stated by Mr. Fay) requires only 16 per cent. of ferrous oxide (12.4 per cent. FeO in form 2 FeO, SiO_2), leaving 24.6 per cent. iron to enter the matte. They, unless an expensive silicious flux is used, the matte fall, in smelting ore of the analysis stated will be about 35 per cent. of the weight and such matte will assay about 7 per cent. copper. It is manifest that a furnace concentration of the character would not be practicable.

But the ore is better than Mr. Fay states. In 1906, the Elizabeth mine was carefully sampled and the average copper contents was found to be 2.4 per cent. to 2.5 per cent. I, personally, had all the samples more or less completely analyzed, but approximately have not the results by me. However, analysis No. 1 is a general sample made up of equal parts of the mine samples mentioned. Analysis No. 2 is of a lot of 60 tons from all parts of the mine in May, 1906. No. 3 is of a lot also mined in 1906. No. 4 is of a selected lot of 200 tons from a report by Prof. H. M. Howe.

ANALYSES OF ORE FROM ELIZABETH MINE.

	No. 1.	No. 2.	No. 3.	No. 4
	Per Cent.	Per Cent.	Per Cent.	Per Cent.
Cu	2 50	2 20	n.d.	5 01
Fe	32 15	34 50	32 20	30 19
Al_2O_3	7 43	8 10	7 70	8 97
CaO	1 70	2 10	2 60	1 68
MgO	2 72	n.d.	n.d.	2 36
SiO_2	29 10	29 00	31 00	27 95
S	19 98	n.d.	n.d.	21 77

The sulphide minerals are chalcopyrite and pyrrhotite closely approximating the formula Fe_7S_8, while the gangue is almost entirely made up of the soda lime feldspar, labradorite (Na_2O, 3 CaO, 4 Al_2O_3, 12 SiO_2); biotite mica (6 FeO, 2 K_2O, 2 MgO, 4 Al_2O_3, 11 SiO_2); the amber mica, phlogopite (K_2O, 6 MgO, Al_2O_3, 5 SiO_2) and quartz. The several gangue minerals, of course, occur in different proportions in different parts of the mine, but the ore represented by analysis No. 1 was a pretty fair general sample of the ore as it can be mined in large quantities, and apparently it was made up of the several minerals mentioned as shown in the accompanying table.

MINERALS IN NO. 1 SAMPLE.

		Fe	Cu	S	K_2O Na_2O	Al_2O_3	CaO	MgO	SiO_2
7.2	Chalcopyrite	2 20%	2 50%	2 52%					
44 3	Pyrrhotite	26 77		17 48					
17 6	Biotite	3 18			1 75%	3 5%		0 91	6 25
8 2	Phlogopite				1 04	1 7		2 66	3.33
7 3	Labradorite				0 34	2 2	1 7		3 82
15 7	Quartz								15 70
100 3		32 15	2 50	20 00	3 13	7 4	1.7	3.51	29 10

The feldspar and micas, being practically the only silicates present in any quantity in the ore, are all singulo-silicates, readily fusible in themselves and easily dissolved in ferrous silicate, so only the relative amounts of the iron of the sulphides and the free silica present need be considered. The iron of the sulphides requires 15.5 per cent. of free silica to form 2 Feo, SiO_2, which is just about the amount the table indicates is present, showing that ore of that composition is substantially self fluxing. As the other analyses indicate the same favorable condition, it must be acknowledged that the general proposition is decidedly more favorable than Mr. Fay's statement would indicate.

It should be understood that I am writing only respecting the problem and am not expressing an opinion as to the wisdom of the proposed method of treatment, which Mr. Fay informs us is admittedly experimental.

JOHN N. JUDSON

35 Wall Street, New York, N. Y.
Aug. 30, 1909.

There are nearly 2000 mining and quarrying enterprises in the State of New York.

Regulation of Gas in Mine Air Currents

I wish to call attention to the article on the "Regulation of Gas in Mine Air Currents" by John G. Smyth, published in the JOURNAL of July 3, 1909. Mr. Smyth states: (1) "The can is full of water when taken into the current and to take the sample both cocks are open," etc.; (2) "The flask full of water is connected with a hose to the can containing the sample," etc.

(1) When the air is sampled as stated in the article a part of its carbonic acid gas is lost in the water by absorption.

(2) When the air is transferred into the flask a portion of the remaining CO_2 again dissolves in the water.

We know that all gases dissolve to a greater or less extent in water and the solubility depends on the temperature and atmospheric pressure. According to W. A. Tilden, one volume of water will dissolve 1.7967 volumes of CO_2 at normal temperature and pressure. Since the quantity of CH_4 to be determined depends directly upon the observation of CO_2 after its combustion as stated by Mr. Smyth, the percentages of CO_2 and CH_4 as published in the article are much smaller than they actually exist in the mine air.

M. I. HACHITA.

Wilkes-Barre, Penn., July 28, 1909.

Sulphide Corporation

In the fourth paragraph of the article on "Sulphide Corporation," published in the JOURNAL of July 17, 1909, page 118, it is stated that in the plant owned by the Minerals Separation Company, the tailings treated for the half year ended June 30, 1908, amounted to 34,500 tons, producing 12,520 tons of concentrates.

This tonnage only represents the material treated in the plant on account of the Sulphide Corporation. The total tonnage passed through the plant for the period under review was 89,253 tons of tailings, producing 31,538 tons of concentrates, the difference between the two sets of figures representing material treated by the Minerals Separation, Limited.

SECRETARY, MINERALS SEPARATION, LIMITED.

London, E. C., Aug. 14, 1909.

The Assay of Cyanide Solutions for Gold Content

BY W. F. BOERICKE

The following method has been used in actual practice and found to be quick, reliable and inexpensive, and requires no extraordinary skill in manipulation. As many as 30 or 40 samples may be run through in a couple of hours, and results check closely. In one case 12 samples were prepared for the assay furnace in 15 minutes.

The samples are sent to the assayer in wide-mouthed quart bottles, properly labeled. Four assay tons (118 cc.) are withdrawn by means of a pipette, and run into a small pear-shaped Erlenmeyer flask; 10 cc. of lead acetate are then added. A reaction follows, and the precipitate settles in a fine, cloudy heap. A few drops of 1 per cent. KCN are added, to make sure all the gold will subsequently precipitate. This might not happen if the solution were too weak. A few drops of silver nitrate (1.37 per cent.) are next added, if necessary to bring up the proportion of silver and cause the gold to part easily. Next a small amount of zinc dust (the amount covering a spatula point is sufficient) is added. This causes a black, muddy precipitate of the gold to form. The flask is then shaken and put on a hot plate and heated to boiling, after which 15 cc. of HCl are cautiously added to dissolve the excess of zinc and make cupeling easier. The HCl need not be pure, the commercial acid being satisfactory. When cool, the solution is decanted and the precipitate washed. The spongy lead and gold remain in the bottom of the flask, and may easily be pressed together with the finger into a small, firm ball. This is wrapped in test lead and cupeled as usual.

The method is especially adapted to assaying zinc tails where the gold content is low. The lead acetate is added to collect the gold and give a larger button to assay. One great advantage of this method is that all the samples may be prepared simultaneously, as no step requires special attention.

A preliminary estimate of the gold production of the Transvaal for the year ended June 30, 1909, is given in the *New York Times*, July 31, 1909. These figures show an output valued at £31,002,226 or an advance of £2,493,850 over that of the preceding year. During June an average of 20,020 rock drills were in operation against 22,002 during July, 1908. The number of men employed in the gold mines in June, 1909, was 19,561 whites and 172,570 colored, as compared with 16,504 whites and 158,004 colored in July, 1908.

*Cobalt, Ontario.

Details of Practical Mining

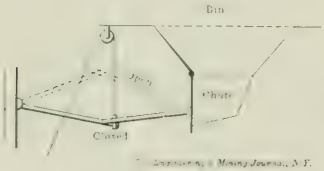
Notes of Interest to the Operators of Small Mines as Well as of Large Mines. The Things That Have to Be Done in Everyday Mining

REPORTS FROM EXPERIENCE

Readers of the JOURNAL are invited to contribute to this department. Articles should be brief, thoroughly practical, and preferably illustrated by drawings or sketches. Our draftsmen will prepare properly any kind of a pencil sketch that is intelligible. Something that is an old story in one district may be quite unknown in another. Articles accepted and published are suitably paid for.

Toggle-Joint Gate

The accompanying illustration shows one type of gate for an ore chute as used by Witherbee, Sherman & Co., Mineville,

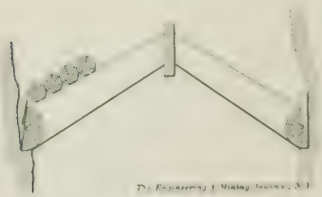


TOGGLE-JOINT GATE

N. Y. The gate itself is about 16x24 in. and the toggle-joint bars are ¾x3-in. steel, 3 ft. long. The gate has proved satisfactory. It is opened by means of a rope and pulley, while the weight of the bars is sufficient to close it.

The Saddleback

The saddleback system of timbering, as shown by the accompanying sketch, con-



[illegible]

[illegible] with their [illegible] upon the opposite sides of [illegible] Sound. If the road [illegible] the [illegible] is too wide to [illegible] at a single stall.

Automatic Safety Clutches

As examples of the latest German practice, engineer Wintermeyer describes the following three devices in *der Bergbau*, July 29, 1909. In these, the aim has been to modify existing forms of such devices in use so that, with heavier loads and higher speed, the stoppage will be gradual instead of sudden.

HEILIG'S APPARATUS

In this device, as shown in Fig. 1, the bars *a a* are automatically pushed outward by the spring *b* when the cable breaks. The faces of *b b* are ridged and stand obliquely to the cross-beams *c c*. When these

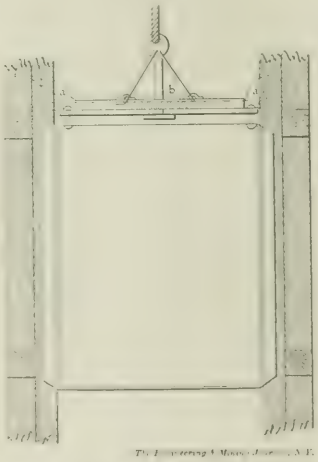


FIG. 1. HEILIG'S APPARATUS

faces come into contact with *c c*, the bars are forced back and the spring *b* becomes compressed. In this manner the fall is checked. The cage falls to the next set of timbers and its velocity is further diminished. After a few such drops from timber to timber, there is not sufficient momentum remaining to force spring *b* back, and the cage remains suspended.

KEIL SAFETY CLUTCH

To the upper part of the cage (Fig. 2) are fastened two movable curved bars *b b* which are connected by the rods *a a* to the drawbar *a* to which the cable is attached. The bars *b b* are pivoted at their bottom ends and are attached from their centers by rods *d d* to the lower crosshead of drawbar *a*.

Ordinarily the bars *b b* are drawn up by the cable pull until they pass freely up and down the shaft. If the cable breaks, the drawbar *a* is instantly pulled down by the spring, bars *b b* are forced out, *d d* are drawn down and snap into slots *e e* in *b b*. The bars *b b* are thus held apart and must wedge themselves between the

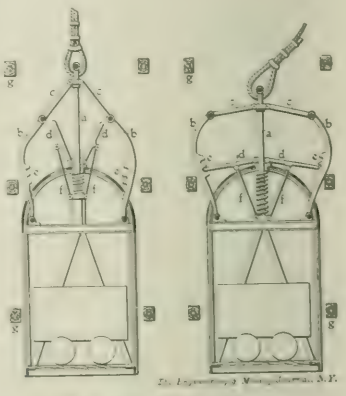


FIG. 2. KEIL'S SAFETY CLUTCH

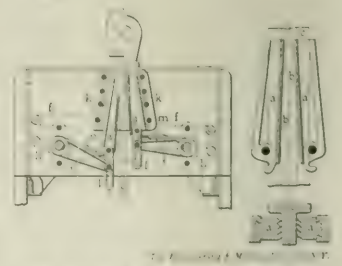


FIG. 3. [illegible] KEIL SAFETY [illegible]

shaft [illegible] *g g*. If the [illegible] *g g* should bend and let the cage fall farther, it will be held certainly at the next set. The bars *b b* cannot yield as they are braced by *a a* at their dangerous point.

THE KEIL SAFETY CLUTCH

In Fig. 3 the wedges *a a* carry, on the sides next the guide rails, the ribs *b b* which extend along the whole length of

the wedges and have a toothed cross-section. These toothed ribs are not parallel to the guides but are arranged at a slight angle so that, when the cable breaks, the upper edges will penetrate the material of the guides to a depth of about 5 mm., and the lower edges about 1 mm.

The engagement of the teeth when the cable strain is removed is effected as follows: Bar *f* is actuated by a spring, depressing *h* and thus forcing *j* upward in the guides *k*. To enable the device to work on various sizes of guides, the hight of possible lift given to *a* is increased by the flat spring *m* and slot *l*. If *a* has been pushed to its fullest hight by the action of the spiral spring without gripping the guide, then it is still farther raised by *m* until the teeth take hold sufficiently to stop the cage.

Surface Plants over Mine Workings

A little foresight and thought concerning the location of surface buildings will often save thousands of dollars in later years. The accompanying illustrations show a plant that was erected on the very edge of an outcrop. So long as the ore is not removed, all is well. But the object of mining is to take out ore, and this is frequently done so near the surface as to endanger buildings. It is not always possible to tell, in the early stages of mining, just where the main underground workings will be. A thorough study of the problem should be made, and the buildings and shafts constructed on as safe ground as possible.

No. 1 BUILDING ON VERGE OF CAVE-IN. LOADING CHUTES OUT OF COMMISSION

No. 2 BUILDING AS ORIGINALLY ERECTED

No. 2 BUILDING, AFTER CAVE-IN

Speed of Pelton Wheels

The article in the JOURNAL of Aug. 7, 1909, entitled "Housing a Pelton Wheel" calls to mind a costly mistake recently observed.

A certain mining company undertook to utilize the water issuing from its mine tunnel to run an air compressor for supplying air for the mine. It was estimated that from 25 to 30 cu.ft. of water were available per minute, with a head of 640 ft. By erecting storage tanks it was estimated that over 40 h.p. would be available during the time the compressor should be running. This would supply three drills.

Unsatisfactory Results

For over a year this compressor gave unsatisfactory results. The work planned in the mine could not be done for want of air. After the expenditure of many thousands of dollars a hydroelectric plant was erected to bring sufficient power from a distance.

An examination of the former compressor showed where the trouble lay. The engineer who made the computations for its installation assumed that for maximum efficiency the wheel should travel at one-half the velocity of the water issuing from the nozzle. The pulleys were ordered accordingly, and when installed, the machine was found to run faster than had been calculated, except when the compressed air was over 100 lb. pressure. At that pressure the Pelton wheel ran at just about half the speed of the water striking it.

Proper Speed of Pelton Wheel

To get the maximum efficiency from a Pelton wheel it should travel a third as fast as the water striking it. In the case cited, if this ratio had been adopted the compressor would have pumped 40 per cent. more air when compressing air at 100 lb. and the efficiency would have been considerably more for lower pressures. This slight alteration in the size of the pulley on the wheel, from 8 to 14 in., would have been worth to this company about $10,000 during the year it was in commission and might, by saving them the expense of installing an electric plant, have saved the outlay of $15,000.

This ratio between the velocity of the water and of the wheel is not commonly known, and often the low efficiency of Pelton wheels is due to this lack of knowledge.

Grading a Drive or Tunnel

Metal miners, especially those working a property on a small scale, cling to the practice of laying rails by guess. The result of this is a drive that contains grades of all degrees of steepness, some of which often pitch in the wrong direction. All guesswork may be avoided by the use of a straight-edge, tapered to the required grade and fitted with a spirit level.

Suppose the grade desired is 1½ in. in 12 ft. The spirit level is fitted to the top of a 12-ft. straight-edge so as to parallel the bottom. Then the lower edge is cut so the new bottom will rise 1½ in. in the whole length. The forward end is marked in some manner. Thus, when the apparatus is laid along a rail or over the ties, the bubble will rest at center when the grade is correct.

Labor Efficiency in Mining Operations

By Peter B. Scotland*

In mining, as in all other industrial undertakings, economy of labor is an essential of success. It is of vital importance that a just and adequate return in labor should be obtained for the wages paid to the employees. In justice and equity the employer demands an honest day's work for a fair day's wage and failure to secure this return may turn the narrow margin of profit earned by many mines into a serious loss. No item of expenditure in mining is so expensive as labor and the reduction of this expense to the lowest figure compatible with equal fairness to employer and employee should be the aim of every mine manager. It is the purpose of this article to discuss some of the factors that contribute toward efficiency of labor.

Working Conditions

Working conditions, such as the system of mining employed, hand or machine drilling, ventilation, drainage and safety, have a great influence on the amount of work performed. It is the duty of the mine manager to have these influencing conditions as perfect as the mine will allow. A half drowned, half suffocated or wholly scared workman cannot do good work. Have each working place as good as it is possible to make it. Good tools, tram roads, rolling stock, shoveling floors and labor-saving devices are all factors that influence the results and therefore merit the most careful attention. These factors, however, are outside the scope of the present article. I shall confine my attention to the personal factor of efficiency and to the consideration of such means as shall aid in securing the best returns for the expenditure made.

Day's Pay and Contract Work

Between a "china boy" tapping a drill and a two-hundred-pound Butte slugger driving the same, there is a wide gulf in the amount of work done, so is there a wide divergence in the remuneration received. Eliminating the dictates of labor unions the wages paid will depend upon the quality of the labor obtainable and the amount available. As the amount of remuneration is various, so also are the methods adopted of allotting this remuneration.

Broadly speaking there are two methods, day's pay and contract. Day's pay is the most common method employed in metal mining and the most unsatisfactory from the employer's standpoint. Little, in fact, can be said in its behalf except its simplicity and its favor in the eyes of the trade unions. It demands a large amount of supervision as the men have no incentive to work beyond the fear of losing their positions. Contract work is much to be preferred when permissible in a mining district. In it a workman has a direct interest in his work, as he is is paid by the results of his own labor and profits by his own extra exertions. It calls for less supervision and preserves a better feeling between the workman and his employer. In many mines part of the work is prosecuted on day's pay and part on contract, if this can be arranged, and such a combination is the most satisfactory method of conducting operations.

Low Efficiency

If we examine the labor conditions in many mines today, we shall find that the methods employed to secure results are very crude and would not be tolerated in most other branches of industry. A crew of miners, timbermen, muckers, etc., are under the supervision of the foreman and his drift bosses. It is the duty of these men to see that the work is carried on in a proper manner and they must in consequence be skilled miners themselves. In addition they must be observant and vigilant in order to detect any "soldiering" or shirking among the workers, and they must know by experience what constitutes a fair day's work. In most cases no record of the work performed is obtainable; the amount done depends largely on the watchfulness and "man power" of the bosses. Of course, there are many workmen sufficiently conscientious to give an employer full value for his day's wage without the mild coercion of a boss, but there are many less scrupulous.

The foreman selects and weeds out his crew to secure the best results. In many cases, however, this selection is largely made by his direct measure of the work done. This is soon detected by the men and has the detrimental effect of directing their efforts toward conciliating the man over them instead of doing useful work. The good worker is conscious that his exertions may be overlooked and the poor worker hopes to escape detec-

SEGREGATION OF LABOR.

.....Mine.

1909	Miners. Day's Pay. Breaking Ore.	Miners. Day's Pay. Break'g Waste.	Miners. Day's Pay. Breaking Fill.	Miners. Contract. Breaking Ore.	Miners. Contract. Break'g Waste.	Miners. Contract. Breaking Fill.	Miners. Special Work.	Miners. Total Miners.	Miners. Efficiency Factor. (b)	Muckers. Day's Pay. Ore.	Muckers. Day's Pay. Waste.	Muckers. Day's Pay. Filling.	Muckers. Contract. Ore.	Muckers. Contract. Waste.	Muckers. Contract. Filling.	Muckers. Special Work.	Muckers. Total Muckers	Muckers. Efficiency Factor. (b)
Average in May	7	1	2	12.6	.....			22.6	14.8	2 3	.	6	18 5				26 8	13 9
June 1	7	1	3	13				24	16 5	2		6 (a)	19	.			27	15.7
June 2	7	1	3	13				24	16 8	3		5 (a)	19		...		27	15 2
June 3	8	...	4	*13	....			25	15 2	2		6 (a)	18				26	16
June 4	7	.	4	9				20	19 5	2		6 (a)	16				24	17 3
June 5 (c)	7		3	13				23	13	3		4 (a)	17			.	24	13
June 6 (d)	7	...	4	8				19	17 7	2		5 (a)	16	...		.	23	14.7
June 7	7		3	13				23	15 7	2		5 (a)	19	...			26	15
Total shifts	50	2	24	82				158		16		37	124			.....	177	
Daily average	7	10 3	3	111 7				226	16.2	2 3		5 3	17.9	....		.	25.1	15 2

General

Timber Men	Helpers	Ore Tramming	Waste Tramming	Ore Sorting	Tool Dressers	Nippers	Track Men	Tally Men	Roustabouts	Supervision	Total Men	Efficiency Factor	Blacksmiths	Carpenters	Miners on Development	Muckers on Development	Grand Total Men	Tons Per Day	Grand Efficiency Factor
2	2	3 1	2	3	2	2 2	2	2	1	2	72 8	4	2	1	10	5	90 8	291	3.2
2	2	1	2 (a)	2	2	2 2	2	2	1	2	74	4 5	2	1	10	5	92	330	3.6
2	2	1	2 (a)	3	2	2 2	3	2	1	2	76	4 1	2	1	10	5	94	335	3 6
2	2	1	2 (a)	3	2	2 2	3	2	1	2	76	4 2	2	1	11	6	96	320	3 3
2	2	3	2 (a)	3	2	2 2	2	2	1	2	67	4.7	2	1	11	6	87	312	3 6
2	2	2	2 (a)	3	2	2 2	2	2	1	2	69	3 8	2	1	11	6	89	260	2.9
1	1	3	2 (a)	3	2	2 2	2	2	1	2	63	4 2	2	1	11	6	83	265	3 2
2	2	4	2 (a)	3	2	2 2	2	2	1	2	73	4 3	2	1	10	6	92	314	3 4
13	13	24	14	20	14	14 16	14	14	7	14	498		14	7	74	40	633	2136	.
1 9	1 9	3 1	2	2 9	2	2 2	2 3	2	1	2	71 1	4 3	2	1	10 6	5 7	90 5	305	3.4

(a) Filling stope 15. (b) Excludes waste and filling. (c) Trouble in stope 13. (d) Trouble in stope 13.

*Mine superintendent, Arizona Copper Company, Clifton, Ariz.

tion. Soon an average gait is arrived at which is only a little better than that of the poorest workman. A section-gang gait best describes it; it is a little heavier than exercise but not heavy enough for work.

Improved Efficiency

Along what line can changes be made to improve these conditions and what are the weak points of the present system? Managers in charge of large crews and responsible for large tonnages are apt to consider their men too much in the collective sense and not as individual units. It is this collective point of view that we must eradicate if we wish to secure better labor efficiency. It is necessary that each employee be considered, and be made aware that he is so considered, a separate individual unit from whom a certain amount of work is expected. Remove from his mind the idea that he is lost in the multiplicity of his fellow workmen or that their extra exertions will average up for his deficiences. Inculcate in his mind that he holds his position by his work and not by the whims of his superior. Let him understand that a shift's work must be given or he must make room for someone else.

These conditions may be idealistic but much can be done toward their attainment. It is of course impossible to propose a system that will be possible of universal application, but by modification to suit the different conditions the system here suggested may be applied with benefit. The principle advocated is to so arrange the work as to permit of the fullest data being obtained of individual performances, and to record the same in such a manner as to allow of daily scrutiny and comparison of results. Each day's work and each day's costs are to be considered as separate units, the causes for their fluctuations to be diagnosed and remedied.

These demands do not call for an army of book-keepers as might be supposed at first sight. A slight addition to the office force is all that will be required in most mines to obtain these data. With the system, however, the bosses will not have much time to think of their troubles or to ruminate on the iniquities of the foreman or the manager. It will keep their attention drawn to the work on hand and the necessity for securing results, and set them thinking how improvements can be made.

Labor Segregation Sheet

We wish to collect daily the data requisite to form a labor segregation sheet. To this end each boss is supplied with a printed card or a book which is a duplicate of the final sheet insofar as his men are concerned. These data are copied into the segregation sheet after each shift and in the presence of the boss responsible, and any changes of the crew or abnormal conditions affecting results are noted. The figures, to have any value, must be above suspicion and to insure this the labor totals and the tonnages must be constantly checked by the foreman and the timekeeper.

An extract from a monthly segregation, covering a period of seven days, will illustrate what is required and is almost self explanatory. The example chosen is that of a low-grade copper mine, worked from adit levels and supplying 300 tons of ore per day. The ground stands well and the ore is mined in ascending slices; waste filling from the surface is employed and little timber is used. The results of each day's work are collected from the reports of the shift bosses and tabulated, as shown in the accompanying specimen sheet.

This statement is full of information to the manager who knows his mine, and a daily scrutiny and comparison of results will keep him closely in touch with the work. Only the more important points to which his attention will be directed need be mentioned. It shows at a glance the number of men at work and any increase or decrease that may have occurred. The distribution of men on dead work and on productive work is easily seen. The most important figure of all is the efficiency factor showing the number of tons produced per man employed. This figure is bound to vary from day to day with the exigencies of mining but any fluctuations beyond reasonable limits call for immediate investigation. If the efficiency falls without any reason known to the manager, he will immediately localize the trouble by referring to the subsidiary reports of the mine bosses. The point of weakness discovered and no reasonable cause found, a word of warning to the particular gang will in most cases cause an improvement.

The men will soon realize that the complaint is founded on actual returns and not on mere surmise. They soon realize that an honest day's work is expected and if not given the fact is soon known and changes are in order.

Foremen and Under-Bosses

As it is impossible for the manager personally to supervise all the men in their work, he has usually to depend upon a foreman and his under-bosses to do so. The suitability and qualifications of these men for their duties is of vital importance in securing results. It is well nigh impossible to obtain men possessed of all the necessary qualifications and most managers have to make their bosses as Napoleon made his generals. Wide mining experience, a vigilant, observant disposition, and force of character are the most important qualifications.

It is not advisable to keep one man looking after the same part of the mine all the time; moving him around occasionally will help to keep his interest from flagging and have a good effect on the crew as well. After all is said, the best supervision will not produce the highest efficiency. There is no better system than contracting for accomplishing this end. The closer the supervision, however, the easier it will be found to introduce contracting, for the men will voluntarily seek the means of freeing themselves from sharing the blame of poor work with their less conscientious fellows.

Payments Based on Results

There are few places where it is not possible to devise some system of payment by results, and it will be found worth while to arrange the work with this end in view. Ore can be broken by the cubic yard or the ton, and mucking and tramming can be paid for by the car. Drifting, raising and sinking are conducted by contract in most mining districts. I have had good results by the payment of miners for the inch or foot drilled by hand or machine. The whole shift was occupied in drilling and after the shift left, a shot-firing crew in charge of a responsible man measured, loaded and fired the holes. As badly placed or unnecessary holes were not paid for, the miners were forced to use judgment in placing their shots.

The loading and tramming of ore can be contracted for provided an accurate record can be obtained. This may be secured by placing tally men at suitable positions; if the tally man is of a different nationality from the rest of the crew, the returns can be relied upon. Chinamen have been found very successful in this capacity in many places.

It is not advisable to let contracts wherein one man employs a large number of others. Small contracts, where each man has an interest, are preferable. It goes without saying that the sublet-ting of contracts is not to be tolerated. It is generally taken for granted that contracting in metal mines is impracticable, but a trial will convince the most skeptical that it is not only possible but that great economies can be obtained by its use.

A recent discovery of tungsten ore in the Moose River gold-mining district in Nova Scotia shows, so far as exploration has gone, a well defined vein composed of scheelite, quartz and a little mispickel. The vein matter is very irregular in composition, varying from pure scheelite to pure quartz or pure mispickel and all combinations of these three.

Personal

Mining and metallurgical engineers are invited to keep THE ENGINEERING AND MINING JOURNAL informed of their movements and appointments.

Robert Schorr, of San Francisco, is in the East on professional business.

Marion L. Thomas, of the City of Mexico, has been visiting New York.

W. H. Shockley has gone to Sobolinnaya, Siberia, to examine the Kluchi gold mines.

Col. Donald McGregor, a pioneer explorer of Yukon Territory, was in Toronto recently.

Robert Linton, of Atwater, Linton & Atwater, has been examining iron properties in east Texas.

Etienne Ritter has been examining mines in the Little Smoky mining district, Blaine county, Idaho.

Prof. J. C. Gwillim, of the school of mining, Kingston, Ontario, is on a vacation at Vancouver, B. C.

F. A. Thomson, professor of mining at the State college, Pullman, Wash., was in Victoria, B. C., for two or three weeks during August.

Chicago subscribers are notified that the streets of Chicago have been renumbered. We request that they send us their old and new addresses.

Gen. O. H. Ernst, E. E. Haskell and W. E. Wilson, American members of the International Deep Waterways Commission, are in Toronto.

F. B. F. Rhodes has accepted the position of night superintendent of the Perth Amboy plant of the American Smelting and Refining Company.

Thomas Kiddie, of Northport, Wash., was in the Nicola valley district last month. He went thence to Texada island, also in British Columbia.

Frederic Keffer, the British Columbia Copper Company's mining engineer, has been looking over some mining properties in the Coast district of British Columbia.

Lewis Stockett, general manager of the Bankhead Mines, Ltd., has returned to Bankhead, near Banff, Alberta, after having spent a week on Vancouver island, B. C.

Frank C. Loving, of Toronto, Canada, has fully recovered from the illness that has incapacitated him for the past three months, and is again engaged in professional work.

Corey C. Brayton for five years past with the Guggenheim interests, in charge of various mines in Mexico, California and Mexico, has resigned and has opened offices in the Chronicle building, Montgomery and California streets, San Francisco.

A. B. W. Hodges, manager of the Granby Consolidated Mining, Smelting and Power Company, Grand Forks, B. C., recently visited several mining camps on Moresby island, of the Queen Charlotte group, in the northern coast of British Columbia.

R. C. Buxton has retired from the active management of the coal mines of the Consolidated Coal Company at Buxton and Ockaloosa, Iowa, and will have general offices in Chicago. Elmer Baysour, recently of Spring Valley, Ill., will have charge of the Buxton mines.

Societies and Technical Schools

Colorado School of Mines—Thomas F. Walsh has given this school, at Golden, $5000 to be used as a special fund to be expended in testing pitchblende and other uranium ores found in Colorado, which may be supposed to contain radium. The school will carry on tests of all such ores which may be sent to it.

University of Kentucky—In this institution at Lexington, the College of Mining Engineering offers three courses in mining: (1) The full course, which extends through four years. (2) A two years' course for young men who for any reason may not be prepared to take the full course, but who desire to obtain more than an elementary training in the methods of mining. (3) A short course for practical miners, mine foremen, and mine managers who desire to improve their knowledge of the principles that underlie correct mining. This course, which covers a term of 10 weeks, is necessarily given in the spring or summer. In 1907-'08 the university authorities erected a commodious mining laboratory. The building is of brick, 40x80 ft., and two stories high. The first floor is used for instruction in ore dressing and metallurgy; the upper one for assaying and metallurgy. Space is provided on the first floor for the clay-testing kilns of the State Geological Survey, and the chemical laboratory of the Survey occupies part of the second floor. This building constitutes a wing of a building, which will contain classrooms, drawing rooms, offices, etc., for the college, and offices and rooms for records, books, etc., of the State Inspector of Mines and the Geological Survey, together with the State Geological Museum.

American Institute of Electrical Engineers—The Western Electric Company has presented to the library of the American Institute of Electrical Engineers a most valuable addition in the shape of a patent specification library. This gift constitutes the largest accession since the original creation of the library by Dr. S. S. Wheeler with the Latimer Clark collection. The patent library which the Institute thus acquires contains no fewer than 461 substantial leather bound volumes containing approximately 100,000 specifications. These specifications begin with May 30, 1871, and run to December, 1908, thus covering the entire period of activity which includes the telephone, the electric light, electric railways and the electric motor. From May 30, 1871, up to the last day of 1887 the volumes are complete, containing all the specifications issued by the patent department, certified. From July, 1887, up to Dec. 1, 1908, the volumes contain all the electrical specifications which are not certified. It is generally believed that this splendid contribution will prove one of the most valuable accessions that the library could possibly have from the standpoint of practical utility, and that it will be likely to stimulate further generosity of the same kind. It is a most fortunate coincidence that the Institute had already been presented with a set of specifications antedating the period prior to those included in this gift.

At Great Falls, after years of experiment to determine the shape of converter which is most economical, the Great Falls engineers have decided to adopt the circular section, 12 ft. in diameter with 15 convergent tpyeres. This is the fourth type which has been used. The first was of circular section, 7 ft. in diameter, with eight convergent tuyeres. The second, of elliptical section, 10 and 8 ft. at the axes, had 12 tuyeres arranged in two opposite rows without any convergence of tuyere mouths.

It was found that the trunnion sides of the lining wore rapidly, where the width was the shorter (8 ft.). Accordingly, the third type, with a width of 10 ft. on the tuyeres section, and 12 ft. in the trunnion section, was used. This had 15 convergent tuyeres. This type has now been replaced by the first described, of circular section and with 15 tuyeres. The converter lining is composed of second-class concentrates and copper precipitate from the electrolytic refinery, with 10 per cent. of sand. The mixture analyzes: Al_2O_3, 12; SiO_2, 57-70; Cu, 3½-6; FeO, 5-6 per cent.

Among the notable engineering enterprises completed this year in Colorado is the Gunnison tunnel, 6 miles in length, built by the United States Reclamation Service. The gates which divert the waters of the Gunnison river into the tunnel will be opened by President Taft on Sept. 22. The bore is 11x12 ft. inside measurement, lined with cement throughout, its capacity being 1,300 cu. ft. of water per second, and it is estimated will furnish water and electric power and light for 25,000 people. The charge for perpetual water right will be $35 per acre, based on the actual cost of the tunnel. The time occupied in construction was four and one half years.

Special Correspondence from Mining Centers

News of the Industry Reported by Special Representatives at Butte, Denver, Salt Lake City, Goldfield, Cobalt and Toronto

REVIEWS OF IMPORTANT EVENTS

San Francisco

Sept. 1—The finding of a new ledge in the famous old Idaho mine at Grass Valley, Nevada county, now part of the Idaho-Maryland Mining Company, is the most important thing which has happened in that quartz-mining county for some time. The rich oreshoot or chimney, which started in the Eureka, ran into the Idaho and then into the Maryland ground and yielded upward of $16,500,000. When the ledge began running from the Idaho into the Maryland ground the workings were at such a distance from the mouth of the crooked shaft that the cost of mining was very great. For some years the property was idle and then a company was formed to work it. Work has gone on with more or less regularity and success, trying to find paying ore. The new ledge now found on the 400 level is from 12 to 16 ft. in width, filled with sulphurets and showing some free gold.

This body was found by following a small seam 55 ft. back from the old 500 level and a raise was made to the 400. The main oreshoot is expected to be encountered shortly, paralleling the rich old chimney but some distance back of it. Chutes have been put through down to the 700 level in anticipation of the pay shoot continuing downward. It will, however, pass beyond the end of any of the levels ever run by the old company and give much virgin ground. Twenty stamps are dropping on ore and soon 30 will be running. It is fully expected by the owners that the Idaho will soon resume its position as a large producing mine.

Efforts are being made in this city to have a large delegation go in a special train to the meeting of the American Mining Congress at Goldfield, Nev., in September. Not only mining but commercial men are becoming interested. San Francisco has been largely benefited for years by the output of Nevada mines and more San Francisco men would interest themselves in that State if they would but go and see what is being done in its most productive camp.

The auto service between Nevada City and Alleghany and other Sierra county points seems to show that these lines will be successful in the mountain regions of this State, as well as in the desert regions of Nevada. The auto service between Redding, Shasta county, and Weaverville, Trinity county, has also done well, though the road is very mountainous. The quick transportation afforded is welcomed by all those having business at the mining camps in the higher mountain counties.

Creditors of the Ruth Pierce Mining Company, operating the Grimshew mine at Hornitos, Mariposa county, have asked the courts that it be declared an involuntary bankrupt. The company acknowledged, May 18, that it could not pay its debts. Among the creditors are the Union Oil Company, the Fulton Iron Works and Pacific Hardware and Steel Company.

Butte

Sept. 2—Following persistent rumors that mining litigation would soon be started involving the ownership of certain orebodies claimed by the Amalgamated, the first of what may be a series of actions was begun a few days ago. The title of the case is W. O. Clymo and Sampson Hoar against the Anaconda Copper Mining Company and the First National Bank of Butte. The suit involves the ownership of certain orebodies in the Ticon quartz claim, which comprises an area of about two acres, and is situated north of the Bell-Speculator claim, between the latter and the Edith May claim. The Bell-Speculator claim was originally a portion of the old Speculator and was given to the Anaconda company in the settlement of a dispute between that company and the Largey estate, the former owners of the Speculator.

The complaint alleges that the plaintiffs, Clymo & Hoar, are lessees of the Ticon claim under a lease given them in 1907 by Silas F. King and that while working the mine they extracted certain ore of the value of $966. The ore was sent to the Pittsmont smelter for treatment and while there the Anaconda company made the claim that it was entitled to the proceeds since the ore was taken from one of its veins. It was then agreed that the proceeds be placed in the First National bank to await the settlement of the dispute. While the amount involved is relatively small, the real object of the action is to determine the ownership of orebodies of great value, since the ledge over which the dispute has arisen is supposed to be a portion of the Edith May vein, the greater portion of which is claimed by the North Butte company.

The Ticon is developed to a depth of 500 ft. Should the plaintiffs succeed, the outcome will undoubtedly be an action by the plaintiffs against the North Butte company to determine the ownership of orebodies now claimed by the latter. The action is generally regarded as the most important mining litigation that has been commenced in the Butte district since the days of the Heinze-Amalgamated troubles.

Governor Norris has named the following as the Montana delegates to the American Mining Congress to be held at Goldfield, beginning Sept. 27: Arthur Carson, Lee Mantle, Thomas Bryant, J. G. Morony, Harry Gallway, T. S. Kilgallon, S. A. Rohn, all of Butte; Owen Byrnes and John Edgerton, of Helena; C. E. Morris, of Pony; M. L. Hewitt, of Corbin; Peter Mussigbrod, of Deer Lodge; J. R. Lucas, of Phillipsburg, and Thomas Ross, of Argenta.

Denver

Sept. 3—The historic Argo smeltery the property of the Boston & Colorado Smelting Company, in this city, is to be closed down. Various reasons are given: scarcity of proper ores and fluxes, high railroad rates, etc. However, as generally understood, at one time Denver was the great smelting center of the State, and Argo was without a rival, but gradually as the various camps developed and new metallurgical methods were discovered, local reduction works and concentration mills were established, and the ore supply in this way so diverted that to run the Argo smeltery became unprofitable. The tall smokeless stack of the old Grant works and now those of the Argo, serve to remind mining men of the passing of Denver's glory as a great smelting center. The Boston & Colorado company was organized by Nathaniel P. Hill in 1867, with a full-paid capital of $275,000. Experimental works were then built, and with Herman Beeger as metallurgist, blew in during January, 1868. At first, the product was wagoned to the Missouri river, and thence conveyed to Vivian & Sons, Swansea, to be refined. In 1873, the capital was increased to $500,000, and in 1878 the smeltery was moved to the suburb of Argo, and the services of Dr. Richard Pearce, who had much previous experience in the Swansea works, were secured, and refining works were erected, which, under his direction, successfully produced the metals of gold, silver and copper until a few years ago, when he retired and went back to Cornwall. Since then the business has steadily declined, chiefly for reasons given, until the present shutdown became necessary.

The Modern smeltery, of 350-ton capacity, at Utah Junction on the Moffat

[illegible] is advertised to blow in next week. One of the local papers goes so far as to say "there is not another smeltery like it in this hemisphere." We shall see.

In the Cripple Creek district, the output for August is given at 63,330 tons, of a gross value of $1,346,814. This shows an increase over July of 4320 tons. The Doctor Jack Pot Company has just paid a $15,000 dividend. For the year ended June 1, the company received over $8000 in royalties from leasers, and has $52,633 in the treasury. The mines belonging to the Stratton estate, comprising about 200 acres on the richest portion of Bull hill, and 600 acres on Gold hill, are being worked entirely under lease, and shipping about 100 tons per diem. Of course, no development is being done ahead of extraction, but there are immense possibilities in this group, and negotiations are under way for a sale of the property. It is said that the trustees are anxious to clear up everything, and devote their energy and money to the projected Myron Stratton Home for the Aged and Infirm, for which Stratton left the entire estate.

Goldfield

Sept. 2—Fifteen tons of specimen ore was received by the classifier of the American Mining Congress as one day's receipt during the past week. Many more specimens are on the way, and when the exhibit is completed it will be one of the best ever shown. The collection of Mrs. Helen M. Sneider, of Austin, Nev., comprising over 3700 specimens, which have been exhibited at a number of the principal expositions of Europe, will be one of the important exhibits.

The report of the Florence-Goldfield Mining Company for July gives some interesting figures regarding the recovery in the various departments of the mill. During the month 2919 tons of an average value of $26.66 were treated, the total bullion recovered being valued at $70,706, or a 91.09 per cent. recovery divided as follows: By amalgamation, 14.2; by concentration, 55.79; by cyanidation, 21.1 per cent. The average total cost of mining and milling is placed at $8 per ton, the mining cost being high on account of the extensive development under way. The milling cost is approximately $3.50 per ton, and is expected to be reduced when the mill is working at full capacity.

Salt Lake City

Sept. 3—The delegates to the meeting of the American Institute of Mining Engineers in Spokane, Sept. 27-30, have arranged to spend four days in Salt Lake and the surrounding mining camps, on their return from the convention. A local committee is now arranging a schedule of entertainment for the engineers during their stay, which will include visits to the Bingham, Tintic and Park City mining districts and to the big smelteries and mills at Garfield, Bingham Junction and Murray.

The aërial tramway of the Utah Consolidated company, which will run from Bingham to the new Tooele smelter, is progressing rapidly and will be in commission before the completion of the smeltery. The foundation of the loading station at the mine has been finished and the concrete work at the base of most of the towers is ready for the superstructure.

Local mining men agree that the Park City mining district is on the verge of an era of great prosperity. During the last few years, the camp has suffered from low metal prices, the blocking of the Ontario drain tunnel and other untoward incidents but several big combinations of the smaller mines are putting new life into the camp, and the old producers, the Silver King Coalition, the Daly-West, and the Daly-Judge are still opening up new resources.

Dr. Benzo Katsuro, professor of metallurgy in the Tokio Imperial University, spent the last week at Bingham and other Utah camps. The purpose of his visit is to obtain more information concerning our methods of mining and treating ores.

The workings on the extension of the Colorado-Sioux vein in the Iron Blossom mine in the Tintic district have for some time been in ore of lower grade than was being mined when the 8c. dividend rate was established and there has recently been much discussion as to the dividend rate the mine would be able to maintain. Recently, offers have been made to take 5c. per share for the September dividend. A mining engineer who recently visited the mine reported that the ore was low-grade but of considerable quantity.

Ishpeming, Michigan

Sept. 2—Practically all the mines in this district are in operation, and the outlook for a large production of ore is good. Much new work is being done in the Swanzy district, southeast of Ishpeming. The Cleveland Cliffs Iron Company is spending a large amount of money in development work. On the Kidder property a concrete shaft has been sunk through peat and to solid rock at a depth of 114 ft. The Smith shaft is only a short distance from the Kidder; it is now 720 ft. deep and will be connected with the Kidder shaft by drifts. When the drift from the third level of the Smith shaft reaches the Kidder shaft, a raise will be made to the present bottom of the Kidder. The shaft will then be sunk full size by sending all the dirt through the raise and hoisting at the Smith shaft. All the hoisting is done at the latter shaft has been with a derrick and boom. A steel head frame is to be built soon at the Northwestern property. A concrete shaft has been started and is down 40 ft. Work has been stopped on account of litigation.

Within about one mile of these shafts the company has laid out the town of Gwinn, covering an area of 118 acres. Good broad streets have been graded and paved; the lots are large and will be sold only under certain building restrictions, which govern the character of the house to be built. A large brick school house has been completed; several substantial business blocks have been built and a club house is now under construction. Everything is being done to make this a model mining town.

About one mile west of the townsite, the Princeton, Austin and Stephenson mines are producing ore and making regular shipments. The district promises to be one of considerable importance in the iron-mining industry. Most of the ore is soft, and the slicing and caving system of mining will be the principal methods used.

Cobalt

Sept. 2—At the Imperial Crown property, which is controlled by the Crown Reserve, a force of men is engaged in thoroughly trenching the surface. The whole territory is being cut into 100-ft. squares, and several promising calcite veins carrying some silver have been discovered. On one of these veins a shaft is being sunk, and it has now reached a depth of 36 ft. Another shaft is soon to be started on a vein near the Kerr Lake-Majestic line. A diamond drill is working to locate the underlying Huronian slates. On the 200-ft. level of the Crown Reserve, the east and west winzes have been connected by a drift. The 200-ft level is all in the Keewatin, and the veins do not show very much change in silver content. They are, however, much more split up. It is expected that the main shaft will reach the 200-ft. level in about a month.

The North Cobalt mine has struck a large vein carrying fair silver content on the 170-ft level. This company started operations in 1907 and sunk on a small calcite vein, carrying practically no silver. The results were considered unfavorable, and work was discontinued until the Jacobs Exploration Company took a working option and obtained control. A compressor was installed, and work was continued. When the shaft was down 182 ft. a crosscut from the 170-ft level was started, and when in 40 ft. the vein was struck.

Development on the new No. 12 vein found on the Lawson is very encouraging. It has been stripped for over 175 ft., and the vein shows a good width of high grade ore. The shaft sunk on the vein in the Keewatin is down about 45 ft., and the vein widened from about 1 in. to nearly 5 in. of high grade ore. The wall rock is also well mineralized. Another new vein has been discovered on the Foster at a point about 300 ft. north of where the first strike was made. The

new vein has been opened up for about 20 ft. and shows about 3 in. of smaltite, with high silver content.

Toronto

Sept. 3—The Canadian government has appointed a commission for the conservation of national resources to coöperate with the American commission. It is a large and thoroughly representative body. Hon. Clifford Sifton is named as chairman and administrative head and the following are *ex-officio* members: Hon. Sydney Fisher, Hon. Frank Oliver and Hon. William Templeman, of the Canadian cabinet; Hon. Francis L. Hazzard, premier of Prince Edward island; Hon. W. T. Pipes, attorney-general of Nova Scotia; Hon. W. C. H. Grimmer, surveyor-general, New Brunswick; Hon. Jules Allard,, minister of lands and forests, Quebec; Hon. Frank Cochrane, minister of lands, forests and mines, Ontario; Hon. Hugh Armstrong, provincial treasurer, Manitoba; Hon. James A. Calder, provincial treasurer, Saskatchewan; Hon. A. C. Rutherford, premier, Alberta; and Hon. F. J. Fulton, commissioner of lands, British Columbia. There are 20 other members, including a representative of each Canadian university. The annual meeting is fixed for January, but the chairman will have power to call the commission together at any time.

F. A. Acland, deputy minister of labor, has gone to Glace Bay, Nova Scotia, to investigate and report to the department on the Dominion Coal Company strike.

The Dominion Iron and Steel Company has declared a dividend of 7 per cent. on preferred stock, to be paid out of earnings, as no settlement has been obtained with the Dominion Coal Company of the amount still due from the latter. Negotiations are in abeyance owing to the coal strike. After the dividend has been paid there will yet remain 28 per cent in deferred dividends on the preferred stock. Work is well under way on extensions at the plant. The deficiency in the supply of coal from the Dominion Coal Company is made up by purchases from other Nova Scotia collieries and from the United States. American coal is being brought in much more cheaply than before the dispute with the Coal company. The cost laid down at Sydney is stated to be under $2.75 per ton.

Mexico

Sept. 1—The recent floods in northern Mexico have done vast damage to the railroads of the states of Nuevo Leon and Coahuila suspending all traffic for weeks in some cases. At Monterey, the overflow from the Santa Caterina river caused a large damage to the city and resulted in a loss of life reported between 3000 and 4000. Several of the important mining camps of the north have been entirely cut off by the disaster and operations curtailed or suspended. The coal-mining companies are the heaviest losers in this respect and the failure to deliver coal has hampered mining operations throughout the whole northern and central part of the Republic.

The John Taylor & Sons interests, of London, are negotiating for important properties in the Sierra Juarez district of Oaxaca. William Crossley, of Chihuahua, is the examining engineer in the negotiations. This firm was one of the largest of the English interests in Mexico from 1825 to 1850 but until recently has not been actually interested in the field.

A. B. Adams has returned from Europe and reports that capital has been secured in England and France to carry out the ambitious plans for the development of the coal and iron deposits in northern Oaxaca and for the building of a railroad from Puebla to the coal and iron district with an ultimate extension to the Pacific. J. W. L. Birkinbine, of Philadelphia, is in charge of the explorations for the company.

The interest of American investors in Mexican lands continues to increase, and there is a prospect that the American investments in lands in Mexico may in a few years exceed the American mining investments. The advent of the American land owner is considered as a favorable feature by the mining interests, as it means the development of roads and commercial facilities in many districts. In some districts the agricultural development interferes with the mining by creating a demand for labor in excess of the supply, but generally the coming of the American farmer is favorably looked upon by mining interests.

London

Aug. 27—This is now the holiday season and business in mining shares or in new ventures is practically at a standstill. As regards South Africans, one or two new amalgamations have been announced and the terms have been advertised upon which the Transvaal government is prepared to grant leases of some of the mining ground that it owns in the eastern Rand. The principle upon which these leases is founded is that the lessee shall find the working capital and pay over a certain percentage of the profits to the government. It remains to be seen whether the leading operators of the Rand who are the only people who have the experience and the funds for handling the business on the lines proposed, will think it worth while to make an offer. Having regard to the large sums involved and the risks of the venture being successful, as well as to the expected shortage of native labor, it seems doubtful whether the offer of the Transvaal government will meet with any response.

In the Rhodesian section there has been a substantial rise in the shares of the Globe & Phoenix, one of the oldest mines of the country. A few months since, the shares were selling at 20s. and this week they have changed hands at over 80s., due to rumors of favorable developments at the bottom of the mine. Nothing official, however, has yet been published.

Johannesburg

Aug. 2—The issue of the chamber of mines' analysis of the June mineral production of the Transvaal contains an interesting statement of the results achieved to date on the Witwatersrand. This is in the form of a table going back three years before the war, but omitting 1899, as the figures for that period are incomplete. The working costs per ton milled are taken as the difference between the declared output and the dividends announced, which brings out last year's costs at just over 22s. 3d. ($5.41), whereas the actual working costs given in the chamber of mines report for last year were 18s. ($4.37). Though the working costs per ton milled are an unsatisfactory, and in many cases, totally misleading index of efficiency, yet they afford a good idea of the progress of the industry as a whole.

For the first half of this year, the difference between yield and distributed profit amounted to £10,419,243, or 20s. 7d. ($4.89) per ton, but the actual amount expended on the mines is shown by the report to have been £8,757,450, or 17s. 4d. ($4.21) per ton. This method, however, is not so applicable to a half-yearly return, as many of the companies do not pay dividends for the first six months proportionate to those of the whole 12, and some even declare after the six months has expired.

One striking feature of the table is the rapid increase of the tonnage milled. From 4,000,000 odd tons in 1896, it advanced to over 18,000,000 in 1908, while during the first half of this year the companies crushed over 10,000,000 tons.

For the first five years embraced by the table the yield was approximately 40s. ($9.73) per ton, but the working costs were in the neighborhood of 30s. ($7.30) per ton. In 1902 there was a slight improvement in grade, accompanied by higher working costs, but this was due to the fact that only the richer mines had again got to work. From then the decrease in grade has been persistent, being most marked in 1903, 1905 and 1908. But this has been accompanied by a proportional decrease in operating expenses, not perhaps in the same year, but immediately afterward.

It looks as if the Rand this year will crush close to 21,000,000 tons of ore, will produce nearer £31,000,000 than £30,000,000 worth of gold and pay dividends within a few hundred thousands of the 10 millions sterling.

Mining News from All Parts of the World

New Enterprises, Installations of New Machinery, Development of Mines and Transfers of Property Reported by Special Correspondents

THE CURRENT HISTORY OF MINING

General Mining News

American Smelting and Refining Co.—At the annual meeting of the company, held in Jersey City last week, the retiring directors and officers were reelected. The usual quarterly dividends of 1 per cent on the common and 1¾ per cent on the preferred stock were declared.

Alaska

Nome—The ammonia freezing process has proven successful in stopping the flooding of the Cyrus Noble mine. At the Nettie and Bessie mines recently the subterranean geysers were temporarily checked, which had the effect of furthering the two-mile drainage tunnel. The dry season is retarding mining all over the peninsula, many companies having ceased operations because of lack of water. If no rainfall occurs in the next few weeks the season will have been practically a loss to the entire district.

Fairbanks—The group of five claims owned by L. L. James is the largest producer in this camp. Last year, the property yielded $400,000 gross, and is doing fully as well this season.

Arizona

COCHISE COUNTY

Calumet & Arizona—During the installation of the new electric hoist at the Irish Mag shaft, retimbering of the shaft has been in progress and ore will be raised through the Oliver. The enlarging of the smeltery at Douglas to a daily capacity of 3000 tons is proceeding steadily. Two of the six 300 ton furnaces have already been increased to 500 tons capacity and work is now under way on the enlargement of the third furnace.

Dunn-Arizona—Sinking has been started from the 1250 ft. level and is to be continued to 1500 ft., the management being much encouraged by the important strikes recently made on the 1250 level.

Lavender & Fitzhugh—Development of the sulphide orebody on the 1400 level from the Junction shaft continues with satisfactory results. This is the deepest ore that has been opened in this section of the Bisbee district. Signal production was maintained, the mine averaging the previous month.

Lucky Queen—Since the Gem shaft, the transportation tower which collapsed so many months ago, has been rebuilt and put into service.

GILA COUNTY

Warrior—An option on this group has been asked for by Henry B. Hovland, representing Duluth, Minn., interests. The stockholders will act upon the proposal at a meeting to be held the latter part of the month. The mine is outputting about 100 tons of smelting ore daily from development work.

PINAL COUNTY

Ray Consolidated—In order to take advantage of the right of stockholders to subscribe for the new stock at $15 per share, over $2,000,000 of the $3,000,000 bond issue has been converted into stock, practically relieving the company of interest charges during the period of construction. From the new stock issue the company will have cash assets of between $4,000,000 and $5,000,000. Eight carloads of rails for the broad gage railroad to the property were recently received.

Gila—It is now estimated that there are between 6,000,000 and 7,000,000 tons of ore, fully and partially developed. The orebody is situated somewhat deeper and is a little thicker than that of the Ray Consolidated, but as the surface is higher the ore is on about the same horizon and both bodies can be mined by a continuous line of workings.

California

BUTTE COUNTY

Marina Washington—At the property, near Kimshew, controlled by W. P. Lynch, rich gravel has been struck.

CALAVERAS COUNTY

Rescue—This company, owning about 600 acres of ancient river channel, near Angels, has made extensive improvements and is now ready to begin operations as soon as the electric power line is completed.

EL DORADO COUNTY

Red Star—At the mine, near Rescue, Fleck & Blake have been taking out very rich ore which is being hand-mortared and pocketed.

[illegible] COUNTY

[illegible] Mining and Dredging Syndicate—[illegible] on Tennessee [illegible] the company has closed down for the season. Preparations are now being made for the [illegible]. Fred T. Hale, Or[illegible] superintendent.

Klamath River Mining Company—The company is now equipping its hydraulic mine near Weitchpec and building a V-flume from Hopkins creek, a distance of 3½ miles.

Tinsley & Hudson—These men have sold 220 acres of mining ground to A. C. Cruchet and associates, of Boston, and the new owners are equipping the property for hydraulicking.

INYO COUNTY

Chicago District—King Brothers have started their mill on ore from the Unthanks lease on the St. Ives at this camp. The ledge is narrow, but the ore is of high grade. The mines are 20 miles northwest of Bishop.

MARIPOSA COUNTY

Tyro—The mine, near Coulterville, owned by McClure Gregory, is being put in operation and is to be unwatered and retimbered. This is an old mine, equipped with a 10-stamp mill.

Hite—The owners of this mine are building a road from the railway station so as to haul in machinery.

MONO COUNTY

Golden Star—Meagher & McDonnell have made a strike of good ore in the tunnel of this mine at Bodie.

NEVADA COUNTY

Moore's Flat—In this section of the county there is considerable activity at present. C. L. Wilson, of Lincoln, has bonded a number of claims and is doing development work upon them. Four tunnels are being run and a mill will probably be erected next season.

Erie Consolidated Mines Company—The old Erie mined in the Graniteville district will be actively worked by this new company. There is on the property a 30-stamp mill, air compressor, drills, etc., and water power is available. R. G. Eckis, of Oakland, is manager.

El Oro—The 10-stamp mill and other buildings of this mine at Washington have been destroyed by fire.

SIERRA COUNTY

Hunch—At the claim, near Alleghany, owned by H. P. Haley, of that place, and S. B. Gracier, of San Francisco, the wide ledge recently uncovered is to be at once developed.

Foster & Squires—These men have bonded their four claims at Whisky Diggings to W. T. Forstmann, of Sacramento, and work is to be commenced in 30 days.

SISKIYOU COUNTY

Atterbury—J. M. Morrison & Co., of Quartz Valley, are keeping the new mill busy on ore from this mine.

Big Cliff—At the mine on Russian creek, specimen ore has recently been struck.

California Consolidated—It is understood that this company at Rollin has reincorporated and that operations will soon commence on the Ball mine.

Oom Paul—At the mine at Oro Fino, owned by J. Carter, rich ore is being mined.

TUOLUMNE COUNTY

Eureka—As soon as electric power is provided the mill of this mine is to start a run on high-grade ore.

Gold Bar—At this claim in Knight's creek district, 15 miles north of Sonora, a 7-ft. vein has been found by Faller & Oakes.

O'Hara—On Brown's flat, a mile from Sonora, this mine has been bonded by T. C. Crawford and London associates. Two years ago a rich strike was made in the property and an effort to reopen the oreshoot will now be made. John F. O'Hara will be in charge.

Dutch—Charles H. Segerstrom, of Sonora, has an option of this property, which is being reopened after an idleness of three years. The shaft is 1750 ft. deep and there is a 20-stamp mill on the property.

Colorado

GILPIN COUNTY

Cyanide Mill—Henry P. Lowe, of the Topeka and Frontenac groups, is arranging to establish a 10-ton experimental cyanide plant at the Frontenac mill on North Clear creek, east of Blackhawk. Tests are to be made of various ores in the district as well as those of the above mines.

Druid—In Willis gulch, a new shaft house is to be erected at the Searle shaft and additional equipment is to be installed under the direction of Max Boehmer, consulting engineer, formerly of Leadville.

FREMONT COUNTY

Rocky Mountain Smeltery—This plant, situated one mile south of Florence, is to be sold at sheriff's sale on Sept. 24 to satisfy a judgment of $78,130, held by the Iowa Fiduciary Company against the Colorado Smelting and Refining Company, which acquired the property about two years ago.

LAKE COUNTY—LEADVILLE

Evelyn—From the Boulder shaft, in South Evans gulch, a drift has been driven east 500 ft. toward the Ball mountain fault. The last 150 ft. has been through porphyry and several small veins were encountered; a 50-ft. raise made on one of the streaks has opened a 5-ft. orebody. The drift will be continued until the fault is reached.

Iron Hat—Lessees at this shaft of the Iron Silver company in Graham park have encountered a good streak of ore, carrying silver and a fair percentage of lead. Operations are confined to a drift started at a depth of 100 feet.

Silent Friend—A vein of excellent ore has been encountered recently in the mine in South Evans gulch. Lessees are taking out the ore through the Yak tunnel.

Garibaldi—Steady operations continue on the tunnel at the head of California gulch. The vein discovered there some months ago has been developed to a considerable extent and continues to maintain its value and size.

Little Evelyn—Work on the St. Louis tunnel is progressing favorably. A good breast of gold-bearing ore has been uncovered in the old workings and as soon as the necessary repairs have been completed, the work of taking out ore will be commenced.

TELLER COUNTY

Gold Dollar Consolidated—Of eight sets of lessees operating on the property of this company, six are mining ore. The most important lease is held by the Union Leasing Company, operating the Mable M. and Husted shafts. During the last three months nearly $10,000 has been paid in royalties.

Henry Adney—Operations have been resumed at this Beacon hill property. The 400-ft. level is the present water level of the mine, which will be one of the first to be relieved by the deep drainage tunnel.

Rexall—In the Spicer mine, the company has opened a new vein about 150 ft. north of the inclined shaft at a depth of about 700 ft. From 12 to 18 in. of the 5-ft. lode is of smelting grade. H. R. Brooks, Victor, Colo., superintendent.

Idaho

SHOSHONE COUNTY

Gold Hunter—The new hoisting equipment having been installed, sinking is to be resumed at the property east of Mullan.

Great Northern—Ore has been struck on this property comprising six claims situated between the Great Eastern and the Hecla, about 1½ miles from Burke.

Iron Mountain—About 60 men are employed and a new hoist and compressor have been installed. The three-compartment shaft will be sunk another 150 feet.

Montana Standard—At the annual stockholders' meeting held at Wallace, Aug. 16, the following directors were elected: O. A. Schenck, B. B. Baker and John Chester of Columbus, O.; H. Eddy of Chicago; J. D. Murphy of Spokane; M. J. Maher of Burke; and Scott Webb. A test shipment has been made to the American Concentrating Company, of Joplin, Mo., to determine the equipment to be used in the proposed concentrating mill.

Knickerbocker—W. B. Pickrell and W. B. Forrester, of Osborne, have bonded this group of seven claims in the Osborne section.

NEZ PERCE COUNTY

Black Lead—Development work is to be undertaken at once at this property recently sold to F. W. Bradley and associates.

Illinois

Dering Coal Company—The American Trust and Savings Company, of Chicago, trustees, has begun suit to foreclose the general mortgage on this company's mines, executed in 1905. The mortgage covers mines in Sullivan, Vermilion and Vigo counties in Indiana and in Franklin and Vermilion counties in Illinois.

Indiana

VIGO COUNTY

Deputy State Mine Inspector Thomas has had suit filed against the following companies for alleged violation of the mining laws in regard to the proper conditions in the mines: The Deep Vein Coal Company; the Atherton Split Coal Company and the Grant Coal Company.

Officials of the Indiana district of the United Mine Workers have served an ultimatum on the Pittsburg Mining Company, that grievances arising from cutting break-throughs, turning rooms and removing slate must be redressed at once or the 225 workmen will be ordered on strike. The situation is exceptional because the company is not a member of the Indiana Operators' Association, and therefore, not amenable to the rules in the wage contract providing for the handling of grievances.

CLAY COUNTY

The suit of Benjamin Simpson against the Big Four Railroad Company to recover $150,000 will be tried this term. Simpson alleges that the defendant company made a deep cut in its road through his coal land and flooded his coal mines with water so that he was compelled to stop mining. Much interest is manifested in the case by mine owners and railroad officials.

Kansas

CHEROKEE COUNTY

Heap-O'Brien—The company has placed a contract for a mill on its land south of Baxter Springs. Manager R. R. Heap, of Baxter Springs, expects the plant to be in operation by Nov. 1. Good bodies of

zinc and lead ore have been opened from two shafts.

Ohio—Favorable prices of zinc ore have had a stimulating effect on prospect work on this tract, which is situated in the heart of Galena. New producers are being opened up and worked at a profit.

Sawyer & Co.—C. L. Sawyer and associate, J. M. Pollard, are opening a rich run of silicate ore in the east part of Galena. The discovery is of much value as it opens up land hitherto regarded as valueless. Ore was found at a depth of 70 feet.

Hickory Flat—Near Short creek on this land, J. L. and Henry Phillips, Charles Trombold and C. W. Adams, of Galena, are working a 15-ft. face of zinc and lead ores in a new shaft 85 ft. deep.

Stone, Cook & Co.—Pumps have been started by this Galena company on the Black Hills lease in the southwest part of Galena. The land has been flooded several years and formerly was a good producer.

Mission—Construction of the company's new 200-ton mill, south of Baxter Springs, has been commenced by the Webb City Iron Works.

Sunburst—On the company's lease, south of Baxter Springs, a big run of lead ore has been found in the "Big Four" shaft by J. W. Barnes. Drill prospecting on this land also indicated good zinc ore.

Kentucky

Laurel County

Bell-Jellico—R. M. Jackson, London, Ky., has been appointed receiver for this coal company, which has offices at Lexington, and at Pittsburg, Penn. Allegations of fraud were made by President Charles F. Coffin, of Indianapolis.

Bell County

Coleman Mining Company—A new electric haulage equipment has been put in the mine at Cary, and will soon be in operation. It has a capacity of 600 tons per day.

Michigan

Copper

Michigan—The company has started the fourth drill hole of the series that is being put down along the strike of the three holes disclosed on the Adventure lands, the third drill core having shown encouraging results. A crosscut has been extended from the eighth level of C shaft to the Minnesota conglomerate lode and drifting from that point has been started. The old shaft on the Rice tract, which was put down on this lode to a depth of about 200 ft. is being unwatered and a crosscut will be driven from the bottom to tap the amygdaloid lode opened in the adit level on this tract. Drifting on this lode continues and some unusually rich streaks are opened from time to time.

Mass—The company continues opening on the New Mass lode and will soon have it sufficiently opened to keep one head in operation and determine the commercial value of the formation.

Keweenaw—This company is diamond drilling with the view of opening the Osceola amygdaloid and the Calumet conglomerate lodes on its lands. The site for two shafts on the Kearsarge lode has been established and will soon be under way. At one point it is planned to drift on the formation at a depth of about 50 ft. Operations are being carried on at the Medora shaft on a small scale, two drills being operated on the west fissure vein at the 13th level.

Iron—Gogebic Range

Bonnie—The working force has been increased at this mine, near Ironwood. It is a Schlesinger property and adjoins the Newport.

Iron—Marquette Range

Conrad—This old mine, with the adjoining Hurkins tract, has been taken under option by George J. Maas, of Negaunee, and will be thoroughly tested.

Montana

Butte District

Tuolumne—The company has recently commenced the shipment of ore to the Butte Reduction Works at the rate of 100 tons per day.

Butte Coalition—Sinking is in progress at both the Rarus and Tramway shafts. An 18-ft. fan is being installed at the air shaft of the Rarus, by means of which it will be made an upcast. The company has built several hundred additional lockers for the use of miners at the Minnie Healey, which is taken as an indication that it is preparing for a much larger production.

Davis Daly—The breaking of a rod on the main hoist at the Colorado shaft caused the cage to drop from the surface to the sump, a distance of 1000 ft., where it was stopped by a bulkhead built for the protection of the men at work sinking. The solid construction of the bulkhead was all that saved the lives of the three men working beneath it. The drum of the engine burst during the runaway and fragments were hurled through the roof, a distance of 200 yards. It is expected that the hoist can be repaired within a few days, when operations will be resumed.

Butte Production—The output of this camp for the month of August is estimated at 26,148,440 lb. of copper, a slight decrease compared with previous months, due principally to the fact of the Mountain View mine of the Boston & Montana not hoisting for over two weeks, owing to a broken driving shaft. The ore produced by the various properties was as follows: Boston & Montana, 87,200 tons; Anaconda, 93,000; North Butte, 39,600; Butte & Boston, 14,260; Washoe, 12,300; Butte Coalition, 46,200; Parrot, 7400; Trenton, 12,900; W. A. Clark, 27,320; East Butte, 12,000; miscellaneous, 3200; total, 355,380 tons.

Gallatin County

Montana Portland Cement Company—Under the direction of O. B. Gilson, the work on the new cement factory at Trident is being pushed, and is to be completed by Nov. 1. Two steel kilns, 150x9 ft. in diameter, two rock crushers, and a steam shovel are now being installed.

Jefferson County

Montana-Corbin Company—Two large boilers and a 10x12 hoist have recently been installed at the property and an electrically driven compressor will be added when the power line of the Missouri River Power Company reaches the mine.

Boston & Alta—The surface plant at present consists of two 75-horsepower boilers, one 4-drill Rand compressor, a gallows frame and a Lidgerwood hoist, good for 500 ft. A 30x70 building is being fitted up as a boarding house for the men.

Calumet & Corbin—The sinking of a 200-ft. shaft has been started. When that depth has been attained crosscuts will be run.

Nevada

Esmeralda County—Goldfield

Frances-Mohawk Mining and Leasing—On Aug. 31, the Western Trust and Savings Bank of Chicago, was appointed receiver for the company on complaint of dissatisfied Chicago stockholders, who also secured an injunction restraining the officers of the company from removing $125,000, on deposit in that city.

Goldfield Belmont—A recent shipment from the Burke lease, comprising 64 tons from the oreshoot just discovered, yielded over $11,000 in net returns.

Goldfield Mining and Ore Reduction Company—Two shifts are employed upon this property sinking the shaft to the 300-ft. point. Marvin Arnold is manager.

Goldfield Daisy Mining Syndicate—General Manager Charles D. Wilkinson has announced that portions of the company's acreage, heretofore denied to lessers, are now to be leased.

Atlanta Mines—On the Precious Metals lease a new 15 h.p. hoist has been installed and two shifts are being employed in sinking the shaft 200 ft. deeper.

Nancy Dorcas—A vein, having a width of about 1 ft., has been cut at a depth of 85 ft. in this shaft.

Esmeralda County—Sweetwater

United Gold—This corporation has purchased rights and title of the Sunny Jim Gold Mining and Milling Company and the Tyler Gold Mining Company. There

are 15 claims in the group, which is situated four miles north of the Pittsburg-Liberty property. Plans are being prepared for the first unit of a mill.

ESMERALDA COUNTY—RAWHIDE

Kerns No. 1—Sub-leasers on the upper lease are now working 25 men and much ore is being taken out and hauled to the mills; the lease expires on Sept. 15.

Kerns No. 2—Bins to accomodate the large amount of ore being extracted have been erected. The new leasers now have ore, mostly of a milling grade from the 80 to the 400-ft. levels. It is understood that the new leasers are paying 30 per cent. royalty to the owners of the Rawhide Queen Mining Company.

Salt Lake-Rawhide—This company, J. C. Guerin, president, J. A. Salsbury, general manager, is soon to install a hoisting plant on its property. At present the shaft is down 75 feet.

LINCOLN COUNTY—FAY

Horseshoe—The 100-ton mill and mine, owned by the Stokes of Los Angeles, has recently been bonded to E. E. Fuller, and the mill put in shape to retreat some of the old tailings.

Tyson—W. S. Anderson, of Pioche, has begun active development of property at this new camp, three miles from Fay.

LYON COUNTY

Nevada Copper Belt Railroad—Contracts have been let for the construction of the first portion of this road, which is to tap the Yerington copper district from the Southern Pacific station at Wabuska. The new road is controlled by interests affiliated with the Nevada-Douglas Copper Company.

Mason Valley Copper—Development work from the No. 4, or lower tunnel, during the last two months, has added approximately 100,000 tons to the reserves. The northern section of the property is now being given more attention and a drift that is being driven toward the Bluestone has a full face of good ore.

NYE COUNTY—BULLFROG

Fleming—A strike is reported on this lease on the National Bank property.

NYE COUNTY—PIONEER

Pioneer Leasing and Milling—This company has been granted a year's extension on its present lease, including the Bimetallic No. 3 claim and a portion of the Conservative claim. Preparations will at once be made for extensive new development.

NYE COUNTY—RHYOLITE

Montgomery-Shoshone—The net profits of the company for the first six months of 1909 were $126,500, being about 50 per cent. of the gross receipts. The mill is treating about 6000 tons per month, the ore coming from between the 200- and 500-ft. levels. The glory hole is now 250 ft. long and 175 ft. wide, with ore exposed on three sides. Development has started on the 700-ft. level as the beginning of an extensive campaign of new work.

WHITE PINE COUNTY—ELY

Steptoe—The August crushing of this plant was 180,000 tons. Some days in excess of 7000 tons were handled. The copper production for the month was in excess of 5,000,000 pounds.

Ely Central—Funds have been provided for sinking the three-compartment shaft on the Eureka Fraction and two more drills have been ordered for the prospecting of the Chispy and Quartette claims, which are about 600 ft. from the Nevada Consolidated line.

WHITE PINE COUNTY—SHOSHONE

St. Lawrence—Engineer C. E. Allen and J. Fewson Smith, of the United States Smelting, Refining and Mining Company, have made an examination of this lead property, 12 miles south of Osceola.

New Jersey

SUSSEX COUNTY

New Jersey Zinc Company—Preparations are being made to sink a new shaft at Franklin Furnace, some distance from the old shaft. When it is completed the old shaft will be repaired and relined New machinery is also to be installed for the purpose of lighting the underground workings by electric light.

Ohio

STARK COUNTY

Massillon Coal Mining Company—The report for the fiscal year ended May 31 shows 176,021 tons coal sold for $372,882; other income was $7295, making a total of $380,177. Costs of mining and selling were $328,989; development, $24,000; a total of $352,989, leaving a net income of $27,188. The interest on bonds was $15,000 and $100,000 was charged as depreciation, showing a loss of $87,812 for the year.

Oregon

JOSEPHINE COUNTY

Chatty-Maurer—At this property, situated in the Cañon Creek district, 7 miles west of Kirby and 37 miles from Grant's Pass, a good showing of free milling gold ore is reported.

United Copper Gold Mines—Owen Thomas, manager, has a crew of 30 men driving tunnels and installing equipment. A wagon road from Booth's Ferry on the Rogue river to the mine at Pickett Creek has lately been completed.

Pennsylvania

ANTHRACITE COAL

Hillside Coal and Iron Company—A fire at the Dupont colliery last week destroyed the boiler house, fan house and some other buildings, and damaged the shaft badly.

Lehigh Valley Coal Company—Hazleton shaft breaker is being rebuilt and enlarged, and will handle the coal not only from its own colliery, but also from the Gowen and Tomhicken collieries, two of the old Coxe Brothers' mines. The old Tomhicken breaker will be torn down.

Lehigh & Wilkes-Barre—A rescue station has been established by the company at the South Wilkes-Barre colliery, and a brick building has been built to accommodate the equipment, which will comprise six Draeger helmets, equipped with oxygen apparatus, portable electric lamps, and oxygen cylinders with suitable attachment for supplying oxygen at the earliest moment to rescued men. The rescue department will be in charge of Tudor Roberts, and the apparatus will be taken to the various mines in the district, so that certain men at each colliery will be familiar with the rescue work and apparatus. It is planned by Chief Engineer Douglas Bunting to have auxiliary stations at the various mines in this section, but all will be under the direction of the main station.

Yost Coal Company—This company, just organized by Edward Shaughnessy and others, of Pittston, has leased a tract in Yatesville. Contracts have been let for sinking a slope and building a breaker. The company will be able to ship over the Delaware & Hudson, or the Erie.

Philadelphia & Reading Coal and Iron Company—The statement for July, the first month of the fiscal year, is as follows:

	1908.	1909.	Changes.
Earnings.....	$1,954,763	$1,597,096	D. $357,667
Expenses	1,894,941	1,691,335	D. 203,606
Net or def..	Net $59,822	Def. $94,239	D. $154,061

The expenses were 96.9 per cent. of earnings in 1908, and 105.9 per cent. this year.

BITUMINOUS COAL

Globe Coal and Coke Company—This company, of Pittsburg, has leased a tract of coal land at Fort Hill, near Confluence, on the Baltimore & Ohio, and has let contracts for a new tipple and other improvements.

Penn-Mary Coal Company—An issue of $2,000,000 in 5 per cent. bonds has been made for the purpose of developing coal lands in Indiana and Cambria counties. The bonds are guaranteed by the Pennsylvania Steel Company.

Tennessee

CAMPBELL COUNTY

Southern Coal and Coke Company—A contract has been taken to furnish coal for a year to the Seaboard Air Line railway. The company has its office at Knoxville, Tenn., and operates mines in the Jellico district.

POLK COUNTY

Tennessee Copper—It is reported that the company has placed its $800,000 issue

of 6 per cent. three-year notes, the proceeds of which are to be applied to the construction of the new $800,000 unit of the sulphuric acid plant. The unit now in operation has an annual capacity of 300,000 tons of acid. The company's copper output is being maintained at about 1,250,000 lb. per month at a cost of slightly over 10c. per lb., without crediting revenue from the sale of sulphuric acid. The company has ore reserves and smelting facilities for an annual production of 18,000,000 lb. of copper, whenever the price of the metal becomes an incentive to reach this output.

Utah

Beaver County

Wild Bill—Matthew Cullen, of Salt Lake, will soon open this property which he has owned since the early 60's. Formerly the surface ores of this mine produced a fortune, and Mr. Cullen now intends to install a hoist and compressor plant to go after the large bodies of ore which are believed to lie at depth.

Cedar-Talisman—An important orebody carrying silver, lead, copper and gold, has been opened on the 400-ft. level. S. S. Pond, manager, Beaver, Utah.

Juab County

Tintic Smeltery—Four furnaces are again in operation at this plant, and power is being supplied by the new electric plant.

Ore Shipments—The Tintic ore shipments for the week, ended Aug. 27, were: Centennial Eureka, 40; Gemini, 2; Scranton, 4; Mammoth, 2; Grand Central, 2; Victoria, 2; Sioux Consolidated, 14; Colorado, 41; May Day, 3; Eagle & Blue Bell, 1; Chief Consolidated, 1; Uncle Sam, 4; East Tintic Development, 2; Iron Blossom, 41; Dragon Iron, 34; Beck Tunnel, 4; Ajax, 3 cars.

Salt Lake County

Columbus Consolidated—A new and independent body of ore has been found in the Columbus Consolidated property at Alta in the 100-ft. level, west of the shaft. Manager Tony Jacobson also reports that the management is extracting ore for shipment from the 400 level.

Prince of Wales—The leasers of the old mine at Alta have encountered a vein which exhibits many of the characteristics of the old bonanza shoot. Fred Schrott, manager, Alta, Utah.

North Emma—An important strike has been made in the property at Bingham. A tunnel is now being driven, and as the cabin is approached, considerable depth has been reached. Jesse Knight is interested.

Summit County

Iron Copper—A body of copper ore has been opened in a tunnel so far from the tunnel level. Shipments have commenced. A. M. Spencer, manager, Park City, Utah.

Tooele County

Boston-Sunshine—Ore has been extracted from all the levels in the mine from the first to the sixth. A good body of ore has been developed on the 300-ft. level, which has given the best results of any ore that has been run through the new mill. On the 600 level ore has also been developed, and the management will install a hoist to expedite further work at depth. George H. Dern, manager, Salt Lake.

Washington

Chelan County

Washington-Meteor—Davis & McDowell, who recently acquired the Blinn group, have also leased this property.

Chelan Consolidated Copper—The company has driven an adit into Red mountain 1300 ft. and opened a 5-ft. vein of high-grade ore at a vertical depth of 1500 feet.

Chinaman Lead and Silver—The company is driving a long adit in the Red mountain district to cut the vein exposed at the surface of the property.

Wisconsin

Iron—Gogebic Range

Geneva—The shaft is now down 2200 ft., and will be sunk some distance further before stoping is begun.

Norrie—A new three-compartment shaft is to be sunk east of B shaft.

Puritan—The main shaft is now down 1300 ft. Some ore has been taken out, but it has been stocked, and no shipments will be made till the shaft is completed.

Canada

British Columbia—Cariboo

An important find of gold-bearing quartz is reported from the Barkerville district. The lode occurs on the divide between Grouse and Antler creeks. For a width of 8 ft. the lode has a high gold content, and there is a greater width of lower-grade quartz.

British Columbia—East Kootenay

Sullivan—Pumping is in progress at this group, which had been closed since February, 1908. Mining will be resumed early in September, and smelting at the lead smeltery at Marysville, as soon thereafter as sufficient ore has accumulated.

British Columbia—Hedley

Nickel Plate—This mine and 40-stamp mill, formerly owned by Marcus Daly, has been purchased by the Exploration syndicate. Frank Albertus Ross, of Grand Forks, B. C., formerly managing director, will remain in charge.

British Columbia—Nelson

Silver King—Fire has destroyed the compressor house, blacksmith shop, ore bins and upper terminal of the aerial tramway at the mine, on Toad mountain, a few miles from Nelson. The destroyed property will be replaced as quickly as possible. R. S. Lennie, manager.

British Columbia—Slocan

Lucky Jim Mines, Ltd.—Thirty cars of zinc ore shipped during recent months from the Lucky Jim mine to the Empire Zinc Company, of Denver, Colo., averaged in value $30.55 per ton. The freight charges were $8.86 per ton.

Ontario—Cobalt

Ore Shipments—Shipments of ore from Cobalt for the week ended Aug. 28, were as follows: Carnegie, 63,410 lb.; Crown Reserve, 124,000; La Rose, 193,020; McKinley-Darragh, 40,980; Nipissing, 255,170; O'Brien, 129,640; Right of Way, 60,210; Trethewey, 66,000; total, 932,430 pounds.

Nancy Helen—A 5-in. vein, carrying high-grade ore, was uncovered in drifting at the 60-ft. level.

Rochester—The directors have decided to increase the capital stock from $1,000,000 to $1,500,000, and to issue the new shares at 10c. or upward, the funds to be used for further development. A meeting of shareholders has been called for Sept. 10 to ratify their action.

Martell—A 12-in. calcite and silver vein has been uncovered on this property which lies directly south of the Waldman location in the Gillies limit.

Ontario—Gowganda

Boyd-Gordon—Drifting east and west at a depth of 87 ft., eleven veins have been encountered. Two of them which promised well on the surface show increased silver content at depth. A carload of ore is sacked ready for transportation.

Bartlett—The shaft is down 110 ft., and a station is being cut at that level. Seventy men are at work with four drills running. An electric-light plant is being installed. A number of surface veins have been uncovered by trenching.

Ontario—Port Arthur

Dominion Bessemer Mines Company—The company is commencing operations on an extensive scale at its iron properties at the head of Thunder bay, 22 miles from Port Arthur. Docks are being built so that shipments may be made direct by water next season. The company owns 6000 acres of iron lands.

Quebec—Black Lake

Canadian Asbestos Company—F. B. Gooderidge, Thomas McDougall, H. F. Mitchell and H. H. Melville, directors, visited the properties recently and were much pleased with the discovery of a new vein of No. 1 grade, made in one of the Beaver Canadian pits. It is announced that a large amount will be expended on improvements on the Standard and Dominion properties in order to double the output and keep pace with orders. An order has been received from Germany for 20,000 tons.

Metal, Mineral, Coal and Stock Markets

Current Prices, Market Conditions and Commercial Statistics of the Metals, Minerals and Mining Stocks

QUOTATIONS FROM IMPORTANT CENTERS

Coal Trade Review

New York, Sept. 8—Western coal trade continues to increase in activity and bulk, but as yet there appears to be no general upward movement in prices. Competition seems to be the chief factor in keeping prices stationary.

Uneasiness is growing in certain sections of both the East and West regarding car supply. Reports from Indianapolis indicate that car shortage threatens seriously to curtail the Fall production in that district. New York reports car shortage on the Baltimore & Ohio, Norfolk & Western and Chesapeake & Ohio railroads. Car transportation is slow, coal taking a little more than schedule time to run through on most roads.

The anthracite market shows a decided improvement, with prices unchanged.

Coal Traffic Notes

Coal tonnage originating on the Southern Railway in June was 279,208 short tons; for the six months ended June 30 it was 1,750,663 tons.

Shipments of Broad Top coal over the Huntington & Broad Top railroad for the seven months ended July 31 were 376,710 tons in 1908, and 262,173 in 1909; a decrease of 114,537 tons.

New York

Anthracite

Sept. 8—There is a decided improvement in the demand for anthracite coal. Prices are the same at $4.75 for lump and $5 for egg, stove and chestnut, f.o.b., New York harbor. For steam sizes prices are unchanged, quotations being: Pea, $3.15@3.25; buckwheat, $2.35@2.50; No. 2 buckwheat or rice, $1.70@2; barley, $1.35@1.50; all f.o.b. New York harbor.

Bituminous

There is a gradual increase in tonnages and the trade expects this to continue. This condition has been coming in flushes for the last few months, and lately signs of better shipments have been gradually becoming more common. As yet this has not affected prices, although they appear somewhat stronger.

The question of car shortage is coming into play and at times coal producers are not able to fill orders in hand as heretofore. With reported small supplies of soft coal on hand in the bins of consumers and winter months approaching, the immediate prospects appear somewhat brighter—this in particular as regards tonnages and probably as to prices.

The Far East is taking moderate amounts of coal upon contracts, although it continues to be chary as to getting much stock on hand. Favorable ocean freight rates are an inducement in this particular. Several brokers, however, do not think the extra low rates now prevailing will continue much longer. Trade along the Sound shows a better condition, and coal is being taken on in larger quantities. In this consuming territory prices continue unchanged.

Trade in New York harbor is quiet and outside of the usual contractors not much new business is being transacted. A few works which have been closed down are starting up, however, and these are taking coal which amounts to considerable in the aggregate.

Prices on current business for gas coal (run-of-mine coal) are 65c. per ton at mines. Ordinary steam coal can be bought at a round figure of $1 per ton at the mines; good South Fork, Miller vein, coal can be bought at prices based on $1.30 at mines.

In the coastwise market vessels are seeking charters, with a plentiful supply on hand. Rates are quoted from New York harbor on medium-sized vessels at 50 to 55c. per ton around Cape Cod. The Philadelphia quotation on large-sized vessels is 50 to 55c. around the cape.

Birmingham

Sept. 7—Conditions continue to improve slowly. The railroads are the chief consumers of coal, and the brighter outlook in traffic business holds forth brighter prospects for the coal mines. While there is as yet no boom in the coal business, present conditions and the outlook for the future are entirely satisfactory.

Chicago

Sept. 6—Sales of nearly every kind of coal are good, with the market firm and growing stronger as the season of activity approaches. Increasing steam consumption keeps up the prices of fine coals as well as lump, and domestic supplies are being laid in somewhat generally. Shipments are well regulated to the demand, with the result that except on run-of-mine smokeless there is practically no coal sold at sacrifice prices to avoid demurrage charges. Prices have not risen and are not likely to rise generally, in view of the keen competition that exists on all classes of bituminous. A slight advance, however, may occur in Illinois and Indiana lump sizes, and Hocking (1¼-in.) has advanced to $1.40 at the mines or $3.05 Chicago, with good sales at the increased price. Country dealers are buying domestic coals more freely, very generally.

Illinois and Indiana lump bring in car lots, $1.75@2.25; run-of-mine sells for $1.60@1.75 and screenings hold up fairly well at $1.25@1.45. Smokeless, the chief of eastern coals, finds an increasing demand, with $3.45 on lump and $2.95 on run-of-mine (freight being $2.05), standard prices that are well adhered to in general for Pocahontas and New River. Anthracite sales are light but well distributed.

Indianapolis

Sept. 6—With the hight of the coal season but a few weeks off and the different railroads hampered by a car shortage, many complaints from the operators of the mines in the Indiana district have reached the railroad officials. The operators say no definite answers can be obtained why the cars are so scarce. Operators in the Terre Haute district say the situation has become so severe that only two or three hours a day can be worked at some mines because there are no cars to fill the orders. Operators say that unless something is done to relieve the situation their fall output will be greatly diminished.

At Fontanet much trouble is being experienced, and it is claimed that on an average of three hours a day can hardly be maintained at a number of mines on the Big Four right-of-way. It is reported that the Vandalia road has been furnishing enough cars to allow the mines reached by it to run half-day shifts, but this is far from being enough to supply the demands of the miners.

Pittsburg

Sept. 7—The coal market has gained slightly in activity, with increasing consumption in the manufacturing industries. Nominal prices remain at $1.10 to large manufacturers and $1.20 to retail dealers, for mine run, and 65c. for slack. These prices are not subject to as much shading as a month or two ago, and it is only on

strongly competitive business that mine-run sells down to $1, or slack to 50c. It is possible that later in the year an advance in schedule prices will be made, but none is in contemplation for the present.

Connellsville Coke—The market continues to advance. In the past week sales of furnace coke have been made of 2000 tons for September delivery at $2 at ovens and 5000 tons for September and early October at $2.10, and the market is very firm at this range, there being no coke to be picked up, even for spot shipment, at less than $2. Comparatively little furnace coke is being sold for the remainder of the year, consumers being already covered, but a few such have been put through in the past week, one of 6000 tons monthly being made at $2.25. There is more inquiry for coke for next year, both for six months and for the whole year, but flat prices are generally quoted at not less than $2.50 and furnaces are not disposed to pay this price. Occasionally contracts are being made on an exchange basis of coke for pig iron, while sliding-scale contracts, referred to the average selling price of pig iron, are growing in favor. The sharp advance in coke in the past two or three weeks is attributed to the scarcity of labor, as there is plenty of idle capacity to bring in if men could be found. This position should right itself very soon and furnaces then expect coke prices to be a little easier. We quote standard Connellsville coke as follows: Prompt furnace, $2@2.10; fourth-quarter contract, $2.25; first-half contract, $2.50; 72-hour foundry, prompt or fourth quarter, $2.25; first-half, $2.50.

The *Courier* reports the production in the Connellsville and lower Connellsville regions in the week ending Aug. 28 at 319,354 tons, a gain of almost 20,000 tons from the previous week, and shipments of 1089 cars to Pittsburg, 7426 cars to points west of Pittsburg and 806 cars to points east of Connellsville, a total of 13,212 cars, or about 100 cars more than in the previous week.

St. Louis

Sept. 6—With the advent of September a decided improvement in demand was noted by all wholesalers. Prices have advanced a little, though the improvement has been much more in the line of material of a cheaper than in any general advance in prices. Quite a few operators report that for the first time in the last eight months they had their entire output sold up for some time ahead.

The operators in the Staunton field have raised their prices from $1 to $1.10 on 3-in. lump coal. These operators have been selling 6-in. lump and 3- to 6-in. egg all summer, but now, on account of the increased tonnage, have found such difficulty in securing of the 6-in. egg that nearly all of them have discontinued making it and are making only 3-in. lump.

The price on standard coal has stiffened and 3-in. lump is now bringing 80c. at the mines, or $1.32 St. Louis, with mine-run bringing 70c. at the mines, or $1.22 St. Louis. Prices on the whole are about 5c. per ton higher than prevailed last week.

The operators of high-grade mines in southern Illinois are running full time, and orders are coming in so freely that higher prices will prevail before long. Carterville 6-in. lump or egg is strong at $1.20 f.o.b. mines, or $1.87 St. Louis, while Franklin county is bringing $1.40 f.o.b. mines, or $2.07 per ton St. Louis. The price on the celebrated Trenton high-grade coal was advanced from $1.75 to $2 per ton f.o.b. mine for 6-in. lump on the first of the month, which makes this coal now cost $2.52 per ton f.o.b. St. Louis. This is about 50c. per ton higher than any other high-grade coal is bringing.

The anthracite situation is gradually clearing up. The cheap hard coal which has been a troublesome factor is slowly disappearing. Indications are that hereafter the circular price of $6.95 per ton f.o.b. St. Louis on the chestnut, stove and egg sizes, and $6.70 on the grate will be strictly adhered to.

The report comes from Terre Haute, Ind., that the United States Steel Corporation on Sept. 1 acquired the coal property from the Hammond company, on which it has had an option for some time. These properties were sold several years ago for $3,000,000.

Foreign Coal Trade

Welsh Coal Prices—Messrs. Hull, Blyth & Co., London and Cardiff, report current prices of coal as follows, on Aug. 28: Best Welsh steam, $4.38; seconds, $4.08; thirds, $3.90; dry coals, $4.08; best Monmouthshire, $3.60; seconds, $3.48; best small steam, $2.28; seconds, $1.92. All per long ton, f.o.b. shipping port.

Iron Trade Review

New York, Sept. 8—There was a decided improvement in the iron and steel markets last week. In finished products, although Pittsburg reports firmness in orders and prices, Chicago reports heavy sales in all departments.

Large sales of pig iron were made at Chicago, the market being strong with promise of greater activity. The Pittsburg furnaces have advanced the price on all grades of pig, but the market is not active. Prices for basic at Philadelphia have been advanced on account of the soldiers' condition of the market. Birmingham producers are holding No. 2 foundry at $14; demand is strong. There is an improvement in general conditions in all districts.

Chicago

Sept. 6—Sales of pig iron have been large in the last week and the market is strong, with promises of increasing strength in every line. In addition to a number of large contracts, the demand for more pig iron has become notable from almost every melter. The timidity that has existed for several months has disappeared. Many melters are now willing to buy freely for 1910 delivery and others have large inquiries out and are closely watching the market.

For first-half deliveries $14.50 Birmingham ($18.85 Chicago) for Southern and $18.50 for Northern may be considered standard, with a range of 50c. up or down on the more or less desirable contracts. Northern iron is especially in demand, with prices very firm. On last-quarter business prices are about 50c. less than on 1910 business. The increased demand is for all kinds of iron, showing a general determination of the market to buy on the upward wave of increasing consumption and recovered confidence.

For iron and steel products the market shows large sales in practically all lines, with structural steel and railroad supplies notably in demand. Coke continues at $4.85 for the best Connellsville with sales large and increasing.

Philadelphia

Sept. 8—The output of basic has been sold about as far ahead as producers care to sell and buyers who have not covered as fully as they desire are seeking outside sources. Prices in consequence have been marked up. The effect of this is to make certain consumers more anxious and inquiries have been presented this week asking as to deliveries during first quarter 1910. It is said arrangements have been made by a few buyers for the second quarter. Pipe iron has just been advanced. Pipe manufacturers were shortsighted when they booked a large amount of business early in the summer, by not contracting for all the pig their contracts called for. Implement and accessory manufacturers are in the market for special irons, including malleable. Foundry No. 2 is quoted 50c. higher for early deliveries but buyers say this asking price can be shaded. Forge is quiet after the placing of orders by several mills to cover work that is assured. The tone of the market is strong and furnace men think there will be no further climbing of prices for awhile.

Steel Billets—Buying is mostly restricted to small lots. The larger interests have covered probable demands by contracts extending over a considerable period. The probability is, though not admitted, that the price to be paid for future deliveries is to be fixed when deliveries are called for.

Bar Iron—Offers have been received

this week from large consuming interests for winter deliveries of common iron. Price offered not given. Refined orders pour in, but for small lots, and all quick deliveries are taken at full quoted prices.

Sheet Iron—The inflow of business continues and manufacturers report a return to about normal conditions. Most sheet buyers are ordering beyond visible necessities. Car material is quite active and there is a still further increase in corrugated orders. The mills have put on some idle capacity and full time is regarded as assured.

Pipes and Tubes—Merchant pipe is quiet and no further advance has been made. Tubes are very strong and mills are reported to have booked a large amount of business. The Baldwin Locomotive Works have 7000 men at work, maximum capacity. Boiler shops are now on full time with few exceptions. Ship yards are preparing estimates upon some very important work.

Plates—Deliveries on contract time are being insisted upon by large concerns using plates. Most of the orders for car builders have been placed, some of them calling for delivery in midwinter. The plate mills are all crowded with work and with the certainty of more car-building orders, manufacturers say they have every reason to be satisfied. Building operations are greatly in excess of last year and many of these call for iron.

Structural Material—The week has not developed any important orders, though there is a steady run of business for small bridges and buildings from our immediate territory. The best encouragement for new work comes from outside territory.

Steel Rails—There has been some delay in the placing of orders that were expected early in September. Rail men say large rail orders are liable to be precipitated on the market at any time and that urgent orders from western sources must come to Pennsylvania. Small orders for mine rails were booked this week.

Scrap—No further developments. An attempted advance on heavy melting and No. 1 yard scrap is holding up business.

Pittsburg

Sept. 7—The tonnage of new orders and specifications for finished steel keeps up very well and prices trend toward greater firmness, but this has been the movement for a long time and the market is really uneventful as regards new developments.

The difference in activity between steel interests and foundry interests becomes more pronounced as the steel trade proper continues to increase its production, while the foundries are melting very little more iron than they did two months ago. The foundries are really not very busy, and while they have been fairly good buyers of pig iron it seems certain that the buying has been largely speculative, consumers covering for more iron than they would need if their present rate of consumption should not change. Pig iron prices have been advancing rather rapidly, but the gain in strength seems to have been due largely to sentimental influences derived from the activity and enthusiasm in the steel trade. The question again comes up whether a material part of the activity in buying and specifying in finished-steel products is not due to manufacturers and jobbers increasing their stocks. If all the business represents actual consumption it is at least interesting to observe that the consumers of cast-iron products are not as active as the consumers of finished steel.

Cold-rolled shafting has been advanced three points, or about $3 a net ton, the new discounts being 57 per cent. off list in carload lots and 52 per cent. off in less than carloads, delivered in base territory.

Plates, shapes and bars are harder to get at minimum prices, 1.40c. on plates and shapes and 1.35c. on bars, many orders being placed at $1 a ton above these figures, while as most mills have their rolling schedules made up from six to ten weeks in advance, premiums are occasionally paid for prompt shipment.

Pig Iron—Furnaces have advanced prices rather sharply in the past week on all grades, and the market is quieter as to actual transactions, the respective parties sparring for position, while sales have been confined to relatively small lots. The lowest sellers on foundry iron have disappeared, being comfortably sold up. One valley furnace in particular, about to blow in within a month, was a free seller both for this year and next. No. 2 foundry iron is at an absolute minimum of $15.75, Valley, for early delivery, most sellers quoting $16 or higher, while for next year quotations are $16.25@16.50. Bessemer iron has advanced to $17, Valley, for prompt or fourth quarter, and we note a sale of 350 tons of prompt at this figure, besides several other moderate sized lots. The advance in bessemer has had a strong sentimental effect on basic, which was selling at $15.25, Valley, three weeks ago, and furnaces are chary of selling at all. We note a sale today of 1000 tons of basic for October delivery at $15.75, Valley, to a merchant furnace interest, and quote this as the minimum of the market for this year. A sale of 5000 tons was made early last week, for delivery through November, by a western Pennsylvania furnace to an Eastern steel works at $18 delivered, equivalent to between $15.50 and $15.75 at furnace. There is more inquiry from the East for basic, totaling between 20,000 and 25,000 tons. There is not much inquiry locally, one small steel works asking prices on 2000 to 3000 tons for first quarter. A sale of four carloads of spot malleable was made Saturday at $17 at Valley furnace, but the market on ordinary lots is about $16.25 Valley.

Ferromanganese—The market is very strong at a minimum of $42, Baltimore, or $43.95, Pittsburg, for prompt, while for forward delivery the market is $1 to $2 higher.

Steel—Both billets and sheet bars are scarce, and the market is higher, with few mills willing to sell. We quote bessemer billets at $25, mill, open-hearth billets at $25.50@26, and sheet bars at $26@27. Wire rods are nominally $31, but the only mills that quote are naming $31.50@32.

Sheets—The sheet market continues strong, with mills well sold up and prices firm at 2.20c. for black and 3.25c. for galvanized, with corrugated roofing at $1.55 per square for painted and $2.80 for galvanized.

St. Louis

Sept. 6—The demand for No. 2 pig iron is strong, the price being $14 per ton f.o.b. Birmingham, or $17.75 per ton f.o.b. St. Louis. Local producers who make basic and car-wheel pig report that their product is bringing $18.50@19 per ton f.o.b. St. Louis.

The demand for 55 per cent. iron ore is steady and strong at $3.50 per ton f.o.b. St. Louis. Nearly all companies producing pig iron have withdrawn quotation on iron for delivery after the first of the year. The Williamsville Iron Mountain Ore Company has just started operations in the new Missouri ironfield at Williamsville, Wayne county. It is producing a high-grade ore that runs 58 per cent. iron. This is the first to operate in this field, though several other companies are developing mines. This source of supply is very welcome to the blast furnaces around St. Louis.

Foreign Iron

German Iron Ore Trade—Imports and exports of iron and manganese ores in Germany, half-year ended June 30, metric tons:

Iron ores	1908	1909	Changes.
Imports	3,320,083	3,766,827	↑ 446,144
Exports	1,675,128	1,320,680	↓ 354,448
Manganese ore			
Imports	180,092	194,844	↑ 14,752
Exports	1,006	1,132	↑ 126

Imports of slag and slag products, 295,100 tons in 1908, and 234,481 in 1909; decrease, 60,619 tons. Exports, 31,007 tons in 1908, and 20,127 tons in 1909; decrease, 9880 tons.

Swedish Iron Trade—Exports of pig iron from Sweden for the three months ended March 31 were 14,400 metric tons in 1908, and 10,600 in 1909, a decrease of 3800 tons. Exports of other iron and steel were 44,000 tons in 1908, and 39,300 in 1909; a decrease of 4700 tons.

Production in Sweden for the three months was, in metric tons:

	1908.	1909.	Changes.
Pig iron	158,500	147,600	D. 10,900
Puddled blooms	41,300	33,000	D. 8,300
Bessemer steel	17,600	21,400	I. 3,800
Open-hearth steel	86,800	76,300	D. 10,500
Total steel	104,400	97,700	D. 6,700

There were in operation this year 99 blast furnaces, 218 puddling furnaces, 18 bessemer converters and 49 open-hearth furnaces.

British Iron Trade—Exports and imports of iron and steel and of machinery in Great Britain, seven months ended July 31, as valued by Board of Trade returns:

	Exports.	Imports.	Excess.
Iron and steel	£21,775,558	£ 4,571,404	Ex. £17,204,154
Machinery	16,535,871	2,773,924	Ex. 13,761,947
New ships	3,709,027	.....	Ex. 3,709,027
Total	£42,020,456	£ 7,345,328	Ex. £34,675,128
Total, 1908	46,063,058	7,410,738	Ex. 39,252,320

Total decrease in exports, £4,642,602, or 9.9 per cent.; decrease in imports, £65,410, or 0.9 per cent. The total quantities of iron and steel of all kinds were, in long tons:

	1908.	1909.	Changes.
Exports	2,437,952	2,384,617	D. 53,335
Imports	608,347	683,135	I. 74,788

Decrease in quantity of exports, 2.2 per cent.; increase in imports, 12.3 per cent. The imports are largely of blooms, billets and other half-finished material.

Belgian Iron Production—Pig iron make in Belgium for the half-year ended June 30 was 578,380 metric tons in 1908, and 739,480 in 1909; an increase of 161,100 tons. Of the production this year 42,970 tons were foundry iron, 71,080 forge and 625,430 tons bessemer and basic pig.

Metal Markets

New York, Sept. 8—The metal markets have been dull during the week ending today and toward the close became somewhat weaker all around.

Gold, Silver and Platinum

UNITED STATES GOLD AND SILVER MOVEMENT

Metal.	Exports.	Imports.	Excess.
Gold			
July 1909	$16,661,782	$ 3,269,885	Exp. $13,391,897
" 1908	4,845,272	2,949,179	Exp. 1,896,093
Year 1909	89,496,119	32,405,477	Exp. 57,090,642
" 1908	58,463,998	29,357,076	Exp. 29,006,172
Silver			
July 1909	5,049,366	3,926,117	Exp. 1,123,249
" 1908	4,930,746	3,039,581	" 1,891,165
Year 1909	34,409,032	26,798,145	" 7,610,887
" 1908	30,445,291	24,180,929	" 6,264,362

Exports from the port of New York, week ended Sept. 4. Silver, $1,089,806. Imports Gold, $140,632; silver, $121,506.

Platinum—Although an upward tendency of prices has been anticipated quotations are unchanged. Dealers are quoting $23@24.50 per oz. for refined platinum, $18@25 for hard metal and $19@21 for good scrap.

Silver—The supply of silver continues sufficient for all demands. The silver centers are well stocked, and there is no indication at present of any great rise.

SILVER AND STERLING EXCHANGE

Sept.	2	3	4	6	7	8
New York	51¾	51½	51⅛	.....	51½	51⅜
London	23⅞	23½	23⅛	23⅛	23¾	23⅛
Sterling Ex.	4.8650	4.8665	4.8650	.....	4.8650	4.8665

New York quotations, cents per ounce troy, fine silver; London, pence per ounce sterling silver, 0.925 fine.

Copper, Tin, Lead and Zinc

Sept.	Copper. Lake, Cts. per lb.	Copper. Electrolytic, Cts. per lb.	Copper. London, £ per ton.	Tin. Cts. per lb.	Lead. New York, Cts. per lb.	Lead. St. Louis, Cts. per lb.	Zinc. St. Louis, Cts. per lb.
2	13¾ @13¾	12⅞ @13⅛	59¼	30⅜ @30¼	4.35 @4.37½	4.20 @4.25	5.57½ @5.60
3	13¾ @13¾	12⅞ @13	59⅛	30¼ @30⅛	4.35 @4.37½	4.20 @4.25	5.57½ @5.60
4	13 @13½	12⅞ @13	...	30⅛ @30¼	4.32½ @4.35	4.20 @4.22½	5.55 @5.60
6	.....	.....	....	.....	.....	.....	.....
7	13 @13⅜	12¾ @13	59	30 @30⅛	4.32½ @4.35	4.20 @4.22½	5.55 @5.60
8	13 @13¾	12¾ @13	59⅛	30 @30⅛	4.32½ @4.35	4.20 @4.22½	5.55 @5.60

London quotations are per long ton (2240 lbs.) standard copper. The New York quotations for electrolytic copper are for cakes, ingots and wirebars, and represent the bulk of the transactions made with consumers, basis, New York, cash. The price of cathodes is usually 0.125c. below that of electrolytic. The quotations for lead represent wholesale transactions in the open market. The quotations on spelter are for ordinary Western brands; special brands command a premium.

Copper—During the week Sept. 2-8 business has been quieter than for some time past. Consumers both here and in Europe are pursuing a waiting altitude, but sellers anticipate more activity after the publication of the statistics. About all of them have been offering electrolytic at 13⅛c., delivered, 30 days, which is equivalent to a little less than 13c., cash, New York, but that price has been shaded on the business that has been placed, some fairly large lots from second hands having been negotiated at a materially lower price. The situation in Lake has also been complicated by the continued offering of this class of metal by second hands at low prices, with transactions at 13c., while the producers are generally asking more and in some cases are getting it. On the decline the market has met with considerable resistance and it is not expected to go much lower. However, the close is only barely steady at 13@13⅛c. for Lake copper, and 12¾@13c. for electrolytic in cakes, ingots and wire bars. The average for casting copper has been 12⅝@12¾ cents.

Copper sheets are held at 17@18c. base for large lots. Full extras are charged, and higher prices prevail for small quantities. Copper wire is quoted at 15c. base carload lots at mill. The market is steady and a fair amount of business is being transacted.

The standard market appears to have reached a certain equilibrium, business having dwindled down to a minimum. The close is slightly lower at £59 1/16 for spot and £59 15/16 for three months. For refined and manufactured sorts we quote: English tough, £62; best selected, £61@62; strong sheets, £73@74.

Tin—The decline which has taken place from day to day throughout the week is attributed to bear selling, but the real cause is more likely the absence of demand on the part of domestic consumers. The close in London is lower at £135⅞ for spot, and £137⅛ for three months, while the ruling quotations here are 30@30⅛c.

Lead—Due to a free offering of second-hand lots and the desire to realize on the part of Missouri producers who have not taken orders for some time, the market has again declined, without bringing out an appreciable demand from consumers. The close is easy at 4.32½@4.35c., New York, and 4.20@4.22½c., St. Louis.

The London market, due to a decided revival in English demand, is somewhat higher at £12 11/16 for Spanish lead, and £12 13/16 for English lead.

Spelter—Consumers are still holding aloof, and the spelter which is coming on the market from day to day can only be placed at concessions from previous prices. The close is lower at 5.70@5.75c. New York, and 5.55@5.60c. St. Louis. The quotation at New York on the 2d and 3d inst. was 5.72½@5.75 and on Sept. 4-8 it was 5.70@5.75.

The better reports regarding the iron and steel business in Europe are in explanation of the firmness of the spelter market there, the London quotations closing again higher at £22½ for good ordinaries, and £22¾ for specials.

Other Metals

Antimony—Quotations are 8⅝@8¾c. per lb. for Cookson's, and 8@8¼c. for U. S. Business seems to be improving, and prices show an upward tendency.

Aluminum—The market remains unchanged. No 1 ingots can be had at 20@23c. per lb. in large lots. The American maker still holds to the higher figure.

Quicksilver—There is a decidedly stronger tendency noticeable in the market and New York prices are rather unsettled. Some business is still being transacted at the old quotation of $43.50 per flask of 75 lb., but as high as $44.50 is asked by some dealers. San Francisco quotations are still $42@43 for domestic orders and $40@41 for export. London is £8 7s. 6d. per flask. Lower prices are quoted by jobbers.

Nickel—Large lots, contract business, 40@45c. per lb. Retail, spot, from 50c.

for 2000-lb. lots, up to 55c. for 500-lb. lots. The price for electrolytic is 5c. higher.

Magnesium—Quotations for the metal are $1.25 per lb., New York, in 100-lb. lots; for 5-lb. lots, $1.40 per pound.

Cadmium—Current quotations are 75c. per lb. in 100 lb. lots at Cleveland, Ohio. In Germany 450@475 marks per 100 kg., at factory in Silesia.

Spanish Metal Exports

Exports of metals and minerals from Spain, six months ended June 30, reported by *Revista Minera*, in metric tons:

Metals.	1908.	1909.	Changes.
Pig and manuf. iron	14,015	33,795	I. 19,780
Copper	5,472	9,590	I. 4,118
Copper precipitate	10,460	8,534	D. 1,926
Lead	91,587	86,242	D. 5,345
Zinc	803	860	I. 57
Quicksilver	1,487	1,480	D. 7
Minerals.			
Iron ore	3,917,076	3,758,038	D. 159,038
Manganese ore	9,997	5,629	D. 4,368
Copper ore	606,646	571,797	D. 34,849
Lead ore	1,709	1,591	D. 118
Zinc ore	53,798	62,416	I. 8,382
Pyrites	759,247	658,774	D. 100,473
Salt	348,284	359,791	I. 11,507

Imports of crude phosphate rock and basic slag, 39,447 tons in 1908, and 46,932 in 1909; imports of manufactured phosphates and fertilizers, 64,080 tons in 1908, and 50,491 this year.

Zinc and Lead Ore Markets

Joplin, Mo., Sept. 4—The highest price paid for zinc sulphide ore was $52.50 per ton, the base ranging from $47 to $50 per ton of 60 per cent. zinc. As high as $30 was paid for zinc silicate ore, the base ranging from $25 to $28 per ton of 40 per cent. zinc. The average price, all grades, was $46.88 per ton.

The highest price offering for lead ore this week was $58 per ton, but as high as $60 was paid in settlement of ore purchased ahead. At the week-end offerings had declined to $57 high, with some sales at $56. The average settling price, all grades, was $58 per ton.

Some members of the Zinc Ore Tariff Club are proceeding to form a permanent organization. It is believed that the experience gained in the tariff fight has taught producers the need of organization, and it may become effective, as other organizations were in the past, until internal disagreements split them asunder. The Ero club was effective in maintaining high prices from June, 1904, until October, 1905, after which period it lost its grip on the situation and went to pieces, making the losing legal fight on the tariff. Previous organizations have lacked stability from inertia of the most interested members.

The zinc shipment of the week is 562 tons less than the previous week and approximately 1200 tons less than the output, which is believed to be conservatively estimated at 6300 tons this week. The lead shipment is of 724 tons less, a decrease of 55 per cent.

SHIPMENTS, WEEK ENDED SEPT. 4.

	Zinc, lb.	Lead, lb.	Value.
Webb City-Carterville	3,483,250	641,420	$102,199
Joplin	1,917,350	269,950	54,928
Prosperity	769,190	73,060	20,578
Duenweg	558,840	123,020	15,193
Galena	417,370	39,770	11,070
Carthage	430,530	.....	10,552
Oronogo	405,450	.....	8,234
Alba-Neck	267,480	.....	7,889
Sarcoxie	419,360	.....	7,700
Spurgeon	295,250	22,660	7,506
Aurora	402,040	.....	7,097
Badger	271,950	.....	6,627
Zincite	253,430	4,110	6,581
Quapaw	211,260	19,050	5,411
Cave Springs	63,580	.....	1,526
Totals	10,166,530	1,193,040	$273,001
36 weeks	405,852,420	61,855,190	$9,512,394

Zinc value, the week, $238,394; 36 weeks, $7,829,293
Lead value, the week, 34,607; 36 weeks, 1,683,101

MONTHLY AVERAGE PRICES.

Month.	Zinc Ore. Base Price. 1908.	1909.	All Ores. 1908.	1909.	Lead Ore. All Ores. 1908.	1909.
January	$37.60	$41.25	$35.56	$38.46	$46.88	$52.17
February	36.63	36.94	34.92	34.37	49.72	50.50
March	36.19	37.40	34.19	34.71	49.90	50.89
April	35.40	38.63	34.08	37.01	52.47	55.63
May	34.19	40.06	33.39	37.42	56.06	56.59
June	33.06	44.15	32.07	40.35	60.48	57.52
July	34.55	43.06	31.67	41.11	59.90	53.74
August	36.63	48.25	33.42	44.54	60.34	57.60
September	37.63	.....	34.44	.....	54.59	.....
October	35.95	.....	33.28	.....	52.63	.....
November	39.13	.....	35.02	.....	54.53	.....
December	42.75	.....	39.63	.....	49.68	.....
Year	$36.43	.....	$34.31	.....	$53.98	.....

NOTE.—Under zinc ore the first two columns give base prices for 60 per cent. zinc ore; the second two the average for all ores sold. Lead ore prices are the average for all ores sold.

Platteville, Wis., Sept. 4—The base price of zinc ore, 60 per cent., declined to $48 per ton; the highest price paid was $50 per ton. The base price paid for lead ore, 80 per cent. was $57@58 per ton.

SHIPMENTS, WEEK ENDED SEPT. 4.

Camps.	Zinc ore, lb.	Lead ore, lb.	Sulphur ore, lb.
Cuba City	322,486	172,100	74,840
Highland	420,800	50,000	.....
Platteville	625,030	.....	168,000
Days Siding	352,000	.....	.....
Hazel Green	359,900	87,700	.....
Benton	387,750	50,120	.....
Harker	257,720	.....	.....
Livingston	130,000	.....	.....
Galena	440,000	.....	.....
Shullsburg	.....	.....	.....
Strawbridge	.....	.....	
Rewey	65,000		.....
Mineral Point	.....	.....	
Linden	173,570	.....	.....
Dodgeville	.....	.....	.....
Total	3,533,356	359,920	242,840
Year to Sept. 4	91,478,030	5,619,370	8,134,780

In addition to the above there was shipped to the American Zinc Ore Separating Company 313,560 lb., and to the Joplin Separator Works, 236,000 lb. zinc concentrates.

Chemicals

New York, Sept. 8—The market shows little change but the tendency is toward higher prices. Better business is anticipated.

Copper Sulphate—Prices are unchanged at $4.22½ per 100 lb. for carload lots and $4.32½@4.47½ per 100 lb. for smaller orders. Business remains quiet.

Arsenic—Prices on white arsenic are at 2.7@2.8c. per lb. The sales are light and there is considerable talk of contracts. As a consequence dealers are holding for better figures.

Nitrate of Soda—Quotations are unchanged at 2.12½c per lb. for spot and 2.10c. for futures. The market is not active.

Mining Stocks

New York, Sept. 8—The general stock market was listless during the early part of the week. The slight recovery continued until the close of business Friday. Saturday and Monday were holidays. The reported relapse of Mr. Harriman Sunday night caused a weak and wide opening Tuesday, the Harriman stocks showing the greatest decline. Opinion is quite divided as to the immediate future of the market. The bears are making the most of Mr. Harriman's illness to depress prices. Those who favor higher prices are strengthening their position by statements referring to the complete harmony now existing among our largest financiers. The report is being circulated that Morgan is to acquire control of all Harriman securities and protect them in case the railroad magnate continues in ill health.

Conservative investors here trimmed sales, figuring that after a two years' advance in stock prices, much of the good things to come in a business way have been discounted. It is reasonably certain that our corn and wheat crops will be about average. The cotton-crop condition is now the worst ever recorded.

Because of the present high average of prices, and because of the strain on capital during the crop-moving period, there is reason for thinking an immediate advance is improbable. In summing up it may be said that at no time in the past two years have market experts been more on the fence. Common advices at present encourage a neutral attitude. The New York Curb market this week has been irregular. Its action has continued largely in sympathy with that of the New York Stock Exchange.

Boston, Sept. 7—The features in this market the past week were the strength and activity of the so-called Calumet & Hecla stocks, or those affiliated with these interests. Centennial spurted from $38.75 to $44.50, and has held the advance. Allouez rose over $7.50 to above $55, losing to $53. In the former case the addition of two stamps to its mill will give it enlarged earning power. The floating stock of both of these companies is not large, which makes it easy to mark the price up. Superior Copper and La Salle both had active periods, although the advances were of less importance. The former touched $61.

... the ... Lake Copper has dropped from sight as a market leader, although fluctuations are rather extreme at times. Its range has been from $27 to $32, with the ... $35. Isle Royale ... $2.25 to $26.75, but lost the advance ... the stock. North Butte held ... strong, and has not varied much over $1 during the week.

The increase in the Calumet & Hecla dividend from $6 to $8 for the quarter was almost entirely unexpected, and stimulated the market for a spell, but the course of the New York market and the continued depression of the metal counteracted this influence. Atlantic has had a $2 advance to $12.25, and the buying was mainly by two brokers who recently visited the Lake Superior district. Michigan is selling at $10.50 with the $2 assessment paid.

U. S. Coal and Oil has had a $6 decline to $32 lately on offerings of the late R. D. Evans, but it is now believed that the line has been liquidated. It has recovered to above $33. There has been comparatively little doing in Amalgamated, and the price is slightly below a week back at $83. Mass showed some activity up to $9.25 on reports that a second mill run would be made shortly. U. S. Smelting has been an active feature at from $56 to $57. Curb trading has been characterized by a few active features. National Exploration had a 12c. advance to 70c. Champion ran off to 10c., recovering to 16c. H. M. Whitney's Rhode Island Coal took a start late last week and rose $2 to $12.

STOCK QUOTATIONS

NEW YORK Sept. 8

Name of Comp.	Clg.
Alaska Mine	‡.11
Amalgamated	83
Anaconda	47⅜
Balaklala	‡2[illegible]
British Col. Cop.	6⅜
Buffalo Mines	‡3½
Butte Coalition	25⅛
Colonial Silver	‡[illegible]
Cum. Ely Mining	7[illegible]
Davis Daly	6[illegible]
Dominion Cop.	‡7
Douglas Copper	‡1¾
El Rayo	2¾
Florence	‡3[illegible]
Foster Cobalt	‡.32
Furnace Creek	‡.05
Giroux	9⅜
Gold Hi.	‡½
Goldfield Con.	6[illegible]
Granby	‡101
Greene Gold	‡½
Greenwater & S.	‡9
Guanajuato	1⅛
Guggen. Exp.	216[illegible]
Hanapah	‡15
Kerr Lake	8[illegible]
McKinley Dar.	[illegible]
Miami Copper	19[illegible]
Micmac	[illegible]
Mines Co. of Am.	[illegible]
Montezuma	[illegible]
Mont. Sho. C.	2¼
Nev. Utah M. & S.	1[illegible]
Newhouse M. & S.	[illegible]
Nipissing Mines	10¾
Old Hundred	[illegible]
Silver Queen	[illegible]
Stewart	[illegible]
Tennessee Copp.	‡35
Tri-Bullion	[illegible]
United Copper	10[illegible]
Utah Apex	‡4[illegible]
Utah Copper	4[illegible]
Yukon Gold	[illegible]

‡Last quotation.

BOSTON Sept. 8

Name of Comp.	Clg.
Adventure	7
Allouez	53¾
Am. Zinc	‡31¼
Arcadian	4½
Arizona Com.	43½
Atlantic	11¾
Boston Con.	14¼
Calumet & Ariz.	105¼
Calumet & Hecla	680
Centennial	43½
Copper Range	81½
Daly West	9
East Butte	11¾
Franklin	16½
Greene-Can.	9½
Hancock	[illegible]
Isle Royal	26¾
Keweenaw	3½
La Salle	15[illegible]
Mass.	9
Michigan	10[illegible]
Mohawk	64
Nevada	24¼
North Butte	60½
Old Colony	[illegible]
Old Dominion	56¾
Osceola	146
Parrot	33¾
Quincy	90
Rhode Island	‡4¼
Shannon	16½
Superior	58½
Superior & Bost.	16
Superior & Pitts	16¼
Tamarack	‡65
Trinity	12¼
U. S. Smg & Ref.	56⅞
U. S. Sm. & Re. pd.	52
Utah Con.	45¾
Victoria	[illegible]
Winona	6
Wolverine	155
Wyandotte	[illegible]

‡Last quotation.

N. Y. INDUSTRIAL

Am. Agri. Chem.	46¼
Am. Steel F. & Ref.	98[illegible]
Am. Sm. & Ref. pf.	114
Colo. Fuel & Iron	43⅝
Federal M. & S. pf.	‡91½
National Lead	90¼
National Lead, pf.	‡112
Pittsburg Coal	21¾
Republic I. & S.	38[illegible]
Republic I. & S. pf.	105¼
Sloss-Sheffield	85
Standard Oil	‡685
U. S. Steel	78⅝
U. S. Steel, pf.	126
Va. Car. Chem.	47¼

BOSTON CURB	Low
Ahmeek	215
Chemung	15¼
Chino	7⅝
Globe Con.	4½
Gila	9½
Mason Valley	2
Ray Central	2[illegible]
Ray Con.	19
San Antonio	8½
Yuma	2¾

Furnished by Hornblower & Weeks, N. Y.

ST. LOUIS Sept. 4

N. of Com.	High.	Low.
Adams	.40	.30
Am. Nettie	.09	.07
Center Cr'k	2.00	1.75
Cent. C. & C.	85.00	83.00
C.C. & C. pf.	83.00	82.00
Cent. Oil	115.00	100.00
Columbia	9.00	7.00
Con. Coal	20.00	19.00
Doe Run	115.00	105.00
Gra. Bimet.	.27	.23
St. Joe	12.50	11.50

LONDON Sept. 8

Name of Com.	Clg.		
Dolores	£1	5s	0d
Stratton's Ind.	0	3	3
Camp Bird	1	9	0
Esperanza	3	1	3
Tomboy	1	1	3
El Oro	1	5	6
Oroville	1	2	6

Cabled through Wm. P. Bonbright & Co., N. Y.

NEVADA STOCKS Sept. 8.
Furnished by Weir Bros. & Co., New York

Name of Comp.	Clg.
COMSTOCK STOCKS	
Belcher	.91
Best & Belcher	.61
Caledonia	.35
Chollar	.26
Comstock	.28
Con. Cal. & Va.	1.42
Crown Point	1.20
Exchequer	.33
Gould & Curry	.27
Hale & Norcross	.43
Mexican	1.27
Ophir	1.30
Overman	.46
Potosi	.58
Savage	.52
Sierra Nevada	.50
Union	.54
Utah	.09
Yellow Jacket	1.27
TONOPAH STOCKS	
Belmont	.80
Extension	.60
Golden Anchor	...
Jim Butler	.14
MacNamara	.30
Midway	.20
Montana	.99
North Star	.02
Tono'h Mine of N.	6.75
West End Con.	.28
GOLDFI'D STOCKS	
Adams	.01
Atlanta	.14
Blue Bell	.03
Booth	.12
C.O.D. Con.	.10
Columbia Mt.	.09
Comb. Frac.	.82
Con. Red Top	.
Cracker Jack	.01
Dia'dfield B. B. C.	.02
Goldfield Belmont	.04
Goldfield Daisy	.15
Great Bend	.06
Jumbo Extension	.17
Kendall	.02
Lone Star	.03
May Queen	.04
Oro	.05
Red Hill	.06
Sandstorm	.06

Name of Comp.	Clg.
Silver Pick	.14
St. Ives	.06
Triangle	.01
BULLFROG STOCKS	
Gibraltar	.02
Homestake King	..
Mont. Shoshone C.	2.12½
Tramp Cons.	.04
MISCELLANEOUS	
Cumberland Ely	7.00
Giroux	9.00
Greenwa'r Copper	.03½
Nevada Con.	24.25
Nevada Hills	.70
Navada Smelting	.87½
Nevada Wonder	.60
Nevada-Utah	1.75
Penn-Wyoming	...
Pittsburgh S. Pk.	.50
Ray Central	2.68½
Ray Con.	18.00
Round Mt. Sphinx	.05

COLO. SPRINGS Sept. 3

Name of Comp.	Clg.
Acacia	.08⅜
C. C. Con.	‡.03⅛
Dante	‡.07
Doctor	.10
Elkton	.75
El Paso	.67
Findlay	.11
Gold Dollar	.13⅛
Gold Sovereign	.04⅝
Isabella	.22¾
Jack Pot	‡.08½
Jennie Sample	.08
Jerry Johnson	‡.06¼
Lexington	.01¾
Mary McKinney	.47
Pharmacist	.03⅜
Portland	.83¾
U. G. M.	.08⅜
Vindicator	.70¾
Work	.08

Assessments

Company.	Delinq.	Sale.	Amt.
Alta Gladstone, Utah	Sept. 15	Oct. 20	$0.00
Andes, Nev.	Sept. 14	Oct. 5	0.10
Arcadian, Mich.	Sept. 1	Sept. 31	0.50
Boulder Cr'k M. & M., Wash.	Aug. 31	Sept. 30	0.01
Brown Star, Utah	Aug. 16	Sept. 14	0.00
Copper Mt. M. & D., Ida.	Sept. 7	Oct. 4	0.003
Crown Point, Nev.	Aug. 21	Sept. 17	0.10
East Butte, Ida.	Sept. 10	Oct. 10	0.000
Exchequer, Nev.	Aug. 16	Sept. 13	0.05
Golden Winnie Tungsten, I.	Aug. 21	Sept. 15	0.001
Hancock Con., Mich.	Oct. 10		1.00
Hypotheek M. & M., Ida.	Aug. 26	Sept. 25	0.005
Laclede, Ltd., Ida.	Aug. 23	Sept. 21	0.003
Lady Washington, Nev.	Aug. 31	Sept. 20	0.05
Massasoit, Utah.	Aug. 21	Sept. 14	0.005
Mexican, Nev.	Sept. 10	Oct. 4	0.10
New Hope, Ida.	July 15	Sept. 25	0.002
Pittsburg Con., Utah	Aug. 20	Sept. 17	0.01
Springfield M. Co., Ltd., Ida.	Aug. 13	Sept. 13	0.002
West Century M. & M., Utah	Aug. 31	Sept. 17	0.01
Winona, Mich.	Sept. 14		1.00

Monthly Average Prices of Metals

SILVER

Month.	New York.		London.	
	1908.	1909.	1908.	1909.
January	55.678	51.750	25.738	23.834
February	56.000	51.472	25.855	23.706
March	55.365	50.468	25.570	23.227
April	55.505	51.428	25.133	23.708
May	52.795	52.905	24.377	24.348
June	53.663	52.538	24.760	24.166
July	53.115	51.043	24.514	23.519
August	51.683	51.125	23.858	23.588
September	51.720	......	23.877	......
October	51.431	......	23.725	......
November	49.647	......	22.933	......
December	48.766	......	22.493	......
Total	52.864	......	24.402	......

New York, cents per fine ounce; London, pence per standard ounce.

COPPER

	NEW YORK.				LONDON.	
	Electrolytic		Lake.			
	1908.	1909.	1908.	1909.	1908.	1909.
January	13.726	13.893	13.901	14.280	62.386	57.688
February	12.905	12.949	13.098	13.295	58.786	61.198
March	12.704	12.387	12.875	12.826	58.761	56.231
April	12.743	12.56¼	12.928	12.93¾	58.331	57.363
May	12.598	12.893	12.788	13.238	57.387	59.338
June	12.675	13.214	12.877	13.548	57.842	59.627
July	12.702	12.880	12.933	13.363	57.989	58.556
August	13.462	13.007	13.639	13.296	60.500	59.393
September	13.388	......	13.600	......	60.338	......
October	13.354	......	13.646	......	60.139	......
November	14.130	......	14.386	......	63.417	......
December	14.111	......	14.411	......	62.943	......
Year	13.208	......	13.424	......	[illegible]	......

New York, cents per pound. Electrolytic is for cakes, ingots or wirebars. London, pounds sterling, per long ton, standard copper.

TIN AT NEW YORK

Month.	1908.	1909.	Month.	1908.	1909.
January	27.380	28.060	July	29.207	29.125
February	28.978	28.290	August	29.942	29.966
March	30.577	28.727	September	28.815	......
April	31.702	29.445	October	29.444	......
May	30.015	29.225	November	30.348	......
June	28.024	29.322	December	29.154	......
			Av. Year	29.465	......

Prices are in cents per pound.

LEAD

Month.	New York.		St. Louis	London.	
	1908.	1909.	1909.	1908.	[illegible]
January	3.691	4.175	4.025	14.469	13.118
February	3.725	4.018	3.868	14.250	13.313
March	3.838	3.986	3.835	13.975	13.438
April	3.993	4.168	4.051	13.469	13.297
May	4.253	4.287	4.214	12.938	13.225
June	4.466	4.350	4.291	12.600	13.031
July	4.744	4.321	4.188	13.000	12.563
August	4.580	4.363	4.227	13.375	12.475
September	4.515	......	......	13.125	......
October	4.351	......	......	13.375	......
November	4.330	......	......	13.538	......
December	4.213	......	......	13.156	......
Year	4.200	......	......	13.439	......

New York and St. Louis, cents per pound. London, pounds sterling per long ton.

SPELTER

Month.	New York		St. Louis.		London.	
	1908.	1909.	1908.	1909.	1908.	1909.
January	4.513	5.141	4.363	4.991	20.563	21.425
February	4.788	4.889	4.638	4.739	20.875	21.563
March	4.665	4.757	4.527	4.607	21.075	21.438
April	4.645	4.965	4.495	4.815	21.344	21.531
May	4.608	5.124	4.458	4.974	19.906	21.975
June	4.543	5.402	4.393	5.252	19.000	22.000
July	4.485	5.402	4.338	5.252	19.031	21.969
August	4.702	5.729	4.556	5.579	19.350	22.125
September	4.769	......	4.619	......	19.563	......
October	4.801	......	4.651	......	19.750	......
November	5.059	......	4.909	......	20.875	......
December	5.137	......	4.987	......	20.625	......
Year	4.726	......	4.578	......	20.163	......

New York and St. Louis, cents per pound. London, pounds sterling per long ton.

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Notes on the Pioche Mining District, Nevada

Operations in the Past Were Generally Unsuccessful Owing to High Cost of Treating the Ores. Renewed Activity Expected

BY S. F. SHAW*

The historic mining town of Pioche is situated in the Ely Mining district, Lincoln county, Nev. It is the county seat and has a population at present of about 1500. The surrounding camps will probably swell this to 2000.

The locust trees lining the streets give the town a rather pleasant appearance. The climate in summer is not uncomfortable and the winter months are not severe, although there are frequent snow-falls. The elevation of Pioche proper is about 5800, while the adjacent hills rise 600 ft. above the town.

There is no timber worth mention, the only growth being a species of scrub pine. The water supply for the town and mines is piped from springs in the Highland range, about 7 miles to the southwest. The town lies in the Pioche mountains, a range extending in a southeast-northwest direction about 15 miles with an average width of 1 mile, lying between Duck valley on the north and Meadow valley on the south. Mt. Ely is the highest point, reaching an elevation of about 7150 ft. To the northwest lies the Ely range, to the southwest the Highland range, and to the northeast and southeast lie respectively the Cedar and Mormon ranges.

MINES ON EAST END OF MEADOW VALLEY VEIN

140 Miles from Railroad Till 1905

Until 1905 the nearest railroad station was Milford, Utah, 140 miles distant. In that year the Salt Lake road was extended through Caliente, about 28 miles distant, and in 1906 a branch of this road was built north from Caliente to Pioche, placing it 352 miles by rail from Salt Lake City and 485 miles from Los Angeles.

The earliest recorded discovery of mineral was made in 1862 by soldiers under General Conner. In 1863 ore was found by some Mormons, and in 1864 several claims were staked off. It was not until 1868, however, that any important work was done. In that year F. L. A. Pioche employed Charles E. Hoffman to purchase some claims which formed the basis of the Meadow Valley Mining Company, soon afterward organized. Other claims were soon acquired and added to the holdings of the company, giving it a length of about 2500 ft. along the principal vein.

Soon afterward Wm. H. Raymond and John H. Ely entered the camp and organized the Raymond & Ely Mining Company which became the most important producer of the district.

Ores Milled on the Ground

Owing to the remoteness of the district, it became necessary to treat a large part

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of the ore on the ground. Raymond and Ely first installed a second-hand 5-stamp mill at Bullionville, near Panaca, and treated the crushed ore by amalgamation in pans and settlers. These stamps weighed 750 lb. per head and treated a total of 25 tons daily at a cost of $30 per ton, netting a profit of $90 per ton. Three large mills were built at Bullionville.

In 1872 a narrow-gage railroad was built to Bullionville reducing greatly the cost of transportation. About the same time the Meadow Valley company erected a 20-stamp mill at Dry Valley, about 10 miles east of Pioche, introducing the Washoe process then in use on the Comstock lode. The erection of other stamp mills followed.

Other processes besides amalgamation were also tried at later dates. Lixiviation was employed to some extent. At Bristol, about 20 miles northwest, a smeltery was built to treat the ores of that camp. All of these operations meant much to the district and the population of Pioche approached the 10,000 mark.

Renewed Activity Expected

In 1875-76 as depth was reached, the ores became impoverished. In the Meadow Valley shaft No. 3 water was struck at a depth of 1314 ft. on the incline, and the pumping problem became a serious one as further depth was attempted. In 1876 the failure of the Bank of California shut off all funds for further development work and the prospected mines immediately [illegible] operations.

In 1879 work was resumed, a narrow-gage railroad to Lockhart was built, a smelter erected and Pioche once more became the center of an important mining region. However, the quick dates did not meet with the anticipated results, and with the decline in the price of silver in 1884 it again took on the appearance of a deserted camp.

In 1892 [illegible] became interested in the camp and developed at Jack Rabbit and [illegible] on the south side of the town, is giving encouraging results. A railroad from Pioche to the south side is projected, and some rumors are heard of a smeltery to be built soon.

Production, Past and Present

The gross production of the properties in the district has been variously estimated at from $16,000,000 to $40,000,000. Probably $25,000,000 would cover the total production to the present time of those properties situated in Pioche and the immediate neighborhood. The mines along the porphyry dike are said to have yielded about $5,000,000, although no reliable figures touching on the distribution of this production are at hand. In the *Sch. Mines Quar.*, July, 1906, tables are given by Prof. Fred J. Pack, which were taken from the Daily Stock Report Assessment List, San Francisco, Jan. 7, 1876. From these tables it is seen that only two companies had, until 1876, paid an excess of dividends over the amount of assessments levied, and this amount, $2,475,000, is about 18 per cent. of the the gross production of these two companies. The total production until 1876 was $15,485,500. Dividends amounting to $4,385,000 had been paid, and $5,482,000 assessments levied.

During the early years of the camp the cost of mining and milling was high and the extraction low, hence it is not to be assumed that the same grade of ore, or for that matter a much lower grade, would not now yield a profit. An accompanying table, also given by Professor Pack, will show the high costs that prevailed in 1875-1876.

In 1875 the average yield of the Raymond & Ely ores was $52.36 at a cost of $45.10 for extraction, treatment, etc.

At the present time the Nevada-Utah Mines and Smelter Corporation is shipping about 150 tons of low-grade fluxing ore from Jackrabbit, averaging about $10 per ton. The Prince, on the south side, and the Meadow, about 6 miles southwest of town, are also making small shipments. The Prince is prepared to ship a largely increased tonnage as soon as the railroad is extended to that side of the range.

Geology

The Pioche mountains consist of an anticlinal fold with its axis extending from east to west, the strata of which consist of an underlying layer of Cambrian quartzite covered by a layer of shale about 400 ft. thick, which, in turn, is overlaid by a layer of limestone about 1400 ft. in thickness. A thin layer of shale of varying thickness is also noted in the limestone. The thickness of the quartzite is unknown, but it cannot be less than 1500 ft., as the Raymond & Ely shaft penetrates it for that distance.

Just south of the town the quartzite has been thrust up between two parallel faults, bringing it into juxtaposition with the shale on the north and south. It towers several hundred feet above the shale which dips away to the southwest from the central quartzite core at an angle of about 35 deg. It is in this upthrust block of quartzite that the Raymond & Ely-Meadow Valley vein, containing the rich orebodies, was first discovered.

WEST END OF MEADOW VALLEY VEIN

PIOCHE KING MINE

Dikes an Important Feature

After the faulting which raised the quartzite to its present position took place, there followed an intrusion of a quartz-rhyolite dike averaging about 75 ft. in thickness. This dike, generally known as the Yuba, strikes approximately magnetic east and west, cutting through all the sedimentary strata and dipping about 80 deg. to the south. In the neighborhood of the Yuba East mine this dike splits, one branch extending in a southeasterly direction, the other disappearing from sight. At the Alps mine, about 1 mile east, a porphyry dike is cut in the lower workings, and, as the shaft is in line with the northeast branch of the dike, this is supposed to be its continuation.

In a westerly direction it continues

through the Yuba East, Yuba, Currency and Mazeppa, and then splits again. One branch comes up through the shale and lime and runs lengthwise through the Alberta claim of the Ohio Kentucky company. The other continues westerly through the Raymond & Ely ground constituting the Independent vein (owned jointly by the Nevada-Utah and Ohio Kentucky companies). This latter fork is found only in the quartzite, not coming to surface through the shale and lime.

A dike of the same character is encountered in the Abe Lincoln tunnel about 2 miles southwest, and in the West Yuba and Fargo claims in the lower divide about 4 miles west of Pioche. There are also outcrops of an igneous nature at intervals both on this and on the other side of Stampede gap, and, as they are all said to line up with the Yuba dike, they are thought to be along the same intrusion.

In nearly all of the outcrops the component minerals of the dike are much decomposed with the exception of the original quartz crystals, which remain unaltered. The decomposition is also found to extend to the deepest workings. However, undecomposed material is encountered in the Abe Lincoln tunnel, and on the 800-ft. level of the Yuba East fresh specimens of a reddish appearance and showing large quartz phenocrysts have been taken out.

In some of the Yuba East workings the decomposed dike material is found to have minute pyrite crystals disseminated through it. In this mine the dike is broken up into an extensive series of transverse fractures which, from observations so far made, could be explained by contraction fractures formed during the cooling of the intrusion. On both walls of the dike movement has taken place, leaving behind a clayey gouge parting between the dike and the quartzite.

Fissures in the Quartzite

The quartzite is broken up into blocks by a series of fissures and cross-fractures. The Raymond & Ely-Meadow Valley ore deposits were found in the largest of these fissures so far discovered. This vein strikes east and west and dips about 70 deg. to the south, and maintains an average width of 2 to 4 ft., narrowing down in places to a mere seam, and widening out in others to 9 or 10 feet.

This vein, being less inclined than the Yuba dike, approaches it in depth, and if the same inclination were maintained throughout would meet the dike at a depth of about 1500 ft. The strike also being different causes the vein to intersect the dike west of the Lightner shaft.

The vein can be traced from its approximate intersection with the dike for a distance of 1300 ft. to the east where it divides into two branches at an angle of about 20 deg. to each other. The northeast branch extends about 1000 ft. to the Pioche shaft, a short distance beyond which it again branches and breaks up. The southeast branch continues beyond the Burke shaft, where it soon loses it identity.

The sequence of events as given by Professor Pack is as follows: (1) Anticlinal movement and shearing; (2) deposition of the bedded deposits; (3) breaking down of the anticlinal fold; (4) intrusion of the Yuba dike; (5) deposition of fissure veins and deposition on the dike contact; (6) minor cross-fissuring.

The Mines on the Quartzite Fissure.

Along the quartzite fissure the principal mines are the Hermes, Raymond & Ely, Meadow Valley No. 3, Meadow Valley No. 5 and Pioche. Also the Washington and Creole and Burke shafts which are located on the southeast branch of this fissure.

The Lightner shaft of the Raymond & Ely mine was started in the shale, and, on sinking a distance of about 100 ft., struck the large Raymond-Ely "bonanza" out of which the greater part of the ore was extracted. This body was about 400 ft. long at the 5th level, was almost continuous from the surface to the 8th level and varied in width from 1 to 4 ft. Below the 8th level the grade of ore deteriorated. At a depth of 1214 ft. the Lightner shaft encountered the water level and was compelled to install a 10-in. Cornish pump in order to reach greater depth. This level was extended west about 2100 ft., and at a point about 1400 ft. west of the shaft a winze 300 ft. in depth was sunk on the "black ledge," opening up a large body of lead and zinc sulphides. This vein is the westerly continuation of the north branch of the Yuba porphyry dike, the best streak being found on the north contact of the porphyry and quartzite.

The Meadow Valley No. 3 was sunk 1314 ft. on the incline before the water level was reached and was then continued to 1375 ft., at which point sinking operations were discontinued on account of the shutting down of the Raymond & Ely pumps which had previously drained the Meadow Valley. Considerable low-grade ore was encountered below the water level, the grade seeming to increase with depth.

The Burke mine was the first located and its vein was followed from the surface to a depth of about 300 ft. The vein in nearly all of the mines continued strong at depth but the orebodies became too greatly impoverished to work. Shafts were also sunk on cross-fissures extending between the main fissure and the dike, among the principal ones being the Williams, Desdemona, Huhn & Hunt, Chapman, and Arkansas.

Mines on the Dike.

The principal mines along the Yuba dike are the Newark, Mazeppa, Currency, Yuba, Yuba East, and Alps. The Williams mine, mentioned as being on a cross-fissure, contains the south branch of this dike. The ores occur on both hanging- and footwalls of the dike, and also along what is known as the "middle vein," which is really a set of fractures paralleling the strike and lying wholly within the dike.

The Yuba mine workings reach a depth of 1300 ft. and consist of about 2700 ft. of shafts and raises, and 7500 ft. of drifts, making a total of about 10,200 ft. The ore extracted from this mine is said to have approximated $1,000,000.

In the Yuba East, immediately adjoining the Yuba on the east and connected with it by a drift on the 100-ft. level, about 1400 ft. of shafts and raises and 3500 ft. of drifts have been made. The depth of the shaft on the incline is 840 feet.

Mines on the Bedded Deposits.

The principal mines working on the bedded deposits are the Prince, Mendha, Abe Lincoln-Half Moon, Point and Ely Valley properties. The Pioche King, Golden Prince, Gold and Silver Prince and Demijohn are also properties exploiting these bedded deposits.

The Prince mine is about 3 miles south of Pioche on the Meadow Valley side of the Pioche range. The shaft has reached a depth of about 600 ft. on an incline of about 65 deg., and about 6000 ft. of drifting, crosscutting and raising has been done, opening up the beds and veins in a systematic manner for a distance of 600 ft. on both the north and south sides of the shaft. The entire workings are in shale and limestone, the beds of which strike about north and south and dip about 15 deg. to the east.

Here the bedded ore deposits replacing the lime were dislocated by a series of fractures into a system of step faults. This faulting was followed by a system of faulting producing a set of vertical fissures, two of which have been explored,

COST PER TON FOR MINING.

Year.	Company.	Extracting.	Prospecting and Deadwork.	Incidentals.	Total.
1871	Meadow Valley.	$14.20	$5 71	$4 59	$24 50
1872	Meadow Valley.				38 55
1872	Raymond & Ely				14 45
1873	Raymond & Ely	13.67	12 19	5 97	31 83
1874	Raymond & Ely	23.06	50.06	6.13	79.25
1874	Meadow Valley.	22.19	48 87		71 06
1875	Raymond & Ely..	14.78	20.18	10 14	45.10

crossing the bed faults at an angle and breaking them up into a regular system of fault blocks. A series of cross-fractures can also be distinguished running between the two vertical fissures. The bedding planes, vertical fissures and cross-fractures all make ore composed of galena, anglesite, and cerussite, rich in silver and carrying some gold.

The shaft was first started on an immense body of low-grade manganiferous ore containing about 6 per cent. lead and 6 oz. silver. As depth was reached this body was found to run into and follow the bedded deposits. The vertical fissures were first discovered on the third level, and when followed upward were found to apex in the large body of manganese ore previously mentioned.

The Abe Lincoln-Half Moon workings are also on a bedded vein which lies between the shale and the limestone. The mineralized part is about 12 in. thick. The Yuba dike was encountered in these workings. At the Mendha mine a system of block faulting quite similar to that of the Prince mine is seen, with the bedded ore deposits occurring along the fault planes. The ores of this property contain more gold than is usual in the ores of the other mines.

Treatment of the Ores.

The first attempt in 1871 to treat these ores, then consisting for the most part of silver chloride and sulphide associated with low percentages of lead sulphate and carbonate, was by smelting. Owing to the low lead content the attempt was not a success. Later stamping, followed by amalgamation in pans and settlers, was tried, and on some of the ores gave as high as 60 per cent. extraction, while on other it fell below 40 per cent. The Washoe process was then employed wherein salt and copper sulphate were added to the pulp in the pans, and the extraction rose to 80 per cent. The amalgam so obtained contained a considerable quantity of lead which was separated by first straining through a sack in hot water, the lead passing through with the mercury. The mercury was then retorted from both the products and the lead and silver thus recovered separately. Lixiviation with "hypo" was also tried with more or less success.

At the Half Moon mine a small crushing plant was put in to handle about 50 tons per day. The product was run over tables and the tailings treated in cyanide vats. The extraction was low and the cost of treatment high, but the reason for this is apparent to one comparing this old plant with the cyanide mills of the present day. In 1899 the new smelter built below Peach was successful in treating the ores then mined, which contained more lead than formerly. These ores came largely from the Yuba dike and from the mines at Lockeddit.

At the present time the ore developed consists principally of lead carbonates, sulphates and sulphide, carrying gold and silver. This ore is adapted only to treatment by smelting. Large bodies of ore, low in lead and silver, but containing an excess of iron and lime, have been developed and will provide the flux for handling the higher-grade and more silicious ores. As depth is reached it is quite probable that the ores will run into lead and zinc sulphide.

Wet concentration tests, obtaining a commercial degree of extraction, have yielded lead and zinc products which are said to have been of good grade.

I am indebted to E. L. Godbe for supplying some of the data herein used.

Practical Working of the Stamp Mill

By Algernon Del Mar*

The number of tons of ore crushed by a stamp mill in a given time depends upon the weight of the stamps, the hight of drop, number of drops per minute, hight of screen discharge, size and character of screen openings, the width of mortar at the discharge, the character of the mortar foundations, condition of wearing surfaces of shoes and dies and the number of hours the mill is at work. The last factor will be the subject here treated.

We see in a certain report that the mill has run 93.8 per cent. of the time. If we allow 25 min. a day for two brushings and 1½ hours per battery once a month for clean-ups, this will consume for a 100-stamp mill about 1400 stamp hours per month, or say 2 per cent. of the time, leaving 4.2 per cent. for repairs (3042 stamp hours), an average of four stamps hung up all the time. The idleness of these stamps entails losses besides that in crushing time from expenditures for repairs and wages for at least four men, unless the loss of time is due to causes outside of the mill proper. With a stamp mill as with other classes of work all necessary repairs should be well made. The time lost in doing a good job will in any case be repaid in the gain in running time.

A mill to attain its maximum capacity should be at work all the time except, of course, such time as is actually necessary for keeping the plates in condition for catching the precious metals, for the regular clean up and for changing shoes about once every six months. This last item does not consume more than 15 min per stamp twice a year and so is hardly appreciable. The dies need only be changed on clean-up days and it takes no more extra time than setting the tappets. There are many stoppages due to defects in construction and operation which may be lessened by careful and knowing management. Much loss of time is often occasioned by not having duplicate parts handy and by carelessness in making repairs.

Important Details of Construction

Our mills of late years have gained in capacity as well as in running time on account of the greater weight of the stamps used, higher speed, better materials used in construction and improvements in the style of the several parts. There has been a retrogression in the adoption of iron guides of the usual individual cap type. These guides have made repairs more frequent because the stems working in the guides wear so that they become too small for the tappets to be set without shimming and excessive hammering, which destroys the tappet gibs besides wearing the patience of the millman. The play in the guides is often so great that shoes and bosses hit or the shoes wear unevenly on the dies.

It might be argued that worn guides should be immediately changed for new ones, but as a rule they are not and the millman must put up with them and the consequent breakages. Wooden guides are preferable to iron ones and wear for years if properly taken care of. When sectionalized they have given trouble and when in one piece (the cap) they cause loss of time in changing stems or tappets, for the whole battery must be hung up. However, there is no reason why sectional wooden guides fitting in a cast-iron frame should not be satisfactory. The Angelo Camp individual sectional guides are a very good type of iron guides. No bolts are used except for bolting the frame to the guide timbers, and the wearing parts are so inexpensive that there is no excuse for having loose guides. The stem works in a cylindrical casting about ½ in. thick, which castings may be split in two for the lower guides or for a burred (broken) stem in the upper guides. The cylinders fit in a truncated cone-shaped receptacle in the frame so that the cylinders are kept in place by gravity and the vibration of the battery frame. To change a stem or tappet the cylinders are forced up and the stem may then be taken out.

Feeders seldom cause loss of time. The expense and trouble due to pawl springs, as well as the time lost over a broken stem caused by a feeder not working and the battery running dry, may be obviated by the use of the Knight wheel in place of the usual friction wheel with pawls. This wheel is worked on the leverage system and gives a more constant and

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even feed than the pawl wheels besides causing no trouble or expense.

A mill may lose time from a variety of causes, such as tappets slipping, bull-wheels coming off, cam shaft collars loosening, cams breaking, cam shafts breaking, stems breaking, bosses or shoes coming off, dies becoming misplaced, changing of shoes and dies, breaking of bosses and shoes, changing of screens and other causes due to the personnel of the mill force. The use of self-tightening cams has reduced this cause to a neglectable quantity and when the same idea is generally applied to the bull wheel the trouble caused by loose bull wheels will end.

Tappets, Bosses and Shoes

Tappets slip usually from the stem having worn too small for the gibs to hold. A tappet that does not fit close to the stem binds only on two surfaces, that of the gib and that on a line opposite the center of the gib. Patents have been taken out for tappets with holes bored in other shapes than round in order to give more than two bearing surfaces, but there is no reason for this as with a keyway opposite the gib for the insertion of a key or shim that would fit the stem and jam it against the gib, the keys would hold the gib firmly.

To set a tappet on a worn stem an iron shim must be driven between the stem and the tappet opposite to the gib and the keys driven in with a heavy hammer. This will, no doubt, in a very short time break or otherwise damage the gib, when the tappet must be taken off and replaced. The battery need not be hung up for this purpose. The remedy is a new stem but few mills can afford this luxury. The cause in the first place was probably the iron-cap guide. Some millmen shift the tappets by allowing the cams to do the work instead of driving out the tappet keys and using the chain-blocks. The time saved is a doubtful economy, for the gib wears into the stem and after a few settings the time taken to loosen the gib may more than offset that required to drive the keys in the first place, with no injury to the stem or gib.

Cam shaft collars loosen by the vibration of the cam shaft; the remedy is to line up the cam shaft, thus reducing vibration to a minimum, and not to have the set screws too deep in the shaft or big holes will wear out as soon as the collars loosen. It might be well to have a split collar bolted on like the feed collar, but with two set screws to replace that next the bull wheel, to replace which, in the ordinary way, would mean stripping the shaft of cams.

Steel cams seldom break, the only cause being from a loose tappet pounding on the horns of the cam. The millman should at once set such a tappet. Cam-shafts some times crystallize and break. This is due to vibrations caused by inattention to keeping the shaft lined up, but even if this is carefully attended to, crystallization will often take place even in a 6-in. shaft. Every mill should have an extra shaft available to replace a broken one.

Breakage of Stems

Stems, too, break from crystallization or change of molecular structure due to vibrations caused by pounding on the dies and the lift of the tappet. The breaking seldom occurs but at the two nodes where the stem enters the boss and where it enters the tappet. The uneven wear of shoes and dies, the play in the guides causing blows at an angle to the line of drop and the introduction into the mortar of mine or mill tools, may cause a broken stem. Broken stems should be annealed before being again used to correct any crystallization remaining near the new end. When a battery is hung up, if the stamp that dropped last is allowed to drop first when starting, the jar due to the shoe striking the die may cause a broken stem. It is therefore best to hang up the feed stem first and drop it first. This throws the ore under the feed when hanging up and acts as a cushion on starting.

The quickest way to change a stem is to take off the guide caps and turn it over if the tappet is good on both ends. If the stem is broken on the top end, the tappet must be taken off, put on another stem and this replaced and caps bolted on. The two batteries need be idle only when hoisting out and replacing the stem, so far as this portion of the work is concerned. The battery is hung up, the boss taken out of mortar, shoe forced off and wedged into the extra boss. The boss with shoe on it is then returned to the mortar, the tappet approximately set, the stem stuck in the boss, the shoe pounded on and the battery is ready. The tappet may be set at its proper place at any time. With two men this may be done in half an hour, but if the broken stem must be wedged out of the boss before starting the battery, it may take an hour or more. With the extra boss the broken stem may be forced out at leisure.

Bosses come off because the drop is either too high for the speed, causing "camming," or too low for the style of cam, causing a series of blows which may force the stem out of the boss. If there is too much play in the guides so that the bosses strike, the stem may come out. It may be that the stem has not been turned to fit the boss, in which case it must be carefully shimmed. Some prefer putting on bosses with iron shims but if the stems fit well canvas is to be preferred. Steel bosses are better in every way than the usual ones of cast iron. They do not break so easily and the holes for shoes and stems wear much better.

Shoes come off from too much play in the guides, too much ore in the mortars or from the pounding of the shoe on the die. The fault is generally a personal one. If the shoe is difficult to "stick," roughen the shank with a chisel and use only hard-wood wedges. Dies when worn down to near the discarding point often become misplaced. When the dies were replaced at the previous cleanup they should have been carefully wedged in place.

Treatment of Millmen

Some of the time lost, due to carelessness on the part of the millman, should indirectly be charged to the inconsideration of the management. Miners generally have a change room with hot water and a place to hang wet clothing, but millmen seldom have this luxury. In the coldest weather a stove may be provided, in some far corner of the mill, so who is to blame the millman if the call of nature for warmth is more potent than the call of duty. The 12-hour shift, which has been practically discarded in the West, was also an injustice and the cause of much negligence. Those who have tried 12 hours' work day in and day out without a day off even at Christmas, know how worked out and ambitionless a man becomes. The night shift becomes a drag of the worse description, a fight between sleep and duty. In order to obtain the best results millmen should be treated with consideration and be well taken care of.

Great activity is being shown in the new Coleraine district, Minn., where the Oliver company is opening three mines. At the Canisteo, at Coleraine, the first trainload of iron ore taken out was shipped July 27. At Taconite, about two miles northeast, the first load of ore was shipped May 17 from the Holman mine. An area of ground over one mile long and several hundred yards wide is now being stripped by shovel, preparatory to taking out ore later in the season. At this place a concrete shaft is also being sunk, but this one is to be used as a pumping shaft to drain the large open pit. A drift will be run from the bottom of the shaft under the pit and the mine drained in this way. A large amount of the ore in the Coleraine district is low grade, being mixed with a high percentage of sand. In order to use a portion of this ore, it is necessary to concentrate it. A washer which will have a capacity of 500 tons per hour is now being installed for this purpose. The power house and pumping station are well under way, while only the foundation piers are in place for the mill.

Silver-Lead Mines of Bawdwin, Shan States

Mines Probably Worked 1000 Years Ago, but First Authentic Record Indicates That Work Began in 1412 A. D. Ancient Chinese Methods

BY T. D. LA TOUCHE * AND J. C. BROWN †

By T. D. La Touche

The existence of rich ores of silver and lead in the northern Shan States has been known for many years. In the accounts of the various missions to the Court of Ava, from that of Michael Symes, in the year 1795, to that of Sir A. Phayre, who was accompanied by Dr. T. Oldham, superintendent of the Geological Survey, in 1855, reference is made to these mines.

A very high antiquity has been ascribed to the Bawdwin mines. C. H. Henniker[1] says that work probably commenced there over 1000 years ago, but gives no authority for the statement. The first authentic record of the mines is found in an inscription, discovered at Bawdwin and translated for Mr. Maclaren, late specialist, Geological Survey of India, by Taw Sein Ko, the Government archæologist, Burma. According to this inscription, work was commenced at Bawdwin by the Chinese in the ninth year of the Emperor Ch'ingtsou (Yonglo) of the Ming dynasty. This date would correspond to 1412 A. D.[2] The first mention of the mines to be found in a European work is by Symes in 1795, who calls the place Badouem, and says that it is six days' journey from Bamoo (Bhamo) near the frontiers of China.[3] Crawford, in 1827, estimated the production of the mines at 960,000 ticals or £120,000 sterling annually, and was informed by two Chinese merchants, who had been to the place, that about 1000 miners were employed and that the tax paid to the King of Ava was 4800 ticals, about £600 sterling. He places the locality, which he calls Bortwang, at 12 days' journey from Bhamo, toward the Chinese frontier.[4]

At about the time of Sir A. Phayre's visit to Ava the Panthay rebellion broke out in Yunnan, and taking advantage of the unsettled state of the country, the Kachins of the northern hills began to advance southward, rendering the position of the Chinese at Bawdwin very precarious. A further cause for the decline of the industry which now took place must have been the increasing difficulty of procuring fuel and supplies and of extracting the ore as the galleries approached the level of the stream flowing through the valley, in the absence of more efficient appliances for dealing with the increasing influx of water than were possessed by the Chinese, and the mines were finally abandoned by them about the year 1868.[5]

After the departure of the Chinese the Burmese Kings, Mindun Min and Thebaw, made several attempts to work the mines, but owing to the ravages of disease and the want of metallurgical knowledge these efforts resulted in failure.

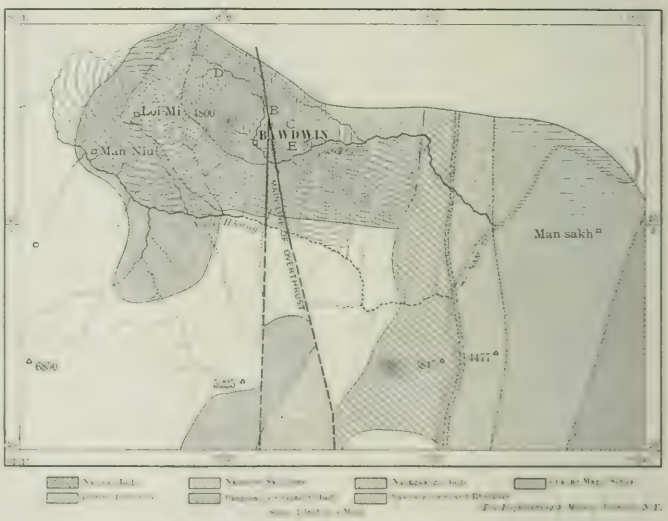

FIG. 1. SKETCH MAP OF THE BAWDWIN DISTRICT

I have been informed by C. A. Freymuth, who was one of the first Europeans to visit the mines on behalf of the syndicate formed to reopen them, that on his arrival he found a number of Kachins employed in smelting portions of the slag heaps left by the Chinese. For this purpose they picked out the richest fragments of slag, containing 50 or more per cent. of lead, and smelted them with a large excess of charcoal in the small furnaces shown in Fig. 4. The furnace was filled with the mixture of ore and charcoal, and then covered over with a heap of earth and turf. It was then lighted from below, and the metal, percolating through the mass, collected in a hollow beneath the furnace, and was ladled out into molds.

Within the last few years interest in the mines has been revived by the discovery that the Chinese worked them principally for the sake of the silver contained in the ore, and threw away the bulk of the lead in the form of slag, huge heaps of which now mark the sites of their smelting furnaces. A company has been formed with the object of collecting and smelting this slag, and has been engaged in constructing a tramway from Manlipwi, the nearest station on the Northern Shan States railway, to the site, in order to bring away the material and smelt it at some more convenient spot.

Up to the present time the company has confined its attention to the slags lying on the surface, but it should not be forgotten that, below the water level, there may still remain bodies of ore untouched by the Chinese miners, and it is to be hoped that as soon as the present scheme is in working order the ground

[1] Note.—Abstract of paper published in "Records of the Geological Survey of India," Vol. XXXVII., Part 3, 1909.

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[2] [illegible] Mining Journal, Vol. LXXIV., p. 52.

[3] J. Maclaren, M.S. Report, 1906.

[4] Symes, Embassy to Ava, p. 324.

[5] Crawford, Journal of an Embassy to the Court of Ava, pp. 427–444.

[6] I am indebted for much of the information regarding the history of the mines to Dr. J. M. Maclaren, who was the first geologist to visit the mines in 1905.

will be thoroughly prospected with modern appliances.

SITUATION AND PHYSICAL ASPECT

The mines of Bawdwin[4] are situated close to the northern border of the State of Tawng Peng, in approximate latitude 23 deg., 6 min., 45 sec., longitude 97 deg., 20 min., 30 sec., on the banks of a small stream called the Nam-pang-yun,[5] a tributary of the Nam Tu (Myitnge of the Burmese). For several miles round this spot the hills are almost entirely denuded of trees, but are thickly covered with grass.

The country for several miles to the south of the mines is quite uninhabited and covered with dense jungle, without paths, in consequence of which it was impossible to follow up the formations found to the south continuously into the Bawdwin area. Some doubt exists therefore, with regard to the exact position of some of the Bawdwin rocks.

Near the base the Silurian beds consist of coarse feldspathic grits, frequently pebbly, which are succeeded by finer sandstones as we recede from the old shore line, and finally by fine-grained sandy marls. They overlap the old Paleozoic or Ordovician beds, in such a manner that the latter are only visible at a distance from the shore line, where they happen to have been brought to the surface by subsequent earth movements. The Ordovician beds consist of shales, marls and limestones, usually rich in characteristic fossils, and known locally as the Naungkangyi beds. At the top of them, immediately beneath the Namhsim sandstones, is found a thin but persistent band of shales, the Panghsapyé graptolite band, containing graptolites of Llandovery types, resting upon a band of purple calcareous shales, which latter represent the purple Hwe Mawng beds of the ranges between the plateau and the Salween to the southeast of Lashio. The Namhsim sandstones are succeeded above by the limestone of the plateau, of Devonian or Carboniferous age, which does not extend to the west of the Nam Tu in the southern part of the area, but crosses it at the mouth of the Bawdwin river, or Nam-pang-yun.

The general sequence of rocks to the southward is the following: At a variable distance of two to five or six miles to the west of the Nam Tu, which in this part of its course runs almost due north and south through a deep gorge, is found an ancient land surface,[6] composed of slates, quartzites and grits of pre-Ordovician age, along the eastern border of which rocks of Ordovician, Silurian and Devonian age were deposited in succession. These rocks have been traced northward from the neighborhood of Hsipaw, forming a broad belt along the valley of the Nam Tu. Along the outer or western edge of this belt Silurian grits and sandstones (Namhsim beds) are found resting directly upon the upturned edges of the rocks forming the old land surface, with a very irregular boundary, deeply eroded by the tributaries of the Nam Tu.

STRUCTURAL FEATURES

The chief structural feature in this belt of rocks is a great overthrust, which has been traced almost continuously from south to north from Panghsapye to Bawdwin, a distance of about 30 miles, running parallel to the Nam Tu for the greater part of its course. Along this overthrust the Naungkangyi beds have been pushed up westward over the Namhsim sandstones, so that a broad belt of the former intervenes between two areas occupied by the sandstones, the latter to the east being found in their normal position under the Plateau limestone, and forming a precipitous scarp along the left bank of the river, with the graptolite and purple bands at its base; while to the west the sandstones dip beneath the Naungkangyi beds along the plane of the fault (see upper section, fig. 2).

The sandstones are found extending four or five miles along the gorge of the Nam-pang-yun below Bawdwin, with a regular easterly dip, until they disappear beneath the Naungkangyi shales. The overthrust passes through the feldspathic grits at Bawdwin, and there is no doubt that the mineralization of the rocks of that area is due to the intense crushing and dislocation of the rocks caused by it. In addition to the grits there are found in the immediate vicinity of Bawdwin patches of quartzitic sandstones and shales, with which is associated, some miles to the west of the mines, a band of coarse conglomerate. It is extremely difficult to make out the relations of these beds with the grits and rhyolites, but the probability is that they are outlying patches of the Namhsim sandstone series, folded or faulted down among the older rocks.

A minor line of disturbance of the same nature as the principal overthrust appears to branch off from the latter at Bawdwin and, taking a more southerly course, passes close to Manglang, to the

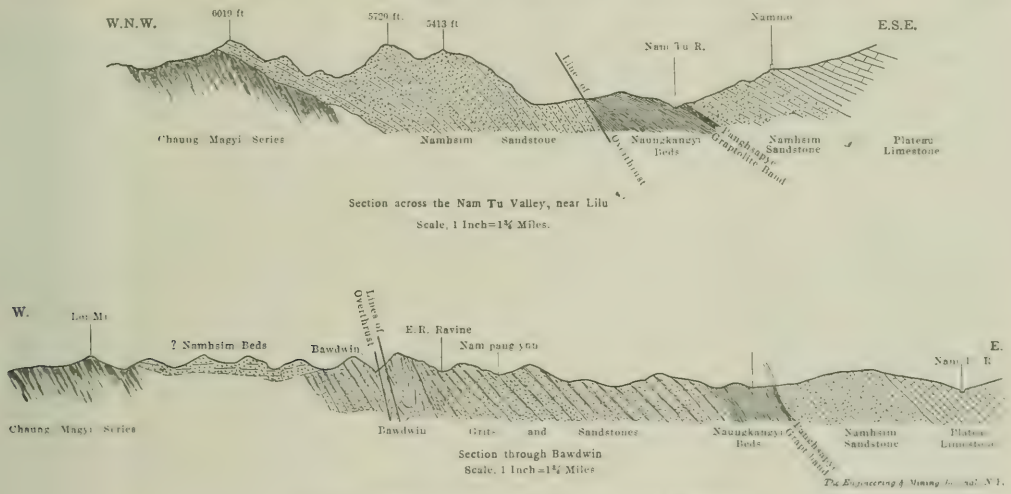


FIG. 2. SECTIONS THROUGH NAM TU VALLEY AND BAWDWIN

[4]Burmese: Silver mines. These mines are also known as Bawdwin-gyi, the great silver mine.

[5]Shan: The Stream of the peacock camp. Probably in allusion to the brilliant blue and green films of copper ores spread over the rocks at several places in the gorge.

south of which it seems to die out. The most intense amount of dislocation and crushing has therefore taken place at Bawdwin, where these two lines unite. Over a broad zone parallel with the plane of overthrust, through which the Nam-pang-yun has excavated a deep narrow gorge, the crushing has been of the most intense description, and the shear planes and fissures thus produced have afforded an easy passage for the mineralizing agencies from below (see lower section, fig. 2).

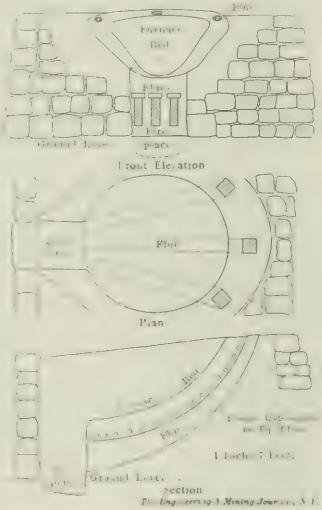
Ore Occurrence

The ore occurs in the form of nodular masses of finely crystalline galena, associated also with zinc blende, in which specks of copper pyrites are disseminated, and as granules impregnating the feldspathic grits, in which, as J. Coggin Brown observes, it appears to have replaced the feldspar. No ore was found in any of the adits left by the Chinese miners, who appear to have worked it out entirely so far as they could reach it, but the nodular masses were found in a section exposed by a slip, or perhaps an old quarry, at the upper end of the Bawdwin gorge (point B on map). Here they are imbedded in the grit, apparently coinciding with the bedding planes, but the country rock is in so rotten a state that it is difficult to make out the original bedding. The largest mass found here actually *in situ* measured about 2½ by 1 ft. Along the zone in which the nodules occur the grits are also strongly impregnated with galena. They are also traversed by thin films of copper ore, azurite and malachite, deposited along the joint planes.

The rotten state of the surrounding rock appears to be due to the formation of soluble sulphates and carbonates. There are no regular veins containing layers of the various minerals arranged in a definite order, and several of the minerals usually associated with galena, such as fluorspar and calcite, are absent. Strings and masses of white quartz are frequently to be found in the disturbed zone, but appear to have had no close connection with the development of the ore. Beds of massive barytes are also of [illegible] occurrence, but they were not found in direct association with the galena [illegible] spot C on map the barytes [illegible] in considerable quantity, in fragments up to a foot in diameter, scattered over the surface of a knoll over an area of 300 to 400 sq. yd. and evidently derived from the outcrop of a large mass. A number of other minerals of secondary origin are found in connection with the ore.

The Mines

[illegible] Chinese adits at Bawdwin [illegible] the [illegible] group of the [illegible] about [illegible] from north to south parallel and close to the zone of dislocation of the strata. The sides of the gorge, especially the eastern, on which side the greatest amount of disturbance has taken place, afforded a ready means of getting at the orebodies by driving horizontal or slightly inclined adits, obviating to a great extent the necessity of getting rid by artificial means of water draining into the mines. Some of the excavations descend below the level of the stream, and are now filled with water, but it is probable that none of them extend to any great depth. Others were driven almost vertically upward either to afford ventilation or to follow up rich bodies of ore, and were ascended by steps cut in the rock. It is probable that one at least was driven right through the hill into a narrow ravine (E on map) to the



LARGE SMELTING FURNACE

east (hereafter referred to as the Eastern ravine), where there are abundant traces of the ore having been washed from the angular talus with which the bed of the ravine is strewn. As there were no furnaces here, it is evident that the ore so collected was taken into the Bawdwin valley to be smelted. Little timbering seems to have been used. Indeed in most cases it was hardly necessary, because of the form given to the galleries, which are always arched at the top and of oval shape. They were so well designed that even now after many years of neglect, many of them can be traversed in perfect safety. There is surprisingly little water to be found in them, at the time of our visit, but no doubt the influx would be greater during the rainy season. The galleries vary in hight from about 3 to 5 or even 6 ft., and are usually well proportioned. At times they expand into irregular cavities, evidently places where large bodies of ore had been met with. This again indicates that the ore did not occur in regular lodes, but in masses or bodies of irregular shape and size.

There appears to have been no definite system of levels and headings, and in some cases one gallery has broken through, seemingly accidentally, into another; but on the whole one is favorably impressed by the excellence of the methods employed. Some of the ore seems also to have been extracted from open quarries, some of which are of large dimensions.

The mines extend along the course of the stream for a distance of about 3 miles to the point marked D on the map, above which the banks are too far from the zone of disturbance to admit of the ore being reached in this way.

Future Prospects

Since the area worked by the Chinese was limited to that which could be reached without much difficulty from the sides of the gorge of the Nam-pang-yun, and downward by the distance to which they could sink without being met with too great an influx of water to be dealt with in the absence of mechanical appliances, it is worth considering whether there is not still a large amount of ore left, which could be extracted profitably with modern mining equipment. I see no reason to suppose that such is not the case, and that if the ore is found on assay to be sufficiently rich in silver and lead, a profitable mining industry should not be established again at Bawdin. There is no reason to suppose that the overthrust, which has permitted the rocks to be impregnated with minerals, does not extend much further to the north, or that the rocks affected by it have not been mineralized in that direction. On the contrary, I am informed that the Chinese worked another locality to the north of Bawdwin, and that the traces of their activity are of the same description as at that place. In any case I think that the country should be adequately prospected, but in order that this may be done an accurate map is absolutely necessary.

In order to reach the ground left unworked by the Chinese at Bawdwin shafts would have to be sunk either in the Bawdwin ravine or in the Eastern ravine, or in both, and levels driven from them into the zone of disturbance. Shafts sunk in the Eastern ravine would have this advantage, that as the overthrust plane is inclined in this direction, there would be a less distance of dead ground between the shafts and the ore-bearing zone to be passed through. The water discharge on this side also would probably be less, though I do not think that it would be great in any case.

Chinese Methods of Treating the Ore

Sufficient remains are left of the old furnaces and other appliances of the Chinese to enable us to form a fairly correct idea of their methods of treating the ores and extracting the silver. The ore after being washed and dressed as described below, was smelted in the large furnaces shown in fig. 3. These were placed in convenient positions on the hillsides at some distance above the bed of the stream, so as to allow plenty of room below them for dumping the slag. The furnace is of simple construction, consisting of a concave fire-clay bed or hearth of circular or oblong shape, sloping from back to front, where it is narrowed, imbedded in a mass of clay concrete built up inside a wall of stone or large bricks. The hearth was heated from beneath by three flues, the roof of which was supported by rods of fireclay, radiating from the back of the fire hole. The ore was mixed with charcoal, of which a large quantity is still left in the slag. As the reduction proceeded the lead ran down to the front of the hearth, and, percolating through the mass of fuel and ore filling the front of the furnace, collected in a hollow beneath the flues.

The smaller furnaces (Fig. 4) were, it appears from what I have been told by Mr. Freymuth, built by Kachins after the departure of the Chinese, in order to smelt the lead remaining in the slag. The design was apparently copied from the original Chinese furnaces, but they are built on a much smaller scale. The method employed in smelting has been described.

The lead was cupelled in beehive-shaped furnaces (Fig. 5), several of which are left in a very good state of preservation. These round furnaces appear to have been used for a preliminary extraction of the silver, the final purification being effected in the square furnace shown also in Fig. 5.

The Chinese do not appear to have made any use of the copper contained in the ore, and it is in such small quantity that it probably would not repay the expense and labor of smelting it in any case. They, however, extracted and smelted a small amount of copper ore near the village of Loi Mi, about 3 miles west of Bawdwin, where several heaps of copper slag are still to be seen. The excavations here are small in extent and were evidently made for prospecting purposes only. Similar heaps of copper slag and small excavations are to be seen near the head of the Nam-pang-yun, west of the Bawdwin mines.

The Ore Deposits and Slags

By J. Coggin Brown

Mr. LaTouche has already given an account of the geology of the district around the Bawdwin mines. He has also dealt with the history of the Chinese occupation there, and has described in detail the methods then used in winning and smelting the ores. I accompanied Mr. LaTouche to Bawdwin in February, 1907, and had then an opportunity for examining the ore deposits and for collecting minerals, as far as circumstances would permit. These notes are based on observations then made and on the results of the examination of the specimens collected.

Limits of Investigation

At the present time it is not possible to make a thorough study of the ore deposits. The whole area has certainly been

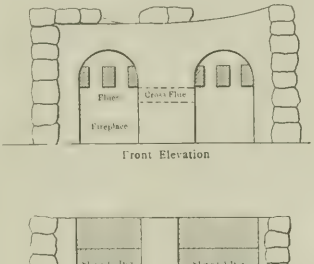


Fig. 4. SMALL SMELTING FURNACE

well opened up by the extensive mining operations conducted there in the past, yet owing to the collapse of the old workings but little can be learned from them now. Some of the adit levels have been reopened by the Great Eastern Mining Company, and found to be constructed with no small degree of engineering skill, and to extend sometimes for considerable distances. I have examined most of these and have come to the conclusion, both from their large size and also from the absence of ore in them, that they represent the travellingways or haulage roads of the mines rather than the actual workings in the ore-bearing strata

Attempts were made to enter the smaller workings in the hope that ore might be discovered *in situ* there, but owing to the decomposed condition of the rock, and the consequent danger of being crushed by falls, these had to be abandoned. There are, however, various orebodies which have not been worked to any extent by the Chinese and which crop out on the sides of the gorge. In such positions the ores have become generally oxidized, both from exposure to the air and from secondary alteration by surface waters, and consequently the true interpretation of their original condition is somewhat interfered with. Any conclusions which may be arrived at in these notes are therefore not to be regarded as final, for the many problems which present themselves in questions of this kind can only be definitely solved after a detailed examination and careful study of the whole of the underground structure of the area has been made.

As defined by the limits of the ancient Chinese workings, the metalliferous area at Bawdwin is a well marked one. Practically the whole of their mines are confined to the north of the main stream, which is known to the Shans as the Nam-pang-yun and has been renamed the Sterne river by one of the European companies holding the mining rights for the district.

Extent of Ore-bearing Ground

As defined by the extent of the ancient workings, the ore-bearing ground is comprised in an area about 1½ miles long and between ¼ to ½ mile broad at its wider parts. This area comes entirely within the Bawdwin grit and rhyolite group of Mr. LaTouche.

The immense amount of material which has been taken from this ground in bygone days is only realized after seeing the number of adits which have been constructed (about 300 old openings—tunnels, shafts and open workings—are said to have been counted by the engineers of the present company), the remains of furnaces scattered over different parts of the valley, and the great heaps of slag which bear eloquent testimony to the quantity of ore smelted. While at the mines I was unaware of the fact that names had been applied to these different localities, but from the map which accompanies a manuscript report by Mr. Maclaren I have been able to make them out as the Jail, Maitland, Doormouse and Amphitheatre workings

The ores which can be seen in these consist chiefly of galena and zinc blende, associated sometimes with small amounts of iron pyrites and chalcopyrite. Other minerals, as anglesite, cerussite, malachite and azurite, derived in all probability from the sulphide ores, are fairly common in some of these open workings. The ores do not occur in veins or lodes, but as impregnations in bands of the country rock, which usually consists of a coarse

rhyolitic tuff containing small rock fragments and a good deal of quartz. Occasionally only a small amount of the sulphides is seen distributed in an irregular manner through the rock. At other places, as in the Upper Maitland area, the ore-bearing band varies from 1 to 2 ft. in thickness and consists largely of galena and zinc blende; the country rock being sometimes entirely impregnated with these minerals.

The largest open workings are those of the Amphitheatre, but this great excavation, which forms a feature of the landscape for miles around, has doubtless been partially formed by landslips.

Metamorphism of the Country Rock

It is very difficult to say what the petrological characters of the unaltered country rock were, owing to the intense dynamic metamorphism which has taken place in the vicinity of the orebodies, and which has led not only to a mechanical effect in smashing up the rock and so rendering it permeable to mineralizing solutions, but has also been the cause of important mineralogical changes. I am, however, inclined to believe that the rock originally was a coarse rhyolitic tuff containing a large percentage of rock fragments. Feldspathic grits, quartzites and thin bands of true rhyolites are all found in more or less direct association with the tuff beds themselves. The grits especially have been affected by the general mineralization which has taken place.

Very often the entire rock has been so altered that it now consists largely of quartz grains set in a mosaic of quartz and feldspar, giving it in hand specimens the appearance of a fine-grained grit. Under the microscope, the mosaic is often almost cryptocrystalline, but sometimes it is developed on a larger scale, and each unit is seen to be quite homogeneous and fitting into the inequalities of its neighbors.

As far as the open workings of the Upper Maitland district are concerned (from which all the specimens here referred to came), the manner of formation of the ores was essentially a process of metasomatic replacement of the minerals of the country rock by metallic minerals probably carried in solution. The galena and other sulphide ores, zinc blende, pyrite and chalcopyrite, attacked first all the feldspar in the rock. As the replacement went on the mosaic like properties gave way to the sulphides, and finally the quartz grains themselves were partially or entirely replaced.

Order of Deposition

The ores found in the open deposits consist as a rule of galena and zinc blende associated with small quantities of iron and copper sulphides. As a rule, if copper is present in association with the galena, the amount of zinc blende is much less. All the sulphides except zinc blende have been found occurring alone in small amounts.

As regards the order of deposition of the sulphides, the microscopic examination of various specimens shows that iron and copper sulphides when present with the others were the first to be deposited. In the case of the lead and zinc sulphides, the relationships are somewhat ambiguous. Galena has been found surrounded by and also surrounding zinc blende. The latter is by far the commoner case, and it may be assumed that as a general rule the zinc blende was deposited prior to the lead sulphide. In all probability the deposition of all the minerals was proceeding in different places at the same time, and the order copper and iron pyrites, zinc blende and galena represents

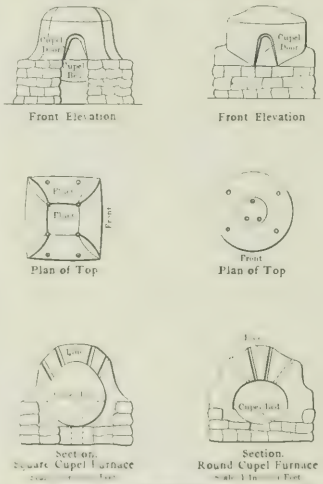


FIG. 5. CUPEL FURNACES

broadly the general rule for deposition only with respect to the area from which the specimens examined came.

Most Important Minerals

Galena is usually found in irregular crystals, picked specimens showing from 65 to 105 oz. lead per ton. Anglesite is common, but more abundant at the Upper Maitland workings. Cerussite is found in association with anglesite and galena. Baryte is fairly common, but has not been noted in direct association with any of the sulphide ores. Zinc blende is common, especially at the Upper Maitland and Lal workings, where it occurs associated with galena, iron pyrites and chalcopyrite.

Chalcopyrite occurs sparingly in small grains disseminated in the country rock. Iron pyrites is not uncommon, it is widely distributed and often accompanied by chalcopyrite. Malachite and azurite are noted wherever copper ores occur. Smithsonite has been noted.

Notes on the Slags

The Chinese, from the commencement of their operations in the 14th century until the year 1868 when they finally abandoned the mines, apparently worked and smelted the ores chiefly for the silver which they contained, allowing the greater part of the lead compounds and probably the whole of the zinc to run into slags. Great heaps of these extend at intervals for over two miles along both banks of the Nam-pang-yun. The location of the smelting furnaces appears to have been dependent on sites suitable for fuel and for water for dressing the ores, rather than on close proximity to the levels themselves.

Granting that by the preliminary operations of washing and dressing the ores the Chinese were able to commence with a practically pure galena, and granting that the silver content of the Maitland ore be taken as a guide, then we may assume that they started with material carrying about 80 oz. of silver per ton, while they finished with a slag containing roughly 1 to 2 oz. per ton. Of course modern methods of silver extraction would do better than this, but taking all things into consideration the Chinese methods though crude were essentially successful.

The slag or lead matte itself usually consists of heavy, dark-colored, porous material sometimes of a vitreous aspect, but more often stony in appearance. It is largely intermixed with charcoal, doubtless the remains of the fuel by which the ores were reduced, and it is permeated by small shots or spherules of metallic lead.

Some of the more ancient heaps are now largely intermixed with débris and rubbish which has fallen from the hillsides, but it will not be a difficult matter to extract the valuable material. The slags contain from 47.8 to 49.3 per cent. lead, 16.7 to 18.20 zinc, 2.5 oz. silver and variable amounts of gold. Small amounts of copper, arsenic, iron, aluminum, manganese, calcium, silica and sulphur are also present, but not in quantities large enough to make them of industrial importance. The small amounts of sulphur are noteworthy as they probably indicate a preliminary roasting of the sulphide ores. It is, however, not uncommon to find small lumps of undecomposed galena in the slag. The heaps are quite accessible and the amount of slag recoverable has been variously estimated at from 110,000 to 125,000 tons. The slags should certainly prove a valuable source of lead if their treatment be approached in a scientific manner.

Some Economic Considerations

The Burma Mines Railway and Smelting Company, Ltd., which at present is the owner of the mining rights of the Bawdwin property, acquired from the Great Eastern Mining Company, Ltd., its partially constructed railway to the mines and is now engaged in carrying it forward.* On completion of the line, the company proposes to proceed with the smelting of the slags before undertaking the development of the mines.

In the event of the development of a mining industry at Bawdwin, the question of the supply of labor is one which will demand serious attention. To recruit coolies from the inhabitants of the country would certainly be the least expensive method of solving the problem, but it is to be feared that the Shans would prove practically useless for work of this kind. The question, therefore, resolves itself into the use of Chinese or Indian labor, or a combination of both, for it is doubtful if Burmese labor would be satisfactory. It will be best to employ Yunnanese as much as possible.

Transportation

By existing paths the mines are inaccessible, and to get to them tedious journeys over mule-tracks of the usual kind found in mountainous frontier districts have to be made. A light railway, however, is now under construction, and when completed will connect the mines with the station of Manhpwi, which is a few miles above Hsipaw on the Shan State branch of the Burma Railways. This light railway will be about 40 miles long, and will place the mines in direct communication with the port of Rangoon at a distance of about 590 miles. Transportation by water along the Nam-Tu river from Hsipaw has been proposed, but there are difficulties in connection with this method which I believe are unsurmountable. The Nam-Tu river, like most of the streams of the Shan States, is frequently crossed by tufa bars and dams, which besides making navigation excessively dangerous, if not impossible, create rapids which no boat can cross. For these reasons I consider that transportation of the ores or finished material by water is out of the question, although it would have been by far the cheapest method.

General Conclusions

(1) The Bawdwin ores, as far as can be gathered from material left by the ancient Chinese, consist of argentiferous galena with smaller quantities of zinc blende, iron pyrites, chalcopyrite, and various other minerals derived from these.

(2) The ore deposits at present visible do not occur in veins or lodes, but in bands of rock impregnated with minerals.

(3) While the greater part of the area above water level has been exploited in the past by the Chinese, there is a good chance of meeting with payable ores at greater depths. Exploration for this purpose by means of borings is strongly advocated, together with the careful and systematic prospecting of the surrounding district.

(4) The slags left by the Chinese workers are rich in lead and also contain a good deal of zinc. There appears to be no reason why they should not constitute a valuable source of these metals, if their treatment be approached in a scientific way.

(5) In case of mining developments at Bawdwin, the question of a labor supply will have to be faced. Considering the natural aptitude for mining which the Yunnanese display, combined with their industry and endurance, it is concluded that it will be best to employ them in preference to Indians, Burmese or Shans.

*Since the above notes were written, this line has been completed and smelters have been erected on Mandalay shore.

State Mineral Lands in the Transvaal

Special Correspondence

The Transvaal government is calling for offers for another state mineral area on the Witwatersrand. This consists of several groups of claims, totalling 144, partially underlying the townships of Boksburg and Vogelfontein. This call for tenders, however, is under section 52 of the gold law, whereas the two Modderfontein areas fall under section 40.

The lease is similar in conditions to those of the Modderfontein areas described in the Journal of Aug. 7, 1909, and will run for a period terminating with the exhaustion of the payable precious metal. These areas are bounded on the north and southeast by the East Rand Proprietary Mines and on the southwest by the Cinderella Deep.

It is calculated that, provided no unforeseen difficulties arise, £180,000 will be required for shaft sinking and preliminary development, and a further sum of £140,000 to bring the property to the full producing stage. It will be recalled that in the case of each of the Modderfontein areas, the sum of £350,000 was allotted for shaft sinking and preliminary development and an equal amount of equipment.

It is stipulated that 25 per cent of the preliminary capital required must be offered for subscribtion to persons resident in the Transvaal, subject to a minimum personal subscription of 10 and a maximum of 200 shares. This provision for public participation has been inserted as a kind of compensation for the abolition of the right of pegging which was allowed under the earlier gold laws. It is stipulated that no vendors', promoters' nor founders' shares shall be created and no commission or underwriting will be allowed. No shares may be issued at less than par, and all capital for preliminary work must be issued at the same price.

The grade of the East Rand Proprietary Mines is about 30s. ($7.30) per ton; while with the equipment that would be applied to this area, if worked separately, the cost would be about 20s. ($4.85). The Cinderella Deep, on its present restricted output of 13,000 tons per month, works at 21s. 4d. ($5.19). But it is improbable that the areas will be worked independently. They could be easiest opened from either the Cason shaft of the East Rand Proprietary Mines or from the Cinderella Deep. Upon exhaustion of the mineral, the government becomes entitled to 10 per cent of the proceeds from the disposal of residual plant, buildings, etc. of the leasing company.

Tungsten Ores in Canada

A report on the tungsten ores of Canada, by Prof. T. L. Walker, of Toronto University, has just been issued by the mines branch of the Department of Mines of Canada, at Ottawa. The report covers 56 pages, and includes 15 illustrations. The several occurrences of tungsten ore in Canada are described in detail, while a general statement is given on the geological occurrence of the ores, chemical tests, concentration, the uses of the metal, producing mines in other countries, statistics of the world's production, etc., together with a useful bibliography of the literature on Canadian and United States occurrences.

Correction

In the article on "The Los Angeles Oil Industry," by Percy E. Barbour in the Journal of Aug. 21, 1909, on page 366, one line was omitted from the description of the standard California rig, which should have read as follows: "This rig is the standard ordinary rig with the addition of a secondary reel known as a 'calf wheel', which is necessary to handle the casing required by the formations of this district and of California oilfields in general," etc.

A notable reduction of working costs has just been achieved at the Van Ryn, which is situated on the northern outcrop of the eastern extension of the Rand. The total costs for June were $3.13 per ton. Deducting development costs the net working cost is a trifle over $2.68 per ton, the net working cost at the Simmer & Jack, but the Van Ryn crushed only 33,000 tons as against 67,500 handled by the Simmer & Jack.

Dressing Plates as Affecting Amalgamation *

Following the successful installation of tube mills in reduction works practice on the Rand and the consequent coarse crushing of ore by the stamps, it appeared to me that longer intervals of time between the dressings of battery plates would not materially affect the percentage of gold recovered by amalgamation, as owing to the coarse sand and increased tonnage passing over the plates, the surface remains bright, and a comparatively small amount of black sand is caught thereon. Even should the extraction be slightly less, it might still be advantageous to dress plates at longer intervals, seeing that there is a secondary amalgamation to follow off the tube mill plates.

Under the New Gold Law Regulations, covers with double locks have to be used on all mill plates. This necessitates the presence of two white men each time these covers are removed, and as every dressing entails extra labor and the withdrawal of labor from the efficient running of the mill, it is clearly evident that any reduction in the number of plate dressings, provided would be beneficial to general mill practice, provided the total extraction be not detrimentally affected.

Trials were accordingly undertaken to ascertain the result of this construction, or otherwise, with the following results.

During November, December, 1908 and January, 1909 all plates in the mill were dressed at eight-hour intervals, and in February, March and April, 1909, at twelve-hour intervals.

Table I gives a comparison of the results obtained for the two periods involved. It will be noticed that the extraction is higher for the period of 12-hour dressings, but on the other hand, and in part explanation of this, the gradings show a finer product passing over the plates during that trial.

A further experiment, covering a period from Feb. 11 to Apr. 19, 1909, was undertaken to determine the extraction at different intervals of time between the dressings of the plates, and the results are as embodied in Table II. From this table it will be seen that the extraction progressively improves up to six hours from the time of dressing plates, and then falls off again, until at the end of twelve hours it has dropped to 49.10 per cent., or 0.09 per cent. lower than that obtained three hours after dressing. The highest extraction of 53.57 per cent., obtained 6 hours after dressing, has an original value of 8.38 dwt., while for the lowest extraction, viz., 49.10 per cent., obtained 12 hours after dressing, it is only 7.79 dwt., this being the lowest original value in the tables. In addition, it is to be noted that the percentage of +0.01 grade is lowest for the highest extraction.

As a result of these tests, I have adopted 12-hour intervals between the dressings of mill plates, which appears to be sufficient under the conditions obtaining at the Simmer and Jack, but I would not advocate others doing the same without making preliminary tests, as the same results may not be obtained in every case.

In conclusion, I would say that the plates must be in good order, and a sufficient setting of amalgam must be left after clean-up. If plates are scraped down to bare copper, a practice only too common in some mills of the Rand, good amalgamation will not be obtained even with dressings every four hours.

I am making similar tests on the tube-mill plates, where there is considerably more black sand. Probably these plates will not run as long as the mill plates without dressing, but from the figures already obtained, it would appear that they do not require dressing every four hours.

TABLE I. EXTRACTION ON MILL PLATES.

	Heads. Dwt.	Tails. Dwt.	Extraction. Dwt.	Extraction. Per Cent.	Grading. +0.01	−0.01 +0.006	−0.006
Three months' run, 8 hours between dressings	7.584	3.952	3.632	47.890	40.90	13.03	46.07
Three months' run, 12 hours between dressings	7.359	3.818	3.541	48.118	38.27	12.97	48.77

TABLE II. PLATES DRESSED EACH DAY AT 6 A.M., AND NOT DRESSED AGAIN DURING THE TIME OF TAKING SAMPLES.

Date	9 a.m. (3 hrs. after dressing). Heads. Dwt.	Tails. Dwt.	Extraction. Dwt.	Extraction. %	12 noon (6 hrs. after dressing). Heads. Dwt.	Tails. Dwt.	Extraction. Dwt.	Extraction. %	3 p.m. (9 hrs. after dressing). Heads. Dwt.	Tails. Dwt.	Extraction. Dwt.	Extraction. %	6 p.m. (12 hrs. after dressing). Heads. Dwt.	Tails. Dwt.	Extraction. Dwt.	Extraction. %
February 11	7.45	4.55	2.90	38.93	6.30	3.80	2.50	39.68	5.25	3.05	2.20	41.90	6.80	3.90	2.90	42.65
12	8.05	3.80	4.25	52.80	14.82	6.75	8.07	54.45	14.06	5.75	8.25	58.63	10.70	4.50	6.20	57.94
14	9.53	4.60	4.93	51.73	9.70	5.43	4.27	44.02	7.65	4.95	2.70	35.29	10.10	4.35	5.75	56.93
March 18	10.37	4.63	5.94	56.20	10.45	5.15	5.30	50.72	8.65	4.57	4.08	47.17	10.50	5.44	5.06	48.19
21	10.03	5.35	4.68	46.66	6.25	2.80	3.45	55.20	8.15	3.00	5.15	63.19	6.20	3.37	2.83	45.65
31	7.15	3.30	3.85	53.85	5.67	2.32	3.35	59.08	5.10	3.15	1.95	38.24	8.20	4.77	3.43	41.83
April 6	4.60	2.38	2.22	48.26	6.20	2.60	3.60	58.06	8.56	3.24	5.32	62.15	5.28	2.28	3.00	56.82
9	8.09	3.72	4.37	54.02	7.84	2.92	4.92	62.76	8.28	3.22	5.06	61.11	7.40	3.60	3.80	51.35
16	6.68	3.00	3.68	55.09	6.70	2.72	3.98	59.40	6.20	4.80	1.40	22.58	5.81	4.08	1.76	30.14
19	7.76	3.84	3.92	50.52	9.92	4.44	5.48	55.24	8.24	4.00	4.24	51.46	6.88	3.36	3.52	51.16
Averages	7.99	3.92	4.07	50.48	8.38	3.89	4.49	53.57	8.01	3.97	4.04	50.39	7.79	3.97	3.82	49.10
Grading			Average.				Average				Average.				Average	
+.01	38.57	36.47	37.52		37.93	36.27	37.10		37.90	36.80	37.35		38.00	36.71	37.36	
−.01 + .006	17.26	17.61	17.44		17.46	17.10	17.28		17.29	16.96	17.13		17.51	17.27	17.40	
−.006	44.17	45.92	45.04		44.61	46.63	45.62		44.81	46.24	45.52		44.47	46.02	45.24	

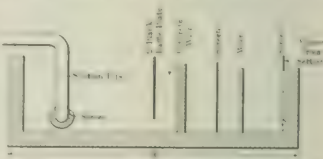
* Abstract of a paper read by C. H. Smart before the Min. and Met. Soc. of S. Africa, Feb., 1909.

Disposal of Slimes and Tailings at Stella Mine, N. Y.

On account of the litigation that is likely to ensue, the disposal of the slimes and tailings from milling operations is often the most serious problem that the mine manager has to overcome. A brief description is given of the method used by the St. Lawrence Pyrites Company at its Stella mine.

Slimes

Just below the mill are two settling reservoirs, which are used alternately. The slimes are run direct from the mill



APPARATUS FOR RECOVERING WATER FROM SLIMES

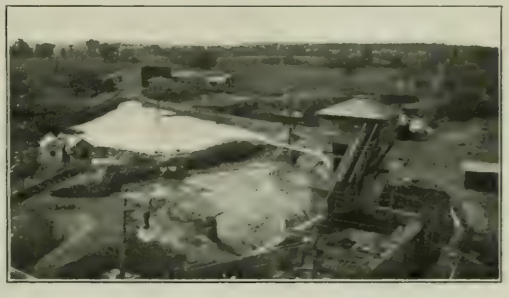
to one of these slime ponds where the fine material is allowed to settle. The water is pumped back and used over at the mill. When the reservoir is full, the second settling basin is then used. A sluice gate is opened and about one half of the slimes in the first pit are sluiced out by means of a fire hose and nozzle to another pit where

a retaining dam has been built. The remainder is then shoveled into ore cars and wheeled out to the waste dump. The overflow water from the settling reservoirs that is not used for the mill is allowed to settle in a third reservoir where the last fines are taken out. Each of the upper settling ponds is cleaned out two or three times per year.

In order to prevent freshets from taking out the slimes that accumulate in the settling basins a diversion ditch was constructed above the mill which turns the channel of the small water course in which the mill is situated. Since all of the water that is used in the mill is pumped from a small creek and elevated more than 100 ft., the recovery of water from the slime pits is a great saving.

An accompanying drawing shows the sump from which the water is pumped back to the mill. The water is not filtered, but it returns sufficiently clear to be used again in the milling of ore. The mill at present is treating 300 to 350 tons of ore per day.

MILL OF THE ST. LAWRENCE PYRITES COMPANY



SLIME PITS OF THE ST. LAWRENCE PYRITES COMPANY

Tailings

The tailings from the Hancock jigs are removed by a bucket elevator to a large storage bin outside of the mill building. These bins are constructed directly over the railroad tracks. The surplus water which is carried to the bins passes off at the top through a trough to the slime pond. The railroad cars are run under the bin and valves are opened to allow the tailings to discharge into the car. The car used for this purpose is an ordinary side-dump 50-ton car. However, for this particular use the swinging door on one side was closed permanently and a false bottom built in this side of the car. This of course reduces the capacity, but allows the material to be discharged all on one side. A 2-ft. lip extends from the side of the car so as to carry the material off the track and nearer the edge of the waste pile. These cars are handled by a standard-gage locomotive in trains of 2 cars.

The production of tin in Singkep, in the fiscal year ending July 31, 1909, was 7000 straits pikuls.

Most Profitable Grade of Ore

Special Correspondence

The report of the Robinson Deep Gold Mining Company, one of the most important mines of the central section of the Transvaal, has recently been issued. During the last financial year, the mine has made a record profit, but the prospects for the future are not altogether satisfactory. During the last three years, the ore reserves have shown a considerable decline, in spite of the fact that the grade has been reduced which, according to the experience of other mines, should have resulted in a large increase in tonnage. The falling off in development is attributed to a want of shaft capacity, the requirements of the mill leaving no time for sinking at the rate desired. One of the shafts is to be widened from a three-compartment to a five-compartment shaft.

A few years ago this mine used to give a yield of over 40 shillings per ton. During this last year the yield has dropped to 33s. 7d. and during the last quarter to under 30 shillings per ton. The increase of the mill from 200 to 300 stamps no doubt partly accounts for this drop, for with the increased output costs have been reduced, allowing lower-grade ore to be profitably extracted. The change of policy in mining lower-grade ore than formerly is not, however, the sole reason for the drop in grade, there being also a general decline in the value of the reef developed.

The question of what is the most profitable grade to mine is a controverted subject. Naturally the higher the grade is kept the higher will be the working expenses, the greater the profit per ton and the shorter the life of the mine. The general policy of the Rand of late has been to mine ore which approaches the pay limit with the result of exceptionally low costs, owing to the greater width of the stopes and the less cost of development.

Some mines, however, like the New Heriot, aim for a high yield, placing little weight on high costs as compared with their neighbors. Which of the two policies is right depends on whether the high profit over a short period is, when calculated in terms of present worth, more or less than the smaller profit spread over a longer period. A suggestive paper on this subject by the manager of the City and Surburban mine, H. Musson Thomas, published in the *South African Min. Journ.* of July 17, 1909, puts forward the view that mining should be carried on more closely than it is at present. There is, according to him, too much waste mined and milled.

In a hypothetical case he calculates that on a mine equipped with 200 stamps the value of the property would be increased 20 per cent. by reducing the stopes from 60 to 36 in. The question of what is the most profitable grade is one that requires careful consideration by mine managers. Low costs do not by any means spell the maximum profit, and it is quite possible that the reduction in grade which so many of the mines have introduced is, from a financial point of view, a step in the wrong direction.

There are three difficulties (*West. Chem. and Met.*, July, 1909) in burning fuel by a straight down draft. (1) With coal it is very difficult, if not practically impossible, to consume all the carbon to produce gas; (2) the ash has to be allowed to accumulate in the machine until the resistance becomes so great as to prohibit the flow of gas, thus necessitating intermittent work and expensive labor in removing clinkers from the furnace; (3) this intermittent work results in a variable gas which tends to vitiate the regular operation of the engine.

The consumption of nitrate for the first seven months of 1909, as announced by the Nitrate Development Association of Iquique, Chile (*Min. Journ.* Aug. 21, 1909) was 2,500,000 quintals in excess of that for the corresponding period of 1908. The production, however, was 1,500,000 quintals less.

Notes on the Evaporated Salt Industry of Kansas

Over 2,500,000 Barrels Produced in 1907; Extent of Beds Unknown; Operations of the Joy-Morton and the Cary Companies Described

BY C. M. YOUNG*

The salt beds of Kansas are a part of the Permian strata. Apparently for a considerable time the water of a salt lake or arm of the sea was concentrated by evaporation, depositing during the process a layer of salt. Gypsum occurs below the salt in some places, and probably underlies the whole bed, as would be expected from the fact that calcium sulphate is much less soluble than sodium chloride.

That the deposition of salt continued during a long period of time is shown by the fact that the salt beds, consisting of salt interstratified with shale, reach a thickness in some places of 404 ft.; whether they are thicker than this at any point is not known, as the whole field has not been explored.

The area known to contain the salt beds is shown in the accompanying map reproduced from one made by the State Geological Survey. The fact that the beds grow thinner toward the east gives a good idea of their eastern extent. It is probable that they do not reach to the northern boundary of the State. The southern limits are not known, but they are found in Oklahoma. The westward extent is entirely an uncertain matter as no explorations have been made which indicated an approach to the limit of the beds. Thus the eastern and northern shores of the Permian lake or sea are roughly known, but its southern and western boundaries have not been determined.

Two Methods of Working the Beds

These salt beds were discovered in the search for oil and gas which accompanied the boom of 1887 and 1888. The finding of the salt was a disappointment in most cases, but later its value was recognized, and it has become a source of large revenue.

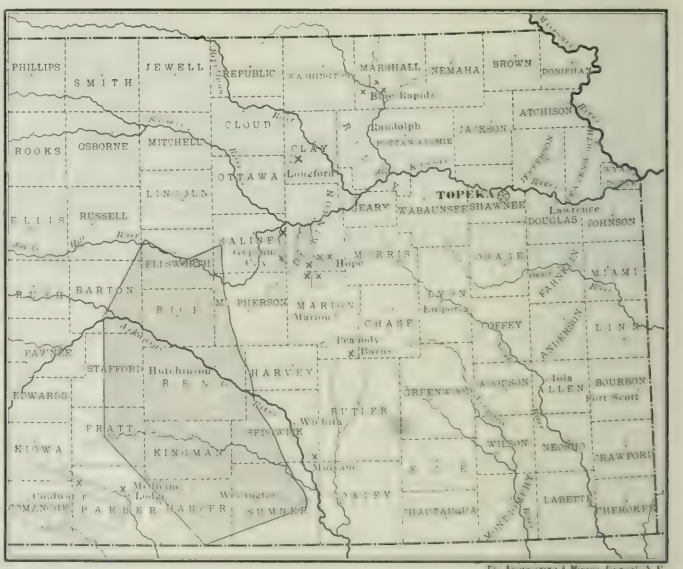
By far the larger part of the salt is extracted as brine, but some is mined as rock salt. These salt mines are very interesting and will be described in a later article. The salt is mined by the methods used for thick coal beds, and is ground and screened. The lump salt commands the highest price. It is used for salting cattle, lumps being left on the ground where the cattle can have access to them. The rock salt is slightly less pure than that obtained by evaporation, because most of the impurities present remain in the rock, some soluble salts of course present in small quantities. It is, however, a nearly pure salt.

The commercial methods used for the manufacture of salt by evaporation have its center at Hutchinson. There are, however, many plants in the surrounding territory. Some of these are evaporating plants only, while in others the evaporation of brine accompanies other enterprises, exhaust steam being the source of heat for the evaporation process. For example, the compressors of an ice plant or cold-storage plant are driven by steam and the exhaust used to evaporate brine.

Evaporation Processes

In all cases the brine is obtained from wells. A 5⅝-in. casing is driven for about 200 ft., being bedded in shale. A 2½-in. pipe extends from the top nearly to the bottom of the well. Water pumped down through the small pipe becomes saturated with salt and flows out of the casing. As more salt is dissolved the surface exposed to the water becomes larger and the capacity of the well increases. An old well will produce about 300 gal. of brine per minute, holding 2.15 lb. of salt per gal. The solar methods of evaporation without the use of artificial heat has been almost entirely abandoned.

Of the processes in which artificial heat is employed, the oldest and simplest is the direct-heat process. In this there is no use of steam, either live or exhaust, but the pans are heated by fires beneath them. The pans, made of sheet iron 3/16 in. thick, are 24 to 25 ft. wide and 85 to 115 ft. long. They are supported on brickwork and heated by direct firing below. As the water evaporates the salt crystallizes out and collects on the bottom. It is raked by hand labor onto the sloping drip board, a large hoe being used. As the temperature of the rooms is high and the air humid, the work of tending the pans is unpleasant, and, when the vapor condenses in the air, dangerous because a misstep might result in a fall into the boiling brine.



The Engineering & Mining Journal, N. Y.

MAP SHOWING KNOWN KANSAS SALT BEDS

As the temperature of the pan bottom is quite high the formation of a scale of calcium sulphate gives a great deal of trouble. This scale has to be broken loose and removed by hand. The direct-heat process has been almost entirely superseded by the grainer and vacuum processes which are considerably more economical.

Grainer Process

This process was developed in Michigan. During the later days of the lumber industry of the lower peninsula it was found that the exhaust steam from the sawmills could be profitably used to evaporate the

*Denver, Colo.

brine which is found under a large portion of the region. Many "salt blocks," as the plants were called, were erected, and the decline of the great lumber industry was contemporaneous with the beginning of the salt industry of the State.

As the Michigan brine contains a considerable quantity of bromides which remain in the mother liquor from which the salt has been deposited, bromine stills were erected which produced liquid bromine, and the mother liquor formerly wasted became a source of revenue. It should be said, however, that the largest bromide plant in America, situated in Michigan, which produces more than half of the bromides originating in this country, has never produced salt, only the calcium and magnesium salts in the brine being decomposed while the sodium chloride is discarded. No bromine has been found in Kansas in the districts where salt is produced, but it is present in some parts of the State.

Operation of Grainer Process

The grainer process, as it was developed in Michigan and introduced into Kansas, is as follows: A pan of about the same form as used in the direct-heat process is employed. In this pan is placed a steam coil of 3-in. pipe suspended from timbers extending across the pan. Generally eight lengths of pipe are used. The low-pressure steam enters at the middle of the tail end, divides and passes through the coils on each side and is trapped out at the head end. As the process was first used the salt was raked out by hand upon dry boards, as in the direct-heat process.

At present this method of removing the salt has been abandoned and mechanical rakes are used. These consist of frames hung on wheels, which run along tracks on the sides of the pans. The frame over each pan carries at intervals of about 9½ ft. a swinging rake which runs below the pipes and when in its lowest position, not quite vertical, scrapes the bottom of the pan. The frame is given a reciprocating motion and, as the rakes move toward the head of the pan, the salt is carried in that direction. When the motion is reversed the rakes tip upward and ride over the salt. The rakes are driven by hydraulic plungers, by pitman and gear, or by rack and pinion. In this way the salt is carried up the drip board, and in some plants is pushed from the dry board upon a belt conveyer which carries it to the curing room. The travel of the rakes is such that there is a lap of about 1 ft. As hand labor is thus reduced to a minimum, the labor cost of the process is low.

The heat of the pipes causes the deposition of calcium sulphates, but as this is deposited on the pipes instead of on the pan bottom, its removal is probably less difficult.

Large Crystals Formed

Naturally, the grainer process tends toward the formation of rather large crystals and crystal masses. This is especially true in the old hand-raking process in which the salt is lifted, or raked out, only six or seven times per day of 24 hours. The agitation caused by the mechanical rakes partly overcomes this difficulty. After the salt is removed from the grainers it is elevated to the second floor of the building, loaded into large carts and wheeled along runways from which it is dumped to the floor below. In the older processes in which the salt had a good opportunity to drain, it carried comparatively little water. In the modern plants the salt is carried by elevators to the runway floor. These elevators are in most cases of the link-belt type with wire-cloth buckets which allow the salt to drain.

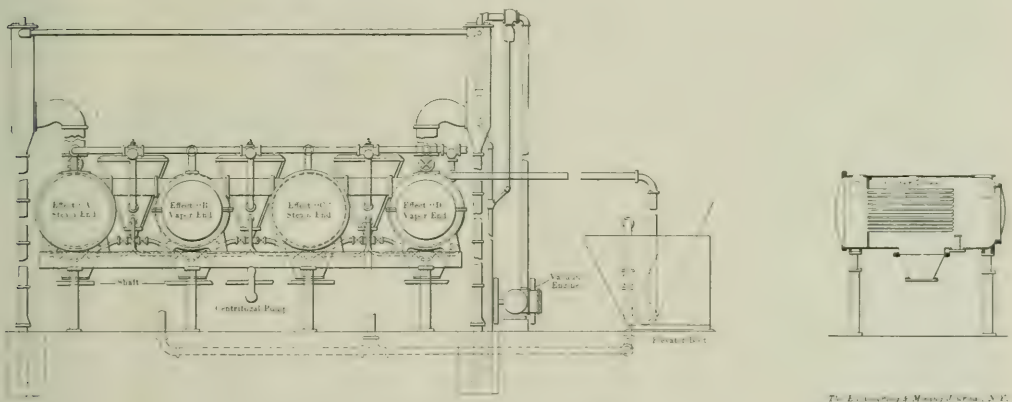
The salt remains on the curing floor from 20 to 60 days to drain, and during this time the heaps settle several inches, the salt becoming so compact that it has to be mined with picks. Most of the salt is packed directly from the heap into barrels holding 280 lb., or into sacks holding 50 lb. A portion is loaded directly into box cars. It would be desirable to have a mechanical loader to do this work, but none has yet been designed.

A portion of the salt, intended for dairy and table use, is dried in revolving kilns. These are of wood, about 6x40 ft., slightly inclined and fed at the upper end by a mechanical elevator. Inside the wooden drum is a smaller steel drum heated by steam. Flights on the inside of the wooden drum elevate the salt which falls upon the hot steeel drum. The moisture is carried away by an air current which also removes a large part of the dust.

Apparatus for Vacuum Process Costly

In the modern plants, having the best equipment, the vacuum process is used. In this process the brine is heated in an airtight vessel and the steam condensed. The partial vacuum thus produced lowers the boiling point and permits a greater evaporation per pound of steam used than is possible with the grainer process. The vacuum process apparatus is costly, and is, therefore, used only by the large producers. The two types used will be described as they were observed in two of the principal plants at Hutchinson.

The Joy-Morton plant of the Hutchinson-Kansas Salt Company is situated on the south bank of the Arkansas river, opposite Hutchinson. This plant has 25 wells and probably produces more salt per year than any other in the world. Its capacity is 3000 bbl. per day. Some Michigan plants may have a greater daily capacity, but they are shut down at the close of navigation on the lakes. Including a few women in the table and dairy packing room, the employees number about 175. Most of the labor is of a skilled or semi-skilled class.



QUADRUPLE-EFFECT SALT EVAPORATOR

VACUUM PROCESS AT JOY-MORTON PLANT

The plant uses both the grainer and the vacuum processes. The vacuum-process plant consists of three large pans, technically called effects. The brine in each is independent of the others, and each has its own feed pipe and elevator. Steam is supplied by six 400-h.p. marine-type boilers. These are generally fired with natural gas from the southern Kansas field, but are supplied with oil burners for emergency use. Eight 150-h.p. horizontal tubular boilers supply the grainer pans.

Each vacuum effect consists of two funnel-shaped zones, one inverted above the other, separated by a cylindrical zone. They are about 60 ft. high by 20 ft. in diameter. This middle zone consists of an annular belt of vertical 2-in. copper tubes, 2750 in number, open at top and bottom, through which the brine circulates like water in a water-tube boiler. In the open center space is a 10-ft. propeller, hung on a vertical shaft, driven by gearing at the top of the effect. This propeller creates a downward current of brine in the middle of the effect and a return upward current through the copper flues. The salt crystals carried down by the central current are not raised, but descend to the elevator boot.

Brine is fed in at the side of the upper zone. Steam is led to a ring surrounding the top of the effect, then through pipes to the steam belt surrounding the center zone. The lower zone is nothing but a settling well for the salt which, falling to the elevator boot, is carried up to the draining bins, from which after the water has drained out it goes to two rotary dryers similar to those previously mentioned.

As the effect is under a partial vacuum the brine level in the elevator housing is lower than in the body of the effect. The whole effect, excepting the copper flues, is made of heavy iron castings. The steam belt of No. 1 effect is supplied with live steam at 2 lb. pressure. The water of condensation is trapped out from the steam belt of each effect. The body of No. 1 effect is connected with the No. 2 steam belt, and the body of No. 2 with No. 3 steam belt. Thus the water vapor from No. 1 furnishes the heat for No. 2, and the vapor from No. 2 heats No. 3. The body of No. 3 is connected to a walking beam vacuum pump having two air cylinders 14x18 in., running at 30 r.p.m. and having a capacity of 5050 cu.ft. of free air per minute. The vapor goes from the pump to a jet condenser.

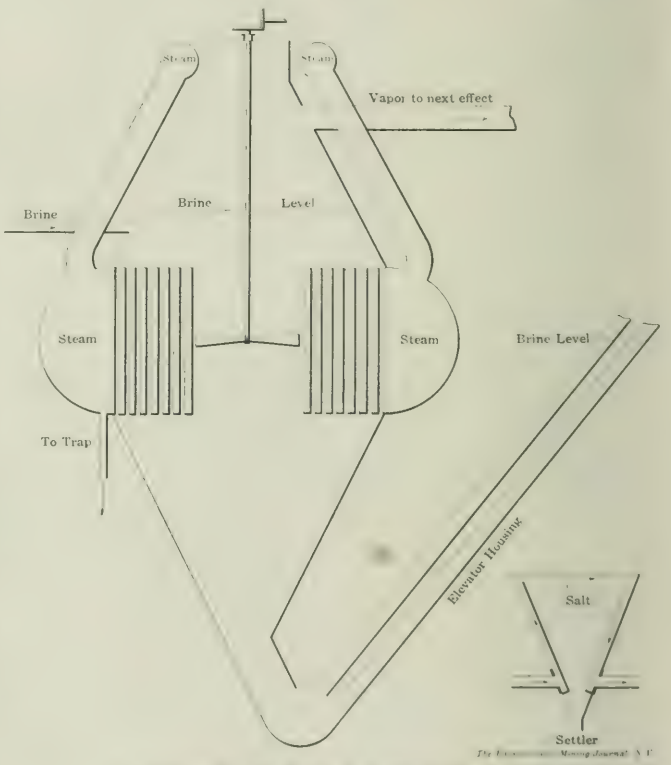
The vacuum measured in inches of mercury is, on the body of No. 1 and steam belt of No. 2, 12 in., on the body of No. 2 and steam belt of No. 3, 22½ in., and on the body of No. 3 29½ in. Thus No. 1 is [illegible] No. 2 is cooler and No. 3 is cooler.

The capacity of the vacuum plant is 300 bbl. per day. The pans are boiled out with fresh water twice per day to remove the salt collected on the sides and tubes, which is not disturbed by the brine circulation. About twice a week the pans are cooled enough to permit men to enter and clean off the scale of calcium sulphate. As the copper tubes are the hottest part of the effect most of the scale collects there. It is removed with boiler-tube cleaners. This plant is considered very successful. The plant has two curing rooms, one 324x132x18 ft. high, and the other 216x132x18 ft. high, with capacities of 150,000 and 100,000 bbl. respectively.

VACUUM PROCESS OF CAREY SALT COMPANY

The other type of vacuum process is employed by the Carey Salt Company, which also has a grainer process plant. The vacuum plant is a quadruple effect, the first of the kind ever built. It is comparatively small, having a capacity of only 300 bbl. per day. Its installation was more or less of an experiment, but it has proved so successful that a 1000-bbl. plant is to be installed.

The pans or effects have the form of horizontal cast-iron drums, with hoppers below. They are set side by side, and between each two effects is a hopper-shaped settler. Near one end of each effect is a partition in which are set the 125 copper tubes, 2½ in. by 6 ft., which provide the heating surface. In the new plant the heating surface will be increased. The drums are set with the steam end of one adjacent to the vapor end of the next. The steam in the hot effect has a pressure of 5 lb. The steam is trapped from the steam end of No. 1 to the steam end of No. 2 and mixes there with the steam evaporated from the brine of No. 1. The steam in No. 3 is supplied by steam trapped from the steam end of No. 2 and vapor from No. 2. The same process is repeated for No. 4. The vapor end of No. 4 is connected to a barometric condenser which in turn is connected to a vacuum pump. This pump is used to start the apparatus and is also an aid in removing air from the brine.



VACUUM PAN AND SETTLER OF TRIPLE-EFFECT SYSTEM

NO CLEANING NECESSARY

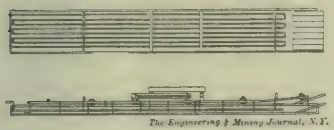
The brine and salt are moved by a centrifugal pump set in the middle of the apparatus on a horizontal shaft extending below the apparatus through its whole length. This shaft also carries four smaller centrifugal pumps, one connected with the hopper of each effect, each agita-

ting the brine in its effect but not passing it forward. The salt carried with the brine exerts a scouring action on the apparatus which keeps it free from scale. The salt produced by this process should differ from the brine only in the removal of water, but no analysis is at hand to confirm this. The fact that no cleaning is necessary is one of the great advantages of the process.

Another aid in keeping the apparatus clean is the reversal of the flow of steam and brine, which is accomplished every 4 hours. Thus effect No. 1, which is at one time the hot effect, becomes the cool one, and No. 4 becomes in turn the hot effect.

As stated before, the brine and salt in the whole apparatus are moved by one centrifugal pump placed in the middle. The salt and brine from No. 1 ordinarily go to the adjacent settler from which the brine and some salt go to No. 2 effect, but they may go immediately to No. 2 effect and so on to the end of the apparatus. Thus the salt produced in all four effects may circulate in No. 4 and the scouring action is considerable. Each effect draws sufficient brine from the brine line to keep the brine in the effect at the proper level.

From No. 4 effect, salt and brine go to the elevator boot from which the salt is elevated to a bin, while the brine goes



GAINER PROCESS PAN

back into the system. The flow of brine from the boot is controlled by a float.

Economical Use of Steam

Each settler has on two opposite sides a narrow chamber partitioned off from the main body. The brine goes into the bottom of one chamber, up to the top, across to the top of the opposite chamber, and out at the bottom. There is then only a surface current and most of the salt settles out.

Every effect and settler is provided with a gage which is constantly watched, and the brine level is controlled by partly throttling the necessary pipes.

No. 1 effect has a vacuum of about 4 in. of mercury, No. 2 14 in., No. 3 19 in. and No. 4 25-26 inches.

This plant gives an evaporation of about four pounds for every pound of steam used, while the grainer process gives very nearly pound for pound.

An analysis of the brine of the district is as follows: Specific gravity, 1.20401; NaCl, 25.500 per cent; $CaCl_2$, none; $MgCl_2$, 0.0613; $CaSo_4$, 0.4703, bicarbonates of Ca and Mg, none. Some of the salt produced contains 99.97 per cent. NaCl.

The importance of the industry is shown by the fact that in 1907 the district produced 2,667,459 bbl. of salt. The deposits of rock salt, the discovery of which was a disappointment to those who first found them have thus become a source of great revenue to the district.

That the possibilities have by no means been exhausted is shown by the fact that the Hutchinson Chemical and Alkali Company has recently erected a plant for the production of 120 tons of soda ash per day.

The author wishes to acknowledge the courtesies extended by the salt manufacturers of Hutchinson, Kan., and especially by the Carey Salt Company.

Notes on the Construction of an Arsenic Plant

By Harold Howes*

In the construction of an arsenic plant a flue with 7-in. wall of reinforced concrete, a flat roof formed of cement blocks laid lengthwise on T-iron, and the whole covered with concrete represents a low initial investment with maximum efficiency. In England and at Anaconda, Mont., the doors in the flues, except the first three, are of wood, and are but little charred by the heat.

The arsenic that collects on the roof and sides, falling off when heavy, protects the cement from heat. As 75 per cent. of the crude and refined arsenic settles within a short distance of the furnaces, a conveyer for handling same should be one-fourth of the total length of the flues.

After a consideration of many furnaces, the Brunton furnace, in my opinion, stands in a class by itself for reliability and thoroughness. The revolving hearth, usually with a cast-iron frame covered with brick, is heavy; much of the weight could be reduced by light steel construction, a circular angle iron at the edge, and the top surface covered with perforated metal, or a screen, and this surface with 1 in. of clay or magnesia sponge; the furnace in revolving spreads out the charge to a permanent depth of 1 to 2 in., subsequent charges passing over this original layer.

To reduce what very little dust the Brunton furnace creates, and to bring the residue under closer observation, the discharge from the last rake should fall on a spiral conveyer, the shaft of which may be actuated by a bevel gear on the main vertical shaft. The residue would be thus discharged into cars or launders and subject to constant inspection.

In the refining furnace the parting wall as often built takes up valuable space, prevents charging conveniently from hoppers above the furnace and has little to recommend it. The residue from refining furnaces used in America might be advantageously rabled into metal chutes built just under the rabling doors. The residue hoppers, being connected with the crude flue, a down draft takes away the fine dust. All holes and covers are thus avoided in the furnace hearth, and construction simplified.

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The Chromite Deposits of Canada

The mines branch of the Department of Mines, of Canada, has just issued a "Report on the Chrome Iron Ore Deposits of the Eastern Townships," by Fritz Cirkel. In the last few years, owing to the rapid development of the iron and steel industry in Canada, more than ordinary interest has been manifested by the mining and metallurgical public in respect to the Canadian deposits of raw materials and ores, which enter into the manufacture of iron and steel products. To meet the demand for information on these subjects, the mines branch has undertaken to issue a series of reports on the Canadian deposits of the substances which form the basis of the iron and steel industry. Several reports on iron ores and one on tungsten ores have already been issued and the present report is another of this series.

The scope of the "Report on the Chrome Iron Ore Deposits in the Eastern Townships of the Province of Quebec" is best judged by quoting the table of contents, which is as follows:

"Introduction. I. Historical. II. The chrome iron-ore deposits of Canada. III. Mining of chrome iron ore. IV. Dressing for the market. V. Market prices, and status of the Canadian industry. VI. Chrome iron-ore mines: Prospects in Canada. VII. Chrome iron ores in foreign countries. VIII. Origin. IX. Composition of chrome iron ores. X. Statistics and chronology. XI. Determination of the value of chromium. XII. Uses of chromium. XIII. Technology of chromium and its compounds. Appendix II. Experiments with chromite at McGill University. Bibliography."

The report is well illustrated by 11 plates in halftone, from photographs of mines, mills and machinery, and 15 diagrams, maps and drawings, all illustrative of the chromite industry. The author of the report is Fritz Cirkel, to whom it was intrusted on account of his long connection, as consulting engineer, with the chromite and the asbestos industries. The deposits of these two substances in the province of Quebec occur in the same region, and the origin of both is closely connected with the serpentine rocks of the eastern townships. The book is obtainable on application to Dr. Eugene Haanel, director of mines, Department of Mines of Canada, Ottawa.

Mine Explosions As Related to Earthquakes

Evidence Is Submitted to Show That an Earthquake May Cause an Outflow of Gas in a Mine Distant from the Center of Disturbance

BY W. A. SPALDING*

As between the man who pins his faith entirely to coincides for a physical demonstration, and the man who scouts and flouts "the deadly parallel," there is little to choose. Neither has a truly philosophic mind. To deny the value of coincidence is to deny the sequence of cause and effect; to reject all empirical proof. In my article published in the ENGINEERING AND MINING JOURNAL, Feb. 20, 1909, I offered the parallels between earthquakes and colliery explosions simply as collateral testimony, to be taken for what it might be worth; at the same time intimating that I believed a complete and convincing demonstration could not be made in such way. There are peculiar reasons why this is true: An important factor in colliery explosions is chance—a chance that sets the spark to the explosive gas. Against such accidents the preventive measures of mining engineers and mine owners are directed. There may be a sudden and considerable outflow of gas in a mine and yet no explosion, because the preventive measures of inspection, forced ventilation, protected lamps, etc., are effective. Hence, a mine explosion is not to be classed as a natural phenomenon—it comes from a natural condition plus an artificial condition plus an accident.

For the above reason I believe that the problem of the relation of mine explosions to earthquakes must be approached, not from the standpoint of the practical miner or the mining engineer, but from that of the seismologist. In this undertaking the investigator should consider, not so much the earth tremor, which is itself an effect, but the cause or the causes lying behind.

There are Two Kinds of Earthquakes

Earthquakes are divided into two classes—volcanic and tectonic. The cause of volcanic earthquakes is believed to be an explosion of gas or steam which forces a vent through the crater. Before this explosion, and at the instant of its occurrence, there must be a tremendous back pressure from the inclosed gases or steam. How far such back pressure may ramify through fissures in the crust of the earth, or through compression of the crust, no man can tell. If anybody questions the probability of such action, let him try to imagine a cannon capable of firing vertically a projectile of 100 or 1000 tons *with* [illegible]

Tectonic earthquakes are believed to be due to stresses or strains set up in the earth's crust. These are attributed to internal or external causes, or both combined. The stress or strain may be progressive, from the contraction of the earth's crust in cooling, from the shifting of loads on the surface through erosion and water action, from internal pressure, or the failure of internal support. The external causes are either periodic or sporadic, being attributed to tidal pull, due to the moon and the sun separately and in conjunction and opposition; to sudden variations in barometric pressure, etc.

If tidal strain is effective upon land surfaces, as it is upon water surface, then, when the gravital influence of the moon and the sun are combined at conjunction and opposition, there are two areas of maximum strain which pass around the earth in 24 hours, and practically every portion of the earth's crust must be put to the test. It is this tidal strain to which seismologists attribute an established increase of frequency in earthquakes at the syzygies.

Stresses on the Earth's Crust

Whatever the cause of these stresses or strains in the earth's crust, it is certain that the region of least resistance or greatest pressure or strain is selected for fracture. Thus the earthquake is localized. The fault represents a former line of cleavage reëstablished, or a fresh break. The pressure is often sufficient to produce a slip in the cleavage and, on either side of that line, the earth's crust may be elevated or depressed, or suffer a longitudinal thrust. The shock is most violent at some point on the line of the fault, and decreases by regular graduations with distance from the epicentrum, so that the area perceptibly affected may be defined by an inclosing isoseismic line. The tremor in the earth is simply a vibration imparted to the crust by a shock; the shock of sudden breaking, violent friction, upheaval or depression, and the energy of this vibration is gradually converted and dissipated. Thus the area of violent disturbance is restricted, and the earthquake is, in a sense, a local phenomenon. But seismographs inform us that minor tremors from such a disturbance pass entirely around the earth, and are recorded at points thousands of miles distant from the center. While the area of pronounced vibration is localized and circumscribed, it is not reasonable to assume that the area of stress or strain which preceded and caused the shock was thus localized and circumscribed. Since, for reasons given, seismic action must be selective, there is no telling how much of the earth's crust may have been traversed and put to the test before that one weak point was encountered. There are notable cases on record—like the Lisbon earthquake in 1755, the New Madrid earthquakes in 1811-12 and the great earthquake central in the gulf of Mexico in 1907—when every continent, so far as known, was subjected to more or less violent disturbance, thus showing presumably that the whole crust of the earth was subjected to simultaneous stresses and strains, and that many weak points were disclosed.

On the desk before me are two interesting objects: a sponge and a small bellows. The sponge is saturated with water; all the little ducts, channels and interstices are filled. I squeeze the sponge vigorously and the liquid runs out in a stream. The bellows, expanded, is filled with air. I compress the sides and the air flows out through the nozzle. Now, the earth's crust is similar to the sponge, inasmuch as it is honeycombed with caves, pockets, seams and fissures; it is somewhat like the bellows inasmuch as these openings are filled more or less with gases. Is there anybody to hold that the earth's crust, when suddenly squeezed, would not act mechanically just as the sponge and the bellows do? It is perfectly apparent that, under stresses which may traverse a considerable part of the earth's crust before a seismic disturbance is precipitated, these contained gases would be driven to and fro along the line of least resistance in an effort to escape the pressure.

Underground Chambers Are Filled with Gas

A mine is an artificial pocket in the earth. At a time when gases are driven forward by compression—when the earth's crust is flexed, buckled, broken by seismic action—what assumption is more natural than that they should find exit through seams and fissures to this place of least resistance?

Here is the whole argument in a nutshell, and it is incumbent upon those who dispute it to indicate wherein it is unreasonable.

That there are times when, without any apparent local cause, underground chambers become filled with gas. Whether such gases are explosive or not, whether it requires the admixture of air or coal dust to render them explosive; whether

*Los Angeles, Cal.

they are actually exploded or not, is entirely foreign to the argument. We are simply tracing natural causes which supply the conditions favorable to accidents of this sort.

Under the hypothesis here set forth, the accumulation of gas in a mine is even more likely to occur in advance of an earthquake than concurrent with it or following it; the actual time of explosion is determined by accident, and due allowance must be made for that uncertain factor.

That the mine in which an explosion occurs is far removed from the locality of a proximate or concurrent seismic disturbance does not discredit the theory of relationship, in view of the wide range of stresses and strains previously discussed.

Results of Investigations in Japan

Japanese seismologists, who are among the most careful, methodical and thorough investigators in this field, and who have the best opportunities for investigating, have thought it worth while to make a series of experiments on wells, to show the fluctuations in water level. They have found a sympathetic relation between such level and barometric pressure and also with the ebb and flow of tides. As there can be no direct connection between fresh-water wells and the body of the ocean, this last factor must be resolved into earth-pressure, due to the rise and fall of tides, or tidal strain. In a monograph on the "Daily Periodic Change of the Level in Artesian Wells," by Prof. K. Honda, published in the 18th report of the Imperial Earthquake Investigation Committee, he says:

"Hence we may infer that in every artesian well, the level of the water is held in position by the equilbrium of two pressures—the atmospheric pressure and the underground pressure. If one of these pressures undergoes a change, a corresponding change of level is produced."

As the title of the monograph implies, there is a rhythmic variation in the pressure of artesian wells. This, Professor Honda shows in a series of curves.

The relationship between ocean tides and phases of the moon is so thoroughly established that mention of it is only necessary to connect the argument. Again, phases of the moon have been associated with frequency in earthquakes. Prof. F. Omori, of the Japanese Commission, found several maxima in the activity-curves for three stations in Japan. By smoothing these curves he obtained two distinct maxima in each curve, which occur about the 5th and 17th hours of the lunar day, the time beginning with the upper culmination of the moon. These positions of the maxima nearly coincide with those of high water. Thus we have five classes of phenomena connected in sympathetic relation; phases of the moon, earthquakes, tides, subterranean pressure and the level of water in artesian wells. It is perfectly plain, then, that there is a relationship between earthquake frequency and subterranean pressure, and this might be shown by comparison of curves as readily as any other two of the relationships mentioned. If there be such a periodic ground pressure affecting the level of the water in wells, why should it not also affect the pressure and flow of a rarer medium—gas—in subterranean channels? If this be a process carried on with a daily periodicity and monthly fluctuations, why should not a violent convulsion in the earth's crust have a much more pronounced effect?

Bearing directly upon this argument and supporting it in a striking way, I beg to repeat the addendum to my first communication to the Engineering and Mining Journal.

The following Associated Press Dispatches explain themselves:

"Well Forecasts Earthquake

"Beloit (Wis.) March 19, 1908. The roaring well on the Charles Lathers farm northeast of Beloit, sounds from which preceded the San Francisco disaster, is again emitting rumbling noises and a strong wnd from its cavernous depths. It is asserted that this well began roaring a few weeks before the San Francisco earthquake, and ceased at exactly the hour of the quake."

"Prophetic Well Tells of Earthquake

"Beliot (Wis.) March 27, 1909 (Exclusive Despatch). The famous 'roaring well' has again made good. March 19 it was found that the phenomenon, on the farm of Charles Lathers, northeast of Beloit, Wis., was active. The well roared for several weeks before the great earthquake at San Francisco, and the curious sound of rumbling, together with wind from the mouth of the well, ceased at the precise hour when the shock struck the California city. On a day, a little over a week ago, when the well resumed its clamor, residents of Rock county predicted a calamity. Yesterday it came in Chilapa, Mexico."

The following letter confirms the Associated Press reports and gives some additional details:

"Beloit, Wis., April 14, 1908.

Mr. Chas. Fletcher,

Dear Sir:

Your letter with regard to 'Roaring Well' just received. In reply I wish to say that about two weeks before the San Francisco earthquake, wind started to blow out of the well with such force as to cause quite a noise. This continued for about two weeks and stopped on the day of the earthquake. It also blew two days just before the Mexico earthquake. We have never had our well examined, but it seems strange that this should occur just before the earthquake. The well is 110 ft. deep, 40 ft. is dug and a 6-in. iron tubing is driven down 70 ft. The water is as good as any, pure and clear. The air that blew out of the well was pure cold air; no smell or taint of any kind. Hoping that this will be satisfactory, I remain

Yours, etc.,

"(Signed) Chas. F. Lathers."

L. F. Rosenthal, postmaster of Beloit, says, in response to an inquiry:

"The public in general take it for granted about the roaring well. Mr. Chas. Lathers is a well known and a very prominent farmer. Whatever he has to say can be relied upon.

"Beloit, April 7, 1908."

Beloit, Wis., is far removed from San Francisco, yet it appears that there was some sympathetic connection between the roaring well and the earthquake in the latter place, April 18, 1906. Again, a still greater distance intervenes between the roaring well and the City of Mexico, yet the phenomenon is repeated March 26, 1908. Such sympathetic action can only be accounted for on the theory of a general stress upon the earth's crust preceding and concurrent with seismic action.

If, under general seismic stress, air from subterranean sources rushes through the depths of a well, why may not gas from subterranean cavities rush into the chambers of a mine?

A Recent Instance

Since the above article was prepared the following report comes from France:

"Paris, June 14. Cable to the Associated Press—Three new earthquakes yesterday swept Provence from the River Var to the Loire. The disturbance was chiefly in the mountain regions, where several deaths are reported.

"Nature sent curious forewarnings of the disaster. At Bargemon, five minutes before the shock, all the electric lights went out, the church bells rang violently and water in the wells and fountains grew hot, so that the inhabitants had time to flee into the open.

"At Fiminy the coming earthquake was announced by thunderous reverberations in the adjacent mines, followed by the explosion of firedamp, but fortunately the mines were empty on account of the Sunday holiday. The seismographic machines did not record the disturbance until the exact moment of the shock."

The most promising outlet for Transvaal coal seems to be India, where already large shipments are being despatched. The price of Transvaal coal landed at Bombay is about $5 per ton, which is less than the cost of the local product, which is considered inferior.

Considerable quantities of iron ore from the Tayeh iron mines in China are exported to Japan.

The Flushing Problem in the Anthracite Region

SPECIAL CORRESPONDENCE

One of the most pressing of the scientific problems confronting mining operators, mining experts and the people living on the surface of mining lands is the prevention of the caving in of the surface, either after the mine has been exhausted, or when the process of "robbing the pillars" begins. The problem is practically confined to what is known as the upper regions of the anthracite-coal measures, where the veins run horizontally. It does not affect, or only to a slight degree, the regions in which the saddle veins exist. In this connection exact mining terminology will not be strictly adhered to. It is a problem that affects the people living on the surface of the mines, exhausted or exhausting, although of course the railroads tapping the anthracite regions are so closely identified with the industrial prosperity of these populous communities that anything affecting the efficiency of the one, or disturbing its equilibrium, must necessarily and inevitably react on the other.

It may be, and, in fact, must be admitted at the outset that the amount of property injured by mine caves has been, up to the present moment, comparatively small. On the other hand, those who have suffered most and who will suffer in the future in a relatively increasing degree are industrious, thrifty miners who have purchased little plots of land of their own and who have erected homes on them.

Another important circumscription of the danger arising from mine caves is that while they are by no means uncommon, they are for the most part confined to surface veins. On the other hand, it must be taken into consideration that with the progressive exhaustion of the coal lying in horizontal beds, the pillars which are in a marked degree the only approximate support of large tracts of land, built over, urban or suburban, will disappear altogether, and if some substitute is not brought into requisition, the danger from mine caves in the future will be formidable indeed.

Take for instance the city of Scranton, with a population of nearly [illegible] and many great industries developed in [illegible] and in proximity of the mines. The central part of Scranton is built on [illegible] a large pillar system. These [illegible] for the most part the [illegible] of the city in fact, and they are most valuable for [illegible] that there is no apprehension as to any well-founded apprehension that subsidence will ever take place. Does that it is [illegible] cataclysm. But this state of affairs does not obtain in the suburbs of Scranton, in Pittston, in Wilkes-Barre and other sections where mine caves are occurring every day, not infrequently with disastrous results to property.

At least 20 per cent. of the unmined coal in sight consists of coal pillars. In some mines, it constitutes as much as 50 per cent. As a matter of fact it is the most valuable and easily mined coal in the mines. It may be assumed that a pillar is coal throughout, pure coal in fact, so far as marketable coal may be said to be purely a constituent carbon. These pillars constitute an enormous reserve of coal to which the operators will increasingly turn their attention when the bedded coal is exhausted or nearly so. The process of depleting the mines of pillars is called "robbing" locally, and is a misapplication of language to a perfectly legitimate phase of industrial exploitation. It has found currency outside of the mining regions and passes in its application for what it is not in any sense. This invariably happens when an extensive cave occurs and the fact is telegraphed far and wide as something ruthless and illegitimate.

FLUSHING THE MINES

To counteract the effect of pillar robbing and natural exhaustion of the veins, the "Scranton system" of flushing the mines has come into general operation, not only in the upper sections of the anthracite regions, but it is in general use in Germany, particularly in those sections of the mining regions that run under the bed of the Rhine. The flushing in simple terms consists of replacing the coal and rock by some foreign material. Here then is the difficulty. Not 10 per cent. of the material taken out of the mines can ever be returned to it. When the "Scranton system" of flushing was first mooted by Samuel McEachen as far back as 1878 or 1880, the culm dumps were unsightly excresences, standing out in hideous insularity all over the mining regions. Neither Mr. McEachen nor any other person realized their intrinsic value, or the vast treasure house of coal that they contained.

It was only within the last 13 or 14 years that the potentiality of the culm dump became apparent and their realization into property and their capitalization in the financial world became an actuality. Culm dumps are disappearing with incredible rapidity. After the culm has been washed the residuum is almost negligible. There is a considerable amount of rock [illegible] in every mine, and this must be taken to the surface or at least very low down. This is made into the [illegible] and numbers have been [illegible] large space to be flushed. Taking any individual mine where such processes are going on, [illegible] can be [illegible] by flushing.

OPERATORS ARE NOT COMPELLED TO FLUSH THEIR MINES

There is no legal obligation on any coal operator to flush his mines. That matter has been decided by the Supreme Court of Pennsylvania. However, there is a moral obligation, but this of course extends only so far as the individual operator or coal company thinks it well to assume. Within the past few months, the Ontario Western Company has installed a system of flushing at its Pine Brook colliery, which if it proves successful will eventually result in giving a solid foundation to the whole of the central, or business, section of the city of Scranton. The "Scranton system," so far as it has been developed, is probably seen in its most perfect form at this colliery. The flushing of the mine in its practical application is under the immediate direction of Superintendent W. L. Allen and Daniel Young, the inside foreman. The initiative and general direction of the work is under the superintendence of John R. Bryden, general superintendent of the Scranton Coal Company, the Ontario Western controlling the mines of this corporation. The location of the Pine Brook breaker is right in the heart of the city. It is a new breaker and one of the largest in the northern section of the anthracite region.

The breaker has a capacity of 750 cars a day. The seam which is in process of flushing is known as the "Clark vein." It is 171 ft. beneath the surface. The Clark vein runs all through the Lackawanna valley, and of course only a small section of it is in the process of flushing. The hight of the vein from roof to floor averages from 11 to 12 ft. As an experiment, the work will be watched with the greatest interest. The flushing has been carried on during the course of the last 12 months. It is estimated that the part of the vein under the business section of the city will be flushed in another year; that is to say, the area contemplated in the present project.

Flushing is slow and expensive work. If the operators do not undertake the work, the State eventually must. I do not see why the State should not assume the responsibility. It has largely profited by the exploitation of the coal lands. Pennsylvania would not be the great industrial commonwealth it is, without its enormous coal measures, and, after all, the amount of coal that has to be filled up in the mines to secure property is comparatively small. At any rate it is useless to try to induce the operators to do much more than they are doing in this way.

The material for flushing is not easily obtained. Any material for flushing purposes must be pulverized, and this necessitates a crusher or pulverizer for that particular purpose. When the stuff, put in wet, congeals to a certain consistency, it consolidates as hard as rock, and may be

left to sustain its reputation for solidity without fear for eternity.

Flushing Is Begun at the Highest Point

The flushing is begun at the highest point in any particular section of the mine, the water flowing by gravitation to the lowest point selected and carrying in suspension the silt and pulverized rock with it. To check this flood at any particular point, "batteries" are erected. These "batteries" are heavy planks placed against props which are embedded, top and bottome, into the roof and floor, respectively, so as to hold them in place against the pressure of the flood of refuse which is carried against them. Interstices in the planks afford an outlet for the water, which sweeps through, rushes down to the foot of the shaft and is there pumped back to the surface and carried into the Lackawanna river, which in this instance is only a short distance from the mine. It is, however, at the opening of the "slush" line that the main interest lies. The coal-black stream issues from the 6-in. flushing pipe with the force of a hydraulic battering ram, sending the stream of culm, boiler ashes, etc., fully 15 ft. from the nozzle of the pipe, to whatever point it is directed. So solid is the packing that after a night's drying it is as firm as concrete that has set. The Pine Brook people are flushing in stuff at the rate of 500 tons a day. This may appear to people who are familiar with large engineering operations as insignificant. But it must be taken into consideration that the work is exceptionally tedious and expensive; that it is a dead loss to the company, so far as they are likely to reap any material benefit from it.

Fighting a Coal Mine Fire

By Frank Lynde

A mine fire is always a cause of intense anxiety to the operator. More than a generation ago, at the Greenwood mine, near Tamaqua, Penn., a workman hurrying out of the mine, after his day's work, allowed his naked light to touch the dry timber in the manway. The little spark left on the timber began to glow and finally the prop caught fire from it. The following morning, when the miners attempted to go underground, it was found that the coal was on fire.

The officials decided to flood the workings, and water was turned into the shaft, but without effect. The fire had gained such headway that it was beyond control. The mine was soon abandoned. The coal, which was about 60 to 75 ft. in thickness, was saved below the water level by many millions of gallons of water, but the part of the seam at or above the water level was badly affected by the fire.

Method of Attack

The company (Lehigh Coal and Navigation Company) was anxious to mine the coal below the water level; in order to do this, the fire had to be extinguished. For the last 50 years engineers and superintendents in the anthracite field have tried to quench the fire, but without results. In 1906 the company proposed to employ modern methods to extinguish the coal, at an estimated cost of about $2,000,000 and the work of fighting the fire was reorganized in the fall of that year.

The plant consists of a boiler house, four 100-h.p. boilers, built on the bank of the Schuylkill river, together with two large pumps having a capacity of 24,000 gal. per min. The water is pumped through a 10-in. line for a distance of three miles up the mountain. On top of the mountain a trough is built into which the water is discharged and there mixed with culm brought by the carload from a culm bank two miles away. The mixture thus formed is introduced into the mine through 6-in. holes drilled at various angles and places. It has been calculated by the engineers that in two years, approximately two billion gallons of water, besides the culm, will have been pumped into the old workings. The results so far show that the method employed is effective.

The Real Value of Steam Coal †

By D. T. Randall*

In general it may be said that a furnace may be designed to burn almost any kind of coal with good efficiency, and that the real value of a coal depends very largely upon the number of British thermal units which it contains. Tests which have been made at the Government Fuel Testing Plant seem to indicate that the most important thing to be considered in a coal is its heating value. Following this, the size of the coal may be considered as next in importance, and when the moisture, volatile matter and ash are widely different they must also be considered. The results of more than 400 boiler tests at the Government Testing Plant show that the average drop in efficiency for a range of coals between 14,000 B.t.u. and 10,000 B.t.u. is only about 6 per cent.

This difference is due to the combined influence of the size of the coal and the moisture, the volatile matter and ash in the coal. It will be seen from these figures that the probable influence of any of these constituents is not as great for hand-fired furnaces as it is often thought to be. With certain boiler equipments in which a considerable overload is necessary at times, the effects of these constituents may be much more important owing to the reduction in capacity which may be obtained, and it is for this reason that when coal is selected for a given plant it is important that the coal supplied should not vary greatly from time to time. Otherwise the fireman may have serious difficulty in maintaining the capacity required, and in burning the coal with good efficiency.

A Close Correspondence between the Heating Value of the Coal and the Water Evaporated

With a furnace which is well designed, there should be a close correspondence between the heating value of the coal and the water evaporated. Small variations in moisture, volatile matter and ash should make little if any difference in the efficiencies obtained.

The size of the coal may influence the results to a serious extent. Small sizes of anthracite coal pack together closely and strong drafts are required to burn them. This results in holes in the fire and a leakage of air in the boiler settings. The loss is often estimated to be at least 10 per cent. This is also true of many of the bituminous coals. Other coals which coke readily, forming a loose bed of fuel, do not show much loss, due to the presence of fine coal, except such as is so small as to be carried off from the grate by the draft.

With any character of coal there may be a loss of fine coal, due to sifting through the grates. That this loss may be large is well known. The carbon in the ash is an important item in determining the losses in a boiler room. In many plants care on the part of the firemen has reduced this loss to the equivalent of 2 and 3 per cent. of the fuel fired.

Occasionally owners of power plants have purchased for testing purposes a coal of higher grade than they usually furnish for the boiler furnaces. The results obtained have often been disappointing and without further investigation they have declared that the plan of purchasing coal on the basis of its heating value is at fault and that corresponding results cannot be obtained from the higher grade coals. On the other hand, it has happened that others have tried coals of lower heating value than the coal regularly burned in their plant and they often find a greater drop in the evaporation than they expected. This has led many people to believe that there is a great difference in the value of coals for only slight variations in the composition.

Boiler tests are a rather crude method of comparing coals especially if the fireman is not accustomed to burning the coal to be tested. A chemical laboratory test is conducted under conditions which may readily be duplicated and the results are therefore more reliable than boiler tests.

†Abstract of paper read before American Society for Testing Materials.

*Engineer in charge, Fuel Engineering Department, Arthur D. Little Chemical Laboratory, Boston, Mass.

The averages of a number of boiler tests on each coal on which the combustion is fairly good in all cases should show results which agree quite closely with the chemical results on the coals provided they are of the same general character. If they vary in composition a slight reduction in efficiency may be expected for the coals high in moisture, volatile matter, and ash.

Apparatus for the Detection of Fire-Damp

In view of recent discussion as to the manner in which examinations are made to detect the presence of firedamp, W. C. Blackett has devised an apparatus (*Trans.* N. Eng. Inst. Min. and Met., June, 1909) by means of which a high lamp flame may be used. He points out most emphatically that small percentages of firedamp can be seen quite as well, and even better, with a lamp flame that is somewhat high and shows a small white light, than with a flame which shows only a blue light. It is necessary, however, that the white light should be shielded from the eye, and, if this is done, a very much longer cap is to be seen than with the small flame which shows only blue; with 3 per cent. gas it is much more than twice as long.

Practical men have always recognized this, and it is a common occurrence to shield with the thumb the white speck of light, and so more easily observe any cap.

This is effected in Mr. Blackett's device by the fixing of a small shield inside the lamp (about ½ in. from the flame) either to the pricker or to the wick-pipe. This, of course, allows of the use of a higher flame, and so reduces the risk of the light being extinguished, and, at the same time, proves more effective in the detection of firedamp.

In the detection of gas Mr. Blackett has failed to find any advantage in the use of blue glass; but a magnifying glass, whether blue or clear, he has found helpful. Anyone who is accustomed to read with spectacles should use them also when examining for gas.

It has also been found that if the inside of a suitable portion of the lamp glass be ground, the reflection which sometimes interferes with proper observation of the flame will be avoided.

Colliery Notes

An air compressor should be cleaned and the valves inspected at least once a week. It is held by many that it is dangerous to run kerosene through the air and on account of the temperature developed. This, however, may be safely done if the machine is the best available without heat, allowing the kerosene to be [illegible] but before the heat is generated

Practice differs in regard to the manner of carrying the air pipe through the mine; some companies suspending it overhead, and others laying it along the floor of the drive beside the track. The overhead system is easier to put up, is less liable to rust through, and is easier of access for connections, repairs, or inspection. The pipe on the ground requires no plugs or sprags for its support, but gets buried in the mud and is liable to spring out against the rails and interfere with the passing of the cars.

With reference to the kind of combustion tube that is best to use in the analysis of coal, some chemists prefer a porcelain tube rather than one of glass. This preference is based on the fact that the initial cost of the porcelain soon repays the outlay because it can be used over and over again. It is essential also that the gases from the combustion tube first pass through the calcium chloride, then through the potash, not *vice versa*.. The calcium chloride should be freshly dried before use.

Arrangements have been completed for the opening of a new colliery at Thorne Moor in Yorkshire, England. This undertaking will rank as one of the greatest achievements in coal mining; preliminary investigation has shown that this new mine will be the deepest and largest in Yorkshire. Sinking operations have been begun, and it is calculated that the coal seam will be reached at a depth of 2760 ft. The contractors already know that at shallow depth the shaft will encounter quicksands and a large volume of water. This difficulty will be overcome by using the freezing process and tubbing. Each of the shafts at this new mine will be 22 ft. in diameter inside the walling. It is estimated that when coal is reached and development started, there will be employment for 4000 men.

The problem of wiring for lighting circuits underground may be safely reduced to a selection between two possible systems. The first system is the open-type wiring, the wires being supported on porcelain insulators. The second system is that where the wires are contained in a strong steel smooth-bored pipe, which is generally protected from corrosion externally, and usually has an insulating internal casing. In dry places where the roof is good, it is possible to use the first system, known as open wiring; the wires are then under constant inspection and they can be readily renewed when necessary. In damp places, or at points, such as haulage road crossings, where damage is likely to occur, protected wiring is to be preferred. Wherever steel piping is used it should have screwed joints suitable to provide mechanical strength and electrical continuity. Such piping also must be permanently earthed.

Now that we have convinced ourselves that the available supplies of coal are sufficient to keep us warm and to provide for all business development in coming centuries, several scientists have thought it best to call our attention to the fact that for every ton of coal we burn, 300,000 cu.ft. of air is used up and rendered unfit for breathing. These investigators claim that it will be only a few hundred years at our present rate of increase in coal consumption, and incidentally oxygen consumption, until all the atmosphere on the earth's surface will be rendered incapable of sustaining life. It appears, therefore, that at best we only have a choice between two evils; either we must freeze to death or be stifled by a lack of proper air. It is to be hoped that some other scientist will arise and comfort us by stating that the carbon dioxide, which the present consumption of coal is returning to the atmosphere, will so greatly stimulate vegetable life, that the rate of growth of plant life will be materially increased, thus preserving our atmosphere by removing the poisons and preventing the final extinction of human life.

An American company is operating and developing a coal mine in Spitzbergen, adjacent to Advant bay. The capital stock is largely owned in Pittsburg and New York. This is the most northerly coal mine in the world, and will be operated this year during the winter months for the first time. This operation is situated about 580 miles north of Hammerfest, Norway, the most northerly incorporated city in the world. At this mine, there are three months in the year when the sun never sets (May 15 to Aug. 15). Six months in the year are passed in practically complete darkness. The greater part of the output from the mine is sold to the whalers; a small part of the production is shipped to Norway. The company can practically command its own price for the fuel, as it is the only coal operation in the region. At present, the only power is that furnished by horses; however, an electrical plant is to be put in next year. The coal seam is reached by a drift. The coal is hard and of fairly good quality. During the summer months the mine is worked 24 hours each day, and the daily output has averaged about 500 tons. Absolutely nothing grows in this region and practically no vegetation exists. All food for the men and horses is shipped in from Norway. Navigation is only possible three months in the year, so all food must be brought in during these open months. Spitzbergen is now owned by no country; however, it is believed that when the question of ownership of this island is decided by the Hague Peace Conference next year, Norway will be given possession. It is understood that the American company has assurance from the Norwegian government that the capital invested will be protected, even should the island of Spitzbergen revert to Norway. About 60 miners are employed.

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The Copper Statistics for August

The American statistics for August prove the deduction that we made several months ago, viz., that domestic consumption had not gained so much as the deliveries indicated and that manufacturers were transferring a part of the accumulation to their own yards. Actual consumption received no setback in August. On the contrary it forged further ahead in all probability, evidence as to which is afforded by important collateral statistics. This being so it is, of course, preposterous to believe that consumption jumped from 47,546,000 lb. in April to 61,163,325 in May, then to 75,520,083 in July, only to fall off to 59,614,207 in August. Rather is it clear now that the deliveries in May-July were in excess of the consumption, and that although the world's uses for copper are increasing steadily, production is still increasing more rapidly.

This condition would theoretically create a downward tendency in the market. Such tendency appears, however, to be practically neutralized by the fact that the accumulation of stock as a whole is in strong hands, which are contemplating carrying it until consumption overtakes production—or more nearly approaches it—and are assisted by the continuance of low rates for money. The copper market seems to be therefore substantially in the condition of equilibrium, and for the present subject only to small fluctuations that arise from ephemeral causes. There is so much copper to be sold that a bull movement cannot be successfully inaugurated, and on the other hand the producers are neither disposed or compelled to sacrifice their holdings.

A Word of Caution as to the Porphyry Coppers

The success of the Utah Copper Company and the Nevada Consolidated is having the natural result of stimulating interest in the newer companies that have been organized to exploit similar ore deposits, and there will be undoubtedly increased speculation in their shares. In this connection it is worth while to advise some caution. Among the newer enterprises there are some, particularly Miami and Ray Consolidated, which will undoubtedly repeat the successes of the older companies. Their development has been carried on so cautiously and so thoroughly, under the most competent engineering direction, that the knowledge as to their ore reserves affords strong ground for this expectation. Giroux also is one of the older and well developed properties, as to which we shall say a word later. The other porphyry enterprises, such as Gila, Inspiration, Ray Central, and Chino, are very new, and as yet comparatively little is known respecting them. Utah Copper Company and Nevada Consolidated were upward of five years in being brought to maturity, and a more or less similar time is to be expected in connection with all such enterprises. This is one condition that should be well considered by investors.

Another condition that should receive careful attention is the difficulty of determining accurately the probable yield of the ore when the exploration is done in a hasty way. It is comparatively easy to make a quick development of a large tonnage of ore in these immense blanket deposits, especially when they are so situated that the existence of ore can be proved by drilling. But drilling as commonly conducted is apt to be a guide only as to the existence of ore and utterly unreliable as to the grade of the ore. However, it may be conducted under certain conditions, with the exercise of extraordinary intelligence and care, as has been apparently the case at the Ray Consolidated, so as to afford what are apparently reliable results. At least, it is said that the sampling of underground openings that have connected with drill holes at the Ray Consolidated have closely confirmed the assay results obtained from the drill holes. Admitting this to be so, it shows only that drill exploration, in order to be reliable, must be conducted with the same engineering skill as at the Ray Consolidated. Everyone knows of drill explorations elsewhere that have led to great disappointment as to the grade of the ore when the latter has been actually extracted.

The most doubtful factor in connection with the newer porphyry mines is the grade of the ore. In nearly all cases the grade is conceded to be low, anyway, and the decrease of only a few tenths of a unit increases greatly the cost of production per pound of copper. Another doubtful factor that has the same effect is the percentage of extraction in milling. These essential factors can be reliably determined only by extensive underground

openings and elaborate mill tests, such as were made in connection with the Utah Copper Company, Nevada Consolidated, Miami and Ray Consolidated, all of which requires a good deal of time.

We referred above to the Giroux company, which is among the older porphyry mines; indeed, its exploitation began almost coincidently with that of its neighbor, the Nevada Consolidated. Giroux is still, however, a long way from the producing stage. This company, according to its report for 1907 had developed approximately 4,000,000 tons of porphyry ore of grade similar to that of the Nevada Consolidated and about 350,000 tons of smelting ore, averaging 6½ per cent. copper. Since the acquisition of the control of this company by Cole & Ryan attention has been chiefly directed to the development of the high-grade ore in the Alpha shaft, and it is said that the resources now disclosed there warrant the erection of a large smelting plant, but no authoritative statements have been made. This ore apparently occurs as chamber deposits in limestone, and is of entirely distinct character from the porphyry ore of Ely. It will be remarkable if Ely becomes famous for both kinds of ore deposits in such close proximity as is the case in the Giroux property. But whatever may be the glittering possibilities of Ely in this respect they do not confer any merit upon the numerous wildcats of that district, whose property is outside of the mineralized zone so far as present geological knowledge extends, the booming of which is now being resumed upon the strength of the substantial companies of the district.

Shooting off the Solid

Undoubtedly the most important recent legislation affecting coal mining in the United States is the prohibition of shooting from the solid by the State of Pennsylvania. This legislation, however, was only half-baked, and left it optional with the State Department of Mines as to whether the law should be interpreted strictly and enforced. The result was that the Department of Mines entered into an agreement with the operators, permitting a continuance of the practice under certain conditions. We shall not spare the time now to comment upon the ineffectiveness and absurdity of this kind of legislation. It is more important to remark that the Department of Mines has lately withdrawn from its agreement insofar as the Connellsville region is concerned and has declared its intention to enforce the law strictly.

The statement of many coal operators that it is unfair to prevent solid shooting in certain states or districts and at the same time permit operators in adjacent and competitive fields to follow this dangerous practice, is an unworthy excuse. It would, of course, be best if we could have simultaneous action in this respect by all of the coal-producing States, but under our conditions such is impossible.

Shooting from the solid should be condemned from a standpoint of economy as well as from that of danger. It is useless to expect miners to remedy this evil themselves, for strange to say, our underground workers seem to be less concerned with the abolition of bad practices than is the operator himself. The very nature of the coal miner's work has made him a gambler of the worst type, for it is his own and the lives of his brother workers that are at stake. It is to be hoped that Mr. Roderick, the chief inspector of Pennsylvania, will follow his recent order by another ruling prohibiting solid shooting in all of the mines of Pennsylvania, and it is also to be desired that the chief mine authorities in other coal States will see their duty and do it.

Gold Production in Australasia

The return of gold production in the States of Australia and the Dominion of New Zealand for the first half of the current year show only a small change from the first six months of 1908. The gold output, as given by the official returns, is found in the table below, in which only the comparatively small returns from South Australia and Tasmania are estimated; the figures are in ounces of fine gold.

	1908	1909	Changes.	
West'n Australia	827,017	782,069	D.	44,948
Victoria	420,677	414,224	D	6,453
Queensland	214,861	204,191	D.	10,670
New South Wales	112,064	90,067	D	21,997
Tasmania	41,000	29,500	D.	1,500
South Australia	7,250	6,900	D.	350
Commonwe'th	1,512,869	1,426,951	D.	85,918
New Zealand	237,297	223,134	D	14,163
Total oz	1,750,166	1,650,085	D	100,081
Total value	$36,175,041	$34,107,256	D	$2,088,675

The total decrease for the year was 5.7 per cent., the greatest proportional reduction being 13.1 per cent. in New South Wales, and the smallest, 2 per cent. in Victoria. The total falling off is proportionally larger than in 1908, the decrease that year from 1907 having been only 2.7 per cent. The maximum production reported for Australasia in recent years was 4,315,759 oz. fine gold in 1903. The output for the first half-year therefore shows a decrease of over 23 per cent. from that year.

Several causes have combined to produce the reduction this year as compared with last. In Western Australia it is a continuation of the story of several years past: general activity, but a decrease in the grade of ore at the larger mines. No new discoveries have been made and no new districts opened to make up for the smaller output at Kalgoorlie and elsewhere.

In Victoria the old districts of Bendigo and Ballarat kept up their production, but a loss in some other districts brought about the small decrease. In Queensland the smaller output was the result chiefly of lower returns from the Charters Towers district, and of a little smaller recovery of gold from the Mount Morgan copper. The large decrease in New South Wales was due to suspension of work at several mines, and to the lack of success of several of the newer dredging propositions. In New Zealand the work at the Waihi and other large mines kept up well, and the decrease this year was due entirely to smaller returns from the gold dredges. For several years past, Australia has opened no new districts. Prospecting and discovery have been wanting in the goldfields, and new enterprises have been chiefly in copper and tin. This tendency seems to continue in the current year.

The cement-manufacturing companies of Canada have completed the organization of a "trust," or combination, which includes practically all the large plants in Quebec, Ontario and Manitoba. Canada is well supplied with materials for cement making, and the consumption has increased rapidly in recent years.

So far the new census appointments appear to be good. As compared with the administration of Mr. North there is a very great room for improvement in taking the census of the mining and metallurgical industry. The last report was about as useless an aggregation of figures as can be conceived.

Gypsum on Cape Breton Island, Nova Scotia

By John Tyssowski

For a number of years New Brunswick, southern Nova Scotia, and more recently Cape Breton have supplied a large portion of the gypsum consumed in the United States. Owing to the reduction in the tariff on gypsum imported into this country, which reduction is from 50 to 30c. per ton on the crude, and from $2.25 to $1.75 per ton on the ground or calcined material, there is no doubt but that added interest will be given to this industry in the localities mentioned.

Nature of the Deposits and Minerals Produced

The gypsum produced in Nova Scotia and New Brunswick is of a superior character. It is of a fine quality, contains little iron or other substances which affect the color, and also carries small quantities of magnesia, or of calcium carbonate. The deposits in this region are advantageously situated in many cases directy on the seacoast, and in harbors where shipping facilities are good, or at least close enough to tidewater so that the product of the quarries can be cheaply loaded on ships.

Many of the deposits are of great extent and can be quarried at a low cost. Labor is comparatively cheap in these provinces, common labor bringing only from $1.35 to $1.50 per day. Owing to these advantages of low labor costs and situation, the operating companies are enabled to market their product at a profit for about $1.10 to $1.25 per ton f.o.b. shipping point. The freight charges to New York, when handled in schooners or steamers especially devoted to this trade, usually run from $1.25 to $1.75 per ton. This enabled importers to place gypsum in New York even under the old tariff at a cost of about $3 to $3.50 per ton. The gypsum must be shipped in lump form, otherwise the mining companies could produce it at a much lower cost. In shipping, if there is a large percentage of fines, it becomes massed in the ship's hold, and in some cases damage to the whole cargo ensues.

The Operating Companies in Cape Breton

Gypsum occurs at many points along the seaboard of Cape Breton island. In traveling along the coast one of the most marked features to be noted is the numerous white "plaster" cliffs which occur in a great many of the harbors and at many points along the shores of the Bras d'Or lakes.

At present there are only two companies engaged in quarrying gypsum on Cape Breton, namely, the Victoria Gypsum Mining and Manufacturing Company, operating at Saint Anns, Victoria county, and the Great Northern Gypsum Company, which commenced to mine during 1908 and is already manufacturing and shipping selinite plaster from near Eastern Harbor, Inverness county.

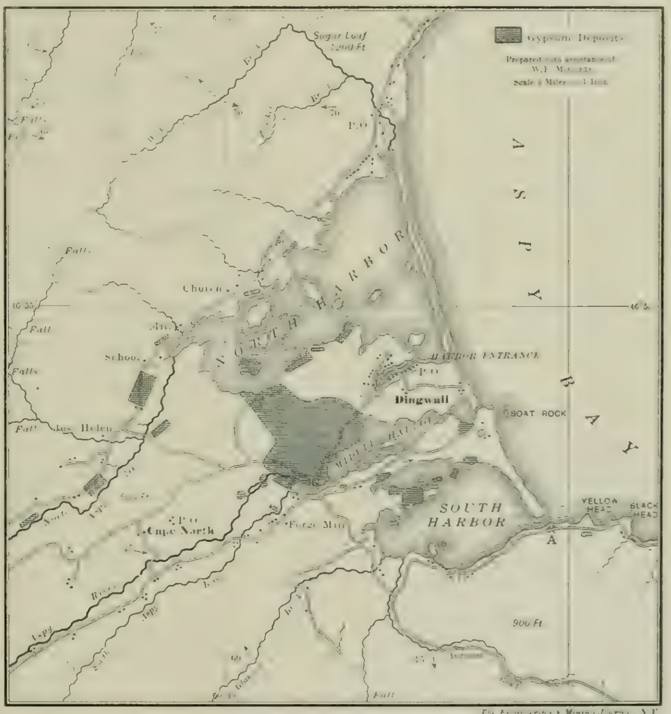
The Victoria company ships its gypsum to the Keystone Gypsum Company, of Philadelphia. The maximum output of this company is about 50,000 tons per year, the present production being about one schoonerload of 1700 tons per fortnight. Before the financial depression last year, the Victoria company had three schooners chartered, and when the market became depressed great difficulty was found in rechartering them for other uses. Formerly this company operated at Port Bevis on the Bras d'Or lake. Its present quarries are about three or four miles from the coast, and are connected with its shipping piers by steam railroads. The shipping facilities at St. Anns are modern.

The Alberta Gypsum Company, which operates at Hillsborough, in Albert county, New Brunswick, on the Bay of Fundy, has opened quarries at McKinnons Harbor on the Bras d'Or lake in Victoria county, but as yet has not begun shipping from this point. Other important deposits of gypsum are known to occur at Isle Madame, Richmond county, at Little Narrows near McKinnons Harbor, at Port Hastings, Inverness county (controlled by William Ross), and at Dingwall on Aspy bay, also Victoria county (controlled by W. F. McCurdy). These deposits are all of known commercial value, and occur at or near the seacoast.

The Aspy Bay and Ingonish Deposits

Large undeveloped deposits of gypsum are found at Ingonish and Dingwall, both on the east coast of Cape Breton island. Ingonish is about 30 miles north of Sydney, and Dingwall twice that distance.

The deposit at Dingwall on Apsy bay, a map of which accompanies this article, is of great size and rather typical of the deposits of Cape Breton island. The gypsum is exposed along the shore of the harbors, along the course of North Aspy river, and even in cuts along the roads, in great cliffs rising in places to a hight of over 50 ft. In all, this deposit covers approximately 5 square miles of territory. Probably not more than one third of this will produce good marketable gypsum, as there is a great quantity of anhydrite, no commercial use of which has as yet been found. This anhydrite, $CaSO_4$, has a hardness of from 3 to 3½, and contains 41.2 per cent. CaO, and 58.8 per cent. SO_3. It is granular, marble like or fibrous, and has cleavages in three directions at right angles. The



SHADED AREA SHOWS APPROXIMATE EXTENT OF THE DINGWALL OR ASPY BAY GYPSUM DEPOSIT

gypsum has a hardness of only from 1½ to 2, and contains 32.5 per cent CaO, 20.9 per cent H_2O, and 46.6 per cent SO_3. Selenite, as mined at Chetticamp, or Eastern Harbor, is a colorless, transparent variety of gypsum occurring in cleavable plates or crystals.—The deposit occupies an area of low lying rolling country, and is for the most part covered with a rather poor growth of spruce and fir trees, although in some places where the land has been cleared it supports a fair growth of grass.

The harbor at Dingwall is exceptionally well protected and commodious, but is not accessible to boats of any size at present; therefore, this deposit can only be developed after the government has opened up the harbor. The best quality of plaster occurs between Middle and North harbors, at some distance from the water's edge, so that short railroads will have to be used to transport the material to shipping piers. At the point marked *A* on the map, on the north shore and near the entrance of South harbor, there is an interesting occurrence of lead ore.

At Ingonish, gypsum cliffs extend for almost half a mile along the coast of South harbor, and most of the way, across a neck of land about half a mile wide, to North harbor. This deposit is not so large as the one at Dingwall, but is much more accessible, as the harbor at Ingonish is now open to schooners of light drafts. The gypsum at Ingonish is for the most part of good quality, little anhydrite occurring.

THE GYPSUM INDUSTRY IN NOVA SCOTIA

At present the greater part of the gypsum shipped from Nova Scotia is mined near Windsor by the Wentworth Gypsum Company. This company, operated by J. B. King, of New York, produces about 200,000 tons per year. The Newport Plaster Mining and Manufacturing Company, operating at Avondale, near Windsor, also in Hant's county, has mined several hundred thousand tons of gypsum, but as yet is not manufacturing selenite plaster. The J. B. King company controls the largest gypsum operations in this section of Canada. It operates mines at Windsor and Avondale, Nova Scotia, and Hillsborough, New Brunswick.

The gypsum industry is rapidly expanding in the portion of Canada, and there is no doubt but that in the larger deposits in northern Nova Scotia and New Brunswick [illegible] will be directed to the available supplies on Cape Breton island. These have been shown to be of superior quality and to possess the same shipping advantages as those to the south. At St. George's bay, Newfoundland, there is also said to be a deposit of good quality, but this is quite inaccessible, so will probably not enter into the development of the industry for some time.

Pyrite Mining in New Hampshire

BY ALBERT H. FAY

In connection with the article in the JOURNAL of Sept. 4, 1909, on the pyrite deposit of the Milan Mining and Milling Company at West Milan, N. H., the accompanying table gives some data, not then at hand, regarding the analyses of the various products obtained in the sorting and dressing of the ore.

ANALYSES OF ORE DRESSING PRODUCTS AT THE MILAN MINING AND MILLING COMPANY.

Date	Lump Ore			Mill Feed			Concentrate			Middlings.			Tailings.		
	S %	Cu %	SiO_2 %	S %	Cu %	SiO_2 %	S %	Cu %	SiO_2 %	S %	Cu %	SiO_2 %	S %	Cu %	SiO_2 %
July 1.	43 61	2 59	12 07	22 69	1 30		44 57	1 70	9 25	21 14	1 53		7 37	0 58	
July 2	39 60	1 83	14 45	18 71	0 87		41 47	1 45	15 15	17 70	1 01		7 44	0 51	
July 3.	39 47	2 94	14 55	20 63	1 57		43 58	1 68	11 05	21 14	1 45		7 42	0 57	
July 6	39 47	2 94	14 55	19 27	1 44		44 96	1 37	10 28	20 96	1 45		9 75	0 66	
July 7	39 48	2 64	12 84	21 02	1 46		44 67	1 55	12 10	21 98	1 35		9 16	0 66	
July 8	41 57	1 92	11 90	24 97	1 38		42 85	1 16	11.50				8 30	0 74	
July 9	41 25	2 70	9 92	24 33	1 09		45 82	1 26	8 07				12 00	0 82	

Dredging in California

SPECIAL CORRESPONDENCE

A great deal of prospecting is quietly going on in different portions of California to find ground suitable for dredging operations. The large dredging fields, such as those at Oroville, Folsom and Marysville, are pretty well taken up, all these being at the lower ends of rivers which have cut through gravel deposits above. But there are many isolated localities where there is room for one or more dredges to make money, and these are all being investigated. Indeed, very many places have been investigated by experts and "turned down" for one reason or another. In other places men with little or no experience in dredging operations have induced others to join them and build dredges to work on ground which the regular dredge men would not touch. In most such instances "freak" types of machines have been built, few of which have "made good." Dredge mining, like mining black sands on ocean beaches, is very attractive to numbers of people who have had little to do with mining gravels or sands for gold, and it seems easy for a certain class of men to get financial aid to start operations on such schemes.

Near La Grange, Stanislaus county, where a company is already successfully carrying on dredging operations, borings are being made to test adjacent lands. The La Grange Dredging and Power Company will install another dredge if the borings prove satisfactory. The Oro Light, Water and Power Company, of Oroville, Butte county, has lately bonded 1000 acres of land along the Merced river below Merced falls, in Merced county, and is prospecting it with drills to test values. One dredge is already at work near Snelling in that county.

Near Smartsville, in Yuba county, where extensive hydraulic mining was carried on for many years before the laws stopped that class of gold mining in the locality, drills are about to be placed on the river claim of the Marysville Quartz Tunnel and Mining Company by people who hold a bond on the ground. That section of the Yuba river forms a sort of basin or dumping ground for the tailings of numerous old gravel mines which were worked years ago, and it is expected that much gold then lost may be recovered by the dredging system. It has already been mentioned in these columns that Boston men have options on dredging lands 10 miles from Chico, Butte county, where a dredge is already working, and that dredges are proposed on the lower Klamath river.

In this connection it may be stated that Yuba county is again attracting more or less attention aside from its successful dredging enterprises. Many persons believe that the Marysville field will yet eclipse that at Oroville in productiveness by dredging, as the ground worked is much deeper and easier to handle, and there is a larger area also. Some quartz and river-bed mining is now projected at old places where mines have been long idle. Below Bridgeport, some 35 miles from Marysville, much exploration work is being done in the river, some of it with the aid of divers. A ditch has been built to bring in water and a power plant has been put up. It seems to be the intention of those engaged in this work to get at the bed of the river by diverting the waters of the Yuba. A strong diverting dam is to be put in. In the same county work is commencing at the very old and historic camp of Timbuctoo, not far from Smartsville, where very extensive hydraulic operations were at one time carried on. This time quartz mines are to be opened. Both the Marc Antony and Bullard ledges, long known, are about to be reopened.

New Publications

MINES OF THE TRANSVAAL. By R. R. Mabson. Pp. 683, illustrated. 5¼x7¾ in.; cloth, 16s. London, E. C., 1909-10: *The Statist.*

MANUEL DU MINEUR: RECHERCHES DES MINES ET LEUR EXPLOITATION. Fourth Edition. Pp. 579, illustrated. 4½x7¼ in.; cloth. Paris, 1909: Ch. Béranger.

A BIOLOGICAL SURVEY OF WALNUT LAKE, MICHIGAN. By Thomas L. Hankinson. Pp. 288, 6x9 in.; paper. Lansing, Mich.: Office of the State Geologist.

ANNUARIO DELLA INDUSTRIA MINERARIA, METALLURGICA E CHIMICA ITALIANA. Anno II, 1909. Pp. 580; 4½x6½ in.; cloth, lire 10. Torino, 1909: *Rassegna Mineraria.*

DIE SICHERHEITSVORSCHRIFTEN FÜR DIE BERGWERKE IN DEUTSCHLAND. By Bergassessor Einecker. Pp. 784. 6¼x9 in.; stoff. Essen-Ruhr, 1909: Verlagehandlung G. D. Baedeker.

PRACTICAL ARMATURE AND MAGNET WINDING. By Henry C. Horstmann and Victor H. Tousley. Pp. 231, illustrated, 4½x6¼ in., leather, $1.50. Chicago, Ill., 1909: Frederick J. Drake & Co.

EIGHTEENTH ANNUAL REPORT OF THE MINING DEPARTMENT OF TENNESSEE. By R. A. Shiflett, Chief Mine Inspector. Pp. 156. 6x9 in.; cloth. Nashville, Tenn., 1909: Mining Department of Tennessee.

DICTIONARY OF CHEMICAL AND METALLURGICAL MACHINERY, APPLIANCES AND MATERIAL. First Edition. Pp. 182. 4½x7½ in.; cloth, 50 cents. New York, 1909: *Electrochemical and Metallurgical Industry.*

CONTRIBUTIONS TO ECONOMIC GEOLOGY, 1907; Part II—Coal and Lignite. By Marius R. Campbell, Geologist in Charge. U. S. Geol. Surv., Bulletin 341. Pp. 444, illustrated. 6x9 in.; paper. Washington, D. C., 1909: Government Printing Office.

MINERAL RESOURCES OF ALASKA: REPORT ON PROGRESS OF INVESTIGATIONS IN 1909. By Alfred H. Brooks and others. U. S. Geological Survey Bulletin 379. Pp. 418, illustrated. 6x9¼ in.; paper. Washington, D. C., 1909: Government Printing Office.

SYSTEMATIC TREATMENT OF METALLIFEROUS WASTE. By L. Parry. Pp. 121, illustrated. 5½x9 in.; cloth, 5s. London, 1909: *The Mining Journal.*

Contents: Sources of supply—kinds of waste. General chemical and metallurgical principles. Partial or semi-refining. The smelting of lead ashes and the cleaning of tin slags. The smelting of tin ashes and solder ashes. The smelting of antimonial material. The separation of copper from tin, lead and antimony. Copper work. Miscellaneous. Metal working and refining.

GOLD: ITS GEOLOGICAL OCCURRENCE AND GEOGRAPHICAL DISTRIBUTION. By J. Malcolm MacLaren. Pp. 687, illustrated. 6x10 in.; cloth, $10. London, 1908: *The Mining Journal.*

Contents: Physical and chemical characters of gold. Compounds of gold. Classification of auriferous deposits. Source and transport of gold. Deposition and concentration of gold. The geographical distribution of gold—Europe; Asia; East Indian Archipelago and Polynesia; Australasia; Africa; North America; Central America and West Indies; South America.

ELECTROMAGNETIC ORE SEPARATION. By C. Godfrey Gunther. Pp. 193, illustrated. 6½x9¼ in., cloth, $3. New York, 1909: Hill Publishing Company.

Contents: Magnetism applied to ore dressing. Principles of magnetic separation and preparation of the ore for treatment. Separators for strongly magnetic minerals. Separators for feebly magnetic minerals. The concentration of magnetic ores. The separation of pyrite and blende. The separation of siderite from blende. Separation of miscellaneous ores and minerals.

This is the first book to appear in English about a very important subject. In the practical work of its field the author has had a good deal of experience, and in the preparation of his book he traveled extensively, visiting many plants where magnetic separation is practiced and carefully studying their operation. The result of his work has been a satisfactory treatise which will prove distinctly useful to many who are engaged in this branch of ore dressing.

COAL. By James Tonge. Pp. 275, illustrated. 5½x8½ in.; cloth, $2. New York, 1909: D. Van Nostrand Company.

Contents: History. Occurrence. Mode of formation of coal seams. Fossils of the coal measures. Botany of the coal-measure plants. Coalfields of the British Isles. Foreign coalfields. The classification of coals. The valuation of coal. Foreign coals and their values. Uses of coal. The production of heat from coal. Waste of coal. The preparation of coal for the market. Coaling stations of the world.

The book is intended for the general public more than for mining students. Detailed descriptions of mining methods have been purposely omitted. The character of the present work cannot be better described than by repeating the author's own words: "This book, though dealing only with the first and last of the aspects of the subject thus suggested, should be interesting and instructive not only to students of various sciences, but to the whole of those people, who, though proud of the high commercial position of England, are unaware as to how greatly this is due to our coal supplies."

THE DRESSING OF MINERALS. By Henry Louis. Pp. 544, illustrated. 7½x10 in.; cloth, $8.50. New York: Longmans, Green and Company.

Contents: General considerations. Volumetric sizing. Sorting and washing. Comminution. Separation by specific gravity. Appliances depending essentially on vertical fall. Jigs. Horizontal current separators. Shaking tables. Pneumatic separation. Magnetic separation. Electrostatic separation. Separation by surface tension. Accessory appliances. General construction of dressing works.

This elaborate work on ore dressing is well uptodate, but in its analytical and critical treatment of the subject it does not seem to us to be quite on the same plane as some other technical contributions that have been made by its distinguished author. It seems to us, moreover, that in undertaking to fill what seems to the author to be a very definite gap in technical literature, he should have manifested a fuller recognition of the classic work of Professor Richards on the same subject. Professor Louis' book is a good treatise on the dressing of minerals, which many will be glad to have in their library, but it distinctly falls short of being a master piece in its field.

MOODY'S MANUAL OF RAILROAD AND CORPORATION STATISTICS, 1909. Tenth annual number. Prepared for the Moody Manual Company. Pp. 3108 6½x9 in.; with maps. New York: The Moody Manual Company. Price, $12.

"Moody's Manual" is now so well established as a standard and reliable reference book, that any extended comment upon it is superfluous. It contains a mass of information, much of which is not to be found elsewhere, and which is of the highest value to all investors. Two of the features of the new edition are: An increase in the size of over 300 pages; a series of signed analytical criticisms on the values of the securities of the 100 most important railroad systems of this country by Roger W. Babson, statistician. This series enables subscribers to make comparison of real value between the securities of various railroad systems located in the same or different parts of the United States, and operating under similar or dissimilar conditions. The "Monthly Digest of Corporation News," an auxiliary publication, mailed regularly to subscribers of record gratis, includes a digest of all the news affecting corporate securities published in about 30 of the leading technical and financial publications, and tends to keep the information contained in the "Manual" strictly uptodate.

Details of Practical Mining

Notes of Interest to the Operators of Small Mines as Well as of Large Mines. The Things That Have to Be Done in Everyday Mining

REPORTS FROM EXPERIENCE

Readers of the JOURNAL are invited to contribute to this department. Articles should be brief, thoroughly practical, and preferably illustrated by drawings or sketches. Our draftsmen will prepare properly any kind of a pencil sketch that is serviceable. Something that is an old story in one district may be quite unknown in another. Articles accepted and published are suitably paid for.

Draining an Ore Chute

By ARTHUR O. CHRISTIENSEN*

At the Enterprise mine, Gunnison county, Colorado, a raise is being driven from No. 3 to No. 2 tunnel, 800 ft. above. The raise is a three-compartment incline following the vein. The manway is in the middle with skipway and chute on either side. The whole is cribbed with 8-in timber. At every 100 ft. a level is driven on the vein in each direction. As the work progressed more or less water was encountered on the levels. This flowed to the stations, and as no provision had been made for carrying off the water, it found its way into the chute. The quantity of water was not large, but was enough to keep the dirt in the chute at just the

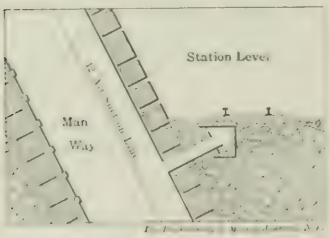


FIG. 1. DRAINAGE SCHEME FROM STATION TO SUCTION PIPE

proper consistency to stick there, the dirt being largely of a clayey character.

The direction offered to making any provision for carrying off the water from the level was that there was no room in the raise to put any conduit for it. The ladder and suction pipe filled all the space there could be spared in the manway.

At intervals of about a foot holes were bored from the manway into the chute. By the use of drills and a bent rod it was possible, with sufficient labor, whenever the chute became "hung up," which was the greater part of the time, to get it down by working through these holes. This was expensive and laborious.

At each level a length of the suction pipe was removed and a T inserted, having a 5-in. side opening. A section of 5-in. pipe was carried through the back of the raise into the station, entering it a little below the bottom. This was connected to a trough, as shown in Fig. 1. The water from the levels is run into the trough and carried by it into the suction line, through which it falls into a barrel arranged at the bottom of the raise.

By having the water fall through the airway the flow of air has been noticeably increased, and the water, instead of being trammed out with the dirt, now helps to run the compressor which supplies power for the mine.

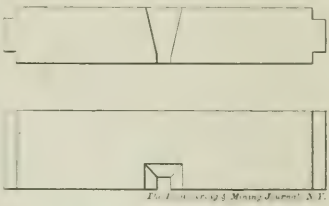


FIG. 2. METHOD OF CUTTING TIMBERS

Comparatively little difficulty is now experienced by the dirt being hung up, as the only water entering the chute is what runs in from the breast of the raise. What hang-ups do occur are readily taken care of by providing the following arrangement in the partition between the manway and the chute.

Slots 2x4 in. are cut between alternate timbers. Over the slot is nailed a piece of inch board about 5x8 in., by driving one nail at the top so the door thus formed can be swung up when it is desired to look up or to poke hung up dirt. These doors keep small rocks and dirt from flying into the manway. The timbers now being trammed are made with a groove across the middle of one edge 2x2 in. on the manway side and 6x4 in. on the chute side, as shown in Fig. 2.

When these partition pieces are put in they form a 2x2x4 in. on the manway side and 6x8 in. on the chute side, the slots being between every other partition piece. By having openings this size and shape a hang-up is easily pried down by working from the manway.

The chute in question is 2 ft. 8 in. x 3 ft. 8 in., cribbed solidly, but not lined. The dip of the raise varies between 60 and 70 degrees. This chute seems to be too small, for even dry dirt, after piling up in it, has to be barred down occasionally.

A chute of this dip should be lined on the bottom to prevent wear and hanging up of the dirt. Planks 2 in. or 4 in. thick, laid longitudinally, or still better, sheet iron, make good lining when well supported from underneath.

Notes on Placing and Cutting Stulls

The hitch bottom should be level and not less than 2 in. in depth, and the back edge should be at right angles to the line of the stull or as nearly so as possible. For a heading, it is sufficient to merely smooth off the face of the rock so as to enable a good fit to be secured, no bottom or sides being necessary. A vertical bevel of from 10 to 20 deg. will hold the stull firmly in place.

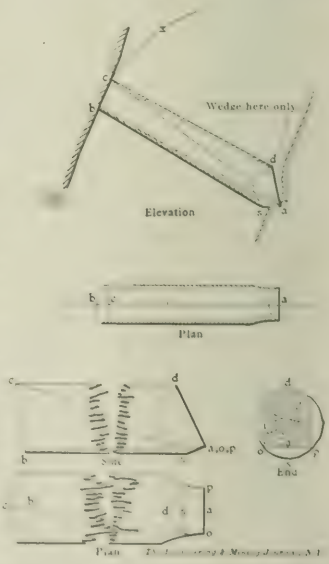


FIG. 1. METHOD OF MEASURING THE STULL

*Mining engineer, Rochester, Colo.

To measure and cut a stull, it is well to have a slidestaff and try square, but a good fit can be made with a tape alone. Referring to Fig. 1, which contains a general sketch showing measurements to be taken and also detail for cutting the timber, the tape is held at *a*, the center of hitch on bottom, and *a-b* is measured. Point *c* is next established vertically above *b* and at a distance from it equal to the thickness of the proposed timber, and *a-c* is measured. These are all the measurements required if the hitch and heading are square. The wall above *c* must be cleared of projections that would interfere with dropping the stull into place along the arc *c-x*. The bevel of the butt of the stull (the angle *b-a-d*) may be estimated by the eye. The butt of the stull is sawed first along the line

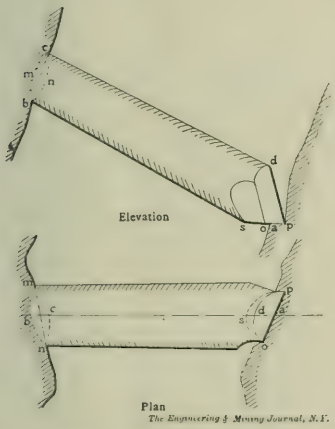


FIG. 2. THE STULL IN PLACE

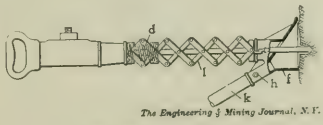
d-a making the plane *d-p-a-o* and the long corner is lopped off with an axe making the plane *s-a-o-p*, and the edge *o-p* square with the line of the timber. Then the sides are trimmed as shown making *o-p* equal to the width of the hitch. With the tape held at *o* or *p*, using the measurements *a-b* and *a-c*, the points *b* and *c* are marked on bottom and top of the timber allowing slightly for the bend in the tape caused by the partial wrapping around the stull.

It is frequently necessary to set a stull where neither hitch nor heading can be made square with the line of the timber. On the heading a circle is marked in some manner to represent approximately the outline of the stull. Referring to Fig. 2, point *a* is the back center of hitch bottom, and *o* and *p* the corners; *b*, *c*, *n*, and *m* are respectively the bottom, top, and sides of the circle marked on the heading; *a-b*, *b-o*, *b-p*, *n-o*, and *m-p* are measured. The face *s-o-p-a*, is first made by a cut with the axe and a mark made on this to represent point *a*. *A-b* is then measured and *b* marked; *o* and *p* are located equidistant from *a* by the measurements *b-p* and *b-o* from point *b*, care being taken that *o-p* is equal to width of hitch. The face *d-o-p* is sawed and the sides trimmed; *o-n* and *p-m* are laid off and the head is sawed through the points *b*, *m*, and *n*. Additional measurements to *c* may be made as a check. A stull of this kind should be braced laterally by a collar brace to the next timber.

Wedging must be done at the butt. The head should fit snugly against the rock at all points but especially at the bottom. Wedges driven at the head are a sign of poor work.

Drill Dust Collector

A German contrivance for collecting the dust produced by an air-hammer drill is illustrated in the accompanying figure. (*Zeits. für B., H. und S.-wesen*, 1909, No. 1). It is giving satisfactory service



DUST COLLECTOR RIGGED ON DRILL.

in the Shamrock I-II mine in Prussia. The dust is caught in the funnel *f* and passes down the pipe *k* into a sack. The funnel is pushed against the rock face by the spring *d*, acting through the system of levers *l*.

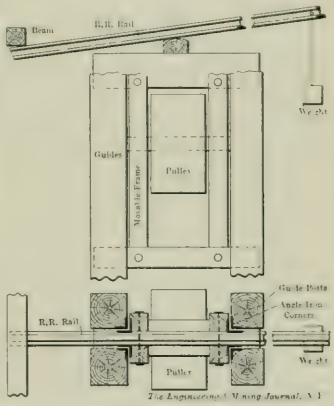
Crane for Use in Machine Shop

In a shop where heavy work has to be done the use of a traveling crane is absolutely necessary if it be desired to do work easily and rapidly. A crane that is being used extensively in the Mesabi range, Minnesota, is one that travels in a circle. The traveling arm is an 8- or 10-in. I-beam, or any size that is sufficiently strong to do the work required. One end is pivoted in the center of the shop, while to the outer end is attached a car wheel of suitable size. Railroad rail is bent in the form of a circle and suspended from the beams above. The track forms a complete circle, and the traveling arm can thus be placed over any part of the floor. A tackle block, mounted upon a traveler, is suspended from the I-beam. A crane of this type is not so heavy as the ones with the long span which are operated upon tracks attached to the wall posts. Its cost of installation is less, and yet it will do effective work, although operated by hand power.

Self Adjusting Bucket Elevator Pulley

The accompanying illustration shows a device whereby the tension on elevator belts may be kept constant. A movable frame is made for the pulley in the usual way and is reinforced by angle iron, as shown. On the top of the frame is placed a piece of wood, or iron, to give a bearing for a railroad rail, one end of which is fixed permanently to a beam or post of the building.

This rail may be any length, 10 to 12 ft., and sufficient weight is added to the free end to give the belt the desired tension. This has the advantage over the type that is adjusted by screws, inasmuch as the pulley will give in case anything is



SELF ADJUSTING PULLEY FOR BUCKET ELEVATOR

run in between the pulley and belt; also should the belt shrink, the tension will remain the same.

Scheme for Loosening a Stuck Drill Steel

In drilling deep holes by hand with 15- or 20-ft. steel, the bar often sticks; or, in some cases, a drill is actually driven in soft ground as one would drive a stake, and then it becomes necessary to resort to some means to remove it. This may be done easily by taking a piece of steel 1½ or 1¾ in. thick, 6 in. square, with a hole in the center about twice the size of the drill. This is placed over the head of the drill and two steel wedges driven in to fasten the piece of steel on the drill. This gives a good shoulder against which to hammer. A few blows on this will soon loosen the bar. It is much more effective than a chain and lever, or pulley block.

Personal

Mining and metallurgical engineers are invited to keep THE ENGINEERING AND MINING JOURNAL informed of their movements and appointments.

Dr. James Douglas arrived home on the "Mauretania," Sept. 9.

H. H. Gregg, of Joplin, Mo., has been chosen permanent chairman of the zinc ore tariff club.

Theodore Gross, of the London Venture Corporation, has returned to New York from his trip to London.

Arthur Lakes, of Denver, has been making examination of mining property near Hahn's peak, Colorado.

Max Boehmer, of Leadville, has been appointed consulting engineer of the Druid Mining Company, in Gilpin county, Colorado.

H. G. C. Thofern, manager of the French syndicate operating at Nioca, Chihuahua, Mex., is in New York purchasing machinery.

Walter Harvey Weed, of New York and F. H. Probert, of Los Angeles, are making examinations in the Guanajuato district of Mexico.

C. L. Constant, Jr., of the C. L. Constant Company, consulting engineers, New York, has left for points in Ontario on professional business.

F. T. Havard, of Helena, Mont., and well known as a metallurgical engineer, has accepted the chair of metallurgy at the University of Wisconsin, Madison, Wis.

Newman Erb, formerly president of the Wisconsin Central Railway Company, has resigned as a director and as chairman of the board of the Davis-Daly Copper Company.

Frank L. Sizer, of Montana, has been appointed superintendent of the Balaklala Consolidated Copper Company in Shasta county, Cal., succeeding R. N. Bishop, who has resigned.

R. N. Bishop, mine manager of the Balaklala Consolidated Copper Company, has resigned to devote his time to personal interests. He will have an office at 1121 First National Bank building, San Francisco.

Dr. Benzo Katsuro, professor of metallurgy in the Tokio Imperial University, has recently been visiting mines of Bingham and other Utah camps to gather data concerning our methods of mining and treating ores.

Henry Fisher has been appointed superintendent of the Calumet & Hecla stamp mill at Lake Linden, Mich. Mr. Fisher, who has been acting superintendent since the death of the late H. W. Cole, has been an employee of the company for the past 40 years, acting in the capacity of machinist.

[illegible] has been appointed superintendent of motive power for the Calumet & Hecla mines, succeeding Jas. D. Ramsay, who retired about one year ago. Mr. Sodde is an old employee of the company, starting when the mine first opened about 43 years ago, and has worked in various capacities up to the present responsible position.

Obituary

William C. Davis, vice-president and general manager of the F. M. Davis Iron Works Company, Denver, Colo., died at Denver, August 18, aged 45 years. He was a graduate in mechanical engineering of the Massachusetts Institute of Technology and ever since his graduation had been connected with the Davis company, of which his father is the head. He was the inventor and designer of much of the mining and smelting machinery that is built by this company and possessed a high order of ability in his specialty. He was widely known in the mining industry of Colorado and adjacent States and had many warm friends, who appreciated his engineering ability and his genial personality.

C. G. Warnford-Lock died at Bandarawella, Ceylon, July 30. He was the son of a mining engineer, and was born in Hampshire on Sept. 9, 1853. Mr. Warnford-Lock was educated at Cranleigh, and his first professional engagement was in the sulphur mines of Iceland. He was afterward engaged in alluvial mining in Hungary, and later on held responsible positions as mine manager in the Black Hills of South Dakota and in New South Wales. It was in the latter country, in 1896, that he took charge of the Wentworth Gold Fields Proprietary Company's mines. While he was controlling affairs there a prolonged strike took place, and it was owing to his energy and determination that he was able to run the mines during the period of disturbance, and bring the strike to a satisfactory issue. Mr. Warnford-Lock also managed mines for the Bulawayo Exploration Company, at Gwelo, Rhodesia, and for the Raub Gold Mining Syndicate in the Malay peninsula. For some time he resided in Sydney, where he practised as a consulting mining engineer.

He was the author of several well known works on mining and cognate subjects, of which the chief are: "Practical Gold Mining" (1889), "Mining and Ore Dressing Machinery" (1890), "Economic Mining" (1895), "Principles and Practice of Gold Milling" (1900), and "The Miner's Pocket Book," which ran into five editions, the last being published in 1907. In that year he also brought out his last work, "Mining in Malaya for Gold and Tin," the second edition of which has already been issued.

Mr. Warnford-Lock was one of the original members of the Institution of Mining and Metallurgy, and served on its council and on its various committees. He moreover contributed several papers on mining and metallurgical subjects to the transactions of the institution, and always maintained a keen interest in its affairs and well being.

He returned to Malaya in 1908, where he was engaged in inspecting and reporting on properties for various mining companies. An attack of ptomaine poisoning in the autumn of last year seriously impaired his constitution, and he was compelled to take voyages to China and Ceylon to recuperate his health. These were unfortunately unavailing.

Societies and Technical Schools

American Mining Congress—The annual meeting of this organization will be held at Goldfield, Nev., Sept. 27 to Oct. 2. An interesting program has been prepared. Special trains will be run from Los Angeles and San Francisco. Some interesting papers will be read, and the local executive committee at Goldfield has arranged bountifully for the entertainment of the visitors.

Michigan Geological Survey—This organization has published the following resolutions:

WHEREAS, Dr. Alfred C. Lane, for 20 years State geologist for Michigan, has resigned his position in this capacity, therefore be it

RESOLVED, by the State Board of Geological Survey that Dr. Lane's resignation is greatly regretted by this board. His administration has been unprecedented in length of time and unparalleled in amount of publication and marked by uninterruptedly harmonious relations with other boards and the great schools of the State. Geological work has been fairly distributed in all parts of the State and without neglecting pure science, economic results have been obtained. Among the economic results gained have been the following: Copper lodes have been located; coal production has increased from 50,000 to 1,500,000 tons; rock salt is now to be mined; soda, salt, mineral water, limestone, cement and clay industries have been fostered and valuable advice on water supply given. In view of these well known facts, be it further

RESOLVED, that the severing of Doctor Lane's official relations with this work is a distinct loss to the State, and that another State is to be congratulated on securing the services of a man who has for so long done valuable work for Michigan, and be it further

RESOLVED, that a copy of these resolutions be spread on the minutes of the Board of Geological Survey.

Special Correspondence from Mining Centers

News of the Industry Reported by Special Representatives at Butte, Denver, Salt Lake City, Goldfield, Cobalt and Toronto

REVIEWS OF IMPORTANT EVENTS

San Francisco

Sept. 8—Two important mining deals have recently been carried out in Nevada county, the principal of which is the purchase of the old Iron Mountain mine at Indian Springs from M. C. Taylor by the United States Smelting, Refining and Mining Company. At the surface the mine was worked for iron ore years ago, but as depth was attained a large body of sulphide copper ore was found. It is understood that a broad-gage railroad will be built to connect the mine with the main line of the Southern Pacific, and that the property will be worked on a large scale. The breaking of ground for the new central shaft of the Brunswick Gold Mining Company, Grass Valley district, is another matter of importance. Manager C. H. Mallon says this new shaft will be sunk to 2500 ft. without a stop. This shaft should intersect the vein at a depth of 1500 ft. The new shaft will have three compartments, and will be equipped with electrical machinery. It is 2600 ft. east from the old shaft on the property. When the shaft has reached 1200 ft. a pump will be installed to unwater the old mine, now filled. The undertaking is the most important which has taken place in the district in some years.

In Sierra county at Sailor's Ravine, near Forest, a remarkably rich strike has been made in the Lucky Frye mine after a long period of prospecting and development. This is one of the newer properties of the county, and is owned by Jason Frye and J. E. Winrow.

The Gold Canyon mine on the Middle Yuba river, below the Plumbaho power house, is also the scene of a new strike. The rich ore was found while extending the drain tunnel, and was only a few feet from where the late F. B. Hill quit work when the mine was known as the Two Counties. Years ago the mine yielded handsomely while being worked by the late D. R. McKillican, of North Bloomfield.

In Amador county sinking has been discontinued for the present at the Kennedy mine at Jackson after the shaft had been sunk 3405 ft. vertically, including the sump. A new level is being opened at the 3300 level of the mine. This property is yielding largely and paying regular dividends. At the 3150-ft. level of the Argonaut, the adjoining mine to the Kennedy, crosscutting has been commenced. Resumption of dividends will soon be in order at this mine. In the same county the old Keystone is having many improvements made of an important character. The old 40-stamp batteries are being overhauled and repairs and excavations have been made for the foundation for a new 80-stamp mill. Finally the mine will have 140 stamps altogether, so that large quantities of low-grade ore may be milled at a profit. Among other improvements the Patton shaft will be sunk 200 ft. deeper.

In El Dorado county while plowing in the main street at Georgetown for the purpose of leveling it, a quartz ledge showing free gold was discovered by the workmen. Near Nashville at the Union mine a new shaft is being sunk to open new ground at a depth of 600 to 800 ft. The old works will be unwatered and a shaft sunk from the 1000 to the 1500 level. The Monarch Consolidated, also at Nashville, is sinking from the 800 to the 1100-ft. level, with the hope of finding the pay shoot which was worked in the higher levels. Considerable other work is being done in this belt of free-milling gold ores.

The fact that the Natomas Consolidated Company, of California, owning dredges and dredge ground at Folsom and elsewhere, has filed articles of incorporation in El Dorado county, is taken as evidence that the company is about to begin dredging operations in that county.

Denver

Sept. 10—In the Cripple Creek gold district, the August production of the Western Investment Company's lease on the Raven hill property of the Mary McKinney company is given at 776 tons, yielding from $25 to $30 per ton. The Gold Hill end of the Mary McKinney company's holdings is also shipping. The Portland company reports the discovery of a new orebody 4 to 6 ft. wide, carrying 3 oz. gold per ton, as broken. The vein was exposed years ago by a cut made for the Circle railroad, and not then considered of any value, but the repeated applications for leases on this ground led the company to do some exploitation work, with the foregoing result. The company is now sinking a two-compartment shaft on the vein in the vicinity of the shoot, and has erected ore bins.

The deep drainage tunnel now measures 10,465 ft. from portal to breast, and it is said to be a splendid piece of work, reflecting credit on the contractor, A. E. Carlton. The importance of this enterprise, which, when completed, will add at least 10 years to the life of that wonderful camp, can hardly be estimated. The Rigi mine, in the gap between Battle and Bull hills, is to be equipped with machinery and its production increased. It was always supposed to be an extension of the Ocean Wave vein of the Modoc company, which is credited with a production of approximately half a million dollars. In the early day the Rigi was worked under lease by Charles J. Moore, then consulting engineer for the Portland company. The August production of the El Paso company is given at 1800 tons, some of this being dump ore, which is being milled on the ground. The mine ore averages $30, and that of the dump $6 per ton. The ore production of the whole camp is said to be unusually heavy so far this month.

The advance in the spelter market is causing renewed activity in the zinc-producing mines of the State, especially those of Leadville. At Central City, the Fifty Gold Mines Corporation has sent to the bank another $5000 gold brick, the result of a 10-day run on ore from the Gregory-Bobtail workings at depth of from 1100 to 1400 feet.

The old Batchelor mine, which some 20 years ago was the chief silver producer in the sedimentaries north of Ouray, and yielded $2,000,000 at that time, is now under lease again, and to the fore with a reported strike of 18 in. of 1000-oz. silver ore. The character of the ore in this mine is argentiferous galena, associated with gray copper. The leasers are two of the original owners, George Hurlburt and Charles Armstrong. The tonnage for Ouray for August is given at 1175 tons, of a gross value of $60,000, and this is exclusive of the gold bullion from the Camp Bird, Revenue and Atlas mines.

The San Juan mines had a hard time during the last nine months of winter snows, and are now having almost as hard a time with its fluid equivalent. At Durango, on Sept. 6, the Animas river rose high enough to close down the furnaces and roasters of the smeltery there, and it will take 10 days to repair the railroad and bridges between that town and Silverton. At Telluride, the dam at Trout lake, which supplies the Telluride Power Company, broke, and sent the entire volume of the lake down the South fork of the San Miguel river, and damaged towns, mining property, etc., to an extent of approximately $300,000. The electric power at Telluride was shut off, and the mining industry placed at a standstill. This also closed temporarily the Camp Bird mine, across the divide. The Buckley mill was carried away, and the town of Placerville

[illegible] and most of the railroad track between that place and Helena are washed out.

Butte

[illegible] United States assay office at Helena reports that $249,982 worth of bullion was received during August. This is an unusually large amount for Montana. Chouteau county was first in production with $99,238 and Fergus county second with $61,521.

The affairs of the Pittsburg & Montana Copper company are in a somewhat involved state. Last spring, it was given out that the East Butte company was to acquire the entire interests of the former company and a stockholders' meeting of the East Butte company was held to vote upon the question. Then in July the bondholders of the Pittsburg & Montana company started to foreclose the mortgage and Oscar Rohn was appointed receiver. The latest move in the company's affairs is the filing with the Montana secretary of state of articles of incorporation of the Pittsmont Copper company, a West Virginia corporation, capitalized at $11,000,000. It is presumed that the new company will take over the properties of the old as a part of the general scheme of reorganization.

Recent heavy rains have caused a number of washouts on the surface roads of the Amalgamated company's properties and necessitated considerable repairs. Within the last week, crosscuts have been started north and south on the 1300-ft. level of the Badger State. New ore bins are now being installed and also a new boiler house. When the latter is finished a new boiler plant will be put in. The present hoist on the property is good for 2000 ft. At the West Colusa mine a crosscut has been started on the 1800-ft. level which will meet the east drift on the 1800-ft. level of the Mountain View mine. The distance between the two points is about 1400 ft. and it is estimated that it will take two months to complete the work. At the Leonard mine, two of the air compressors were shut down for three days last week. These compressors supply air to the air driven pump on the 1800-ft. level of the Pennsylvania, the lowest level of that mine, and as a result the water rose in the sump and flooded the stope to a depth of three feet.

Goldfield

Oct. 1909. The Goldfield Consolidated [illegible] the business [illegible] the history of the mine. A hoist is being [illegible] and installed [illegible] a power cable at [illegible]. The [illegible] production, period [illegible] and [illegible] a [illegible] [illegible] production [illegible]

The output includes about 150 tons of sorting ore from the Hampton stope, having an average value of about $600 per ton.

A number of surface improvements are being made around the Clermont shaft. A change room, 20x60 ft. in size, has been constructed, and work upon ore bins of at least 500 tons capacity will soon be started. Grading is under way for extending the Consolidated railway to the above bins. On the 600-ft. level of the Clermont shaft a crosscut is being run to cut the Red Top vein. When completed this crosscut will cut the vein about 270 ft. below the deepest level of the Red Top shaft. On the 860-ft. level a crosscut is being driven to intercept the Jumbo vein on its course downward.

The specimen ore received at the Nevada Mineral Palace is now being classified and catalogued and placed in show cases. The Wells-Fargo Express company has agreed to give free transportation of specimens for the exhibit, from all points in the State providing the consignment does not weigh over 20 pounds.

Salt Lake City

Sept. 10. With the work of remodeling the Copperton mill of the Utah Copper Company completed, the mine will begin producing more than at any previous time. Last spring the mill was treating 750 tons of ore daily at a comparatively high cost. The management closed the mill and installed the processes used at the Garfield mill and now the Copperton plant has a capacity of 1000 tons daily with the cost almost as low as at the Garfield concentrator. Formerly the net cost of producing copper, including mining, milling and smelting, was 9.192c per pound at the Copperton mill and it is expected now that it will be about 8.98c. The steam shovels are now in a better grade of ore which will also reduce the cost of production.

The management of the Iron Blossom reports that the characteristic high-grade ore in the north shaft has returned and that conditions at the mine are encouraging. Under the main level, the orebody that was temporarily lost, continues now in full strength. The ore that is being extracted is of a high grade and the shipments are heavy.

A project of importance is under way in the Park City district. The plan includes a long tunnel from the old Comstock-Chicago properties in Thaynes canyon through Scott hill to the Copper Apex and Lower Copper workings. This tunnel would drain the lower levels of some promising properties where the water has prevented further development and would provide an outlet at the sites on a lower level in the canyon which would insure cheap transportation to Park City.

The details of the consolidation of the Bingham-Central Standard, Bingham Central, Bingham Standard, and Bingham Metals properties are practically complete and the articles of incorporation will be filed next week. Walter B. Farmer, of Boston, who is heavily interested in the enterprise and Sam H. Treloar, manager, are conducting a party of interested Boston capitalists through the properties. The new company will install electrical equipment and build its own power plant. A transportation tunnel will be driven through the mountain from the Bingham Metals grounds to the mining properties in Carr fork.

The Silver-King Coalition Company, of Park City, will on October 1, distribute $187,000 among its stockholders, the regular quarterly dividend of 15c. per share. The dividends of this mine now amount to nearly $12,000,000.

The Thor Mining Company, capitalized at $100,000, has been formed to operate in the Bonanza Flat district in Big Cottonwood. The company controls 22 claims located around the Snake Creek tunnel project, which will permit deep development work. Work will be started at once sinking a shaft and driving two tunnels to ascertain the possibilities of the proposition.

Ore shipments from Tintic during the past week amounted to 207 cars. The shipments follow: In 50-ton cars, Centennial Eureka, 40; Scranton, 4; Grand Central, 5; Victoria, 4; Sioux Consolidated, 17; May Day, 2; May Day (concentrates), 1; Eagle & Blue Bell, 3; Chief Consolidated, 2; Uncle Sam, 3; East Tintic Development, 2; Ajax, 8; Eureka Hill, 3; Yankee, 2. Bullion Beck, 3; in 20-ton cars, Iron Blossom, 27; Colorado, 29; Dragon Iron, 44; Beck Tunnel, 7 cars.

Cobalt

Sept. 12. Although no official announcement has been made at Toronto, there are indications that the petition of several of the Cobalt mines to have the heavy royalties reduced will be considered. A deputation recently called upon the officials, and received an assurance that the matter would be taken into consideration.

The work on the substations of the Mines Power Company at Cobalt and Kerr lake is making good headway. At Cobalt, the substation is being built on the Nipissing property, just back of the Cobalt lake, and the poles for the transmission line have been erected. The substation which is to serve the Kerr Lake district is being built at Brady lake. Altogether there is a total of about 1000 men at work, 700 working at the plant at Matabechewan River and about 300 more on the transmission lines and substations.

In the drilling contest held in Cobalt on Sept. 8, the first prize was taken by the team from the Nova Scotia mine, who drilled 98 in. In a similar contest, held on Aug. 18, the same team, only drilled

25⅛ in. The difference in these records, as well as those made by the other competing teams, is largely due to the great strides made since the advent of Pickens and Page, the world's champions, who drilled here in the first contest.

It is understood that Montreal interests identified with the Crown Reserve have obtained control of the Silver Leaf, and the appointment of Colonel Carson, president of the Crown Reserve, and Mr. Cohen, manager of the same company, to the positions of president and consulting engineer, respectively, of the Silver Leaf, would seem to point to the authenticity of the report. The Silver Leaf is capitalized at $5,000,000, and it is understood that a controlling interest in the stock was held in New York, and that this has been sold at a price far enough under the market value to prove attractive to the adjoining company. Up to date the property has never done anything to justify the large capitalization, as only about $300,000 worth of ore has been produced. The greater portion of this was taken from the continuation of the Crown Reserve vein, but soon after entering the Silver Leaf property the vein pinched out.

The provincial government, after almost inexcusable negligence, has recognized the gravity of the fever situation in Cobalt. Doctor Hodgets, the medical officer for the province, has been in camp, and is taking active steps to clean up the town, and remove the accumulation of filth. Four special inspectors have been sent from Toronto to look after the work, and it is hoped that the methods now being employed will be successful.

Some good finds have been made lately in the Gowganda district, and it is expected that within the next few months the camp will make a much better showing, and will recover to some extent from the ill-advised advertising to which it has been subjected since the first rush commenced. At present the prices of supplies are very high, and as an instance it may be stated that hay is worth $160 per ton, potatoes $17 a bag and blacksmith coal costs $92.50 per ton.

Toronto

Sept. 12.—Hon. Frank Cochrane, Ontario, minister of lands, forests and mines, in a speech at Haileybury on Sept. 7, announced that the provincial government would make a large increase in the appropriations for opening up and developing northern Ontario.

A similar policy with regard to Quebec was outlined by the premier, Sir Lomer Gouin, in an address at St. Johns, Que., on the 6th, when he said that they wanted a Quebec "Cobalt." If the report of mining authorities who would be sent to the Chibougamoo district to investigate its supposed mineral wealth was to the effect that it was worth the cost, the provincial government would build a railway to serve the district.

Transportation facilities to Gowganda and the neighboring camp will be greatly improved for the coming winter. The government wagon-road connecting Gowganda and Elk City with the railway at Charlton will be a first-class highway. The Bisco route by road and water connecting Gowganda with the main line of the Canadian Pacific will be an active competitor. Since last winter the extension of the Canadian Northern Railway has brought it to within 35 miles from Gowganda and a new cut will be made from the railroad to Phœnix, following from that point a natural route to the camps at Shining Tree, Elkhorn and Gowganda.

The annual report of the gas and electricity inspection branch of the Canadian inland revenue department for the fiscal year ending March 31, shows that the total amount of electricity exported was 359,283,286 kw. hours, as compared with 135,075,680 kw. hours generated for home consumption. During the year only one company, the Provincial Natural Gas and Fuel Company exported natural gas, its exports amounting to 387,019,800 cu.ft. No further licenses allowing the exportation of natural gas will be issued.

Mexico

Sept. 10.—The mining companies of Mexico have endeavored to secure special rates from the railroads for the shipment of zinc ore to gulf ports for export to Europe, but so far have had no encouragement. However, it is believed that they will be able to ship profitably to the European market, notwithstanding the comparatively high rail rates which prevail on this low-grade product. Buyers at Chihuahua are offering 25.28 pesos per metric ton for 40 per cent. ore at Chihuahua on the basis of £22 per long ton of spelter in the London market. This offering is less than the average rate which prevailed for the American market, but still it permits of the profitable operation of the Mexican mines in many instances. The steamship companies have made very low rates on the shipment of zinc ore to Europe, and have promised to continue the low rates in order to permit and encourage the business.

The express business of the National Railways of Mexico, formerly controlled by the Wells-Fargo company, is now operated by a Mexican company, in which the Mexican government owns control. This company also controls the National Express Company, and the Interoceanic Express Company. The movement is along the line of the increased government interest in the transportation of the republic. The Mexican government also owns the telegraph lines, and with the successful outcome of the railroad merger practically has the control of the transportation and telegraph systems of the republic in hand.

The concession for the proposed railroad from Monclova to Chihuahua has been ratified by the new state legislature in Coahuila, and a subsidy of 5000 pesos per mile has been granted within the limits of Coahuila. It is expected that Chihuahua will grant a like subsidy and that the road will be built. The road opens up important coalfields in the northern states, and will be a means of outlet for the coal mines to the important consuming centers of the northern part of the republic. It is rumored that the F. S. Pearson syndicate, which has already large interests in Mexico and which has organized the Northwestern Railway Company to purchase the Chihuahua & Pacific, the Sierra Madre & Pacific, and the Rio Grande, Sierra Madre & Pacific, will be interested in the new road, but the situation has not progressed far enough to make this definite as yet. The concession is granted to Edward Hartman. For a time it was thought that the concession would be refused by the new government in control of Coahuila. The distance from Chihuahua to Monclava is 700 km., over a very level country.

It is reported now that the Mexican Central has restored the use of the oil-burning locomotives on the southern divisions, being able again to secure a sufficient supply from Ebano to take care of the business.

The whole Mexican mining industry is interested in the various propositions for the installation of self-contained and small-unit treatment plants at the mines and numerous inventions and suggestions are offered to the miners of the republic along these lines. The transportation conditions make it imperative that something should be done to relieve the mines from the burden of transporting low-grade or moderate-grade ore over long, extensive trails, and the inclination is to install treatment plants at the mines.

London

Sept. 4.—A certain amount of interest is taken in West African mining shares but the interest appears to be mostly professional. As lately announced in the JOURNAL, a good deal of fresh capital has been found to carry on development work and those who have interests in the country appear to be taking it for granted that the success of West African mines is now beyond doubt, ignoring altogether the experience of the past when over and over again the optimists have proved false prophets. Until the results of the development work are known and until closer estimates can be made of the earning powers of the properties now being opened up the public would be well advised to leave West African shares alone.

Mining News from All Parts of the World

New Enterprises, Installations of New Machinery, Development of Mines and Transfers of Property Reported by Special Correspondents

THE CURRENT HISTORY OF MINING

General Mining News

Phelps, Dodge & Co., Inc.—The copper production of the various properties of this company during August amounted to approximately 11,000,000 lb., of which the Detroit Copper Company contributed about 2,000,000 lb. and the Copper Queen and Moctezuma properties 9,100,000. The production to date this year has been 87,934,000 lb. and with this rate maintained, the annual output of copper by this company, will approximate 130,000,000 lb. The directors will hold a meeting this week to take dividend action. Two quarterly dividends of $2.50, each, have been paid, this year.

Alaska

Nome—Oil burners are displacing coal throughout the district. It has been demonstrated that oil in many cases is cheaper than coal in its steam-producing qualities for thawing plants. The Sesnon Company, the Pioneer Mining Company and others are employing California crude petroleum this season.

Fairbanks—Rich strikes have been made in the Innoko country, southeast of Norton sound. This is the third season of prospecting in the Innoko district.

Alaska-Perseverance—During July, 14,928 tons of ore were treated, from which a total recovery of $1.73 per ton was made.

Dawson—The first quartz mill in the Klondike was started on the property of the Lone Star, on Victoria gulch. William Catto is president.

Yukon Gold—The new electrical conveyer installed at 58 Below on Bonanza creek has been started, using the power from 60 miles distant.

Arizona

Cochise County

Copper Queen—The company has started extensive exploration and development work from the 1400-ft. level of the Lowell shaft and the 1600-ft. level of the Sacramento.

Gila County

Inspiration—At a depth of 900 ft., a station is being cut at the Joe Bush shaft, and after its completion drifting is to be started in the four cardinal directions. The orebody encountered at 90 ft. has now been disclosed to a depth of 300 ft. and is estimated to average 2.5 per cent. copper. An increased flow of water was encountered near the 400 level, but it is still being handled by the gasolene hoist and buckets. Slightly higher-grade material has been passed through in the lower portion of the Joe Bush shaft, the last 35 ft. having averaged 2.9 per cent. A shaft has been started on the Scorpion claim of the recently acquired Black Copper group. Drill holes have indicated that the orebody here lies at greater depth than at the Joe Bush shaft.

Old Dominion—The August output was 3,260,000 lb., a decrease of 241,000 lb. from the August production of last year.

Cole-Goodwin—Work has been started on this property near Globe after five years of litigation. P. J. Cole is in charge.

Graham County

Arizona Copper—The company produced in August 2,600,000 lb. of copper, an increase of 200,000 lb. over the July output.

Maricopa County

Vulture—Twenty stamps are now dropping at the 80-stamp mill of this company near Wickenburg, the second 10-stamp unit having been placed in commission on Sept. 11. W. Spencer Hutchinson, engineer in charge.

Pinal County

Ray Consolidated—The company now has over $4,000,000 cash available from the sale of the recent stock issue, and preparations are being made for the construction of the reduction plants. Production is expected to commence in about 15 months. Eleven churn drills are at work exploring the orebodies and there has been disclosed approximately 50,000,000 tons, estimated to average 2.3 per cent. copper. It might be noted that this tonnage has been developed on about one-fifth of the area covered by the company's property, other portions of which are expected to disclose payable quantities of copper upon exploration.

California

Amador County

South Eureka—This company at Sutter Creek which has been renting 20 stamps from the Central Eureka, is about to add 30 stamps to its own mill.

Original Amador—At this property, Amador City, the new mill is nearly completed and the ore bins are being built.

Newton—It is reported that this copper mine, near Ione, has passed into the hands of the Peyton Chemical Company, and that the property will again be operated.

Butte County

Banner—This mine, six miles from Oroville, at one time owned by an English company, has been sold to W. E. Livesley and T. Fitzgibbons.

Calaveras County

Union Copper—This mine at Copperopolis has been sold to the Calaveras Copper Company, organized by P. Chester Thompson, of New York and Salt Lake. The property has belonged to the Ames estate, of Boston, since 1869, and has been extensively worked. It is equipped with a 300-ton smeltery and 600-ton concentrator. A hydroelectric installation will be made by the new company. Josiah H. Trerise will be manager of the company. The Ames estate retains a large interest and is represented on the board by Charles M. Hayden.

Nunes—The gravel mine at Mokelumne hill has been placed under bond to New York men and active operations have commenced. The upper channel is to be opened by a raise from the lower tunnel.

El Dorado County

Vandalia—The mine, near Shingle, has been purchased from Merrill, Reed & Seymour by the Alaufeseyite Products Company, which will open and work it extensively.

Inyo County

Maverick—At this group, formerly the Neylon, at Bishop, a new tunnel will be started 300 ft. up the hill from the main tunnel. Air compressors have been ordered by Superintendent William Eva.

Mariposa County

Dawes & Thorne—The mine at Horatos has been purchased by the Reliance Mining Company, and milling machinery has been ordered. F. M. Johnson is in charge.

Nevada County

Golden State—J. F. Hennessy, Thomas Gill and other Grass Valley men have purchased this mine. There is a five-stamp mill at the mine.

Empire Mines—The company has started its new five-throw electric plunger pump on the 2200 level, lifting the water 1100 ft. Another pump of the same description is being installed on the 3400 level to lift to the 2200 level. At the 1100, the hydraulic pump takes the water to the drain tunnel.

Eagle Bird—The 30-stamp mill, machine shop and compressor room at Maybert have been destroyed by fire.

PLACER COUNTY

Dewey—This drift mine on the Forest Hill divide has been bonded to a Denver company and a new tunnel is being run. W. R. Grant is in charge.

SAN BENITO COUNTY

New Idria—From the operation of three furnaces the quicksilver production for the year ended Dec. 31, 1908, was 9600 flasks; sales amounted to $231,389, with a net profit of $147,289. The mine still has large ore reserves.

SAN LUIS OBISPO COUNTY

Pozo Placers—The company which is to dredge the sand and gravel at this place is having machinery built in Wisconsin and several carloads will shortly arrive. An electric power plant is to be established.

SIERRA COUNTY

Eclipse—The company recently bonded the Foster & Squires claims, near Gibsonville, and will put up the 10-stamp mill already ordered.

Acme—This company at Whisky digging, two miles from Gibsonville, will shortly put up a 5-stamp mill.

SHASTA COUNTY

Tarantula—This group of claims, west of Iron mountain, now under bond to Stauffer Chemical Company interests of San Francisco, is developing favorably. The main ledge is 5 ft. wide and carries free gold. Charles Kunze, Redding, superintendent.

TRINITY COUNTY

Eastman Gulch—In this district four mines are now taking out shipping ore, the principal producer being the Knob or Gifford mine, under lease to James Wilson and Gus Ehrman. The ore will be worked at Deadwood and will be packed over the mountain.

Colorado

CLEAR CREEK AND GILPIN COUNTIES

German—Uranium ore of high grade has been found in this mine, which belongs to Bishop Matz of Denver.

Griffith Mines—Work has been commenced on the construction of the 50-ton, Malm process mill at Georgetown.

Centennial—A 50-ton stamp mill will be erected at this mine at Georgetown.

EAGLE COUNTY

Eagle Mining and Milling—The mill at Red Cliff is completed and is treating Iron Mask ore.

LAKE COUNTY—LEADVILLE

Highland Chief—This property, in Iowa gulch, a heavy producer in early days, will resume.

Big Chief—Development work is being driven ahead and the prospects for opening another body of ore in new territory are good. The mine, on Upper Carbonate hill, is shipping 50 tons daily.

Evelyn—The recent body of ore opened in an upraise from the east drift still persists. The drift is being driven from Boulder shaft to the Ball mountain fault. The mine is in South Evans gulch.

Tenderfoot—From this property, in South Evans gulch, 30 tons daily of sulphide ore is sent to the local smeltery.

Yak Tunnel—Connections have been made with Resurrection No. 1 shaft, and the lower levels are being cleaned out. The breast of the tunnel has passed the new Monarch shaft.

OURAY COUNTY

Sutton—The Slick Mining Company, operating this property at Mount Hayden, will drive a long development tunnel.

SAN JUAN COUNTY

New Gold King Mines—The land-slide on the Denver & Rio Grande road below Silverton has delayed the arrival of machinery for the mill and caused a suspension of work. Other mines in the San Juan district have been affected by the same condition.

TELLER COUNTY

American Eagle—Active operations have been resumed. The shaft is 1510 ft. deep, the deepest on Bull hill. Prospecting has been carried on for some time and one of the richest orebodies in the history of the mine found at the 1100-ft. level.

Half Moon—Work will be resumed on the body of shipping ore disclosed by explorations.

Chicago & Cripple Creek—Shipments have commenced from the tunnel in Poverty gulch.

Illinois

WILLIAMSON COUNTY

Big Muddy—The production of this mine at Herrin for the last fiscal year is reported to be 512,176 tons, which gives it first place in output in the State.

Indiana

PERRY COUNTY

All the coal mines are working from three to five days per week. There are a number of small or hill mines in this district and these are being worked for home consumption.

Troy Coal Mining Company—This company has been incorporated at Troy to do a general coal mining business. The incorporators are H. L. Williams, J. M. Butler and Aaron Butler.

CLAY COUNTY

Coal Bluff—At one of the mines near Fontanet the company will sink a shaft to the deep or Mitchel vein.

Bee Ridge Block Coal Company—This company has been organized at Brazil by John E. Robertson, Andrew T. Spears, Lloyd Robertson and William G. Spears.

PIKE COUNTY

Indianapolis capitalists have obtained options on 2000 acres of coal land in Marion township near the Southern railroad. The price is $40,000 an acre for the mineral products.

The Oakland oilfield continues to receive attention. Several 100-barrel producers were drilled in during the past week. There are now 320 producing oil wells in Indiana. In 1908, 2,283,620 barrels were produced and valued at $3,203,883.

Kansas

CHEROKEE COUNTY

Illinois—George Boughton is installing pumps on a 20-acre lease on this tract and will work a lower level than heretofore. The zinc and lead runs have been under water several years. A mill will be built.

Gerster & Stone—This company, operating on the Southside land, has completed extensive preliminary work and resumed operations with an enlarged mill. One of the improvements is an aërial tram, 375 ft. long, capable of supporting 1000-lb. buckets.

Vest—J. P. Vest and others have begun drill prospecting on a lease on the Illinois tract. The work has disclosed good ore from 103 to 120 ft., continuing in varying richness to 150 feet.

East Galena—J. M. Pollard and C. L. Sawyer the past week encountered rich zinc dirt at 80 ft. on new land. From the same shaft considerable zinc silicate has been mined.

McAllister—The company's mill on the Sweeney land, south of Baxter Springs, is being overhauled and new machinery added. Development work on the lease shows a run of high grade zinc rock averaging 30 ft. in thickness.

Michigan

COPPER

Ahmeek—The company is outputting 2000 tons of rock daily from two shafts, a production per shaft not equaled elsewhere in the district. The rock carries about 24 or 25 lb. of copper to the ton.

About 1700 tons of this output are being treated at the Franklin and Tamarack mills and the balance is being handled at the Calumet & Hecla mill on a test run. The two new shafts at the north end of the property are down about 250 feet.

Franklin—The shaft on the Pewabic lode is nearing the 27th level. At the 26th level over 100 ft. of drifting has been done with the lode well mineralized throughout.

Atlantic—Section 16 shaft is down to the 25th level and from this point extensive explorations will be carried on. This shaft has gone down in a badly shattered formation. No lateral openings were extended below the 20th level. At the fourth level a crosscut has cut the Baltic lode a short distance from the shaft, showing a 20-ft. width and good indications. Drifting at this point is under way.

Quincy—The fourth head at No. 1 stamp mill has been equipped with an enlarged cylinder. The enlarging of the cylinders from 20 in. to 24 in. on the single stamp heads has increased the capacity to about 710 tons per 24 hours. Plans are being prepared for the enlarging of the wash end of the mill.

Section 12—Plans are perfected for the organization of a company to explore the tract adjoining the Isle Royale on the south and believed to carry the extension of the Baltic lode. Diamond drill work will be undertaken.

Indiana—This company has started diamond-drill operations. Two outfits are in commission.

Isle Royale—Sinking has been resumed at "A" shaft on the Baltic lode, below the 500-ft. level, at which point it was temporarily suspended, while extensive lateral openings were made, without results. The shaft is now a few feet below this point and copper has appeared in the shaft. Several drills have been discontinued in the shafts of the main mine and for the present operations will be confined to the mining of the higher grade of rock, the copper contents of the rock not being sufficient to warrant the extensive openings that were being carried on.

Adventure—The new vertical shaft to open the three unexplored lodes that were expected to the drill cores is down 100 ft. in the ledge, and from now on, greater progress can be made in sinking. It is calculated that the rock formation will be cut at a depth of about 900 ft. This company has exposed the new Mass lode by means of trenches and it carries some copper.

[illegible] Mass and Ropes

Calumet [illegible]—Surveys are completed for an electric transmission line connecting the Centennial Mass and the North Lake mines. Generators operated by steam turbines will be installed at the Mass and Centennial. Each plant will [illegible] 1,000 kw. It is the intention to eventually connect all the mines with this system, using two central power stations. The North Lake shaft No. 1 is 98 ft. deep, while shaft No. 2 was started last week. These two shafts open a new section about 3 miles west of Ishpeming. Foundations for a power house and steel head frame for shaft No. 1 are now being put in. The two shafts will be 500 ft. deep.

Kloman—Two diamond drills are at work prospecting this old property at Republic. It is now under the management of the Cleveland Cliffs company.

Iron—Menominee Range

Tader's—The Antoine Iron Company is mining approximately 1000 tons of ore per day. The surface milling system is employed. Frank Carbis, Iron Mountain, is superintendent.

Chapin—The Cornish pump which has not been in use for a number of years has been installed in the Ludington shaft. It has a capacity of 3000 gal. per minute and will pump from the 1500-ft. level. There are eight lifts of 192 ft. each; stroke, 10 ft.; size of water column, 28 in.; the plunger is solid steel, 7 in. in diameter and 1536 ft. long; the weight of plunger and connecting rod, 182 tons; balance wheel is 40 ft. in diameter and weighs 162 tons.

Missouri

Joplin—Zinc-Lead District

Mercantile—The company is building a 250-ton mill north of Webb City. This is the sixth plant operated by the company. Robert Douglas, of Joplin, is manager.

Center Creek—S. Y. Romage, of Webb City, will build a second 300-ton mill on the Morgan tract.

Excelsior Zinc and Lead Company—This company has purchased 1032 acres of undeveloped ground in the Joplin district for $100,000. The company will drill the land and sublease. D. V. Sholl, of Joplin, is manager.

Crumby—At Oronogo, the company has leased 15 acres to H. Tonkin, of Joplin, and two concentrating plants will be erected.

Lead, Baryte and Mercantile Company—This company has been organized at Potosi, Mo., with a capital of $5,000,000. Edwin J. White, of Yarmouth, Mass., is at the head.

Montana

Butte District

Butte Coalition—The August output was 2,000,000 lb. It is expected that this rate of production will be maintained in the future.

Butte & Boston—The raise on the Linda shaft from the [illegible] to the surface has been completed and sinking on the two-compartment shaft begun. The company will sink to a depth of 500 feet.

Beaverhead County

Pioneer—At a recent meeting of directors it was decided to contract for the running of a 200-ft. tunnel on the property near Jackson.

Calumet-Montana Mining Company—The company has recently been formed by Minneapolis people to operate the Dark Horse mine. Twenty-four men are now at work on three shifts. J. H. Lanyon is in charge.

Broadwater County

Ohio-Keating—The incline shaft, being sunk on the lead, is now down 175 ft. No ore is being shipped and the work is confined to development, which will continue to 250 ft. A new five-drill compressor has recently been installed, and an 80-h.p. gasolene engine ordered. Barton Mitchell, of Radersburg, is superintendent.

Madison County

Tri-State—The company has recently purchased the Broadway mine, near the Silver Star. The management states that operations will be begun within 60 days.

Powell County

Elliston—The tunnel on the Flagstaff claim is now in 450 ft. It cuts a vein 10 ft. wide 400 ft. from the portal and at a depth of 280 ft. Fifteen carloads of ore have been shipped.

Sanders County

French Bar—The principal work of the company has been done on the Messenger claim near Trout creek, where a shaft has been sunk 180 feet.

Nevada

Esmeralda County—Goldfield

Pittsburg Nevada Mining—Crosscutting at 400 ft., a lode has been found from which assays running from $8 to $14 per ton have been obtained.

Combination Fraction—The output for August was 2340 tons having a gross value of $57,700. A new vein has been opened on the 387 ft. level.

Atlanta Mines—Upon the Cherokee lease a station has been cut at 615 ft. in the shaft, and a crosscut is being driven to intersect the vein cut at 514 ft. while sinking.

Lander County—Austin

Austin Manhattan Consolidated—Work is resumed at the Union shaft and all the old workings will be unwatered. J. H. Humes is superintendent.

Lincoln County

Bambergo Delamar—This mine has been permanently closed. It is 35 miles southeast of Caliente. Dry crush-

ing was tried but the fatalities were numerous from the dust.

Santa Barbara Company—A concentration plant will be erected in Eldorado cañon.

Colorado River Dredging Company—A dredge will be installed at the mouth of Vegas wash by this company, which is now operating a gold dredge near Eldorado cañon handling 3000 yd. per day.

LINCOLN COUNTY—PIOCHE

Smeltery—It is authoritatively stated that sufficient funds have been subscribed for the construction of the proposed smelting plant for this district and that the project now hinges on the conclusion of certain subsidiary negotiations.

Nevada-Utah and Ohio-Kentucky—These important silver-zinc-lead mines at Pioche have practically concluded negotiations for consolidating the properties.

NYE COUNTY—ROUND MOUNTAIN

Round Mountain Mining—The company has declared a dividend of 4c. per share. This makes a total of $192,812 paid.

Blue Jacket—Carl Stofelt, Willard Morgan and Harry Cook have made a first shipment from this lease.

NYE COUNTY—MANHATTAN

Manhattan-Thanksgiving—The shaft will be sunk from 350 to 500 ft., making the deepest shaft in the camp. The ore found is not amenable to cyanidation. G. T. Stanley is manager.

WHITE PINE COUNTY—ELY

Butte & Ely—The Cole-Ryan option has been taken up for the Giroux Consolidated.

New Mexico

GRANT COUNTY

Chino—Eight churn drills are at work on this property and 140 holes, spaced 100 ft. apart, have been put down; the results of the drill cores are being checked by underground work, and raises and crosscuts in the Santa Rita orebody have checked closely with the drill-hole samples. The company's engineers estimate between 4,000,000 and 5,000,000 tons "in sight" and about 2,500,000 tons as "probable ore." On the company's holdings of about 3000 acres, six main orebodies have been disclosed, some of which will be amenable to steam-shovel mining and for the others the caving system is expected to be used. Of the six orebodies the Romero, Montoyo and Chino are to be mined by the former method and the Hearst, Texas Flat and Whim Hill orebodies by some form of the caving system. The property is notable for the variety of the ores, which vary from sulphides to native copper, the latter being particularly in evidence on the Santa Rita group. The ores developed range from 2 to 3.25 per cent. copper, averaging about 2.5 per cent. An extraction of 70 per cent. has been estimated from weekly runs in the experimental mill at the property. The mine work is in charge of John M. Sully at Santa Rita, N. Mex.; A. Chester Beatty, of New York, is consulting engineer.

Mangas Development Company—This company has been organized to develop a group of claims between the Burro Mountain and Chemung mines in the Burro mountain district near Silver City. The property has been examined by J. Morgan Clements, who has recommended prospecting by churn drills for which an appropriation of $100,000 has been made. Judge Norman W. Haire, of Houghton, Mich., formerly general manager for the Bigelow properties, is interested.

LINCOLN COUNTY

Parson—J. H. Fuller, of Mishawaka, Ind., has purchased this mine at court sale for $35,000 and will operate it.

North Carolina

Ashboro Gold Mining Company—The old Tucker mine, two miles from Ashboro, N. C., has been purchased by this company, and machinery is being installed. The ore is in decomposed rock and will be treated by log washers.

Oklahoma

A lead and zinc discovery has been made in the Ozark hills, Cherokee county.

Oregon

DOUGLAS COUNTY

Myrtle Creek—J. E. Overman of Roseburg, Ore., is operating a lode mine at Myrtle creek.

LANE COUNTY

Sweepstake—This mine at Bohemia will install a 10-stamp mill. John Brund is owner.

North Fork—A stamp mill is being erected at this mine between the Blue river and Bohemia. J. Christie, of Eugene, Ore., is manager.

Combination Mines—The company is installing machinery at Bohemia and carrying on development. Sherman Clark is engineer.

Dean Cabin—Lewis Hartley will open up this mine near Bohemia

South Dakota

LAWRENCE COUNTY

Homestake—The total increase for the year ended May 13, was $6,309,572, of which $2,042,000 was net income. Dividends declared amounted to $1,121,000. Work is in progress on a hydro-electric installation that will cost $1,000,000.

Utah

BEAVER COUNTY

Black Bird—A core drill will be used to prospect the lime-granite contact. The mine adjoins the Newhouse. B. N. Lehman is manager.

Nevada Ready Pay—Development has been started after extensive explorations.

Newhouse—The South Utah Mines and Smelters will be the title under which this property at Newhouse will be operated after the foreclosure proceedings have been completed.

King David—At 525 ft. a change of formation is coming in. Work is being actively carried on in charge of David Evans.

BOX ELDER COUNTY

Little Butte—Work on a 200-ft. shaft has been begun. The mine is in the new Lucin district on the Utah-Nevada line.

JUAB COUNTY

East Tintic Development—The shaft is now at the 500-ft. level. Four cars have been taken from the rich strike made recently.

Bullion-Beck—High-grade lead-silver ore has been struck on the 300-ft. level. The property belongs to the United States Smelting, Refining and Mining Company and supplies low-grade flux.

May Day—Ore has been found at the 1000-ft. level and the shaft will be sunk 100 feet.

Uncle Sam Consolidated—The usual dividend of 2c. a share, amounting to $10,000, has been declared.

Tintic Smeltery—The plant will close an account of lack of ore and the output of the Knight company will be diverted to Bingham Junction.

SUMMIT COUNTY

Daly-Judge—An important strike has been made at the 1400-ft. level.

New York—Quartzite has been struck at 845 ft. and the mine drained, saving the expense of three pumps.

Washington

FERRY COUNTY

Black Tail—Twelve carloads of ore have recently been shipped from this property near Republic and the company contemplates increasing the equipment.

West Virginia

A deal involving $10,000,000 in timber and coal lands in Boone, Raleigh and Logan counties has been closed at Charleston. The deal is financed by a railroad company, the identity of which is not yet made public.

BARBOUR COUNTY

Sterling Coal Company—This company

has been organized with $2,750,000 capital F. M. Kirk, of Wheeling, is in charge.

MONONGALIA COUNTY

Elkins Coal and Coke Company—The coke ovens at Bretz and Richard have been fired, the company having taken a contract to supply coke to the Maryland Steel Company.

PRESTON COUNTY

Preston County Coke Company—The first block of 140 coke ovens at Cascade has been completed and fired. There are 160 more ovens under contract, to be built at once. The coke is shipped to La Belle Iron Works at Wheeling.

Wisconsin

ZINC-LEAD DISTRICT

Kennedy—The company's two mills are now turning out 50 tons of 40 per cent. zinc and 10 tons of lead concentrates daily; recent drilling has proved the deposit for 700 feet.

Vinegar Hill—At Hazel Green, the company has started shaft sinking on the Kennedy land, which showed rich borings of lead and jack.

Canada

BRITISH COLUMBIA—HEDLEY

Nickel Plate—The mine at Hedley, B. C., formerly owned by the Daly estate, of Montana, has been acquired by the Hedley Gold Mining Company, of which W. E. Corey, T. F. Cole, C. A. Congdon, I. L. Merrill, George E. Tener, James Hoatson and C. D. Fraser are the executive committee. The property is 20 miles from Karamoos, B. C. It consists of 16 claims and has a 40-stamp mill, concentrator and cyanide plant. A sliming plant will be added, and development pushed extensively by the new owners. The mine has a record of $900,000 net profit, and is now earning $200,000 yearly. The ore runs from $11 to $15 per ton, and a saving of from 85 to 90 per cent. is now made.

BRITISH COLUMBIA—BIG BEND OF COLUMBIA

Twenty men are developing a deposit of mica on Yellow creek, a tributary of the Columbia river, which enters on the northeast side of the big bend. The mica is of good quality, but transportation facilities will have to be provided before shipment to market at reasonable cost will be practicable.

BRITISH COLUMBIA—GREENWOOD

Bluebell Columbia Copper—The company has acquired a control in the New Dominion Copper Company. The Dominion company is interested in the Bluebell Columbia [illegible] which will be enlarged.

ONTARIO—COBALT

Latour Lake—In this section, on the Wright claim, a vein 1 in. wide, with high silver content, has been discovered. The Lang-Caswell has made a discovery of a new vein of cobalt ore.

Station Grounds Mining Company—A diamond drill has been started opposite the post office to prospect under Cobalt square.

Crown Reserve—A concentrator will be erected by this company. There are 15,000 tons on the dump. The vein in depth is split and yields low-grade ore.

Trethewey—The concentrator for this mine is under way; an electric tram is being built to connect the mill and mine.

ONTARIO—GOWGANDA

Blackburn—Ore will be shipped as soon as the roads freeze. The mine is at Miller lake in the Gowganda district.

NOVA SCOTIA—SYDNEY

Dominion Iron and Steel—The production for three months shows an increase over last year, despite the shortage in fuel because of the coal strike. The June, July and August output is as follows: Pig iron, 68,237; ingots, 80,529; blooms, 71,404; rails, 46,854; rods, 19,276 tons.

Mexico

CHIHUAHUA

Descubridora—This mine, about five miles from Chihuahua, is again producing at the rate of 100 tons daily. The product is shipped to the local plant of the American Smelting and Refining Company. Krafft Brothers are the owners.

Yoquizo—J. S. Qualey & Co. have lately purchased a small cyanide plant for immediate installation at this property in the western part of the State. Stamp-crushing in cyanide solution followed by fine grinding in tube mills will be practiced.

Sierra Consolidated Mines Company—The Cole-Ryan interests have organized this Arizona corporation for the operation of the Colonel Greene and adjoining properties in the Ocampo section. The main properties are those of the old Belvanera, Belen, Eduviges, San Ramon and El Refugio. Active work will be started at once under the supervision of Dr. L. D. Ricketts, general manager of the Cananea Consolidated Copper Company. The company will be capitalized for 300,000 shares of $10 par value, although only $6 will be called for at the start. The properties, it is stated, will be turned over to the new company at cost, no promoters' shares being issued.

Inguaran—Ore was lately marketed from this mine in the Santa Eulalia camp, and as the returns therefrom will depend the amount of early shipments and the nature of future developments. J. C. Shepherd is manager.

San Francisco del Oro—This mine at Parral has shipped 500 tons of ore to Wales for experimental treatment.

Capazaya—This company, promoted by Britton Davis, of Washington, D. C., is settling claims against the property, presumably with the intention of resuming. The company has mining ground adjoining the Palmilla and has expended large sums so far without finding an extension of the Palmilla orebody.

Parral Consolidated—The Prieta mill at Parral is under construction.

DURANGO

Lustre—At a meeting in Pittsburg, it was decided to accept the proposal of S. H. McKee, Augustus Hartje, Robert L. Stevenson, R. W. Bissell and C. A. Cooper, to advance $105,000 at once to prevent Mexican creditors from foreclosing the property, control of which may be reassumed by the stockholders at the end of six months upon repayment of the above sum and giving security for several hundred thousand dollars due Pittsburg creditors. The property is about 50 miles from the railroad.

GUANAJUATO

Guanajuato River Mill—The Guanajuato River Company has been formed to install a cyanide plant for treating the lower river tailings. About 600,000 tons of tailings are measurable above the dam, said to average $3 in gross value, of which about 65 per cent. is gold. The tailings are quite free from sewage contamination, and are in a deposit averaging 25 ft. in thickness. Below the dam are several million tons of tailings which are more scattered. The company is controlled by the same interests which are in the Guanajuato Development Company. Plans are made for a large mill installation. The tailings will be treated without grinding or other preparation.

JALISCO

San Vicente—A cyanide plant is to be installed at this mine at San Martin Hidalgo, M. J. Slattery, manager. Recent tests of the ore, which is refractory and supposed to contain tellurium, have demonstrated the availability of cyanidation.

SONORA

Cananea—Negotiations are under way for the building of the Cananea & Sonora Central railroad from Lonch on the Rio Yaqui line of the Southern Pacific. The distance is 70 kilometers.

El Tigre—The option to Leggett & Hellmann, of New York, on this mine was allowed to lapse after examination. The price was between $5,000,000 and $6,000,000. Over 3000 samples were taken in the examination.

Metal, Mineral, Coal and Stock Markets

Current Prices, Market Conditions and Commercial Statistics of the Metals, Minerals and Mining Stocks

QUOTATIONS FROM IMPORTANT CENTERS

Coal Trade Review

New York, Sept. 15—A large amount of coal is being used in the East. The demand on the Atlantic seaboard is improved but irregular. The car shortage continues to bring forth complaint, although promise of improvement is held forth in this direction.

Car shortage is also complained of in Illinois. In this district prices continue to hold firm, with medium demand. The South reports better production and steady movement. The labor situation here is giving no trouble. Southern States are using much coal from the Birmingham district, although the bulk of the output is used by the railroads.

The Western demand is improving, with a tendency to hardening prices. Labor shortage is reported from some localities but conditions are improving in this respect. Connellsville coke is in strong demand, with higher prices for all deliveries.

There seems to be a general expectation of higher prices in the near future in all districts.

The demand for anthracite continues to improve, with prices about the same.

Coal Traffic Notes

Coal tonnage of Chesapeake & Ohio railway, short tons: July, 1909, 1,109,446; July, 1908, 976,749. Coke: July, 1909, 34,813; July, 1908, 22,349.

Coal and coke tonnages originating on Pennsylvania Railroad lines east of Pittsburg and Erie, year from Jan. 1 to Sept. 4, short tons:

	1908.	1909.	Changes.
Anthracite	3,435,533	3,245,711	D. 189,822
Bituminous	22,068,146	24,348,692	I. 2,280,546
Coke	4,613,678	7,067,313	I. 2,443,635
Total	30,112,347	34,646,716	I. 4,534,369

The total increase this year to date was 15 per cent.

New York

Anthracite

Sept. 15—Demand for anthracite coal continues to increase. There has been a decided improvement in business during the past 10 days. Prices are the same at $4.75 for lump and $5 for egg, stove and chestnut, f.o.b., New York harbor. For steam sizes prices are unchanged, quotations being: Pea, $3.15@3.25; buckwheat, $2.35@2.50; No. 2 buckwheat or rice, $1.70@2; barley, $1.35@1.50; all f.o.b. New York harbor.

Bituminous

The Atlantic seaboard soft-coal trade shows some improvement in demand, although this improvement is rather irregular and hence unsatisfactory. The question of car supply seems to be becoming a feature of the trade, and serious complaints are heard on several of the roads.

The general impression prevails that this situation is temporary and will work out satisfactorily in a few weeks.

Trade in the Far East is calling for quite an amount of coal in small lots from all over that territory. It is not thought that there is much stock on hand, except in those plants that are prevented from getting coal during the winter months, and have consequently been foresighted in taking advantage of the low water-freight rate that has prevailed. Along the Sound the trade is calling for many small lots of coal. These orders coming with urgent instructions for prompt shipment indicate that the plants are not well stocked.

Trade in New York harbor is picking up slightly, some little current business being transacted, but prices continue low. During the past week ordinary steam coal could be bought at $2.25 f.o.b. New York harbor shipping point, with some better grades coming down to that figure in order to get rid of surplus stock on hand. Good grades were selling at $2.50@2.60 f.o.b. New York harbor shipping point. Slack sold at 50@60c. f.o.b. mines.

During the Hudson-Fulton celebration the Hudson river will be practically closed to navigation, and shipments in this locality are accordingly being rushed to cover contingencies. Transportation from the mines to tide is still not quite up to schedule. Car supplies to the Virginia capes and on the Baltimore & Ohio is poor. Stringent regulations maintained in this particular by the Baltimore & Ohio over small mines are chafing owners.

The coastwise vessel market is a shipper's market at this time. Low rates continue to be quoted as follows: From New York harbor around Cape Cod, 50@55c. per ton; from Philadelphia around the Cape on large vessels, 50@55 cents.

Birmingham

Sept. 13—The coal production in Alabama is much better than it was a month ago, and there is a steady movement of the product out of the district. It is announced on the best authority that the mining companies in this State are receiving more orders every week and the prospects are bright that there will be a steady output at the mines. It is acknowledged by several of the mining companies that prohibition in this State has had much to do with improving labor conditions. There is no trouble in getting labor now, though there is no telling what will be the case when the mines are in full operation. The reports at the office of the State mine inspector indicate that there are many men yet unemployed.

There was some coke accumulated during the past 12 months, but this is being worked down rapidly. The resumption of operation at coke ovens is increasing the requirements of coal. The winter demands are going to be steady and a large quantity of coal will be necessary to meet the needs. Much coal is being shipped to southern States from the Alabama mines.

Chicago

Sept. 13—Increasing sales and strength everywhere on bituminous, except fine coals, characterize the wholesale coal market. Screenings are nearest to being weak and the lower-grade run-of-mine from Illinois and Indiana mines comes next. The market for lump and egg is rapidly improving, though domestic business is not expected to be brisk for another month. Coals from east of Indiana share in the improved demand and hardly any shipments from Eastern or Western mines are sacrificed to escape demurrage charges. Any large shipments to this market of any kind of coal, however, would probably restore the old conditions of surfeit and low prices, so nearly is the amount received now adjusted to demand.

Prices on bituminous are firm, but can hardly be said to be advancing generally. Lump and egg from Illinois and Indiana bring $1.75@2.40, run-of-mine from the same States holds to $1.00@1.75, while screenings are quiet at $1.20@1.45.

Smokeless lump and egg brings $1.25@1.50 at the mines, or $3.30@3.55 Chicago; smokeless run-of-mine, so long over-abundant, is 90@95c. at the mines, or $2.95@3 Chicago, these prices being on Pocahontas and New River. Hocking at $2.95 is in fair demand and moves steadily. Gas coals are quiet and firm, Youghiogheny ½ in gas selling f.o.b. $3.15.

Anthracite sales are increasing slowly and are well distributed, with all sizes in

good supply. Coke is active, with large sales and no oversupply, the best Connellsville bringing $4.85 per ton.

Pittsburg

Sept. 14.—Demand for coal has improved both from retail dealers and from manufacturers and prices show a slight further stiffening. It is not improbable that there will be an advance in official prices within three or four weeks. Present prices, for mine-run at mines, are $1.10 to manufactureres and $1.20 to retail dealers, these prices being sometimes shaded 5 to 10c. per ton. Slack is officially 65c., and this price is being fairly well maintained.

Connellsville Coke—The market has continued to gain in strength, prices being higher for all deliveries. The Connellsville region has been suffering severely from a labor shortage which prevents as rapid an increase in operations as is desired, although there has been a steady improvement. Thus far production has been considerably short of the actual capacity of the region on account of the labor scarcity. Maximum production in a week thus far this year was in the week ended Sept. 4, when it was reported 421,320 tons were made. The maximum production reported in 1907 was 429,127 tons, at a time when there were reported 34,850 ovens in existence, with 33,195 in blast. At present there are listed 38,558 ovens, which in proportion to an utput of 429,127 tons with 34,850 ovens in existence, would give 475,000 tons, the best production shown this year falling 11 per cent. short of this.

Prompt coke has practically disappeared from the market and can be had only on the same price basis as coke over the fourth quarter, $2.40@2.50 for furnace and $2.50@2.60 foundry. Coke has advanced an even dollar a ton since the low point, made in the second quarter. Producers are chary about quoting for next year, but occasionally quotations are made ranging from $2.50 to $2.75 for furnace or foundry.

The *Courier* reports the production in the Connellsville and lower Connellsville region in the week ending Sept. 3 at 421,320 tons, an increase of 5000 tons from the previous week, and shipments at 5221 cars to Pittsburg, 7497 cars to points west of Pittsburg and 801 cars to points east of Connellsville, a total of 13,579 cars, or [illegible] 367 cars from the previous week.

St. Louis

Sept. 13.—Due the long anticipated car [illegible] is [illegible] with as there can be no doubt. Reports from Illinois mines show that nearly all of them in southern Illinois [illegible] last week on account of car shortage. The shortage was also felt in central and northern Illinois fields but not so keenly. The Illinois Central and Iron Mountain operators seem to have suffered the worst. Officials of the Illinois Central railway say that the trouble is only local, and that they expect to have the situation temporarily relieved next week, though later in the season they fear there will be a serious shortage. The demand at present is not heavy so we may expect serious trouble on account of the car question in October.

Though the demand is medium, there has been comparatively so little coal on the market during the last week that prices have been firm. Both prices and demand are improving slowly but surely. The market on lump is quite strong, but central Illinois operators are having some difficulty in moving egg and are offering liberal concessions on it.

Operators in the Staunton-Mt. Olive district have advanced their prices to $1.20 per ton f.o.b. mines for lump, or $1.72 per ton f.o.b. St. Louis. Egg and nut can be had at from 10 to 20c. per ton under this figure. The Standard mines are running much better than heretofore, and are realizing much better prices for lump; screenings, however, have come down so much that the mine-run is not netting the operator a cent more than it did when lump was bringing much less money. Standard 3-in. lump is bringing 85c. per ton f.o.b. mines, or $1.37 f.o.b. St. Louis. Preferred grades of 6-in. standard lump are bringing from $1@1.10 f.o.b. mine, or $1.52@1.62 f.o.b. St. Louis. Three-inch nut is bringing about 65c. per ton f.o.b. mines, or $1.17 f.o.b. St. Louis, while 2-in. screenings are down to 30c. f.o.b. mines, or $0.82 per ton f.o.b. St. Louis.

Six-inch Carterville lump or egg is bringing $1.25 per ton f.o.b. mine, or $1.92 per ton f.o.b. St. Louis. Franklin county coal is bringing from 15 to 25c. per ton more. Three-inch nut from this district is going around $1.15 per ton f.o.b. mine, or $1.82 per ton f.o.b. St. Louis, while 1½-in screenings are bringing from 40 to 50c. per ton f.o.b. mines, or $1.07@1.17 per ton f.o.b. St. Louis.

The demand for washed coal is good for all sizes except No. 5, which is not moving as well as the other sizes. Several washers report that they are sold up for a month ahead on Nos. 1 and 2. The situation as the whole looks bright. Coal of all grades will doubtless increase in price as [illegible] date.

Iron Trade Review

New York, Sept. 15.—In the East there is active demand for all grades of pig, prices being lightly higher. The finished product market is less active.

In the South and Southwest the demand for pig is strong and increasing. Most sales are made at $14 for No. 2 foundry, although in some cases $14.25 and even $14.50 is being asked. In the Birmingham district the raw-material conditions are satisfactory and several furnaces are preparing to go in blast. Improved industrial conditions have increased the demand for finished products. Higher prices are expected at an early date.

The West reports improving demand and an upward tendency of prices generally. Heavy sales are made in all lines of iron and steel. Prices show an advance of from 25 to 50c. per ton, with deliveries for 1910 quoted at from 50c. to $1 above present prices.

Birmingham

Sept. 13.—Southern pig-iron prices are advancing, demand continues strong and business is placed well into the first quarter of the coming year. Immediate delivery is not easily procured in this district save at the strong prices that have been prevailing during the past week. The prices have settled on a basis of $14 per ton, No. 2 foundry, with $14.25 and $14.50 per ton being asked and two or three orders already taken in at that price. The make is to be improved at once in this territory. The torch has been applied to one furnace in the last few days and two others are to be started up before the end of the month. The Southern Iron and Steel Company alone will start up three furnaces during October. The Tennessee, Sloss-Sheffield and Republic companies each are to start up one furnace before the last of the month; the Sloss-Sheffield will have a second furnace ready for operation immediately after the turn of the new month. Reports which are given out freely here are to the effect that there is hardly any apprehension felt that the raw material will not come up to all requirements.

Home consumption continues steady. It is announced that the cast-iron and soil pipe plants and the steel plant of the Tennessee company, at Ensley, will be able to operate for nine months to come at least on business that is in hand, with business in sight it will be necessary to put the plants on full time and operate double shifts in some departments. The Tennessee company is still receiving orders for steel rails, the production is healthy and the output is being shipped away about as rapidly as it is ready to be loaded on cars. Southern railroads are using steel manufactured in this district.

Chicago

Sept. 13.—Strong conditions continue everywhere in the iron market, with prices tending upward and the average melter buying pig iron liberally for first half

needs. Last-quarter needs are pretty well supplied, but such iron as is needed is bought at about 50c. less than is paid for 1910 deliveries.

Selling agents say they are not anxious to sell at the prices current, being confident that the market is bound to grow stronger. Minimum prices may be considered $18.50 for Northern and $14 Birmingham ($18.35 Chicago) for Southern. At these prices Northern is comparatively the stronger, though both kinds may be considered very strong. Sales are for larger amounts, in general, and the occasional large order is more frequent. The carload lot sales for quick delivery are comparatively few, nearly every melter being inclined to buy more and more for the future. Confidence in the future and in higher prices soon, indeed, marks the average buyer as well as the average seller of pig iron. Foundrymen have booked and are booking heavy orders for their products; they see only prosperity ahead.

All lines of iron and steel products have recorded heavy sales in the last week, railroad supplies and structural materials leading.

Philadelphia

Sept. 15—All kinds of pig iron are in active demand at hardening prices. One cause of the activity is the reflex influence of conditions in western Pennsylvania. The most active raw material is basic pig. Large orders have been placed during the past week and today buyers are awaiting answers to propositions made a few days ago. A great anxiety prevails in this territory concerning the future of basic because of incoming business which calls for basic material. A further advance is considered the logical outcome of the present situation. Bessemer is quoted 50c. higher. Foundry iron is 25c. higher in actual selling price than a week ago. This has temporarily discouraged some taking, but foundrymen are recognizing that the situation is against them and they will not sulk in their tents very long. Sales of malleable were made at 50c. above the price of two weeks ago. Gray forge is strong and no higher. Mills are buying only as they need except in a few cases where contracts for pig run over into next year. Basic is quoted at $18.25; best gray forge, $17; inferior, $16.50; No. 2 foundry, $18; one or two brands slightly higher.

Steel Billets—Recent negotiations have resulted in the placing of several orders, large and small, for early and late delivery at manufacturers' prices, which are 25 to 30c. higher than previous orders. An advance is rumored and buyers are unable to get the prices and dates of delivery to suit their views.

Bar Iron—A further general improvement in demand is reported at all local offices and reports direct from mills in the interior indicate that business is pouring in, but for the most part for small orders. Mill men are not courting winter deliveries. Prices are firm. No advance is intimated, but from the tone of replies, manufacturers will not be slow to take better prices if they see the chance.

Sheet Iron—The moderate expansion in demand heretofore mentioned has increased and consumers are now buying for later delivery in larger quantities. Sheet bars are higher and there is greater pressure for all manner of sheet-mill products. The situation is gratifying to manufacturers and they are in no accommodating mood when asked to name prices for winter delivery.

Pipes and Tubes—Work in all the industries using tubes is piling in. The Baldwins have booked orders for about seventy engines within a few days. All the smaller establishments in eastern Pennsylvania are filling up and their orders are for quick delivery. Very little business is coming in for winter delivery.

Plates—No large orders are reported, but the usual rush of small orders is observed. Building enterprises and small engineering operations will soon be calling for steel plate for early winter. Prices are $1 per ton higher on small orders and concessions have been refused on large early winter work.

Structural Material—There have been no important developments in shapes, though a very large volume of business is within speaking distance, including bridge material, warehouse building and shipyard requirements. A general advance is believed to be close at hand because of the oversold condition of mills.

Steel Rails—No large orders have been placed. Small repairing orders are numerous.

Scrap—Dealers are once more securing stocks of scrap with a view of meeting any probable demand for the last quarter, which most of them anticipate will be heavy. It is probable that considerable of the Panama scrap will find its way to this port. Most buyers of scrap have but little on hand and dealers have managed to keep prices at a high level.

Pittsburg

Sept. 14—A strong advancing tendency continues to be manifested in pig iron and finished-steel products, and the trade is beginning to be seriously concerned with the question whether the improvement is not too rapid. It is less than seven months since the market broke and not more than five months since bottom prices were reached. There is no criticism of the present level of prices, which no one asserts is too high, but it is clear that the rate of advance of the past two or three months, if continued for any length of time, would carry the market up to an unsound level.

The mills are well filled with tonnage all along the line and do not need to encourage the placing of additional business, so that there has been a constant tendency to ask higher prices which buyers as a rule have been willing to pay, and thus the movement is continued. As a rule the buying is not by the largest interests, as they covered their requirements in the second quarter, and there is some concern as to what may occur when the contracts of such large interests expire and the question of renewal comes up at a time when the general market is so much higher.

The Carnegie Steel Company has issued a new list of extras on steel bars, effective Sept. 1. The extras are approximately half those in the former list, upon which list the rule of half extras applied, so that superficially there is no great change, but in some quarters it is held the new list will tend to cut down jobbers' profits, as jobbers frequently charge full extras on small lots. It is inferred that the promulgation of the new list is in connection with the United States Steel Corporation's plan of eventually having a string of warehouses of its own in the principal distributing centers.

The Carnegie Steel Company has finally withdrawn its price of 1.35c. on bars, and now quotes nothing below 1.40c., while on less desirable business it quotes 1.45c., these prices having been quoted by most of the independents for some time. The 1.40c. price on plates and shapes has disappeared, leaving the market at 1.45@1.50 cents.

Ore—The more optimistic among ore producers predict that the Lake Superior ore movement this season will break the 1907 record, when 42,000,000 tons was exceeded. Shipments down the lakes to Sept. 1 amounted to 22,588,549 tons and estimates are made of 7,000,000 tons for September, 7,500,000 tons for October, and 6,500,000 tons for the remainder of the season, which would make a total of about 43,000,000 tons, not counting all-rail shipments. While there has been no formal discussion it appears to be the general impression that Lake Superior ores for next season will be advanced 50c. per ton, thus restoring the 1907 level, the highest since the discovery of the Mesabi range.

Pig Iron—Bessemer iron has occupied the center of the stage, transactions in the past week totaling 45,000 tons or more. The Jones & Laughlin Steel Company bought 20,000 tons from the Bessemer Pig Iron Association, at $17, Valley, or $17.90 delivered Pittsburg, for fourth quarter delivery. A prominent merchant furnace interest bought 20,000 tons from another furnace interest, for early delivery, at $16.75, furnace, the furnace not being located in the valleys. Total transactions in bessemer iron since Sept. 1 total between 70,000 and 75,000 tons, in which time the market has advanced from

$16.75@17. Valley. A meeting of the Bessemer Pig Iron Association will be held in Cleveland Thursday to discuss the Steel Corporation inquiry and other matters. Under the lead of bessemer all grades of iron have advanced in the local market, basic and foundry being firm at $16, Valley, while malleable is quoted at $16.25 and forge at $15.25, both at valley furnace. The advances are from 25 to 50c. in the week, and were accomplished without there being heavy sales.

Ferromanganese.—The market is stronger, being quotable at $42.50 for this year and $44.50@45 for next year, f.o.b. Baltimore, the freight to Pittsburg being $1.95.

Steel.—Unfinished steel is stronger, open-hearth billets being at a minimum of $26 at mill. Bessemer billets are nominally 50c. to a dollar lower. Sheet bars have sold at $27 at mill. Open-hearth rods have advanced and can hardly be had at less than $32 at mill, bessemer rods being about $31.50.

Sheets.—The market continues firm, with mills well sold up. Prices remain at 2.20c. for black and 3.25c. for galvanized, 28 gage, corrugated roofing being $1.55 per square for painted and $2.80 for galvanized.

Metal Markets

New York, Sept. 15.—During the past week the markets for lead and spelter have been dull, but toward the close there were signs of increasing activity in spelter. The copper market has been fairly active, especially in business for export, but at concessions in price. However, there seems to be a good buying power, and the decline is not expected to go further. The silver market was practically unchanged throughout the week.

Gold, Silver and Platinum

UNITED STATES GOLD AND SILVER MOVEMENT

Metal.	Exports.	Imports.	Excess.
Gold			
July 1909..	$16,661,782	$ 3,269,885	Exp. $13,391,897
" 1908.	4,845,272	2,949,179	Exp. 1,896,093
Year 1909.	89,496,119	23,405,477	Exp. 57,090,642
" 1908.	58,363,098	29,357,075	Exp. 29,006,172
Silver			
July 1909..	5,049,466	3,926,117	Exp. 1,123,249
" 1908.	4,930,746	3,049,581	" 1,801,165
Year 1909..	34,409,032	26,798,145	" 7,610,887
" 1908.	30,445,291	24,180,929	" 6,264,362

Exports from the port of New York week ended Sept. 11: Gold $29,143; silver $747. Specially to London. Imports: Gold $109,851; silver $29,113; chiefly from the West Indies, Mexico and South America.

Receipts of gold at the Australian mints for the half-year ended June 30 were, in fine ounces: Sydney, New South Wales, 405,[illegible]; Melbourne, Victoria, 400,055; Perth, Western Australia, 713,007; total 1,380,602 oz. These receipts were 93 per cent. of the total reported production of the Commonwealth for the half-year.

Platinum.—Our correspondent at St. Petersburg reports under date of Sept. 2, that the advance in price still continues, sales having been made in the previous week at 20,500@21,000 rubles. The large producers are standing aloof, looking for a further rise. Quotations at St. Petersburg are 20,500@21,000 rubles per pood; at Ekaterinburg, 5.2@5.3 rubles per zolotnik.

At New York, the expected stiffening of the market has materialized. Ordinary refined platinum is quoted at $25.50 per oz., with $29.25 for the hard metal.

Silver.—The market continues to fluctuate between narrow lines. Although the price of silver seems well sustained, a slight decline has materialized.

SILVER AND STERLING EXCHANGE

Sept.	9	10	11	13	14	15
New York....	51½	51⅝	51½	51¾	51½	51⅜
London.....	23¾	23½	23¼	23⅛	23¼	23⅛
Sterling Ex..	4.8645	4.8645	4.8625	4.8625	4.8620	4.8625

New York quotations, cents per ounce troy, fine silver; London, pence per ounce sterling silver, 0.925 fine.

Exports of silver from London to the East, Jan. 1 to Sept. 2, as reported by Messrs. Pixley & Abell:

	1908.	1909.	Changes.
India.....	£ 6,448,443	£4,305,700	D. £2,142,743
China.....	516,400	1,555,200	I. 1,038,800
Straits.....	90,510	82,800	D. 7,710
Total.....	£ 7,055,353	£5,943,700	D. £1,111,653

Copper, Tin, Lead and Zinc

Sept.	Copper. Lake, Cts. per lb.	Copper. Electrolytic, Cts. per lb.	Copper. London, £ per ton.	Tin. Cts. per lb.	Lead. New York, Cts. per lb.	Lead. St. Louis, Cts. per lb.	Zinc. St. Louis, Cts. per lb.
9	13 @13⅛	12¾ @13	58⁷/₈	29⁷/₈ @30	4.32½ @4.35	4.20 @4.22½	5.55 @5.60
10	13 @13⅛	12¾ @12⁷/₈	58¾	29⁷/₈ @30⅛	4.32½ @4.35	4.20 @4.22½	5.55 @5.60
11	13 @13⅛	12¾ @12⁷/₈	...	30 @30⅛	4.32½ @4.35	4.20 @4.22½	5.55 @5.60
13	13 @13⅛	12¾ @12⁷/₈	58⅛	30 @30⅛	4.32½ @4.35	4.20 @4.22½	5.55 @5.60
14	13 @13⅛	12¾ @12⁷/₈	58¼	29¾ @30	4.32½ @4.35	4.20 @4.22½	5.55 @5.60
15	13 @13⅛	12⅝ @12⁷/₈	58¼	29⁷/₈ @30	4.32½ @4.35	4.20 @4.22½	5.55 @5.60

London quotations are per long ton (2,240 lb.) standard copper. The New York quotations for electrolytic copper are for cakes of the transactions made with consumers, ingots and wirebars and represent the bulk of the New York sales. The price of cathodes is usually 0.125c. below that of electrolytic. The quotations for lead represent wholesale transactions in the open market. The quotations on spelter are for ordinary Western brands; special brands command a premium.

Copper.—During the week beginning with Sept. 6, the offerings of lake copper from speculative hands appear to have been cleaned up, although some Lake seems still to be available from those sources. However, while there has been less pressure from second hands there has been more from first hands, especially since the publication of the statistics on the 10th inst., which had a dampening influence on the market. Sellers who had previously held back then began to meet the market or to underbid their competitors. With one or two exceptions all of the producers have offered electrolytic at 13c., delivered 30 days, corresponding to a little less than 12⅞c., net, cash, New York, while some have been willing to contract for deliveries up to the end of the year at that price and have shaded it for prompt and early deliveries. At the concessions, a liberal business was done, particularly for export. Domestic consumers are holding back in the hope of still lower prices, although it is generally believed that consumption in this country has now reached a point that is very near to the best ever recorded. Quotations at the close are 13@13⅛c. for Lake copper, and 12⅝@12⅞ for electrolytic copper in cakes, wirebars or ingots. The average of the week for casting copper has been 12½@12¾ cents.

The market for copper sheets and wire remains unchanged, with sheets held at 17@18c., base for large lots, and wire at 15 cents.

The Copper Producers' Association reported on Sept. 10 the following statistics for August: Stock on hand Aug. 1, 122,596,607 lb.; production during the month, 120,597,234 lb.; deliveries for domestic consumption and export, 107,996,911 lb., of which 59,614,207 was for domestic consumption; stock on hand Sept. 1, 135,196,930 pounds.

For two or three weeks back the copper market has been somewhat disturbed by rather large offerings, both of lake and electrolytic, by second hands, which evidently were liquidating and in order to do so were willing, or obliged, to make concessions. Some producers, especially when they are holding out for higher prices, have affected to look scornfully upon the market conditions created by operations from second hands and say that they do not represent the market as between producers and consumers. Of course, this is a biased view. The speculators do not make their copper or transmute it from lead or any other cheaper metal, but buy it from first hands, who are frequently glad to sell to speculators as well as to manufacturing consumers. That being the case, it is amusing that some producers assume such an attitude when the unfortunate speculator has to resell.

The standard market broke sharply under the influence of the unfavorable statistics, the lowest prices being established

lished on Monday, when spot closed at £58¼ and three months at £59. Since then there has been better support, and the close is firm at £58⅝ for spot and £59½ for three months.

Refined and manufactured sorts we quote: English tough, £62; best selected, £61@62; strong sheets, £73@74.

Tin—In spite of the good business that is reported in all lines requiring tin, the tone of the market has been heavy throughout the week and the metal is actually offered at below the European parity. This situation must be due to speculative causes, which within a short time should be overcome. The close is steady at £136¼ for spot and £137⅜ for three months, while business here is being done at 29⅞@30 cents.

Lead—This metal has been practically neglected. The close is steady and unchanged at 4.20@4.22½c., St. Louis, and 4.32½@4.35c., New York.

The London market also closes unchanged at £12 11/16 for Spanish lead, and £12 13/16 for English lead.

Spelter—The market has shown a great deal of persistence at the lower prices established recently; in consequence, consumers are beginning to show interest and a firmer tone is being effected. The close is sensitive at 5.57½@5.60c., St. Louis, and 5.72½@5.75c., New York. The price at New York was 5.70@5.75 on Sept. 9-13, and 5.72½@5.75 on Sept. 14-15.

The London market has been buoyant, and the close is higher at £23 for good ordinaries and £23¼ for specials.

Other Metals

Antimony—The market is steady, quotations remaining at 8⅝@8¾c. per lb. for Cookson's, and 8@8¼c. for United States.

Aluminum—No change is noticed in the market for aluminum. No. 1 ingots can be had at 20@23c. per lb. in large lots with the American maker still holding to the higher figure.

Quicksilver—Demand is good and the New York market is strong at $44 per flask of 75 lb. Jobbers quote 00@02½c San Francisco quotations are still $42@43 for domestic and $40@41 for export. The London market holds to £8 7s. 6d per flask with the jobbers underselling.

Nickel—Large lots, contract business, 40@45c per lb Retail, spot from 50c for 2000-lb. lots, up to 55c for 500-lb lots The price for electrolytic is 5c. higher

Magnesium Quotations for the metal are $1 25 per lb., New York, in 100-lb. lots; for 5 lb. lots, $1 40 per pound

Cadmium—Current quotations are 75c per lb. in 100-lb lots at Cleveland, Ohio In Germany 450@475 marks per 100 kg., at factory in Silesia.

Zinc and Lead Ore Markets

Joplin, Mo., Sept. 11—The highest price paid for sulphide ore was $52 per ton, the base ranging from $47 to $49 per ton of 60 per cent. zinc. Zinc silicate ore sold up to $31 per ton, the base ranging from $23 to $25 per ton of 40 per cent zinc. The average price, all grades, was $44.34 per ton.

Some lead was loaded out this week on purchases of one and two weeks ago, and while the highest offering of this week was $56.50, the average settling price, all grades, was $56.06 per ton.

The demand for all ores was exceedingly light all week. No ore was purchased until Thursday afternoon and the first offerings came from the sellers. All buyers had light buying orders and these were easily filled. With the heaviest output of the year the stock in bins throughout the district has increased rapidly the past three weeks of light shipments.

SHIPMENTS, WEEK ENDED SEPT. 11.

	Zinc, lb.	Lead, lb.	Value.
Webb City-Carterville	3,608,530	374,590	$ 95,288
Joplin	1,840,860	146,490	48,236
Prosperity	726,250	38,300	18,138
Duenweg	728,850	126,710	19,871
Galena	785,850	45,730	19,747
Carthage	124,970	.....	2,998
Oronogo	115,630	.....	2,544
Alba-Neck	221,070	.....	5,305
Sarcoxie	66,000	.....	1,518
Spurgeon	262,560	50,110	6,472
Aurora	626,380	.....	12,534
Badger	318,230	8,050	7,796
Zincite	152,630	.....	3,816
Quapaw	136,130	1,100	3,025
Cave Springs	62,310	.....	1,557
Miami	624,250	232,090	16,681
Granby	939,240	31,580	14,675
Carl Junction	211,430	.....	5,291
Stott City	52,790	.....	1,287
Wentworth	28,620	.....	499
Totals	11,632,410	1,054,750	$287,578

37 weeks	417,484,830	62,909,940	$9,800,205
Zinc value, the week, $257,957; 37 weeks, $8,087,250			
Lead value, the week, 29,621; 37 weeks, 1,712,955			

MONTHLY AVERAGE PRICES.

Month.	Zinc Ore. Base Price.		Zinc Ore. All Ores.		Lead Ore. All Ores.	
	1908.	1909.	1908.	1909.	1908.	1909.
January	$37.60	$41.25	$35.56	$38.46	$46.88	$52.17
February	36.63	36.94	34.92	34.37	49.12	56.50
March	36.19	37.40	34.19	34.71	49.90	50.82
April	35.40	38.63	34.08	37.01	52.47	55.63
May	34.19	40.06	33.39	37.42	56.08	55.59
June	33.06	44.15	32.07	40.35	50.48	57.52
July	34.55	43.06	31.67	41.11	59.90	53.74
August	36.53	48.25	33.42	44.54	60.34	57.60
September	37.63	.....	34.44	.....	54.59	.....
October	35.95	.....	33.28	.....	52.63	.....
November	39.13	.....	35.02	.....	54.65	.....
December	42.75	.....	37.83	.....	49.68	.....
Year	$36.63	.....	$34.31	.....	$53.93	.....

NOTE—Under zinc ore the first two columns give base prices for 60 per cent zinc ore, the second two the average for all ores sold. Lead ore prices are the average for all ores sold.

Chemicals

New York, Sept. 15—A quiet market and a slight shading of prices have prevailed during the past week.

Copper Sulphate—The market for copper sulphate exhibits no changes Prices are still $4 22½ per 100 lb in carload lots and $4 32½@4 47½ per 100 lb for smaller orders.

Arsenic—The white arsenic market is still rather weak and prices have failed to rise as anticipated. Quotations are 2⅝@2¾c. per pound.

Nitate of Soda—The market for nitrate of soda is extremely quiet with quotations at 2.10c. per lb. in all positions

Mining Stocks

New York, Sept. 15—The news of Mr. Harriman's death which was first known after the close of the stock market on Thursday, was followed by a shrewd and unexpected bit of manipulation. London was used as a powerful lever for supporting prices before the market in New York opened. The sentimental effect was all that could be desired, and without any great support in the New York market, the day following the railroad magnate's death resulted in a semi-bear panic, rather than in a slaughter of bulls as many believed would occur. Prices were also affected by the fact that Union Pacific was heavily purchased by two different factions who wished to secure voting privileges.

Mr. Harriman's illness and death have so absorbed attention this week, that the unfavorable changes in money and crop conditions have received only small consideration. The indicated corn crop for 1909 is below the average of the preceding five years. This is not favorable when we consider that our crops should gradually increase with population. Wheat, corn and cotton all show declines when compared with the crops of 1906. Oats is the only crop showing an increase

The general revival in business continues, and there is also talk of a car shortage this fall. Stock prices, however, have discounted many of the good things we are now beginning to see. It is also probable that any excited speculation in stocks, such as took place last month, would result in a considerable raising of money rates

The unfavorable aspect of the Copper Producers' report, which shows an increase in stocks of more than 12,000,000 lb. was received with some listless. As a result, copper shares have been heavy all week

Boston, Sept. 14—Mining shares have received quite a set back last week, but quite recoveries have followed. The report of the Copper Producers' Association showing a large increase in the visible supply of the metal for August contributed with

the sharp break in Amalgamated, to cause a weak day Thursday. Calumet & Hecla has reduced its asking price from 13¾ to 12½c., but this was passed by in the stock market.

Again, the action of the Calumet & Hecla affiliated companies turned sentiment for the better. The fact of the matter is very few mining stocks are pressing for sale, while, on the other hand, there is no demand. Allouez had a good sharp spurt to $57.50. It has sold as low as $51.50. Copper costs at the Allouez are low, and it is said below the price at which Calumet & Hecla can produce. Centennial, after a $4.62½ break to $39.50, recovered to $43 today.

There has been little news to affect mining shares one way or the other. Developments in the Lake Superior district may bring favorable news at any time. Lake advanced from $32.50 to $36, and closed at about the highest. Isle Royale has been active; the extreme price variation during the week was from $23.87½ to $26. U. S. Smelting has been an active feature with both weak and strong days.

Amalgamated, after a $5.50 slump to $77.50, is back to $80.50. A considerable short interest is said to exist in this specialty. La Salle had a sharp spurt to $15.75 today.

Curb trading was characterized by heaviness in Davis-Daly and First National, which have now recovered. Rhode Island Coal holds above 11, which is the supporting point. Vulture has held strong close to $8.50.

STOCK QUOTATIONS

NEW YORK Sept. 15	
Name of Comp.	Clg.
Alaska Mine	‡.11
Amalgamated	80½
Anaconda	47⅞
Balaklala	‡2 1/16
British Col. Cop.	6¾
Buffalo Mines	3⅛
Butte Coalition	24½
Colonial Silver	5/16
Cum. Ely Mining	7⅛
Davis-Daly	5 13/16
Dominion Cop.	7
Douglas Copper	1¼
El Rayo	3
Florence	3
Foster Cobalt	‡.32
Furnace Creek	‡.05
Giroux	8¾
Gold Hill	⅝
Goldfield Con	6¾
Granby	99
Greene Gold	‡½
Greene G. & S.	‡9
Guanajuato	1¾
Guggen. Exp.	218
Hanapah	‡15
Kerr Lake	8¼
McKinley-Dar.	89
Miami Copper	15¾
Micmac	[illegible]
Mines Co. of Am.	[illegible]
Montezum of C. R.	[illegible]
Mont. Sho. C.	2⅛
Nev. Utah M. & S.	[illegible]
Newhouse M. & S.	4
Nipissing Mines	10⅝
Old Hundred	[illegible]
Silver Queen	40
Stewart	[illegible]
Tennessee Copper	[illegible]
Tri-Bullion	[illegible]
United Copper	10[illegible]
Utah Apex	4½
Utah Copper	44
Yukon Gold	[illegible]

‡Last quotation.

BOSTON Sept. 15	
Name of Comp.	Clg.
Adventure	6
Allouez	58
Am. Zinc	‡31¼
Arcadian	4⅞
Arizona Com.	43¾
Atlantic	10¾
Boston Con	14¾
Calumet & Ariz.	104
Calumet & Hecla	670
Centennial	42
Copper Range	80¾
Daly-West	8½
East Butte	11
Franklin	16½
Greene-Can.	9
Hancock	9½
Isle Royal	25¾
Keweenaw	3⅝
La Salle	15½
Mass	8⅛
Michigan	10½
Mohawk	61½
Nevada	24
North Butte	57¼
Ojibway	9
Old Colony	60
Old Dominion	54½
Osceola	146
Parrot	32
Quincy	90
Rhode Island	‡4¾
Shannon	15⅞
Superior	69
Superior & Bost.	16
Superior & Pitts.	15¾
Tamarack	‡65
Trinity	13
U. S. Smg. & Ref.	54⅞
U. S. Sm. & Re. pd.	52
Utah Con.	44½
Victoria	[illegible]
Winona	6
Wolverine	151
Wyandotte	[illegible]

‡Last quotation.

N. Y. INDUSTRIAL	
Am. Agri. Chem.	48
Am. Smelt. & Ref.	97½
Am. Sm. & Ref., pf.	111¾
Colo. Fuel & Iron.	43¼
Federal M. & S., pf.	‡91½
National Lead	90¼
National Lead, pf.	‡112
Pittsburg Coal	22⅞
Republic I. & S.	38½
Republic I. & S., pf.	106
Sloss-Sheffield	85½
Standard Oil	‡685
U. S. Steel	79¼
U. S. Steel, pf.	125¼
Va. Car. Chem.	47

BOSTON CURB	Low.
Ahmeek	215
Chemung	16½
Chino	7¾
Globe Con.	‡4½
Gila	9⅜
Mason Valley	2
Ray Central	2½
Ray Con.	18⅝
San Antonio	8⅜
Yuma	2

Furnished by Hornblower & Weeks, N. Y.

ST. LOUIS Sept. 11		
N. of Com.	High	Low
Adams	.40	.30
Am. Nettie.	.09	.07
Center Cr'k	1.75	1.50
Cent. C. & C.	85.00	84.00
C. C. & C. pf.	84.00	83.00
Cent. Oil	110.00	100.00
Columbia	9.00	7.00
Con. Coal	20.00	19.00
Doe Run	115.00	100.00
Gra. Bimet.	.30	.25
St. Joe	12.50	11.00

LONDON Sept. 15			
Name of Com.	Clg.		
Dolores	£1	5s	0d
Stratton's Ind.	0	3	3
Camp Bird	1	8	3
Esperanza	2	19	0
Tomboy	1	1	3
El Oro	1	5	6
Oroville	0	12	6

Cabled through Wm. P. Bonbright & Co. N. Y.

NEVADA STOCKS. Sept. 15

Furnished by Weir Bros. & Co., New York

Name of Comp.	Clg.
COMSTOCK STOCKS	
Belcher	.91
Best & Belcher	.61
Caledonia	.35
Chollar	.26
Comstock	.28
Con. Cal. & Va.	1.42
Crown Point	1.20
Exchequer	.33
Gould & Curry	.27
Hale & Norcross	.43
Mexican	1.27
Ophir	1.30
Overman	.46
Potosi	.58
Savage	.52
Sierra Nevada	.50
Union	.54
Utah	.09
Yellow Jacket	1.27
TONOPAH STOCKS	
Belmont	.72
Extension	.58
Golden Anchor	..
Jim Butler	.12
MacNamara	.29
Midway	.18
Montana	1.02
North Star	.02
Tono'h Mine of N.	6.76
West End Con.	.27
GOLDFI'D STOCKS	
Adams	.01
Atlanta	.14
Blue Bell	.03
Booth	.12
C.O.D. Con.	.08
Columbia Mt.	.10
Comb. Frac.	.77
Con. Red Top	...
Cracker Jack	.02
Dia'dfield B. B. C.	.01
Goldfield Belmont	.04
Goldfield Daisy	.16
Great Bend	.06
Jumbo Extension	.16
Kendall	.02
Lone Star	.03
May Queen	.04
Oro	.06
Red Hill	.06
Sandstorm	.06

Name of Comp.	Clg.
Silver Pick	.14
St. Ives	.05
Triangle	.01
BULLFROG STOCKS	
Gibraltar	.02
Homestake King.	...
Mont. Shoshone C.	1.87½
Tramp Cons.	.04
MISCELLANEOUS	
Cumberland Ely.	7.00
Giroux	8.87½
Greenwa'r Copper	.03
Nevada Con.	23.87½
Nevada Hills	.70
Navada Smelting.	.87½
Nevada Wonder	.70
Nevada-Utah	1.68
Penn-Wyoming	...
Pittsburgh S. Pk.	.50
Ray Central	2.27½
Ray Con.	18.75
Round Mt. Sphinx	.05

COLO. SPRINGS Sept. 16	
Name of Comp.	Clg.
Acacia	.07⅞
C. C. Con.	‡.03½
Dante	‡.07
Doctor	.09⅛
Elkton	.74⅝
El Paso	.65
Findlay	.11⅜
Gold Dollar	‡.13⅛
Gold Sovereign	.04½
Isabella	.21⅜
Jack Pot	‡.08½
Jennie Sample	.08
Jerry Johnson	‡.06¼
Lexington	‡.01¼
Mary McKinney	‡.47
Pharmacist	.03½
Portland	.84
U. G. M.	.08
Vindicator	.71
Work	.07½

Assessments

Company.	Delinq.	Sale.	Amt.
Alta Gladstone, Utah	Sept. 15	Oct. 20	$0.00
Andes, Nev.	Sept. 14	Oct. 5	0.10
Arcadian, Mich.	Sept. 1	Sept. 31	0.50
Boulder Cr'k M. & M., Wash.	Aug. 31	Sept. 30	0.01
Copper Mt. M. & D., Ida.	Sept. 7	Oct. 4	0.005
Crown Point, Nev.	Aug. 21	Sept. 17	0.10
East Buffalo, Ida.	Sept. 10	Oct. 10	0.006
Hancock Con., Mich.	Oct. 10		1.00
Hypotheek M. & M., Ida.	Aug. 26	Sept. 25	0.005
Laclede T. I., Ida.	Aug. 23	Sept. 21	0.005
Lady Washington, Nev.	Aug. 31	Sept. 20	0.05
Massasoit, Utah	Aug. 21	Sept. 14	0.00
Mexican, Nev.	Sept. 10	Oct. 4	0.10
New Hope, Ida.	July 15	Sept. 25	0.002
Overman, Nev.	Sept. 8	Sept. 29	0.05
Pittsburg-Idaho, Utah	Aug. 30	Sept. 17	0.01
S. [illegible], Utah	Sept. 13	Oct. 5	0.05
Sterling [illegible] M. Co., Ltd., Ida.	Aug. 13	Sept. 13	0.002
West Century M. & M., Utah	Aug. 1	Sept. 17	0.01
Winona, Mich.	Sept. 14		1.00
Zenith Silver Copper, Utah	Sept. 10	Sept. 27	0.05

Monthly Average Prices of Metals

SILVER

Month.	New York.		London.	
	1908.	1909.	1908.	1909.
January	55.678	51.750	25.738	23.834
February	56.000	51.472	25.855	23.706
March	55.365	50.468	25.570	23.227
April	55.505	51.428	25.133	23.708
May	52.795	52.905	24.377	24.343
June	53.663	52.538	24.760	24.166
July	53.115	51.043	24.514	23.519
August	51.683	51.125	23.858	23.588
September	51.720	.....	23.877	.....
October	51.431	.....	23.725	...
November	49.647	.....	22.933	.....
December	48.766	.....	22.493	.....
Total	52.864	.....	24.402	..

New York, cents per fine ounce; London, pence per standard ounce.

COPPER

	NEW YORK.				LONDON.	
	Electrolytic		Lake.			
	1908.	1909.	1908.	1909.	1908.	1909.
January	13.726	13.893	13.901	14.280	62.386	57.688
February	12.905	12.949	13.098	13.295	58.786	61.198
March	12.704	12.387	12.875	12.826	58.761	56.231
April	12.743	12.56¼	12.928	12.93¾	58.331	57.363
May	12.598	12.893	12.788	13.238	57.387	59.338
June	12.675	13.214	12.877	13.548	57.842	59.627
July	12.702	12.880	12.933	13.363	57.989	58.556
August	13.462	13.007	13.639	13.296	60.500	59.393
September	13.388	....	13.600	......	60.338	......
October	13.354	....	13.646	......	60.139	......
November	14.130	.....	14.386	......	63.417	......
December	14.111	.....	14.411	......	62.943	.....
Year	13.208	......	13.424	......	59.902	..

New York, cents per pound. Electrolytic is for cakes, ingots or wirebars. London, pounds sterling, per long ton, standard copper.

TIN AT NEW YORK

Month.	1908.	1909.	Month.	1908.	1909.
January	27.380	28.060	July	29.207	29.125
February	28.978	28.290	August	29.942	29.966
March	30.577	28.727	September	28.815	......
April	31.702	29.445	October	29.444	......
May	30.015	29.225	November	30.348	......
June	28.024	29.322	December	29.154	.....
			Av. Year	29.465	..

Prices are in cents per pound.

LEAD

Month.	New York.		St. Louis	London.	
	1908.	1909.	1909.	1908.	1909.
January	3.691	4.175	4.025	14.469	13.118
February	3.725	4.018	3.868	14.250	13.313
March	3.838	3.986	3.835	13.975	13.438
April	3.993	4.168	4.051	13.469	13.297
May	4.253	4.287	4.214	12.938	13.225
June	4.466	4.350	4.291	12.600	13.031
July	4.744	4.321	4.188	13.000	12.563
August	4.580	4.363	4.227	13.375	12.475
September	4.515	......	.....	13.125	
October	4.351	......	......	13.375	..
November	4.330	......	......	13.538	...
December	4.213	......	......	13.156	..
Year	4.200	......	......	13.439	.....

New York and St. Louis, cents per pound. London, pounds sterling per long ton.

SPELTER

Month.	New York		St. Louis.		London.	
	1908.	1909.	1908.	1909.	1908.	1909.
January	4.513	5.141	4.363	4.991	20.563	21.425
February	4.788	4.889	4.638	4.739	20.875	21.563
March	4.665	4.757	4.527	4.607	21.075	21.438
April	4.645	4.965	4.495	4.815	21.344	21.531
May	4.608	5.124	4.458	4.974	19.906	21.975
June	4.543	5.402	4.393	5.252	19.000	22.000
July	4.485	5.402	4.338	5.252	19.031	21.969
August	4.702	5.729	4.556	5.579	19.350	22.125
September	4.769		4.619	....	19.563	...
October	4.801		4.651	.....	19.750	...
November	5.059	.....	4.909	...	20.875	....
December	5.137	....	4.987	.....	20.625	..
Year	4.726	.....	4.578	....	20.163	

New York and St. Louis, cents per pound. London, pounds sterling per long ton.

Mining and Metallurgical Companies—U. S.

Name of Company and Location.		Shares. Issued.	Par Val.	Dividends. Total to Date.	Latest. Date.	Amt.
Alaska, Mexican, g.	Alas.	180,000	$ 5	$ 2,292,381	July '09	$0.60
Alaska Treadwell, g	Alas.	200,000	25	10,685,000	July '09	1.00
Alaka United, g	Alas.	180,200	5	585,600	July '09	0.40
Amalgamated, c.	Mont.	1,538,879	100	70,788,432	Aug. '09	0.50
Am. Sm.&Ref.,com.	U. S.	500,000	100	17,000,000	Oct. '09	1.00
Am. Sm. & Ref., pf.	U. S.	500,000	100	32,375,000	Oct. '09	1.75
Am. Smelters, pf. A.	U. S.	170,000	100	4,220,000	Sept. '09	1.50
Am. Smelters, pf B.	U. S.	300,000	100	6,375,000	Sept. '09	1.25
Am. Zinc,Lead&Sm.	Kan.	80,000	25	280,000	Nov. '07	0.50
Anaconda, c.	Mont.	1,200,000	25	44,700,000	June '09	0.50
Arizona, c.	Ariz.	3,682,520	....	6,182,520	April '06	0.50
Atlantic, c.	Mich.	100,000	25	990,000	Feb. '05	0.02
Bald Butte, g. s.	Mont.	250,000	1	1,354,648	Oct. '07	0.04
Beck Tunnel, g. s. l	Utah.	1,000,000	0.10	675,000	Oct. '07	0.02
Bent'a M.&D.,pf.,l.z.	Wis.	196,607	1	10,949	Nov. '08	0.01½
Boston & Montana.	Mont.	150,000	25	53,850,000	July '09	3.00
Bull.Beck.&Cham.,g.	Utah.	100,000	10	2,728,400	July '08	0.10
Bunker Hill & Sull.	Ida.	300,000	10	11,151,000	Oct. '09	0.15
Butte Coalition, c. s.	Mont.	1,000,000	15	2,450,000	Dec. '07	0.15
Calumet& Arizona, c.	Ariz.	200,000	10	10,700,000	Sept. '09	1.00
Calumet & Hecla, c.	Mich.	100,000	25	109,750,000	Sept. '09	8.00
Camp Bird, g., s.	Colo.	820,000	5	5,579,280	July '09	0.24
Carisa, c. g	Utah.	500,000	1	55,000	Nov. '06	0.01
Colorado, l. g. s.	Utah.	1,000,000	0.20	1,710,000	Aug. '09	0.08
Columbus Con., c.	Utah.	285,540	5	226,832	Oct. '07	0.20
Con. Mercur, g	Utah.	1,000,000	1	3,385,313	Dec. '06	0.02½
Continental, z. l.	Mo.	22,000	25	231,000	Oct. '08	0.25
Copper Range Con.	Mich.	384,185	100	8,836,255	Oct. '09	1.00
Creede United, g	Colo.	1,625,000	1	214,053	July '06	0.00½
Daly Judge, g. s. l.	Utah.	300,000	1	225,000	April '07	0.37½
Daly West, g. s. l	Utah.	180,000	20	5,985,000	July '09	0.30
De Lamar, g. s.	Ida.	80,000	5	835,200	Sept. '06	0.24
Doe Run, l.	Mo.	63,508	100	1,955,156	June '09	1.50
Elkton Con., g	Colo.	2,500,000	1	2,391,960	Aug. '09	0.01½
El Paso, g.	Colo.	2,450,000	1	1,315,545	Sept. '08	0.01
Fed. Sm., com	Idaho.	60,000	100	2,708,750	Jan. '09	1.50
Federal M & S., pf.	Idaho.	120,000	100	4,961,250	Sept. '09	1.75
Findley, g	Colo.	250,000	1	337,500	Sept. '06	0.01
Florence, g	Nev.	1,050,000	1	525,000	June '09	0.10
Frances-Mohawk, g	Nev.	912,000	1	546,000	Jan. '08	0.05
Gemini-Keystone.	Utah.	5,000	100	2,000,000	Aug. '07	10.00
Gold King Con	Colo.	3,750,370	1	1,407,504	May '05	0.01
Goldfield Con., g.	Nev.	3,558,367	10	2,840,269	Oct. '09	0.30
Grand Central, g	Utah.	250,000	1	1,321,250	Dec. '07	0.04
Granite, g	Colo.	1,650,000	1	230,500	June '09	0.01
Hecla, s. l.	Idaho.	1,000,000	0.25	1,840,000	July '09	0.02
Homestake, g	S. D.	218,400	100	24,700,040	Aug. '09	0.50
Horn Silver, g.s.c.z.l.	Utah.	400,000	25	5,642,000	Sept. '07	0.05
Imperial, c.	Ariz.	500,000	10	300,000	June '07	0.20
Inter'l Nickel, pf.	N. Y.	89,126	100	2,005,335	Aug. '09	1.50
Iron Blossom, s. l.	Utah.	1,000,000	0.10	240,000	July '09	0.08
Iron Silver.	Colo.	500,000	20	4,150,000	Sept. '09	0.10
Jamison, g.	Cal.	390,000	10	354,900	July '09	0.02
Jerry Johnson.	Cal.	1,500,000	1	86,700	Jan. '08	0.01
Kendall, g.	Mont.	500,000	5	1,275,000	Oct. '08	0.02
Liberty Bell, g. s.	Colo.	130,551	5	228,353	June '09	0.15
Lightner, g	Cal.	102,255	1	253,081	Oct. '06	0.05
Lower Mammoth, g	Utah.	190,000	1	57,000	Sept. '07	0.07½
MacNamara, s. g.	Nev.	728,341	1	21,850	May, '09	0.01
Mammoth, g. s. l	Utah.	400,000	2.50	2,220,000	Mar. '08	0.05
Mary McKinney, g	Colo.	1,309,252	1	867,278	June '09	0.02
May Day, g. s. l	Utah.	800,000	0.25	108,000	Sept. '08	0.01½
Mohawk, M. Co.	Mich.	100,000	25	1,950,000	July '09	1.00
Mont. Ore Purch	Mont.	80,833	25	9,437,274	Jan. '07	15.00
Nevada Hills, s.g	Nev.	746,000	5	373,000	Dec. '07	0.10
New Century, z. l	Mo.	300,000	1	213,000	Dec. '06	1.01
Newhouse M. & S. c.	Utah.	600,000	10	300,000	Sept. '07	0.50
New Idria, q.	Cal.	100,000	5	1,404,000	July '09	0.30
New Jersey Zinc.	U. S.	100,000	100	12,000,000	May '08	4.00
North Butte	Mont.	400,000	15	8,200,000	Sept. '09	1.00
North Star, g	Cal.	250,000	10	2,186,988	Sept '09	0.40
Old Dominion, s.	Ariz.	293,245	25	1,147,413	Sept. '09	0.50
Old Dominion,M&Sc	Ariz.	162,000	25	850,500	Sept. '09	1.00
Ophir, g. sz.	Nev.	201,600	3	1,816,360	May '08	0.10
Osceola, c.	Mich.	96,150	25	7,997,150	July '09	4.00
Parrot, c. s.	Mont.	229,850	10	6,807,649	Sept. '07	0.25
Phelps, Dodge & Co.	U. S.	44,934,600	1	2,246,730	June '09	0.02½
Portland, g	Colo.	3,000,000	1	8,227,080	Jan. '09	0.40
Quartette, g. s.	Nev.	100,000	10	375,000	July '07	0.20
Quincy, c.	Mich.	110,000	25	18,780,000	Sept. '09	1.00
Round Mountain, g.	Nev.	800,000	1	160,027	June '09	0.04
Sacramento, g. q.	Utah.	1,000,000	1	225,000	Nov. '06	0.00½
St. Joseph, l.	Mo.	1,000,000	10	6,458,357	June '09	0.15
Shannon, c.	Ariz.	300,000	10	450,000	July '07	0.50
Silver Hill, g. s.	Nev.	108,000	1	81,000	June '07	0.05
Silver King, g. s. l.†	Utah.	150,000	20	11,187,500	July '07	0.33½
Silver King Co't'n.†	Utah.	1,250,000	5	1,490,850	Oct. '09	0.15
Sioux Con., s. l. g.	Utah.	746,389	1	544,583	Aug. '09	0.07
Snow Storm, s. l.	Ida.	1,500,000	1	780,000	June '09	0.03
Standard Con., g. s.	Cal.	178,394	10	5,194,130	Dec. '08	0.10
Stratton's Independ.	Colo.	1,000,000	5	4,895,865	April '06	0.12½
Swansea, g. s. l.	Utah.	100,000	5	329,500	Mar. '07	0.05
Tamarack, c.	Mich.	60,000	25	9,420,000	July '07	4.00
Tennessee, c.	Tenn.	200,000	25	2,056,250	Sept. '08	1.25
Tomboy, g. s.	Colo.	300,000	5	2,160,000	June '09	0.48
Tonopah of Nev.	Nev.	1,000,000	1	4,600,000	July '09	0.35
Tonopah Belmont.	Nev.	1,500,000	1	600,000	April '07	0.10
Tonopah Ext'nsion	Nev.	943,433	1	283,030	April '06	0.15
Tonopah Midway.	Nev.	1,000,000	1	250,000	Jan. .07	0.05
Uncle Sam, g. s. l.	Utah.	500,000	1	305,000	Sept. '09	0.02
United States, com.	Utah.	351,010	50	2,323,565	July '09	0.50
United States, pf.*	Utah.	486,042	50	5,731,609	July '09	0.87½
United Cop. com.	Mont.	450,000	100	5,962,500	Aug. '07	1.75
United, c. pf.	Mont.	50,000	100	1,500,000	May '07	3.00
United, z. l., pf.	Mo.-Kan.	19,556	25	312,782	Jan. '08	0.50
United Verde, c.	Ariz.	299,927	10	1,385,322	Mar. '09	0.75
U. S. Red & Ref. Pf.	Colo.	39,458	100	1,005,504	Oct. '07	1.50
Utah, g. (Fish Sp'gs)	Utah.	100,000	10	323,000	Feb. '09	0.02
Utah Con., c.	Utah.	300,000	5	7,650,000	July '09	0.50
Utah Copper.	Utah.	733,624	10	1,793,562	Sept '09	0.50
Victoria, Utah	Utah.	250,000	1	177,000	Mar. '07	0.04
Vindicator Con., g.	Colo.	1,500,000	1	2,002,500	July '09	0.01½
Wolverine, c.	Mich.	60,000	25	5,400,000	April '09	5.00
Work, g.	Colo.	1,500,000	1	172,500	July '08	0.01
Yankee Con.	Utah.	1,000,000	1	182,500	Jan. '07	0.03
Yellow Aster, g	Cal.	100,000	10	958,789	Aug. '07	0.20

*Previous to consolidation $1,436,250 were divided. †Amalgamated.

Coal, Iron and Other Industrials—United States

Name of Company and Location.		Shares. Issued.	Par Val.	Dividends. Total to Date.	Latest. Date.	Amt.
Allis-Chalmers, pf.	U. S.	161,500	100	$3,108,875	Feb. '04	$1.75
Amer. Ag.Chem., pf.	U. S.	181,530	100	1,747,620	April '09	3.00
American Cement.	Penn.	200,000	10	1,348,000	July '09	0.30
American Coal.	Md.	50,000	25	2,572,187	June '09	0.375
Bethlehem Steel, pf.	Penn.	150,000	100	900,000	Nov. '06	0.75
Cambria Steel.	Penn.	900,000	50	9,450,000	Feb. '09	0.75
Central C. & C., com.	Mo.	51,250	100	2,613,750	April '09	1.51
Central C. & C., pf.	Mo.	18,750	100	1,476,562	April '09	1.25
Col.&Hock.C.&I.,pf.	Ohio.	69,244	100	487,684	July '09	1.50
Consolidated Coal.	Ill.	50,000	100	350,000	July '04	1.00
Consolidation Coal.	Md.	190,247	100	x17,020,770	July '09	1.50
Crucible Steel, pf.	Penn.	244,365	100	8,736,049	June '09	1.25
Empire S. & I., pf.	N. J.	25,000	100	933,033	Jan. '09	1.50
Fairmont Coal.	W. Va.	120,000	100	1,980,000	Jan. '09	2.00
Gen. Chem., com.	U. S.	74,103	100	2,371,296	Sept. '09	1.00
General Chem., pf.	U. S.	100,000	100	6,555,000	Oct. '09	1.50
International Salt.	Penn.	182,280	100	911,400	Dec. '06	1.00
Jeff.&Cl'f C.&I., cm.	Penn.	15,000	100	330,000	Aug. '05	5.00
Jeff. & Cl'f C. & I., pf.	Penn.	15,000	100	937,500	Aug. '09	2.50
Kern River Oil.	Cal.	20,000	100	84,000	July '08	0.10
Lehigh Coal & Nav.	Penn.	382,260	50	15,779,410	May '09	2.00
Maryland Coal, pf.	Md.	18,850	100	2,061,122	June '09	2.50
Monon. R. Coal, pf.	Penn.	100,000	100	2,324,000	July '08	3.50
Nat. Carbon, com.	U. S.	55,000	100	715,000	April '08	1.00
Nat. Carbon, pf.	U. S.	45,000	100	3,071,259	Nov. '08	1.75
National Lead, com.	N. Y.	149,034	100	3,456,497	July '09	1.25
National Lead, pf.	N. Y.	149,040	100	18,415,888	Sept. '09	1.75
Nat'l Steel& Wire,pf.	N. Y.	25,778	100	631,561	May '06	1.75
New Central Coal.	Md.	50,000	20	390,000	Nov. '08	0.40
New River Coal, pf.	W. Va.	37,617	100	451,405	Nov. '08	1.50
Pacific Coast Borax.	Cal.	19,000	100	2,086,500	Aug. '05	1.00
Peerless Oil.	Cal.	92,000	10	711,000	June '08	0.06
Penna. Salt.	Penn.	60,000	50	15,098,000	Oct. '08	3.00
Penna. Steel, pf.	Penn.	165,000	100	8,662,500	Nov. '08	3.50
Phila. Gas, com.	Penn.	664,800	50	*24,264,600	Feb. '09	0.75
Phila. Gas, pf.	Penn.	120,000	50	2,850,000	Sept. '08	1.25
Pittsburg Coal, pf.	Penn.	297,010	100	11,434,962	April '09	1.75
PocahontasC.C., pf.†	W. Va.	28,000	100	252,000	Jan. '09	3.00
Pocah'tasC.C., cm.†	W. Va.	45,000	100	†406,800	Oct. '08	3.00
Republic I. & S., pf.	Ill.	204,169	100	8,189,111	Oct. '09	1.75
Sloss-Sheffield, com.	Ala.	100,000	100	2,133,000	June '09	1.25
Sloss-Sheffield, pf.	Ala.	67,000	100	4,338,000	July '09	1.75
Standard Oil.	U. S.	970,000	100	658,622,000	Sept. '09	6.00
Tenn. C. & I., com.	Tenn.	225,536	100	3,583,060	Nov. '07	1.00
Tenn. C. & I., pf.	Tenn.	2,840	100	390,040	Nov. '07	2.00
Texas & PacificCoal.	Texas.	23,940	100	1,747,620	April '09	1.50
Uni. Metals Selling.	U. S.	50,000	100	5,875,000	Jan. '09	5.00
U.S. Steel Corp., cm.	U. S.	5,083,025	100	89,701,837	Sept. '09	0.75
U. S. Steel Corp., pf.	U. S.	3,602,811	100	244,194,948	Aug. '09	1.75
Va. Carolina Ch., pf.	U. S.	180,000	100	15,060,869	July '09	2.00
Warwick I. & S.	U. S.	148,671	10	517,739	Nov. '08	0.30
Westmoreland Coal.	Penn.	60,000	50	8,880,000	Oct. '08	2.50

*Since 1894. †Since 1907. ‡Since 1890. xStock div. $6,130,000 Mar.'09

Canada, Mexico, Central and South America

Name of Company and Location.		Shares. Issued.	Par Val.	Dividends. Total to Date.	Latest. Date.	Amt.
Amistad y Conc'rdia	Mex.	9,600	50	$417,070	April '08	$1.36
Batopilas.	Mex.	446,486	20	†55,870	Dec. '07	0.12½
British Columbia, c.	B. C.	503,000	5	201,200	Sept. '07	0.40
Buffalo, s.	Ont.	900,000	1	471,000	Aug. '09	0.03
Butters' Salvador, g.	Salv.	150,000	5	600,000	April '05	0.25
Cobalt Central, s.	Ont.	4,761,500	1	187,460	Aug. '09	0.01
Coniagas	Ont.	800,000	5	720,000	July '08	0.15
Consolidated M. & S.	B. C.	53,552	100	781,885	Nov. '07	1.25
Crow's Nest Pass.	B. C.	160,000	25	2,018,648	July '07	0.62½
Crown Reserve, s.	Ont.	1,750,000	1	898,500	July '09	0.15
Dolores, g. s.	Mex.	400,000	5	660,000	Aug. '09	0.15
Dominion Coal, com.	N. S.	150,000	100	3,300,000	July '09	1.00
Dominion Coal, pf.	N. S.	30,000	100	‡630,000	Feb. '08	3.51
Dos Estrellas, g.s.	Mex.	300,000	0.50	3,780,000	Jan. '09	1.00
El Oro, g.s.	Mex.	1,147,500	5	4,989,600	June '09	0.36
Esperanza, s.g.	Mex.	455,000	5	9,785,000	June '09	0.37
Foster Cobalt, s.	Ont.	1,000,000	1	50,000	Jan. '07	0.05
Granby Con.	B. C.	135,000	100	3,508,630	Dec. '08	2.00
Greene Con. Copper.	Mex.	864,000	10	6,137,800	Mar. '07	0.40
Guanajuato.	Mex.	540,000	5	74,250	Oct. '06	0.07
Guanajuato D., pf.s.	Mex.	10,000	100	184,356	July '09	3.00
Guggenheim Expl.	Mex.	105,000	100	5,535,000	July '09	2.50
Hinds Con., g. s. c. l.	Mex.	5,000,000	1	100,000	Feb. '08	0.02
Kerr Lake, s.	Ont.	600,000	5	1,288,000	Sept '09	0.30
La Rose Con., s.	Ont.	1,143,368	5	856,925	July '09	0.20
Le Roi, Ltd., g.	B. C.	200,000	25	425,000	Dec. '06	0.48
Le Roi No. 2, g.	B. C.	120,000	25	859,200	Mar. '09	0.48
Lucky Tiger-Com.,g.	Mex.	65,000	10	570,500	Sept '09	0.60
McKinley-Darragh,s	Ont.	2,247,692	1	580,000	June '09	0.05
Mex. Con. M.&S. Co.	Mex.	240,000	10	660,000	Mar. '08	0.25
Mex. Mill.&Trans.pf.	Mex.	10,500	100	65,858	July '08	3.00
Mines Co. of Am.	Mex.	2,000,000	1	3,605,000	Aug. '09	0.03
N. Y. & Hond. Ros.	C. A.	150,000	10	2,542,000	Aug. '09	0.10
Nipissing, s.	Ont.	1,200,000	5	2,940,000	July '09	0.25
N. S. St.&Coal, com.	N. S.	9,876	100	1,087,856	April '08	1.50
N. S. St. & Coal, pf.	N. S.	10,300	100	479,130	April '09	2.00
Penoles*	Mex.	2,500	100	8,630,000	Dec. '07	20.00
Peregrina Min.& Mill.	Mex.	10,000	100	248,656	Sept '09	3.50
Pinguico, pf. s.	Mex.	20,000	100	300,000	April '09	3.00
Reco, g.s.l.	B. C.	985,000	1	527,082	April '06	0.02
Right of Way.	Ont.	499,518	1.00	294,672	July '09	0.06
Securities Corp., pf.	Mex.	2,000	100	42,699	July '08	3.50
Silver Queen, s.	Ont.	1,500,000	1	345,000	Nov. '08	0.05
Temiskaming, s.	Ont.	2,500,000	1	525,000	April '09	0.06
Teziutlan Copper.	Mex.	10,000	100	.....	Dec. '08	1.20
Tilt Cove, c.	N. F.	89,000	2	495,630	May '08	0.55
Tretheway, s.	Ont.	945,450	1	311,998	May '09	0.01
Tyee, c.	B. C.	180,000	5	201,600	Aug. '07	0.48

*Mexican Currency. †Since reorganization. ‡Since August, 1905.

Industrials

The Mill and Smelter Engineering Company, of New York, has completed shipment of cyanide equipment for the San Felipe Mining Company, at Jalisco, Mexico.

J. W. Sittig, 5 Beekman street, New York City, advises having received from Chile, South America, an inquiry for catalogs and full information on all kinds of apparatus and machinery for use in the mining and metallurgical industry.

C. O. Bartlett & Snow Company, Cleveland, Ohio, has received an order from the Philadelphia & Reading Coal and Iron Company, Pottsville, Penn., for one Greene self-dumping car haul, to be installed at the Burnside colliery. Capacity two cars per minute.

Frank H. Hill, who has long been identified with the sales and engineering department of the New York office of the Sprague Electric Company, assumed the duties of manager of the branch office in Atlanta, Ga., on Sept. 1, in place of F. V. L. Smith, who has resigned.

The Hayward Company has just issued a new catalog No. 36. This catalog has much "news interest" in the illustrations and presents engineering problems in a different light than they have been presented before, and besides being a catalog issued to sell goods, it is of vital interest to our readers.

Chalmers & Williams, Inc., Chicago, Ill., advise having recently closed a contract for a 10-stamp cyanide plant with Burt filter and power and electric plant with the Barranca Mines (Mexico), Ltd., Torres, Sonora, Mexico; also a 15-stamp mill with power for the Mexico Consolidated Mining and Smelting Company, Tepehuanes, Durango, Mexico.

The Western Electric Company, at New York and Chicago, is distributing a bulletin illustrating and exploiting the Sunbeam tungsten miniature lamp for use on voltages between 1½ and 20. These lamps vary in efficiency from 0.9 watts per candlepower to 1.33 watts per candlepower and are particularly desirable for use in any place where battery or low-voltage power circuit lamps are used. A copy of this bulletin No. 8-A may be obtained from the Western Electric Company's nearest house.

Keuffel & Esser Company, Hoboken, N. J., has just issued a circular on the subject of blueprint papers. The results obtained in making blueprints depend upon the careful selection and application of the chemicals and essentially upon the quality of the paper employed. It has always been this company's endeavor to maintain the high quality of its papers and improve its formulas for coating these papers, and to produce papers best adapted for their purpose. The reputation which the company's several brands of blueprint paper enjoy, proves that its efforts have been successful, and that its papers may be depended upon for the work for which they are recommended.

Traylor Engineering Company, Allentown, Penn., recently closed a contract with the Rhode Island Coal Company, of Portsmouth, R. I., for a complete new briquetting plant with a capacity of 15 tons per hour. The company furnished all of the machinery for this plant including the press, which is one of its latest and perfected design designated as a Tangential type. It has also closed a contract with the Superior Fuel and Coal Company of Winnipeg, Manitoba, Canada, for a similar one except in some minor details, the principal one being that the Rhode Island company supplies the market with a briquet being about 1½ oz. in weight, while the Superior Fuel and Coal Company produces a briquet weighing 2¼ ounces.

The Dayton Globe Iron Works Company, recently received a contract from the United States Government for two 44-in. improved new American turbines, to be installed vertically in open concrete flumes, and to be complete with gears and special bed plate to receive air compressors which will be built by the Hall Steam Pump Company, of Pittsburg, Penn. These units will be installed in the turbo-compressor plant which the Government is erecting at lock No. 5, of Monongahela river. The work is in charge of Major H. C. Newcomer, of the corps of United States engineers, with headquarters in Pittsburg. These turbines will be of a special nature, brass fitted so as to prevent the corroding effect caused by the water of Monongahela river. This company's wheel was selected on account of its having a solid cast runner which is so much more durable under the requirements called for by the engineers on this work.

The Trenton Iron Company, Trenton, N. J., has issued a handsome booklet entitled, "Aerial Tramways." The Bleichert system of aerial tramways is one whereby the material is carried in receptacles suspended from carriages on stationary track cables of special construction, supported at varying elevations above the ground. The carriers move in a continuous circuit, at definite intervals, determined by the individual loads and the amount of material to be transported in a given time, and at distances apart varying in accordance with the speed; the loaded carriers traveling along a line of cable graduated in size to the weight it has to support, and the empties returning along a lighter line of cable parallel with the loaded line. Motion is imparted to the carriers by means of a comparatively light endless wire rope, of the ordinary or Lang lay, commonly known as the traction rope, to which the carriers are gripped. The Bleichert system belongs to that class of aerial tramways known to many as the "double rope," in contradistinction to the "single rope" class, wherein one rope performs both the functions of support and propulsion. The Bleichert system is especially adapted to the transportation of ores, coal, crushed stone, slate, clay, sand, and all kinds of raw materials. The materials are carried in bee lines, directly from the loading stations to the places of delivery, without rehandling, at costs per mile varying from 2 cents to 5 cents per ton.

C. L. Constant, who has conducted for many years, in New York, one of the best known laboratories in connection with the analysis of ores, has decided to increase the facilities and operating scope of his establishment and to associate himself with several well-known engineers, geologists and metallurgists in New York. For this purpose he has organized what will be known as the C. L. Constant Company. Those who have become identified with this new engineering organization are C. L. Constant, Dr. Walter Harvey Weed, C. L. Constant, Jr., R. B. Lamb and Frank H. Probert. The object of this new organization has been to gather together a number of recognized mining specialists, giving the firm special inducements to take care of all the details and operating features of a property. They will assume all the responsibility of this end of the enterprise. This is only one of the many features which are contemplated. Others will embrace furnishing details on the geology of a property and the subsequent metallurgy of the ore. In addition mine examinations and reports will be features of the new organization. C. L. Constant, who is to have charge of the laboratory end of the enterprise, is one of the best known specialists in this line of work in New York City. Dr. Walter Harvey Weed is one of the acknowledged foremost geologists in the United States. He has been retained for years by the United States Government and many of the largest mining interests in the United States to attend to their geological work. C. L. Constant, Jr., is a son of Mr. Constant, and has had a great deal of laboratory experience. R. B. Lamb will furnish the metallurgical talent for the new enterprise. He has had a transcontinental experience here and abroad in this class of work. Frank H. Probert is a well-known mining engineer, which rounds out the technical combination of this new engineering company. The result of the coöperation of these mining interests is largely the result existing for an institution of this kind, which will go into all the details necessary on the mining end of a proposition.

Widely known throughout the mine-repair shops all over the world is the McCabe 2 in 1 double-spindle lathe. While prominent shops have been using lathes of this type for a number of years, the new style heavy pattern machine, as built today, is worthy of mention, for it embodies the best of the old and the present. It has many constructional advantages and special features peculiarly adapted for their work, because united with all the power and capacity of a regular 48-in. triple-geared lathe, is a handy all-round 26-in. back-geared size. This lathe is both back geared and triple geared and power can be further increased by use of an internal geared faceplate on the large swing. The average ordinary style lathe is triple-geared ratio about 52 to 1. With the geared plate on McCabe's lathe, the ratio of gearing is 72 to 1, which gives tremendous power on the 48-in. swing. Turning tires, boring out wheels, etc., and all big work can be handled to advantage the same as on any standard 48-in. triple-geared lathe. The principal reason why this lathe so strongly appeals to mine-repair shops of every description is because small work can also be handled on the back-geared 26-in. swing. Changing over to this size is but a matter of a few minutes, and the lathe is, therefore, kept busy doing other work which regular style large lathes could not attempt to handle. Neither is it awkward or cumbersome doing this small work, as might be imagined, for provisions are made in the lathe's construction, with proper power, feeds and speeds to operate as conveniently as a straight 26-in. lathe. As a machine of this type covers more range than other lathes, it is generally recognized as the most serviceable and complete lathe for mine-repair shops. The McCabe lathe is not the result of an attempt to build a low-priced big lathe, but of an effort to produce a machine specially suited for the work mine-repair shops have to do. The manufacturers have made a specialty of this one machine for a great many years, turning them out in large lots at a time, making the parts all duplicate and interchangeable, and the result is that the work is of the highest standard and this quantity production, it is claimed, reduces the cost about $1000 on a regular big lathe's cost.

Trade Catalogs

Castner, Curran & Bullitt, 1 S. 15th street, Philadelphia, Penn. Booklet. Manual of Firing Steam Boiler. 70 pages, 3½x6 inches.

The J. Geo. Leyner Engineering Works Company, Littleton, Colo. Bulletin No. 1108. Drill sharpeners. Illustrated, 12 pages, 6x9 inches.

The Sweetland Filter Press Company, Union Trust building, Los Angeles, Cal. Bulletin D. Type D slime filter. Illustrated, 16 pages, 8x10½ inches.

McDonald & Nickle, Detroit, Mich. Pamphlet. Evaporation by the McDonald & Nickle direct firing system. Illustrated, 14 pages, 6x9 inches.

The Roessler & Hasslacher Chemical Co.,
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The Engineering and Mining Journal

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Coal Mining Methods in England

The Hulton Colliery Secures Coal without Explosives, and Is the Only Mine in England Ventilated Electrically by Underground Fans

BY FLOYD W. PARSONS

Great Britain, like many other European countries, is in many ways, a minus nation. The British are minus wheat, corn, cotton, iron and copper, while on the plus side of the balance sheet we may place coal, brains and free-trade. Coal is the most valuable natural resource in the British Isles.

According to the estimates of the Royal Commission appointed in 1871 to inquire into the probable duration of the coal supply, the available resources of the country in seams of 1 ft. thick and upward, situated within 1000 ft. of the surface were about 90,000,000,000 tons. In the final report of the Royal Commission on coal supplies in 1905, the amount still available, of the same thickness and within the same distance of the surface, was given as more than 100,000,000,000 tons. Great Britain still has many unproved areas, so that notwithstanding the immense annual production, the end of the coal industry must still be considered as in the distant future.

The chief coalfields of Great Britain are: South Wales, area, 920 square miles; Somersetshire and Gloucestershire, area, 150 square miles; Forest of Dean, area, 34 square miles; North Staffordshire, area, 75 square miles; South Staffordshire, area, 93 square miles; Warwickshire, area, 39 square miles; Lancashire, area, 217 square miles; North Wales, area, 82 square miles; Yorkshire, Derbyshire and Nottinghamshire, area, 760 square miles; Northumberland and Durham, area, 460 square miles; coalfields of Scotland, 1547 square miles.

The Lancashire Coalfield

From a standpoint of methods used and equipment supplied, the mines in the Lancashire field are of great interest. In this district, there are 18 seams having a thickness of more than 2 ft.; according to the latest estimate, the quantity of available coal is about 4,500,000,000 tons. The dip of the coal measures is generally toward the south. Large faults traverse the field in a northwesterly direction. The deepest development work in the Lancashire field is carried on in the lower coal measures at a depth of about 2500 feet.

The surface equipment of the best mines in Lancashire is superior to the modern mines in the United States. The shafts are usually circular, and the method of mining is generally longwall. The most widely developed seams vary from 3 ft. to 7 ft. in thickness. Under no circumstances is any coal shot from the solid.

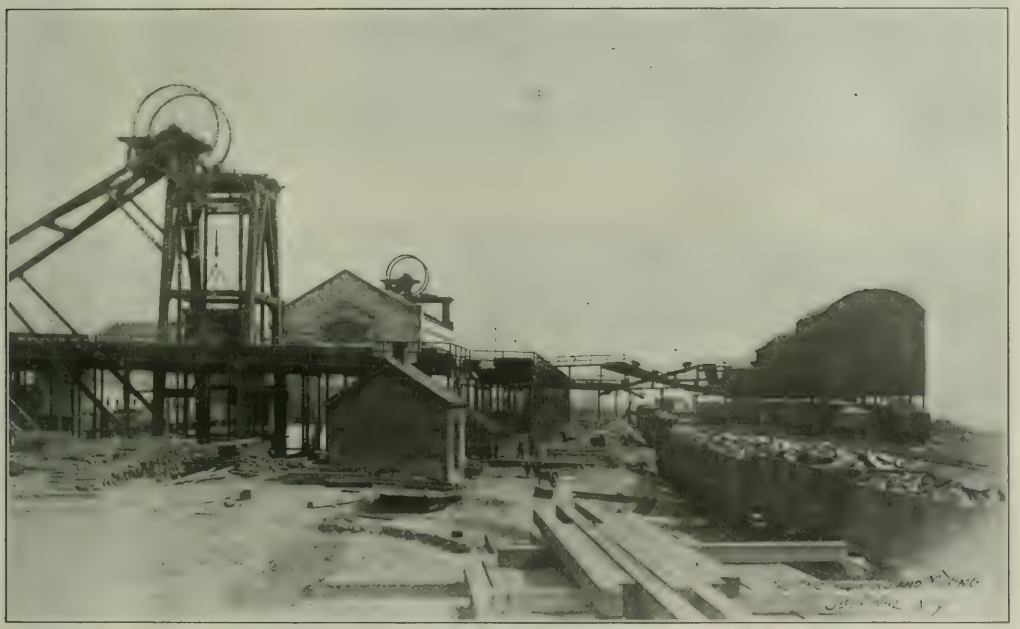


FIG. 1. HULTON COLLIERY COMPANY, LANCASHIRE, ENGLAND. VIEW SHOWING BANKING ARRANGEMENT, POWER AND SCREENING HOUSES

and the law with respect to the use of permitted explosives, when explosives are used, is carefully obeyed. As a result of careful timbering, good ventilation and systematic shot firing, the percentage of accidents has been reduced to a minimum.

The power house is placed midway between the two shafts. The building has two stories, the upper of which is the engine room, and the lower is divided into an electrical fitting shop, repair shop, condenser room, and transformer chamber.

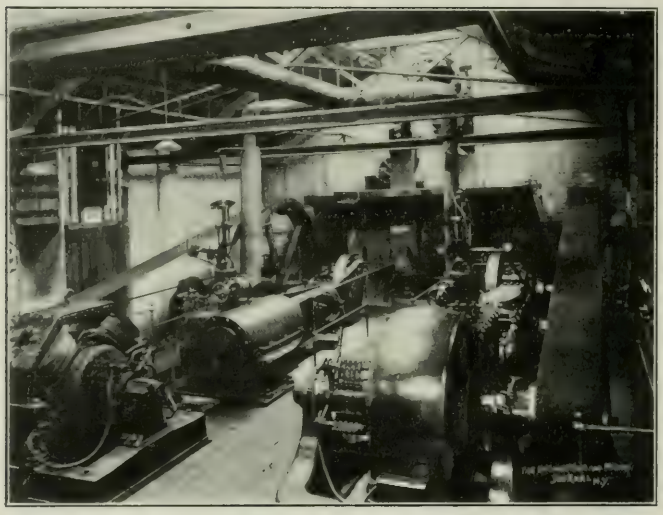


FIG. 2. ELECTRICAL GENERATORS AT THE CHEQUERBENT PITS OF THE HULTON COLLIERY COMPANY

The Hulton Colliery

The Hulton mine, situated at Chequerbent, about 30 miles northeast of Manchester, is one of the representative collieries in the district. Coal is here hoisted from what are known as the Nos. 3 and 4 Atherton pits. The No. 3 pit winding engine has cylinders 32 in. in diameter, with a cylindrical drum 15 ft. in diameter. The depth of winding is 900 ft. The engines are controlled by foot and steam brakes, and the ropes are fitted with Ormrod's patent safety detaching hooks.

The No. 4 pit hoisting engine has cylinders 36 in. in diameter, with a cylindrical drum 18 ft. in diameter. This engine hoists from two different mines of 450 and 1320 ft. depth respectively. The safety arrangements are the same as those on the No. 3 pit engine.

Boilers

The boiler plant consists of ten boilers, half of which work at 100 lb. per sq. in. and the others at 150 lb. per sq. in. steam pressure. The low-pressure boilers supply steam for the winding engine, while the high-pressure ones supply the electrical generators. The high-pressure boilers are fitted with forced draft equipment. All of the boilers are fed through economizers by means of electrically driven three-throw pumps, one being of the variable speed type. A steam pump is retained as a reserve.

age is 465, speed, 3000, steam pressure, 150 lb., and the turbines work condensing. The circulating water to the condensers, which are of the ejector type, is supplied by two motor-driven centrifugal pumps.

Power is supplied from these generators for the whole of the work at the Nos. 3 and 4 shafts, with the exception of hoisting, and also for a considerable portion of the work at the Chequerbent and Atherton No. 1 pits. This power is conveyed to the Atherton No. 1 shaft by means of an overhead transmission line about 1¼ miles long, the voltage being transformed up at the power house to 3300 volts. At the other mine (the Chequerbent pit) the power is applied without stepping down, to a 150-h.p. motor-driven ventilating fan, and to two 125-h.p. motors driving direct-current generators. These two motors have taken the place of two horizontal steam engines, which were originally installed.

The larger switchboard in the power house controls the supply of power to the Nos. 3 and 4 shafts, and the smaller one the high-voltage transmission line. The transformers, situated on the lower floor, are three in number and of 120-kw. capacity each. The work to which electric driving is applied comprises ventilating, screening, pumping, hauling, coal cutting, boiler feeding, forced draft, sawing, air compressing, briquet making and other purposes. There is also an extensive installation for lighting.

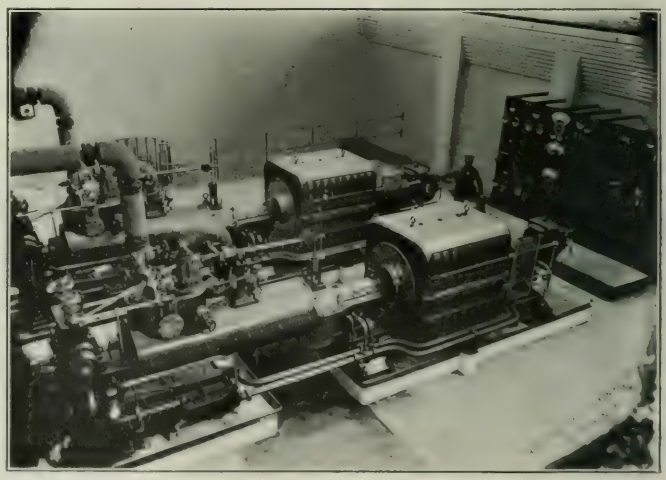


FIG. 3. INTERIOR OF POWER HOUSE, ATHERTON PITS, SHOWING PARSON'S TURBO GENERATORS

The Electric Plant

The engine room contains three Parsons' 3-phase turbo-alternators, with high and low-voltage switchboard. One of the alternators is of 350 kw. and the other two of 300 kw. normal capacity, all three alternators are capable of standing 25 per cent. overload for two hours. The volt

The management at the Hulton collieries have tried both three-phase and direct-current systems, and after detailed investigation, it is asserted that the three-phase system is far superior. It is, however, acknowledged that the men must be

better trained for the three-phase system.

The new turbine, which has only recently been installed, is run entirely by exhaust steam from the winding engine. In case the winding engine is stopped, an automatic arrangement has been installed whereby it is possible to shift to live steam. If the turbine is not in use, the winding engine exhausts into the atmosphere.

The Screening Arrangement

The cages are of the two-deck type, holding three cars on each deck. The cars on leaving the cage gravitate to a creeper chain, which conveys them to the weighing machine at a higher level. The tipplers are mechanically driven, and the screening is done by means of shakers. The picking belts are of wire webbing, and the coal is lowered into the cars by means of mechanically controlled lowering arms. The small sizes of coal are stored in bunkers, from which the coal is let out into the railroad cars by means of trap doors as required. The empty cars from the tipplers gravitate round a curve to a creeper chain which elevates them to such a hight that they then run by gravity to the back of the shaft.

The railway sidings lead under the screens, and then on to the car-weighing machine. A diversion from the main line leads on to the briquet siding, on the side of which is built the briquet house. The sidings are so laid that the railway cars gravitate gently to the various points of call and away again when liberated. The services of a locomotive are not required from the beginning of this operation until the cars have been filled, weighed and placed in the sidings.

Included in the surface equipment is a briquet plant, water-softening and purifying plant and a "Korting" water-cooling system. This latter arrangement is used to reduce the temperature of the water in the lodge from which the circulating water for the turbine condensers is taken. This "Korting" system of water cooling is successfully used at many European mines.

The Underground Arrangement

The general system of underground development at the Hulton collieries is most deserving of imitation. All the underground roadways have been carefully laid out with a view to facilitating the quick handling of coal. The haulageways are well ballasted and laid with heavy steel, so that trips of cars can be drawn at moderate speed. The uppermost seam, known as the Trencherbone mine, is equipped with an electrical hauling engine, having a rope of the endless type. This mine is ventilated by an underground fan (30-in. "Sirocco") rope driven by an electrical motor of 30 h.p., giving about 20,000 cu.ft. of air per minute at a 1-in. water gage. There are two large pumps, both being of the three-throw type and driven by an electric motor; the one nearer the shaft pumps about 10,000 gal. of water per hour.

The Yard mine, operating in the middle seam at a depth of 900 ft., is also equipped with an electrical hauling engine of the endless-rope type. This mine is ventilated by an underground 45-in. "Sirocco" fan, which is rope driven by a 45 h.p. electric motor; this ventilator gives about 50,000 cu.ft. of air per minute at a 1.5-in. water gage.

The Arley mine, operating in the lowest seam at a depth of about 1,320 ft., has an

FIG. 4. GENERAL VIEW OF ATHERTON PITS

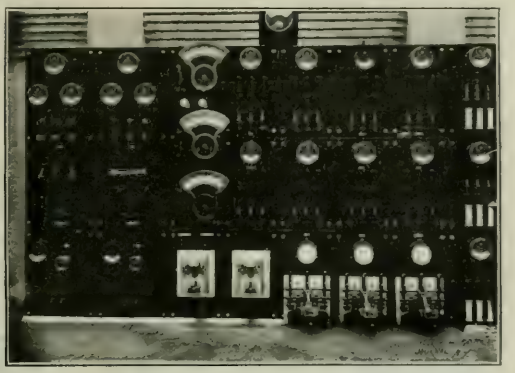


FIG. 5. SWITCHBOARD IN POWER HOUSE

FIG. 6. HYDRAULIC MINING CARTRIDGE BEING INSERTED IN HOLE. THE COAL HAS BEEN UNDERCUT AND SPRAGGED

FIG. 7. THE OPERATOR IS PUMPING AND THE COAL IS JUST PARTING FROM THE ROOF

electric hauling engine of the endless-rope type, and is ventilated by an underground 45-in. "Sirocco" fan, which is rope driven by a 45-h.p. motor, giving about 50,000 cu.ft. of air per minute at a 1½-in. water gage.

The "Hurd" coal cutter is used in the upper seam, while the "Diamond" disk three-phase coal cutter is used in the lower seam. In the three-quarters mine, which is reached by a tunnel from the Arley mine, there is fitted up an electrically driven "Ingersoll-Sergeant" air compressor, which works one of the "Ingersoll" heading machines of the percussive type.

A Unique System of Ventilation

The Hulton colliery in its methods of ventilation, as in many other respects, is unique in the history of coal mining. No other colliery in Great Britain ventilates the entire mine electrically by underground fans, with an auxiliary standby fan on the surface. Investigation showed me that at all points underground, in the different mines, the air currents were more than sufficient. The management after careful investigation and actual tests has pronounced this underground system of ventilation as most successful.

an explosion, it would open easily and permit the passage of any unusual force.

It is further stated in support of this system of underground ventilation, that even though all of the underground ventilators were disarranged, there is a 98-in. double-inlet "Sirocco" fan on the surface which can be called into immediate service. This large standby ventilator is driven by a 300-h.p. three-phase motor

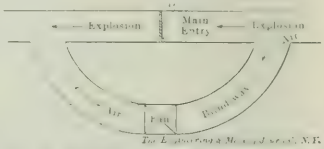


Fig. 8. General Arrangement of Blindway to Protect Fan

The current supplied to this motor is 465 volts.

The Hydraulic Mining Cartridge Is Used

The general system of mining is long-wall. The working face is carefully gobbed and timbered, so that fatalities from roof falls seldom occur. The main entries, as well as the face, are sprinkled regularly. The management has found

about 20 in. long, and having six or eight small duplex rams fitted radially along the cylinder. By an arrangement of passages a communication is made between each of these rams, whereby simultaneous action is obtained. The cartridge is operated by a small hydraulic pump, to which it is connected by a pipe. The pump is fitted with a small water tank. The water required for the whole operation is about 1½ pints, and this water returns to the tank, so that it can be used again. There are different-sized cartridges, the smaller ones giving a total pressure on the coal of about 60 tons; the larger cartridge is capable of a pressure on the coal of 120 tons.

At the Hulton colliery, each cartridge produces approximately 90 tons per day. About 74 per cent. of this production is large coal. Before the cartridge was introduced explosives were used and only 61 per cent. of the output was lump coal. The large coal at the Hulton colliery sells for $3.50 per ton at the mine, while slack only brings about $1.60 per ton. The profit obtained from the use of the cartridges is, therefore, considerable.

Freedom from Accidents

The voltage carried underground for all power purposes is 465. The cable used

Fig. 9. Lamp Room Showing How Each Lamp Is Numbered

Fig. 10. Electrical Fitting and Repair Shop

Fig. 11. Colliery Lassies in Regulation Costume

[illegible] argument is [illegible] the requirements of the underground [illegible] and this unfavorable comment [illegible] to my statement that the underground [illegible] are likely to be destroyed by [illegible] explosion. The Hulton management claims that the damage to the mine would not be great in some [illegible] due to the fact that the [illegible] would go in a blind way [illegible] Fig. 8. It is argued that if there is an explosion, the [illegible] would go directly along the entry, [illegible] passing through the [illegible] entry in Fig. 8. During the [illegible] of the mine, this door is held shut by a simple [illegible] which is [illegible]. This door is designed [illegible] that in case of

that the roof is not affected by this plan of watering down the dust.

One of the most interesting features in connection with the Hulton collieries is the hydraulic mining cartridge, which is the sole power used for bringing down the coal. The general method employed is to have regularly appointed drillers who drill a gage hole at 6 or 8 ft. intervals along the face and near the roof of the coal seam. Following these drillers comes the man with the cartridge, who inserts the machine and then applying the pressure for several minutes, the coal is heard to crackle and then break away from the roof. The general arrangement and operation of the cartridge are shown in Figs. 6 and 7.

The cartridge consists of a steel cylinder

to carry this current is three-core, paper, lead covered, and is armored with galvanized wire. All miners carry Marsaut lamps, which they secure from the lamp room in the morning before going down the pit. All of these lamps are carefully numbered, and in this way the men are checked in and out of the mine each day. The pit bosses use the Wolf lamp.

It is evident from the foregoing description that the management of the Hulton collieries has taken every precaution to insure against accidents. Since the abandonment of explosives, there has been no explosion of any kind at these mines. The only accident that has occurred in recent years was a mine fire. In overcoming this trouble the officials used chemical extinguishers and water under pressure.

Working Costs on the Witwatersrand

SPECIAL CORRESPONDENCE

The marked reduction of working costs on the mines of the Witwatersrand during the last two years and the low level that they have now reached, mark a distinct revolution in the history of mining. As a whole they reflect an eminently satisfactory state of affairs.

However, when one comes to consider the performances of the individual mines one finds that a proportion of this reduction is fictitious. The difficulty of finding out which are obtaining the best results is surprising when one remembers that they are all working on the same orebody and one too that possesses a uniformity of characteristics that is hardly approached by any other ore deposit; certainly not by any other gold occurrence. In spite of the unique similarity the various factors which influence the working costs of the different mines are found to vary within wide limits. For want of a better mode of comparison the cost per ton milled has come into use locally for purposes of comparison. As a result, in the strenuous—one might almost say panic-stricken—efforts of the various managers to avoid being left behind, a serious abuse has crept into Rand mining methods. This has been remarked on from time to time locally and recently has afforded some fruitful discussion in the *So. Afr. Min. Journ.* This abuse lies in crushing a proportion of easily obtained unpayable rock and hence a larger tonnage, thus reducing the working costs per ton milled at the expense of true economy.

The fallacy of this mode of comparison, originated and still condoned by the Chamber of Mines in its published monthly table of statistics, may be illustrated by imagining a 12-in. reef to be extracted in one mine from 60-in. stopes and in another from 36-in. stopes, the whole being milled; the resulting working costs per ton milled in the second case would be about 25 per cent. more than those of the first, though the second would be working with the greater economy. Few managers have the courage to continue what are commonly supposed to be high working costs, though they can only lower them at the expense of true economy.

IDEAL PRACTICE FOR NARROW VEINS

There can be no doubt that the ideal practice in exploiting narrow mineral seams like the reefs of the Witwatersrand is to combine the closest stoping with the maximum sorting. To permit of this, however, there must be two assured factors, namely, an adequate labor supply and a commensurate mill capacity. The labor must be sufficient to supply the mill with the ideal product—that is, reef with a minimum of waste—while, conversely, the mill must be coördinated to the amount of the ideal product made available by the labor. Unfortunately this ideal practice is not always attainable on the Witwatersrand for the reason that the labor supply periodically falls below the normal, while in most cases the mill capacity is larger than the normal labor supply warrants. Nevertheless the principle remains true.

In some cases, no doubt, as the late Wager Bradford maintained, it is more profitable, during periods of labor scarcity, to discard sorting altogether, and to employ the men who would be required for that purpose on stoping. On the other hand a large percentage of waste has to be supplied to many of the mills, even with the normal labor complement, because of the excessive size of the former and the consequent inability of the latter to supply a sufficient quantity of the ideal product. The ideal practice is thus often prevented by the existing labor and mill conditions, and the loss entailed thereby is an after effect of error of judgment in the initial equipment of the mines. Yet this error remains unheeded. It is more than doubtful whether the huge mills proposed for many of the new properties now completing their preliminary development are justifiable. Still, although the ideal practice can seldom be attained, every effort should be made to approach it as closely as individual circumstances permit.

RELATION OF COSTS TO PROFITS

The most interesting contribution to this problem is the paper by H. Musson Thomas, manager of the City and Suburban mine, and until lately manager of the Jumpers Deep, on "The Relation of Costs to Profits in Mines of the Rand."

Mr. Thomas starts from the hypothesis that the "Minimum waste milled increases the costs and profits per ton milled (waste and reef), but the profits are increased in a greater ratio, and, although the pay limit is higher, some of the unpayable ore reserves become payable, or, maximum reef milled decreases the costs and increases the profits per ton of reef milled, and some of the unpayable ore reserves become payable." A series of interesting calculations are given upon these bases.

He assumes a mine of 300 claims which contains two reefs with a 30-deg. dip. The average reef thickness is 24 in., which will produce a value of 6 dwt. over a 60-in. stope width. The reduction plant consists of 200 stamps and four tube mills with a crushing capacity of 40,000 tons per month. With this postulate he gives the variation in costs and profits in detail for seven different working policies, and shows what would be the result if the external waste were gradually reduced from 36 to 12 in., and at the same time, the maximum amount of waste were sorted out on the surface, thus insuring the minimum waste or the maximum reef being milled. These figures are, of course, not intended to be taken as anything more than approximate, because, although he fixes the more important factors, there still remain many others which are uncertain.

COMPARISONS OF MINES TAKEN AS A BASIS FOR DISCUSSION

The basis mine *A* sorts 20 per cent. of waste (from stopes of an average width of 60 in.) at the surface. The *C* mine sorts 20 per cent. also, but reduces the stope width to 54 in. by leaving 6 in. of waste in the hanging and foot, which, when compared to the basis mine, is equivalent to sorting 10 per cent. on the surface; this, together with the 20 per cent. sorted, makes an equivalent of 30 per cent. sorted. Mine *G* only sorts 10 per cent. on the surface, but through reducing its external waste to 12 instead of 36 in., is credited with 50 per cent. less waste milled.

He also assumes that all rock is broken by machines. With the costs per ton milled for the *A* mine at 16s. 1d., those for the *G* mine are shown to increase to 19s. 6d. The profits are, however, increased from 11s. 10d. to 19s. 10d. per ton milled, or an increase of 8s. per ton. The 60-in. mine would have a life of 23.1 years, whereas the 36-in. mine would be worked out in 15.6 years, or a decrease of 33 per cent. Although the 36-in. mine has a decreased life of 7.5 years, yet in the shorter time it would yield £847,000 more profit.

In discussing this paper of Mr. Thomas, it was pointed out that the truth of the principle became more obvious on the west Witwatersrand and the western extension where most of the mines depend largely on the there extremely thin South reef. An excellent demonstration of the truth of the principle is afforded by the Central Roodeport Deep mine. This is working the South reef, which averages about 1 in. in thickness and 190 dwt. gold. It is equipped with the small crushing capacity (50 stamps, and has no tube mills) necessary, under the circumstances, to permit of high sorting and narrow stope width. During 1908, 27 per cent. of the rock hoisted was sorted, and the stope width averaged 34 in. The resulting milling width was 24 in., averaging only 8 dwt. During 1908, 104,030 tons were milled, with a working profit of £37,635. This in spite of nontreatment of slimes and heavy timbering costs—the stopes requiring very close timbering. It is obvious that the application of this principle alone makes this comparatively poor undertaking payable. This is probably the most economically worked mine on the Witwatersrand, yet its working costs were 24s. 8d. per ton milled.

The Development of Heavy Gravitation Stamps

A Series of Tests Which Resulted in the Recommendation of 1500-lb. Stamps on the Rand; Heavy Stamps Compared with Lighter Ones

BY W. A. CALDECOTT*

The history of ore crushing by means of gravitation stamps shows a progressive increase in their weight and in corresponding efficiency. This holds good in the development from the square wooden non-rotating stamps in use in Germany in the Middle Ages[1] to iron-shod wooden stamps in Cornwall, and then to rotary iron stamps in California and mild-steel stamps in South Africa. The latter have greatly improved during the last few years, and probably represent the highest existing stage of development. About 1835, the first stamp mill in the United States was started at Tellurium, Virginia.[2] The stamps weighed 50 lb. and were made of square wooden stems with iron shoes and dies, the cams operating in slots in the stems.

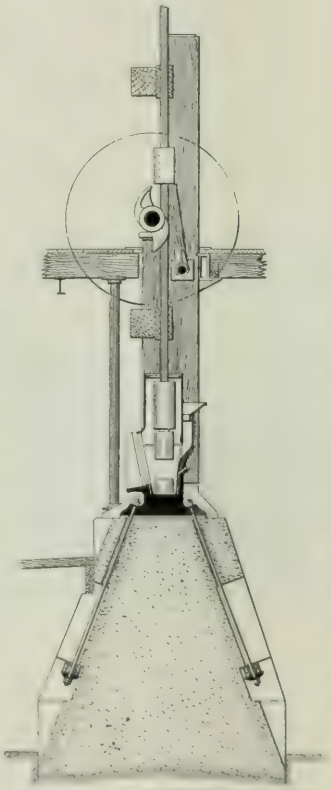
Ten years later the Vaucluse mine installed 380-lb. stamps, of which the head weighed 125 lb. When the first batteries were erected on the Rand over 20 years ago, California practice probably represented the highest state of the art, and was introduced upon these fields by J. S. Curtis, J. H. Hammond and other well-known Californian mining engineers.

Stamp Duty of 3 Tons on Rand, 1889

To illustrate the type of battery in operation on the Rand in 1889, in which year my experience of stamp milling began, the following details may be given of the Du Prez Gold Mining Company's mill, premising that this was before the introduction of the cyanide process, and that concentrators, other than blanket-strakes and buddles, were not in common use.

The mill was erected in that year and was of Sandycroft make, designed in accordance with the best Californian practice to date. It consisted of 20 stamps weighing 900 lb. each when new, and was run at the rate of 90 seven-inch drops per minute. The stamp duty was about 3 tons per 24 hours, using a screen of 900 meshes per square inch.

By 1895 some progress had been made and 1250 lb. stamps were in use at the Robinson Gold Mining Company, and elsewhere, though in Australia and the United States 900 lb. per stamp remained the almost universal maximum limit, and this remains true of the celebrated Homestake mill at the present time. At the Mount Morgan Gold Mining Company (Westralia), in December, 1902, 30 stamps weighing 1500 lb. each were erected. These were eclipsed, however, by the neighboring Millionaire Gold Mining Company's battery of five stamps weighing 1750 lb. each.[3] The advance made on these small companies was not generally realized, and in 1907 few stamps dropping on the Witwatersrand weighed more than 1250 lb., with the exception of certain batteries of Consolidated Goldfield companies, as will be noted later.



1670-POUND STAMP

In 1904 I was authorized by R. M. Catlin, acting consulting engineer of the Consolidated Goldfields, to carry out a series of milling tests at the Knights Deep battery, which was equipped with stamps weighing 1350 lb. when new. The object of the trials was to discover some means whereby stamp-milling efficiency could be increased.

Scope of Tests

The initial experiments were made to test the effect of fine breaking before stamp milling, and also whether the increased discharge area afforded by a double discharge mortar box increased the stamp duty. A pair of rolls was installed to effect the preliminary fine breaking, and also a double-discharge mortar box. A special staff of men was employed to carry out the trials, and most complete and detailed records were kept.

The tests extended over more than a year, and a considerable amount of money was expended in testing many variations of conditions, such as varied angles of screen frames, hights of discharge and of drop and different methods of water introduction into the upper portion of the mortar box.

An accompanying table illustrates some of the many experimental runs.

The results of these typical trials with a double discharge mortar-box and with fine breaking before stamp-milling are almost identical within the limits of experimental error.

The above conclusions were confirmed by the fact that the average stamp duty on ordinary mill-feed for six pairs of parallel trials was 5.82 tons with a double discharge mortar, and 5.82 tons with a single discharge mortar.

The average stamp duty for four pairs of parallel trials on the product from rolls set ½ in. apart was 5.64 tons with double discharge mortar, and 5.78 with a single discharge mortar. There was no increased duty to compensate for the extra cost of preliminary fine breaking,[4] and the only difference with the double discharge mortar-box was a considerable increase in the amount of water used.

This last conclusion is in accordance with the fact that the ordinary single battery screen has about 40 per cent. of its area available for discharge, or, say 1½ sq. ft. of discharge area for the small stream of pulp yielded by five stamps.[5] It will be observed that in trial, many flat pieces of ore which had passed the rolls ½ in. apart remained on a coarser screen used in the grading analysis.

*Mine, Lidgett, Johannesburg.

[1] See a paper by *Rolf*, 59, Inst. of Min. and Met., Vol. 12, 1909.

[2] Quoted by Bennett H. Brough, *Proc.* Inst. of Eng. Min. Eng., Vol. 10, 1902, during discussion of a paper by A. H. Lupton on "Gold Quartz Rock-Crushing."

[3] Lange's "Gold and Silver," p. 474 *et seq.*

[4] Also *Journ.* Chem., Met. and Min. Soc. of South Africa, Vol. 6, Jan., 1906, p. 215.

[5] Lock's "Gold Milling," p. 79.

Increased Crushing Requires Heavier Blow

Finally it became obvious that to crush more rock it was necessary to strike a heavier blow. This was sought by affixing helical springs round the stem above the tappet so as to be compressed by the upper guide during the stamp's rise, and so that when released the stamp would fall more rapidly, rendering a higher drop practicable, and would likewise strike harder. While this object was in some measure fulfilled, the noise in the mill was much increased and the life of the springs did not promise to be long. Hence, finally, the conclusion was reached that a simple increase of stamp weight was the best course.

A series of runs was then made whereby direct comparisons could be obtained of the actual tonnage milled by alteration in the weight of the stamps. An accompanying table exemplifies the increased tonnage obtained by increased weight of stamp on ordinary mill feed, both under ordinary milling conditions, and with a high discharge and back water feed to obtain a very fine product.

Another run with 1337-lb. stamps having a hight of discharge of 2 in. and a 64-mesh screen gave a duty of 10.23 tons per 24 working hours of which 52.8 per cent. remained on a 60-screen. The water-feed adopted in this test consisted of inlets at an angle of 45 deg. at the back of the mortar-box, as suggested by the late H. T. Pitt.[6]

1550-lb. Stamp Recommended

Encouraged by the results of these and many other tests, including a duty of approximately 6½ tons through 1500-mesh screening with stamps weighted up to 1622 lb., I felt fully justified in recommending that the next 360 stamps erected by Consolidated Goldfields Companies, at the Simmer East, Robinson Deep and Luipaards Vlei, should have a weight of 1550 lb. each when new.[7]

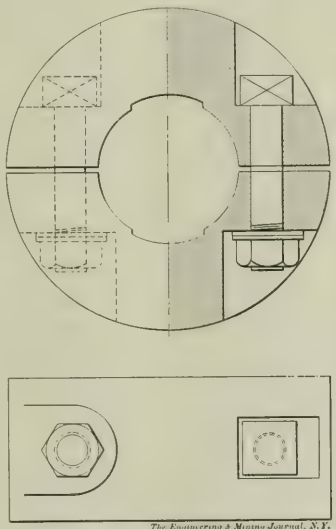
Such a departure excited much adverse comment among experienced millmen generally, on the ground that no foundations could stand the shocks, but the reasoning that if foundations could be built to endure the blow of the colossal steam stamps, it would be possible for them to be built to withstand gravitation stamps, proved correct. All the above mills are satisfactorily at work today after periods of service ranging up to three years, and the foundations promise to last as long as did their lighter predecessors.

In accordance with the present changed state of professional opinion, all Rand batteries lately erected or designed have stamps of a weight not long ago deemed extravagant, and aided by the installation of tube-mills, stamp duties of 8 tons are as common as of 4 tons but a few years previous.[8]

While in the United States and in Mexico the relatively light stamp is still generally upheld, there is at least one notable exception in the recently built mill of the Boston Consolidated Copper Company which is equipped with 312 single Nissen stamps of 1500 lb. weight each and with a 9-ton duty.[9]

An accompanying diagram illustrates a modern heavy gravitation stamp with its mortar-box, as used in the Simmer Deep Jupiter joint mill. The total weight is 1670 lb. distributed as follows: Shoe, 285 lb.; head, 410; stem, 723; tappet, 252.

Results obtained on a large scale under regular working conditions by the use of heavy stamps are given by an accompanying table, and it further shows in the case of the Simmer East that while stamps alone can be used with a high discharge to produce a fine product, yet the later use of tube-mills as well yielded at the same total cost a product with fewer coarse (+0.01 in.) particles and hence a still more perfect exposure of the gold.



Cast-iron weight for stamps

Cast-Iron Anvil Blocks Not Needed

Somewhat later than the series of battery tests already described the matter of battery foundations was also investigated. It was recognized that timber foundations were unsuitable for heavy stamps, their liability to decay rendering them less durable than the then recently introduced cast-iron anvil blocks. However, it had never been practically proved since the introduction of these anvil blocks that they were superior to concrete foundations in themselves, and that this point might be elucidated, I had a series of 23 comparative trials carried out in 1906 on two five-stamp batteries side by side in the Simmer East mill, the one with a concrete block only, and the other with a cast-iron anvil block as well, shown in an accompanying cut.

The results of the parallel trials were on the average practically indentical. These extended from the use of 100-mesh screening to 1400 mesh, and the cast-iron anvil block battery showed an average stamp duty of 6.84 tons as against 6.78 tons for the concrete block, the average screen-grading analysis of the latter showing, however, only 25 per cent of —60 (0.01-in.) grade as against 26.76 per cent. for the cast-iron anvil block.

The question of the life of the concrete block without timber or a cast-iron anvil block has received attention also, and one mortar-box, erected on H. C. Behr's recommendation at the Simmer East mill, upon a concrete block with only a thin layer of insertion between, has been in use now for three years with no visible sign of cracking or deterioration. This has been so encouraging that at the Simmer Deep and Jupiter mills all the batteries have been erected with the mortar-box resting on the concrete blocks.

Impact or Abrasion

Crushing is usually performed either by impact or abrasion, and though hard ores are best dealt with by the former method, the latter is applicable to softer material. The relative efficiency of the two methods for hard material is well illustrated by the case of the diamond, which is hardly capable of abrasion at all except by its own dust, whereas, if placed on an anvil, it will be shattered into a thousand fragments by one blow of a hammer.

As has been pointed out by C. de Kalb, the crushing of the larger pieces of ore in stamp milling is done as the result of reaction from the resilient die, the waves of compression transmitted through the ore from the shoe being reflected from the die, until the strains set up from the oncoming and reflected waves exceed the elastic limit of the ore, and rupture results.[10] The stamp is essentially an impact machine, and hence readily pulverizes hard tough ore.

Such ore, if handled in any of the legion of rubbing or shearing appliances, would only be reduced at the expense of serious wear by abrasion of costly steel

[6]*Trans.*, I., M. M., 1904, Vol. 14, p. 164; also *Journ.*, Chem., Met. and Min. Soc. of South Africa, 1908, Vol. 8, p. 374.

[7]Annual report of Cons. Goldfields of South Africa for 1905, p. 32; also report for 1906, p. 27, and report for 1907, p. 28.

[8]*So. Afr. Min. Journ.*, p. 802, Sept. 19, 1908; p. 1016, Nov. 14, 1908; p. 1100, Dec. 5, 1908; p. 1318, Feb. 6, 1909; 1880 lb. stamps with a 12 ton estimated stamp duty are to be erected on the West Rand Consolidated property (*So. Afr. Min. Rev.*, p. 232, Nov., 1908).

[9]Eng. and Min. Journ., Sept. 14, 1907, p. 433.

[10]*Mines and Minerals*, p. 135, Oct. 1906; O. H. Howarth in *Mines and Minerals*, p. 141, May, 1906, and *Journ.* Chem., Met. and Min. Soc. of South Africa, Vol. 6, June, 1906, p. 385.

parts which may have to be discarded when but a fraction of their weight has been worn away. With soft material the case is different, and machines of the latter class may be employed with advantage and without undue abrasion of wearing faces.

It is much to be regretted that no satisfactory machine for testing the capacity of material to resist abrasion, or conversely of testing the abrasive capacity of materials requiring reduction, yet exists, as this property is of prime importance in all crushing operations.

Gravity Stamp an Impact Machine

When gravity stamps are used for very fine crushing, they pass beyond the economic range, and operate by abrasion rather than by impact, with consequent reduction of efficiency, as may be seen from the following considerations. Impact is essentially dependent upon the pressure exerted by the blow, and depends upon the weight of the stamp and the hight of the drop. Assume that a 1750-lb. stamp having a 9.5-in. diam. shoe and with a set hight of drop of 8 in. strikes a layer of ore 2 in. thick on the die, and comes to rest 0.5 in. from the die. Then having fallen 7.5 in. and having done work for 1.5 in., it has exerted on the ore a mean total pressure of 8750 lb.[11] The shoe having an area of 71 sq. in., the average unit pressure exerted over the whole of its area is only 123 lb. per sq.in., or less than that exerted by a man of average weight supported upon an area of 1 sq.in.

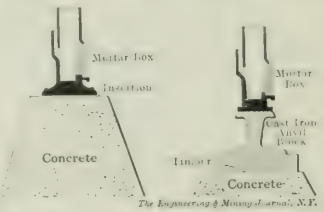
The crushing effect of such a pressure on hard quartz grains is trivial, and a certain amount of reciprocal abrasion of grains of sand rearranging themselves under pressure is probably the main effect produced. The case, however, is quite different in the first impact of the stamp on the ore in the box. Assume that only a 2-in. cube resting on the die is first struck; having an area of 4 sq.in., the average unit pressure here is 2190 lb. per sq.in., or 18 times as much as under former condition.

The finer the crushing is carried in the battery the longer sand particles remain before sufficiently reduced to escape, and the higher the ratio of fine to coarse material in the mortar-box. Hence, under these conditions the liability is for the falling stamp to have its force of impact distributed over so large an area as to produce little effect but abrasion on a bed of drifting compressible sand. These considerations serve also to explain why fine breaking before milling with heavy stamps does little good. A large number of pieces of ore of approximately equal size afford a large area to receive the blow of relatively small pressure upon each. And further, the abrasive action, above referred to, explains why stamp milling with a fine screen and a high discharge, or both combined, is inefficient through the waste of energy in converting fine sand into slime by abrasion of the particles rearranging themselves under the stamp.[12]

As regards the desirable size to which ore should be broken before entering the mortar-box, the disadvantage of too fine crushing yielding a uniform bed has already been pointed out. The maximum limit varies with the class of ore, being less for hard ores, but in general it should be such that not more than one blow of a stamp is required to pulverize the largest piece of rock. Hence, the heavier the stamp, the coarser the preliminary breaking admissible, and *vice versa*. With unweathered banket ore probably a maximum diameter of 1¾ in. is permissible. Larger pieces are more economically reduced by the rock breaker and the lowering of stamp duty, owing to less actual hight of drop with such a feed, is thus avoided.

Compensating Weights

Taking the average running weight of a stamp as with a half-worn shoe and with a stem of less than its original length,



MORTAR BOX, WITH AND WITHOUT ANVIL BLOCK

owing to breakage, it will be found that this weight is about 10 per cent. less than the weight of the stamp when new, and that its duty is correspondingly reduced. The obvious remedy is the use, as the shoe wears down, of compensating weights in some form or other, which have been frequently suggested and occasionally used.[13]

Since, however, greater attention has been directed to the weight of stamps through the trials on the Knights Deep referred to, the use of compensating weights has become common on the Rand, and their importance in maintaining a high efficiency and stamp duty is so considerable as to be well worth the small additional trouble and expense involved by their use. Probably the earliest form of this device was placing an old head at the top of the stem, or an extra tappet above the one in use.

These devices were, however, crude, and the writer has tried various other methods, including a false head intermediate between the true head and the shoe, on the ground that additional weight is better added near the bottom than near the top of the stem. Probably the most convenient compensating weights, however, are split cast-iron disks about 4 in. high, and weighing about 50 or 60 lb. each, which are clamped on the stem by means of two bolts either above or below the tappet. Such a compensating weight is illustrated in an accompanying sketch, and as many may be gradually added as are needed and can be accommodated.

Area of Shoe and Die

With increased weight of stamp, the question of increased shoe and die area arises, but the considerations already advanced, showing the small amount of pressure per square inch of total shoe area, indicate that very large shoe and die areas are not needed for hard ores, while for soft ore a lower, quicker drop can be used. Some increase, however, is usual owing to the fact that the larger diameter of stems and tappets required with heavier stamps necessitates increasing the distance between stamp centers.

An increase is desirable when the total force of impact of the falling stamp requires a thick layer of ore on the die to avoid excessive shock. Such heavy feeding lessens the duty, because the thicker ore bed reduces the actual hight of drop, and the blow is likewise cushioned so that the stamp crushes by abrasion rather than by impact. As already shown, the cushioning caused by fine particles in the mortar-box increases with the hight of discharge and the fineness of the screen.

The greater the force of impact per unit of area the coarser the screen required for maximum efficiency, as otherwise a thick layer of fine ore particles would be needed to avoid pounding. Since even a heavy stamp crushes but a couple of ounces of ore at each blow, and this weight would form but a very thin layer over the surface of the die, it is obvious that the least thickness of ore layer necessary to take the impact of the stamp without pounding is sufficient to supply ample material for pulverization.

The prevention of irregular wear of dies is as yet an unsolved problem. At first sight it would appear that a slight cavity in the die surface due to soft metal would, when formed, be protected against further excavation by the surrounding portions of the die standing above it, but in practice no such protection seems to be afforded. The cavity grows steadily deeper with use, and even turning the dies regularly is not a cure.

In my opinion the trouble is due to the larger pieces of ore, or pieces of steel such as drill ends, gravitating in the swirl of pulp in the mortar-box to the lowest point, that is, into any slight depression originally due to softness of the metal, and thus

[11] Hiscox, "Compressed Air," p. 437.

[12] A. Horsum's paper on "Economy of Power in Crushing Ore," published in *Min. and Sci. Press*, Nov. 16, 1907, p. 624; also C. de Kalb in *Mines and Minerals*, p. 136, Oct., 1906.

[13] Lock's "Gold Milling," p. 109; also *Journ. Chem., Met. and Min. Soc. of South Africa*, Vol. 2, April, 1898, p. 299.

the impact of the falling stamp is transmitted to gouge out the bottom of the cavity. Such irregular wear is especially liable to start at the back of the center dies where the ore feed first lodges and is thus struck while at its largest size.[14]

Tube Mills for Regrinding

Consequent upon the introduction of tube-mills, coarse battery screening has generally replaced the finer mesh, and thanks to the work of this Institution, and of the Chemical, Metallurgical and Mining Society of South Africa, more accurate descriptions are now applied to screening,[15] with the result that the millman can with some certainty obtain a duplication of a previous order.

stems and other battery parts are still commonly described as being due to "crystallization" set up by vibrations incidental to the operation of crushing. At the present day, however, such an explanation cannot be accepted, it having been proved that repeated shocks in time develop, in such essentially crystalline aggregates as iron or steel, minute microscopic crevices which gradually extend until a fracture results.[17]

Among the few who have initiated improvements in stamp-mill design of recent years is that experienced millman, M. P. Boss, whose design of a stamp with long head, thus giving strength at what would otherwise be a weak point in the stem, is worthy of serious investigation.[18]

mum speed and hight of drop be safely used without fear of camming; and the damage done in a few moments by sudden increased speed above the normal may prove a costly matter both in loss of time and material. Further, with heavy stamps the use of 5-stamp cam shafts is desirable, in that as compared with 10- or 15-stamp cam shafts, both the power to be transmitted and the number of shocks due to lifting stamps are reduced by one-half or two-thirds for each shaft.

Stamp Mills Still the Standard Machine

Many attempts have been made to supersede the use of gravitation stamps as the standard machine for the crushing of gold-bearing ore, but without success. That, in spite of certain obvious disadvantages, they still hold their own, is probably due to the fact that pneumatic and steam stamps as hitherto designed have proved wasteful of power and liable to derangement under the vibrations and shocks inevitable during crushing, while the gravitation stamp has little to go wrong, and power can be cheaply developed by a complex and economical steam engine removed from unfavorable conditions and tended by a skilled operator without other duties. A serious effort is, however, now being made to utilize a new type of Holman pneumatic stamp at the New Kleinfontein mill, and there is no doubt that the energy and experience of those concerned in this test

TABLE SHOWING DUTY OF HEAVY STAMPS.

	Luipaards Vlei.	Simmer and Jack East.	
	(August, 1908.)	(May, 1907.)	(January, 1909.)
Tonnage milled during month	18,807 tons	35,500 tons	29,600 tons
Number of stamps	60	250	130
New weight of stamps	1629 lb. (with 18½-ft. stem)	200 at 1550 lb. 50 at 1350 lb.	1550 lb.
Running weight of stamps	1520 lb	200 at 1450 lb. 50 at 1250 lb.	80 at 1450 lb. 50 at 1550 lb. (with compensating weights)
Average drops per minute and set hight of drop	98.6 at 8½ in.	96 at 8 in.	96 at 8 in.
Duty per stamp per 24 working hours	9.667 tons	5.006 tons	8.333 tons
Hight of discharge	4 in.	9 in. (average)	3½ in.
Screen used and aperture	200 (0.056 in.) and 250 (0.046 in.)	1600 (0.016 in.) and 1200 (0.017 in.)	200 (0.057 in.) and 400 (0.035 in.)
Ratio of water to ore by weight	8 to 1	8 to 1	6.46 to 1
Percentage of + 60 (0.01-in.) grade in screen pulp	43.7%	10.92%	1.61 (final pulp)
Cost of crushing per ton of ore—			
(a) Stamps	1s. 3.879d.	1s. 10.424d.	1s. 3.672d.
(b) Tube mills	6.215d.	.....	7.070d.
(c) Total	1s. 10.094d.	1s. 10.424d.	1s. 10.742d.

In accordance with the demands of the modern millman armed with a micrometer gage, manufacturers' catalogs, in place of giving vague trade terms, now detail diameters of aperture, wire and so forth, with a most laudable desire for extreme accuracy.

Since this development, however, the general introduction of secondary grinding by means of tube-mills has lessened the importance of the battery screen as a criterion of the degree of reduction of an ore, and, in fact, the grading analysis of the final pulp leaving the crushing plant as an overflow of the hydraulic classifiers is now the guide to the metallurgist.

This change makes the degree to which a particle is reduced dependent upon both its diameter and its specific gravity, instead of upon the former only, with the result that the pyritic material undergoes that finer comminution and more perfect exposure of gold contents which its greater value renders desirable.[16]

Breakages

Breakages of cam shafts as well as

TYPICAL TESTS WITH STAMP MILL.

	(a) Single Discharge Mortar. Ordinary Mill Feed.	(b) Single Discharge Mortar. Ore from Rolls Set 0.5 in. Apart.	(c) Double Discharge Mortar. Ordinary Mill Feed.
Running weight of stamp	1343 lb.	1342 lb.	1356 lb.
Set hight of drop	7½ in.	7½ in.	7½ in.
Drops per minute	98	98	98
Duty per stamp per 24 working hours	5.85 tons	5.68 tons	5.81 tons
Hight of discharge	2¾ in	Level	3¾ in.
Screen used and aperture	700 (.024 in.)	700 (.024 in.)	700 (.024 in.)
Ratio of water to ore by weight	7.67 to 1	8.35 to 1	10.70 to 1
Percentage of + 60 (0.01 in.) grade in screen pulp	29.00%	27.50%	26.00%
Ore feed + 1½ in.	54.8	1.1	49.9
− 1½ + ¾ in	14.3	19.3	16.3
− ¾ in.	30.9	79.6	33.8

It is somewhat remarkable that while the number of crushing machines invented to supersede stamps is endless, and much space in metallurgical publications is devoted to the description of crushing plants, yet the actual operation of the gravitation stamp and the discussion of its most appropriate design has been but little dealt with either by the skilled engineer or by the mathematician.

In order to employ heavy gravitation stamps to full advantage, it is absolutely necessary that a uniform speed be maintained by proper governing of the engine. Only under these conditions can the maxi-

will, if it is possible, overcome such difficulties as have been encountered in the past with similar crushing appliances.

From the foregoing discussion it will be evident that the day of the stamp as a unit of crushing capacity has passed away. The unit of the present basis is the tonnage crushed per month or per day, and this is dependent on many factors—the relative proportion of stamps to tube mills, the actual running weight of the stamps, the ratio of water fed, the hight of discharge, the hight and number of drops per minute, the screening used, and the maintenance of "concert pitch" in the mill engine.

The future limit of stamp weight is difficult to foretell, but it will probably be

[14] *Journ.*, Chem., Met. and Min. Soc. of South Africa, Vol. 7, 1907, p. 216 and 293; also paper by M. P. Boss on "Crushing Ore," *Min. and Sci. Press*, March 14, 1901, p. 356.

[15] *Journ.* Chem., Met. and Min. Soc. of So. Africa, June, 1906, Vol. 6, p. 393; also Oct., 1907, Vol. 8, p. 130.

[16] *Trans.* Inst. Min. and Met., Vol. 14, 1904, p. 55.

[17] Rosenhain on "The Crystallization of Iron and Steel," in the *Times Eng. Supplement* p. 1, Nov. 6, 1907.

[18] *Mines and Minerals*, p. 209, Dec., 1908.

determined more by the mechanical considerations involved, as in the cam system of lifting, than by any decreased relative efficiency as a device for pulverizing ore.

Heavy Stamp Compared with Lighter

The advantages of heavy stamps, as compared with lighter ones, may be briefly stated as follows:

(1) Reduction of the initial capital expenditure in erecting, say, 200 stamps at 1750 lb. with accessories, in place of 280 stamps at 1250 lb. each; (2) reduction in size of mill building, almost proportionate to the less number of stamps; (3) 30 per cent. less shafting, belts and other moving parts to maintain; (4) 30 per cent. less labor required for dressing plates, lubricating moving parts, changing screens, and other work incidental to milling operations.

In concluding this somewhat lengthy, yet incomplete discussion of some of the factors affecting present-day stamp milling, it is my pleasant duty to acknowledge my indebtedness to the Consolidated Gold Fields of South Africa, whose foresight provided means whereby a departure was rendered possible which, beside benefiting the gold-mining industry in general, has enabled them to claim "the heaviest stamps and the highest average stamp duties of any gold-mining corporation in the world;"[9] and to Messrs. R. M. Catlin, H. H. Webb, and H. C. Behr and their staffs for greatly appreciated encouragement and suggestions during the progress of the experimental work detailed.

TABLE SHOWING INCREASED TONNAGE FROM HEAVIER STAMPS.

Apertures per Sq. In. in Screen Used	Running Weight of Stamps, Lb.	Set Hight of Drop, In.	Hight of Discharge, In.	Tons Water per Ton Ore	Tons Ore Crushed per Stamp per 24 Working Hours.	60 (.01 in.) Grade in Screen Pulp, Per Cent
981 (0.021 in	1196	8	3	5.8	5 88	22 63
981 (0.021 in	1279	8	3	5 8	6 58	22 23
981 (0.021 in	1531	8	3	5 7	6 74	20 86
1512 (0.016 in	1216	8	11	5 40	4 26	5 16
1512 (0.016 in	1288	8	11	5 30	4 29	4 91
1512 (0.016 in.)	1293	8	11	5.43	4 55	9 49
1512 (0.016 in.)	1337	8	11	6 27	4 96	6 66
1512 (0.016 in.)	1562	8	11	5 05	5 17	
1512 (0.016 in	1605	8	11	6.30	6 02	11 66

According to *Rassegna dell' Industria Solfifera*, the new bill for the regulation of the sulphur industry, presented to the Italian parliament, is intended to take the place of the laws of July 15, 1906, June 6, 1907, and July 5, 1908, relative to the "Consorzio." The object of the principal modifications is: (1) to simplify administration and reduce the number of directors; (2) to authorize the "Consorzio" to cede to one parts or compute the all of its total production for the price being at the farmer's expense; (3) and from Aug. 1, 1909, and (4) to pursue the designs as far as possible in the consumption.

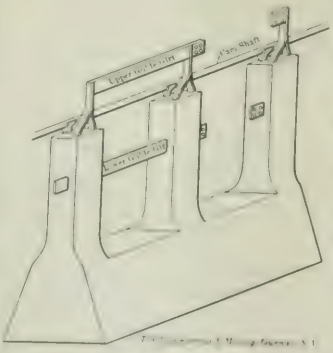
[9] Annual Report of the Consolidated Gold Fields of South Africa, Ltd., 1908, p. 30.

Battery Posts of Reinforced Concrete

By Algernon Del Mar*

Some one has remarked that it was about time stamp-mill constructors broke away from the conventional designs and adopted something new. The accompanying sketches will supply a new idea. With the successful use of cement for battery foundations, which surely must have suggested the further application of this material, millwrights have stopped short as if afraid to go on to the logical end. We see battery posts bolted to short wooden sills which are in turn bolted to the concrete. This is crude and soon leads to loose battery posts. Why not make the battery post itself of reinforced concrete? It requires only a pillar 10 ft. high from top of mortar-block to cam-shaft boxing. "Yes, but the vibration," they say. Why not cushion the vibration? It looks practicable to me.

One objection to the all-steel battery frame is the extreme rigidity. With the cam-shaft vibrations cushioned this objection would be negatived. There can be little doubt that reinforced concrete is superior to steel in this connection. A

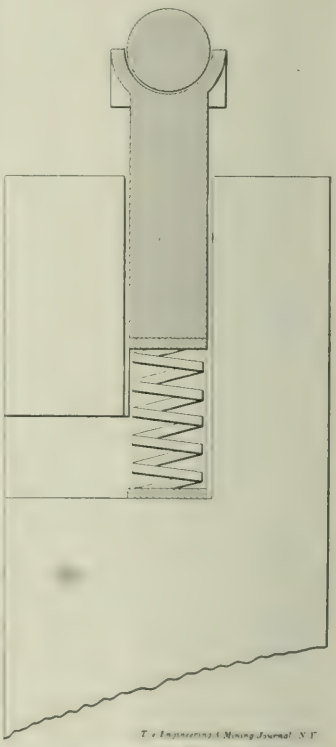


CONCRETE BATTERY POSTS

feature of the reinforcement might be an 8-in. pipe with ribs running the whole height of the column, the top being the pipe used for the cushion spring.

The guides may be bolted to a cast-iron girt bolted to brackets embedded in the concrete, or to a girt running through the pillars and changeable. With little or no vibration in the battery pillars there would be no fear of girts breaking. The casting for the upper guides is 4 ft. above top of pillar and should be embedded at least 2 ft. in the concrete.

To cushion the vibrations of the cam shaft, the boxing or bearing is a long cast-iron cylinder resting on a heavy railroad-carriage spring which in turn is within an 8-in. pipe imbedded in the concrete. An opening is left in the concrete pillar for the purpose of inserting iron shims under



CAM-SHAFT BOXING

the spring to bring it into alinement. The springs must be heavy and with just enough give to take up the vibrations without producing oscillations. Strips of rubber belting might answer the purpose.

According to the *New Zealand Mines Record*, April 16, 1909, the Campbell's Creek Dredging Company, Victoria, grew trees and lucerne on its ground after the dredging operations had been completed. The Closer Settlement board recommended that the land be taken up for growing lucerne.

*Mining engineer, South Pasadena, Cal.

Sinking a Reinforced Concrete Mine Shaft

A Circular Shaft, 21 Feet in Diameter, through 190 Feet of Water Bearing Strata; Approximate Cost of the Shaft Was $500 per Foot

BY ALBERT H. FAY

At the Morton Mine, Hibbing, Minnesota, the Foundation Company, of New York, is sinking a shaft for the Todd-Stanbaugh Company, of Cleveland, O., that is an extraordinary piece of work requiring perseverance, skill, energy and capital. The ground through which the shaft is being sunk is a water-bearing gravel and sand 190 ft. thick. There are occasionally strata of tough clay, the thickest of which is about 10 ft. near the 160-ft. level. There was also one layer of hard cemented conglomerate about 2 ft. thick which caused some trouble as it had to be blasted. Below the 190-ft. level is 40 ft. of taconite which lies directly upon the iron ore. The shaft is only a few hundred yards from Carson lake and, strange to say, the water level of the shaft is 7 ft. below the level of the lake. It would seem that this is due to the fact that the bottom of the lake is covered with an impervious layer of clay.

Shaft Construction

The shaft is 21 ft. inside diameter, circular in form, with wall 4 ft. thick, making the outside dimension 29 ft. The concrete portion will be at least 190 ft. deep or until an impervious solid stratum is reached. The concrete mixture used is 1-2-4, the sand coming from the shaft as the work progresses. Small gravel, screened from the glacial drift, is used for the rock constituent of the concrete. The mixing is done with a Smith concrete mixer.

The work of construction began October, 1908, and was carried on without interruption during the winter, even though the temperature reached 50 deg. below zero. The shaft was housed and the building heated by steam. The sand was thoroughly heated before using and the concrete mixed with warm water during the cold weather. However, as work progressed it became necessary to have more head room on account of using a larger derrick. Although the shaft is more than 160 ft. deep, not a man has been within 75 ft. of the present bottom, all the work having been done from the surface. The water is controlled by pumps so that it stands 75 to 100 ft. deep all the time. No attempt has been made to pump all the water out.

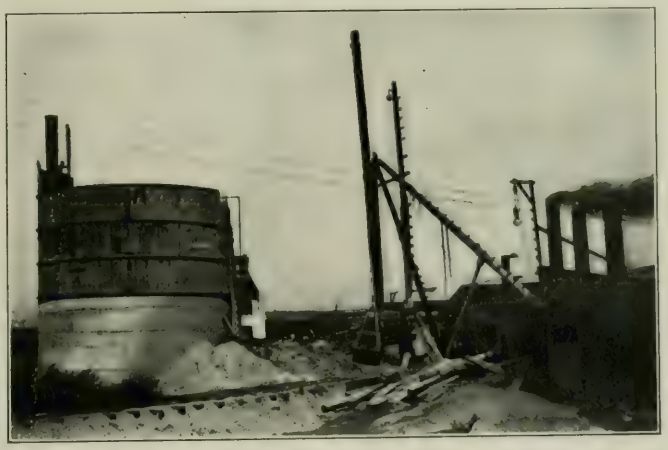
Cutting Edge—A steel cutting edge was made of 1-in. plate, the outer portion being vertical and about 7 ft. high as shown in the accompanying drawing. The inner portion of the cutting edge has a slope or batter of about 35 deg. These two steel shells were reinforced by 4x4-in. angle iron with webs extending from the vertical plate *e* to *f*, which forms the inner plate. This cutting edge was then put in place and the concrete structure begun by filling it with concrete.

Forms—The concrete forms for the outside were made of ⅜-in. sheet steel, 2½ ft. high and reinforced by 4x4-in. angle iron at the top and bottom. Two of these sections were placed one above the other and bolted together so as to make the form 5 ft. high. It required 6 of these double sections to reach entirely around the shaft. The inner sections were of the same width but required only 5 to complete the circle. These were made with 4x4-in. angle iron with 1¾-in. wooden planks placed vertically for lagging. Enough of these sections are made so as to enable the operator to use 3 forms, giving a vertical hight of 15 ft. Each section is fitted with lugs and eyes for handling with the derrick. A set of these forms being placed on the cutting edge, the work of filling in the concrete was not difficult. A 5-ft. form could be put in place and filled with concrete in a 10-hour shift. As one section of the concrete would set, the lower form would be taken off and placed above. By making forms in this manner it was only necessary to make three complete sets, as each one would be used over and over again.

Reinforcing—The reinforcing in this shaft consists of 2 rings of 1-in. square steel bars placed horizontally, one on the inside of the shaft about 1 ft. deep and one on the outside a like distance from the outer circumference, as shown at *c c'*. These rings are placed every 2 ft. the entire length of the structure, as shown by dots *c c'*, vertical section. There are also two rows of vertical reinforcing bars, *a* and *b*, 1 in. square, placed alternately 4 ft. apart.

Water Holes—These are 6 in. square and placed 3 ft. 10 in. apart, as shown. These were formed by nailing together two 6-in. and two 8-in. boards in 5-ft. sections to conform with the hight of the concrete form. The outlet at the lower end *g* was made funnel shape, and is only large enough for a 2-in. pipe to pass through the cutting edge. Through these water ways a 2-in. pipe was inserted which extended any required depth into the sand. Water is forced down under a pressure of 100 lb. per sq.in. at the pump which, with the additional pressure due to head, gives approximately 125 to 140 lb. per sq.in. The object of forcing water down through these pipes is to loosen and remove the sand from under the edge and force it out to the center of the shaft so as to enable the dredge bucket to remove it.

Dredge Well—After the shaft had reached a depth of 85 ft., it was found that the concrete structure was not heavy enough to overcome the skin friction. In order to give it additional weight, and in



CONCRETE SHAFT AT HIBBING, SHOWING FORMS AND HOISTING APPARATUS

steel shell 12 ft. in diameter was placed on the inside which gave a 4½-ft. annular space that was filled with 200 tons of pig iron plus sand and water. This well was placed on a cone that had a secure footing on a 4-in. hitch cut into the concrete wall. The bell or funnel part of the shell is reinforced with 4x4 in. angle iron. When the shaft is completed this inner shell will be taken out.

Sinking—All the material was hoisted from the center of the shaft by means of a 1¼-yd. clam-shell bucket, weighing 5400 lb. While the surrounding country contains a large number of granite boulders the shaft did not encounter any that gave trouble. The clay strata as well as the conglomerate had to be broken beneath the cutting edge and this was done by drilling holes below the concrete through the 6-in. water holes with a churn drill. A charge of 5 to 10 sticks of dynamite was used to loosen up the material. The dynamite sticks were broken and put in a tin cartridge 2½ ft. long by 1½ in. in diameter. The lower end was pointed. The cartridge was then attached to a ⅝-in. rod, 6 or 8 ft. long, to give sufficient weight to sink it through the water. The charge was lowered through the 2-in. pipe, and when the bottom was reached, the pipe was withdrawn 10 or 15 ft., and the shot discharged by electricity from a dynamo.

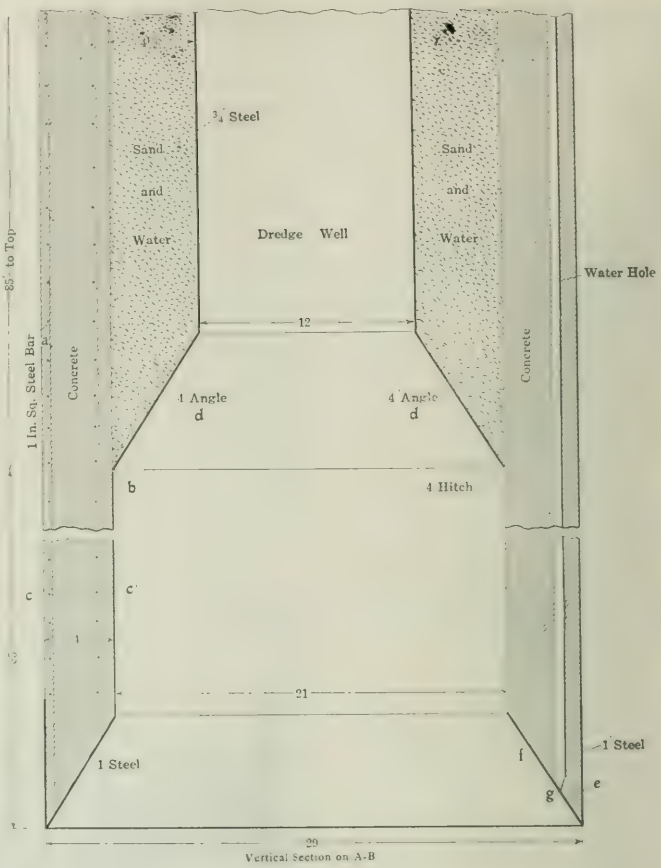
During the progress of excavating the sand and gravel, large cavities formed a number of times on the outside of the concrete wall, which would occasionally result in caving. Two different times the inrush of sand and water due to these cavings forced the water to the top of the concrete shaft which at that time was 40 ft. above the water level. In order to prevent this holing and hanging up, an occasional shot was discharged in the bottom of the shaft.

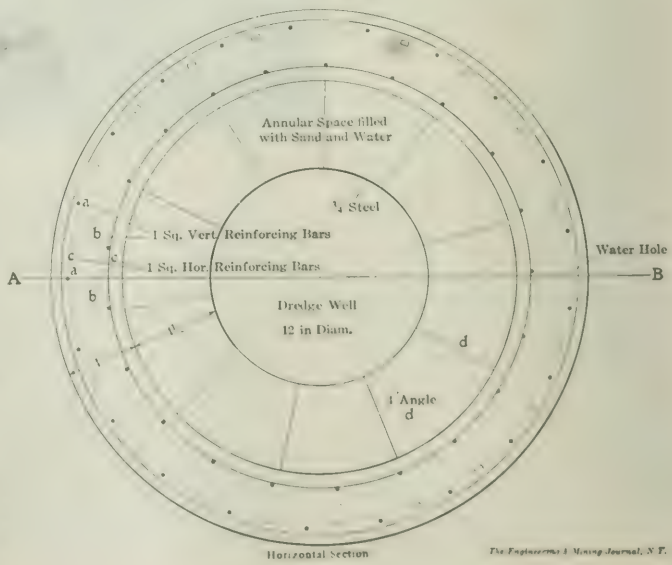
Alinement

Only once during the sinking of the shaft was it actually plumb and this was at about the 80-ft. level. At no time was it out of alinement to exceed 8 or 10 in. This was regulated by cutting more dirt from under the higher side and at the same time adding extra weight. No serious difficulty, however, was encountered along this line. Three times it was necessary to add 1000 tons of sand upon a temporarily constructed platform at the top of the shaft to give sufficient weight to sink. This sand was placed upon and taken off the platform with the clam-shell bucket. In this way the load could be shifted to suit the condition of the ground.

Cost about $500 per Foot

The greatest depth that the concrete structure settled in one 10 hour shift was 3 ft. 10 in. The slowest work was 3 or 4 in. in 10 days. One month averaged 19 in. sinking per day and the work to date





The Engineering & Mining Journal, N. Y.

averages between 6 and 7 in. per 10-hour shift. The contract price for this work is approximately $500 per ft. or about $100,000 for 190 ft. The work of the Foundation Company is to place the concrete shell on solid rock below the water level. The timbering and equipment of the shaft will be done by the mining company. A well equipped power house has already been completed and the mining company will construct a steel headframe as soon as the concrete work in the shaft is finished.

At the present writing the cutting edge is 160 ft. deep, while the concrete shell is a little over 25 ft. above the top of the ground. About all the work that remains to be done is the sinking, as the shaft shell is practically complete. The weight of the structure is about 5000 tons. At least 1000 tons of sand will be placed on top to assist in the final sinking. The boiler plant required is about 125 h.p. A Lidgerwood 10x12-in. engine is used for hoisting.

This same company has a contract for sinking a shaft on the Scranton mine, at Hibbing, through 150 ft. of similar material. This shaft will be 29 ft. outside diameter with a rectangular opening 9x17 ft. This will give about double the weight of concrete, and the structure should sink more readily.

I am indebted to J. C. Fox, superintendent of the Foundation Company's work, for the above information.

The Metallurgical Behavior of Barium Sulphate

According to W. Mostowitsch, in *Metallurgie*, 1909, VI, 450-467 (through *Journ.* Soc. Chem. Ind. of Aug. 31, 1909), pure barium sulphate can be heated in pure, dry air for 15 to 30 minutes at 1400 deg. C. without decomposition; at 1500 deg. it begins to dissociate to a small extent. When heated rapidly, it melts at 1580 deg., with partial decomposition into barium oxide, sulphur dioxide, and oxygen. Barium sulphate is decomposed by both silica and ferric oxide at 1000 deg. The sesqui-, bi-, and tri-silicate mixture sinter at 1350 deg., and fuse at 1400 deg. C.; the melted mass contains undecomposed barium sulphate in solution. The degree of decomposition increases with the temperature and the proportion of silica present. The behavior of mixtures of barium sulphate with one, two, and three molecular proportions of ferric oxide is similar, the sintering and melting points being the same, but far more ferric oxide than silica is required to effect the same degree of decomposition; the ferrites formed, are thin liquids, solidifying to crystalline masses; they are capable of dissolving both barium sulphate and ferric oxide.

The reduction of barium sulphate by carbon, begins at 600 deg. and is practically complete at 800 deg. C. With carbon monoxide, reduction begins at 650 deg. and is nearly complete at 800 deg. C. When heated to 1200 deg. in an atmosphere of carbon monoxide, the barium sulphide formed loses a small proportion of its sulphur. The decomposition of barium sulphate into barium oxide, sulphur dioxide, and oxygen involves the absorption of a large quantity of heat (136,740 calories), and this may occasionally be useful in lowering the temperature of the slag in the converter treatment of lead and copper.

Slags containing barium are very liquid, but specifically heavy. Such slags are able to dissolve iron from copper matte. When heated in a reducing atmosphere, barium sulphate is readily reduced to sulphide, which has a strong tendency to enter the matte; a matte containing 35 per cent. of barium has been obtained. Barium sulphide apparently tends to carry the noble metals into the matte.

The Purchase of Lead Ore in Derbyshire, England

The primitive methods of mining and for the sale and purchase of ores that formerly characterized the Joplin district of Missouri and Kansas and still exist there to some extent are by no means confined to that region. An article by H. L. Terry in the *Min Journ.* of Aug. 14, 1909, contains an account of the method of effecting transactions in the Peak district of Derbyshire which presents some interesting features of similarity.

A special feature of Derbyshire mining is the small scale on which many of the mines are worked. Two men, or a man and a boy, often comprise the whole personnel, the larger partnerships of old days not being now met with. The usual plant consists of a bucking stone, a hand crusher, a Derbyshire jig, and, in some cases, a flat buddle. More often than not the mines are at elevations where there is no water supply, and what is stored in the large tub is used over and over again in the dressing operations. Though the hand crusher still survives, the horse crusher, which is of quite a different type, is only to be met with in a ruined condition at abandoned mines.

Sales of ore at these mines are usually effected on what would be considered elsewhere rather insignificant quantities, less than half a-ton in fact often changing hands. The procedure is as follows: The miner informs one of the two smelting works in the country that he has ore to sell, and a day is arranged to bring off the deal, the barmaster having three days' notice given him to attend. On the day agreed upon the smelter's agent and the barmaster go to the mine, and the ore is measured in the standard "dish" which the latter brings with him. The total number of dishes being known, the dish full of ore is weighed on the barmaster's portable scales. The tare having been subtracted, the weight of the ore forms the basis by which the value of the ore is arrived at by the smelter's agent. The somewhat abstruse calculation having been made, the barmaster deducts the royalties, and in some cases a tithe, and the rest of the cash is handed over to the miner, who, during the proceedings, has remained mute, but inwardly consumed with anxiety as to the outcome of several weeks' hard labor. When the money he receives is much less than he expected explosive language may disturb the previously existing calm, though the officials do not allow such ebullitions to upset their equanimity.

Assaying does not enter into the transaction. The miner knows nothing about the percentage of lead in his ore, but the buyer estimates it by the weight of the dish, the degree of accuracy with which this is done being a point which might conceivably lead to the expression of different views were it made a subject of discussion. The ore is removed from the mine by the smelter, and reweighed at its destination, which is either the Brough lead work, near Bradwell, or the Lea lead works, near Matlock Bath. It is probably a safe assumption that the buying and selling of lead ore in Derbyshire is unique at the present day, but there is general agreement that it works very well considering the local conditions. The smelters never refuse to purchase a lot of ore of however small dimensions, or to send a cart to rather inaccessible places to take it away. In the absence of these facilities for disposal of the ore, the working miner, without capital resources or office equipment, would doubtless find it even harder work to pay his way than is at present the case under the discouraging market conditions of to-day.

Queensland began its independent existence Dec. 10, 1859, and in 1867 gold was discovered in the Gympie region which, up to the end of 1908, had produced £10,350,000 worth of gold (Chas. Chas. *Min. Journ.* July 15, 1909). The other notable gold producing localities, the date of their discovery and their outputs to the beginning of 1909, respectively, are: Ravenswood, about 1868, £3,096,600; Etheridge and Woodgar fields, 1869, £2,177,385; Charters Towers, about 1870, £24,600,000; Palmer, 1873, £5,250,228; Hodgkinson, 1875, £175,728; Mount Morgan mine, 1882, £15,260,000 (gold and copper); Croydon, 1889, £3,031,157; total, 100,076,802 oz., valued at £68,200,08; The Mount Morgan mine has returned £7,230,000 in dividends besides paying out for wages, etc., about £7,000,000

Flue Construction and the Saving of Flue Dust

By J. B. Wynne*

To all lead smelters the fume question is of prime importance. Escaping fume means direct expense by loss of metal and indirect expense by possible payments of compensation to surrounding landowners. More especially is this the case in Europe, where of late years the strong competition for ores has reduced the returning charges to a point where the margin of possible profit is so small that it disappears altogether for such works as cannot recover nearly 100 per cent. of the metal values contained in the ore smelted, and where the factory inspector is becoming more and more exacting each year. These causes have led to much work being done of late in improving old methods of catching fume and in developing new ones.

Most of these new methods consist in passing the furnace gases through a more or less complicated system of water sprayers, and the fundamental idea is, that the fume will be caught by the particles of water and carried down to be recovered in suitable settling tanks, filters, etc.

Difficulty of Wetting Fume

Anyone who is acquainted with the physical properties of fume, and who takes the trouble to think the matter out, will soon see that this method can never be successful. Every lead smelter knows how difficult it is to wet flue dust when it comes fresh and powdery from the flue. If, for instance, a bucketful of water is thrown on a heap of fresh fume, a cloud of dust rises and only an infinitesimal amount will be carried away in the water as it runs off the heap. Exactly the same thing happens in the spraying chambers. There the heap of dust and the bucketful of water are replaced by a particle of fume and a minute drop of water, or rather by an atmosphere full of extremely small fume particles into which is discharged a stream of minute drops of water; for no matter how efficient the sprayer may be the water still persists in the form of drops. Some of the fume particles will be struck by the water but, having no mutual affinity, the fume particle will be pushed aside and the water will pass on, just as when poured from the bucket upon the heap of dust.

In this way the spraying process fails because of the great difficulty which exists in wetting dry fume. On the other hand, when once the fume is moistened it is readily dissolved by water, and only by paying due attention to these facts can a satisfactory result be expected from a wet-fume collector.

Choosing a Fume-Catching Plant.

When the Silberhutte smeltery decided to put up a fume-catching plant, four systems were considered: (1) Increased length of flue; (2) bag house; (3) mechanical dry filters (System Frichter); (4) wet method. The first system was discarded as inefficient, the second and third as too expensive, and it was resolved to erect a spraying machine.

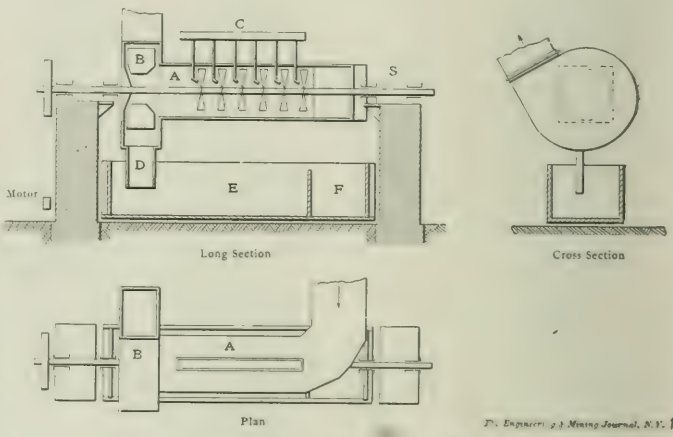
The "Theissen" wet scrubber so largely used in cleaning iron blast-furnace gas was first considered. It is a very efficient machine, but absorbs considerable power. This is immaterial to an iron works where almost unlimited power is a by-product, but for other works it is an item which cannot be overlooked and in this particular case it put the Theissen scrubber out of the question. A special machine had therefore to be designed to suit the conditions of a lead smeltery, and, with a minimum expenditure of power, obtain a maximum recovery of dust. The working theory on which this machine was designed is perhaps not original, but is probably novel enough in its application to lead smelter fume to be of general interest.

Designing the Plant

Starting from the facts given above, it was clear that good results could be expected from a wet collector only when the fume was moistened before entering it. The question then arose: "How could the fume be most effectively moistened?" If a vapor be cooled down below its "dew point," it condenses to a mist of minute particles of liquid which further combine and fall rapidly as small drops. If any solid particles, such as dust, are present in the vapor they form "nuclei" on which the vapor, as it cools, rapidly condenses, so that any dust atom present is soon inclosed in a drop of liquid. It seemed, therefore, probable that good results would be obtained by introducing into the dusty furnace-gases a sufficient amount of dry steam (water in the true gaseous state, in which state it mixes rapidly and intimately with any other gas), and cooling the mixture to below 100 deg. C. before it entered the sprayer.

Description of Apparatus Adopted

To this end a small centrifugal spraying nozzle was inserted in the flue directly behind each furnace where the gases were sufficiently hot to vaporize the sprayed water to a truly gaseous condition. In this way an intimate mixture of dry steam and furnace gas was obtained.



(The Engineering and Mining Journal, N.Y.)

GENERAL ARRANGEMENT OF FUME COLLECTOR

About 25 yd behind the furnaces in the main flue, a larger sprayer was installed as a cooler, and 50 yd behind this, where the temperature of the gas had fallen to between 70 and 90 deg. C., the fume collector was built. The general arrangement is shown by an accompanying sketch. The fan, *B*, draws the gas and moistened fume from the main flue into *A*, a rectangular box of 1 m. square section. On a shaft, *S*, revolving in this box are keyed 6 propeller fan-wheels upon each of which a 1½ in. gas pipe delivers water from a distributing launder, *C*. The water falling on the propeller blades is thrown out radially, forming a curtain of spray through which the gas must pass. The box, *A*, has a slight fall toward the fan, *B*, which is also keyed on the shaft, *S*, and draws directly from *A*, so that the water collecting on the bottom of the box flows to *B*, where some of it is caught by the fan wheel and is again

*Mechanical and Chemical Engineer, Silberhütte, Anhalt, Germany.

mixed with the gas, finally falling to the bottom of the fan, housing and passing through the channel, *D*, into the collecting tank, *E*.

This tank is sufficiently large to allow most of the absorbed dust to settle out. It is built of wood and is divided by a partition-wall into two unequal parts in the larger of which, near the inflow, *D*, the fume settles down as pulp. The partially cleaned water overflows into compartment *F*, and from there is drawn off by a centrifugal pump and, after passing over a cooling tower, returns to the distributing launder, *C*. A plunger pump, drawing from *E*, passes the pulp through a suitably placed filter press from which the filter cakes fall into a trench and are trammed away, the clear water returning to *F*. Only a small amount of fresh water is required to make up for leakage and evaporation. This is added to launder, *C*.

Water Should be Kept Neutral

In order to prevent the water becoming acid and corroding the shaft, fan-blades, etc., two or three bucketfuls of slacked lime mixed with water to a thick soup are added daily. This not only corrects the acidity but acts as a binder in the filter press, which may be looked upon as combining the functions of filter and briquetting machine. The circulating water should be tested regularly with congo paper and always kept neutral. The filter cakes are firm and contain, on an average, 70 per cent. Pb and Sb in the dried state, and fall from the press with about 15 per cent. moisture. The high percentage of metal in the presscakes is remarkable and not easily explained, as the average metal content of the dust caught in the flue is 55 per cent

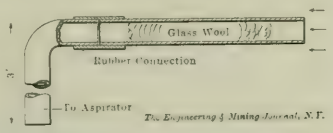
The housing of the apparatus is of wood and the fan blades of 3 mm. sheet iron. If the circulating water is kept neutral by the regular addition of lime, corrosion need not be feared. The plant is electrically driven and the power required, including filter pump, circulating pump, shafting, etc., is 17 h.p. The estimated volume of gas treated is 300 cu.m. per minute.

The results of many tests showed that nearly 50 per cent. of the total dust content of the gas was caught in the apparatus, and in addition to this over 30 per cent. was caught in the flue, so that, in all, 80 per cent. of the total dust content of the gas was recovered. It should be mentioned here that the total length of flue at Silberhütte is less than 300 m.

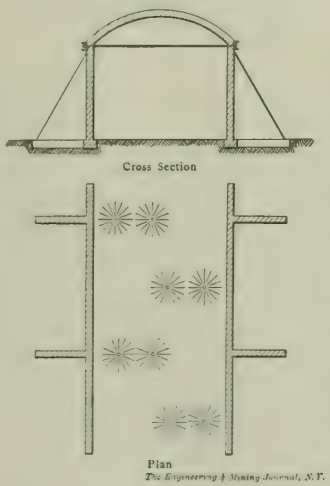
Method of Testing

As the apparent results depend so largely on the accuracy of the tests made, it may be well to describe the method adopted in determining the quantity of solid matter contained in the gas.

A piece of glass tubing, 4 in. long and ⅜ in. internal diameter, was filled with glass wool, leaving about ½ in. free at each end. The whole was thoroughly dried, well shaken to remove any bits of glass wool that might be loose, and finally weighed. Enough dusty gas was then drawn through this filter to deposit about 50 mg. solid matter, the volume of gas and the increase of weight being noted. In making a test, the weighed filter-tube was attached by a short piece of rubber pipe to another glass tube, 2½ to 3 ft. long, bent at right angles at one end, so that when inserted in the flue the filter tube should take a position parallel to the flow of the gas, and with the open end facing the draft. A carboy,



APPARATUS FOR TESTING GAS



ACID PROOF FLUE

carefully sealed and fitted with syphon to draw off the measured quantity of water, acted as aspirator. By placing the filter at the inflow end of the aspirator pipe instead of drawing the gas first through a sample tube, all losses of dust due to adhesion to the walls of the tube before reaching the filter were eliminated. After slowly drawing sufficient gas through the filter it is removed from the flue, any dust adhering to the outside carefully wiped off, and the whole dried and weighed. The increase of weight gives the amount of solid matter contained in the volume of gas filtered. Tests taken in this way gave very consistent results.

Construction of Acid Proof Flue

It had been originally proposed to build a large wooden chamber directly behind the fume collector to act as a settling tank in which any dust particles that had escaped the spray should have time to absorb further moisture out of the saturated gases and become heavy enough to fall down. The necessary concession for this building was, however, not granted, on account of the supposed danger of fire. As the gases left the fume collector with a temperature of 50 to 60 deg. C., and were, moreover, saturated with water vapor, this danger was not very real. It was expected that the gas would have had time to deposit most of its excess moisture while passing through the chamber, so that, on reentering the flue, it would not contain an amount of water injurious to the masonry. However, as the settling chamber could not be erected at once and in consequence very wet gases were to be expected, a special acid-proof flue was designed and built. This flue is in every way most satisfactory and may be expected to last an almost unlimited time under conditions most trying to ordinary construction.

The flue is 2.50 m. wide by 2.20 m. high, measuring to the springing of the arch which forms the roof. The walls, as well as the arch, are of ordinary red brick laid in tar mortar and are built half a brick thick (4½ in.). The walls are strengthened with buttresses, also built of half a brick in thickness, placed every 2.5 m. The arch of the roof abuts on either side against a channel iron, 12 cm. high, running the whole length of the flue, and the thrust is taken up by ⅞ in. tie rods spaced 1.25 m. apart, which hold the two channel irons in place. As these tie rods have to pass through the gases and would soon be corroded by the acid vapors, they are protected by running them through a length of 1 in. lead pipe. The length of the pipe is such that when the tie rods are tightened up in place, the ends of the lead pipe are forced into close contact with the channel irons, and the whole is well bedded in tar mortar so that the iron is thoroughly protected.

Tar Mortar Used

The mortar is made of fine clean quartz sand and well boiled tar. Sand is stirred into the tar while it is still in the boiling pot, in sufficient quantity to bring the mixture to the consistency of ordinary lime mortar. It must be used hot as it thickens on cooling. The tar must be thoroughly boiled to drive off the contained water; the sand also must be dry, otherwise the mortar will set badly. Even after boiling, the mortar sets very slowly but finally becomes extremely hard, so that in pulling down old walls built with this mortar the bricks often break before the mortar gives way.

The flue is painted on the inside with tar thickened with pitch, and the roof on the outside is given several coats till a good surface is obtained which throws off all rain and protects the two channel irons. The buttresses outside the flue are built with cement mortar.

LOW COST OF CONSTRUCTION AND MAINTENANCE.

The first cost of a flue of this type is not great and if the durability and absence of repairs is taken into consideration it will probably be found to be cheaper than almost any other type. At Silberhütte, where the building site necessitated heavy casting, the cost per meter run came to very little over 100 marks (about $25). The walls, being very thin, require a minimum of building material, and greatly assist in cooling the gases, which tends to good recovery of fume. As far as the labor cost is concerned, when once the masons have grown accustomed to working with tar mortar, the building progresses as rapidly as with ordinary lime mortar.

Baffles have been used to good advantage in the flue at Silberhütte. Spruce trees of suitable size placed alternately on either side of the flue as indicated in the plan, give excellent results and are very cheap. They can, of course, be used only in connection with a wet sprayer, otherwise they would soon be burned.

The above described system of fume saving is capable of considerable development and promises good results. At the same time the cost of installation is not very great and the power and attendance required are moderate.

The problem of economic fume saving is not easily solved and the solution can only be reached by practical trial. No doubt many authors have made trials in various directions but unfortunately the results are seldom, if ever, published. Experience is a dear school and it is a pity when knowledge, even of a negative kind which has been gained through the expenditure of much thought and cash, is lost. The whole smelting world would [illegible] if the work done in this direction by individuals were made public. [illegible] in this field might [illegible] the problem from others left it, and [illegible] to start from the beginning. The attempt is made in the hope that it may be of use to others, and may induce others to send from experience to the general stock for the general good.

The [illegible] of [illegible] is given in Europe in the Stolberg District, in Belgium, France, Germany, Switzerland, Upper Silesia, Middlesbrough, Westphalia, Rhenish, in Germany; Pueblo, Colorado, in America; in Italy, Belgium, in Germany and France.

Contributions to the Chemistry of Zinc Smelting*

Experiments are described in which pure zinc sulphide was roasted alone, with ferric oxide, with calcium carbonate, and with a mixture of iron sulphide and calcium carbonate in porcelain crucibles of 10-c.c. capacity, by the flame of a Teclu burner at a temperature of 850-950 deg. C. The residue was analyzed and the loss in weight determined, the results being tabulated after calculation in percentages of the original amount of substance used. The results show that: (1) Pure zinc sulphide can be roasted completely to the oxide if the conditions are such that the zinc sulphate produced is again decomposed. (2) Incomplete removal of sulphur is due to incomplete decomposition of the sulphate. Iron oxide influences this by reacting with the zinc sulphide forming ferrous sulphide. Calcium carbonate does not prevent the complete roasting of the zinc sulphide, but forms calcium sulphate.

Experiments on reduction were carried out in covered graphite crucibles in a muffle heated to 1300-1400 deg. C. for 14 hours, when the crucible was allowed to cool in the closed muffle, and its loss in weight determined, the results being calculated and tabulated as before. It is shown that calcium sulphate and carbon do not quantitatively react according to the equation

$$CaSO_4 + 4\,C = CaS + 4\,CO$$

Part of the calcium sulphide produced appears to react with the sulphate according to the equation,

$$3\,CaSO_4 + CaS = 4\,CaO + 4\,SO_2$$

Zinc sulphide appears to be volatile, since zinc and sulphur are lost in atomic proportions. Iron sulphide is more readily reduced by carbon than zinc sulphide. Ferric oxide, zinc sulphide and carbon yield carbon monoxide and bisulphide, iron sulphide, and the metals iron and zinc, with some reproduced zinc sulphide.

In the technical roasting of zinc sulphide ores it is concluded that the iron present in the blende is to a slight extent harmful during the smelting because it prevents the complete reduction of the zinc sulphide by the carbon, a process rendered difficult in presence of ferric oxide (1) because during the roasting of concentrates zinc sulphide [illegible] and [illegible] the [illegible] sulphate [illegible] and prevents the complete reduction of the zinc sulphide. In preparing the material for roasting in case the blende contains much [illegible], it is advisable to add [illegible] in order to obtain a better yield of zinc. Of course, it is advisable to remove the calcium salts after roasting, preferably by washing; if this were done, the roasted blende would be as easily distilled as a calciferous calamine, since in the absence of calcium sulphate the small amount of ferric oxide usually present in the mineral would be sufficient to convert unroasted zinc sulphide into zinc oxide.

* Abstract of an article by V. Lenarcic in [illegible] Vol. 8, pp. [illegible] through Chem. Soc. Chem. Ind. Aug. 16, 1909.

Metallurgical Practice on the Rand

According to Lionel Phillips, chairman of the Transvaal Chamber of Mines, the main feature of 1908, was the increase in duty per stamp. The factors responsible for this are the introduction of heavier stamps in new mills, and the weighting up of the existing stamps accompanied by the use of coarser meshes. In each case subsequent tube milling has been used to produce the necessary fineness for extracting the gold by cyanide.

In tube milling, the only advance has been the general adoption of reef in place of pebbles for the grinding load, which has effected a considerable saving. Practically no liners are now imported, and requirements in this respect have been drawn from local sources. The ribbed iron liner is being tried on several mines, and affords promise of being very successful. Classification of sand fed to the tube mills has advanced considerably, both in respect of dewatering and separation of the already fine material.

In cyanide treatment there have been no innovations, attention being concentrated upon making best use of plant capacity. Mr. Caldecott has introduced a new method of collecting sands, which is yet in its infancy, but is doing good work on the Simmer Deep. In slime treatment, the Adair-Usher process has been installed on a few more plants. A modification of the Brown agitator has been successfully adopted for the aeration and sweetening of accumulated slimes, and it is probable that its use will be extended for that purpose.

The utilization of waste heat for warming cyanide solutions has met with much success and effected a saving in plant required in slimes treatment. Many metallurgists believe that amalgamation plates can be dispensed with, and the whole of the free gold recovered by direct cyanide treatment. A further experiment in this connection on a practical scale will shortly take place. If successful, the opportunities for gold stealing would be much reduced, and a reduction in size of future plants effected.

In ordinary pattern work an average extraction of from 85 to 90 per cent. of the silver and from 20 to 25 per cent. of the gold content of the ores may be counted upon.

Unloading Railroad Cars by Machinery

Mechanical Dumping Device That Handles Total Weight of 255,000 lb.; One Machine Unloaded 265 Freight Cars in Twelve Hours

BY SNOWDEN B. REDFIELD

If railroad cars can be loaded by machinery, why cannot they be unloaded by machinery?

Loading coal and ore into gondola freight cars has been done by machinery for a long time, for we are all familiar with the conveyer and elevator, and the coal chute is among the oldest inhabitants of almost every railroad yard.

Not very long ago the laborer with the shovel for unloading ore and coal cars was partially put out of business by the introduction of the hopper-bottom gondola car. It might almost be said that the hopper-bottom car marked the dawning of a new epoch in the rapid unloading of coal and ore trains, for theoretically all that had to be done was to run a long train of these hopper-bottom cars up on a trestle, then to open the doors on all the cars and have their contents drop out onto the piles below the trestle.

This sounds very well, but in actual practice it has been found that the process is slow and that the laborer has invariably to be sent into the car to assist the material out through the bottom door. In the case of freezing in winter the coal and ore have to be dug out with a pick as well as a shovel, and the process is anything but rapid.

Picks Car up and Dumps It

Again came the question, if cars can be loaded by machinery why cannot they be unloaded by machinery? The accompanying illustrations show one of a pair of car-dumping machines built by the McMyler Manufacturing Company, of Cleveland, and operated on the Hoboken, N. J., docks of the Delaware, Lackawanna & Western Railroad Company. Each one of these machines is capable of picking up and turning almost bottom side up any gondola freight car now in existence or liable to be designed for some time to come. This machine picks up the car, carries it upward to a convenient hight, and there literally turns it over almost completely bottom side up, dumping its load down into a funnel-like apron, which directs the material through a chute into a barge underneath, alongside the dock. The material handled at Hoboken is coal, and it is by these machines that the Delaware, Lackawanna & Western Railroad Company transfers its coal from rail to barge transportation.

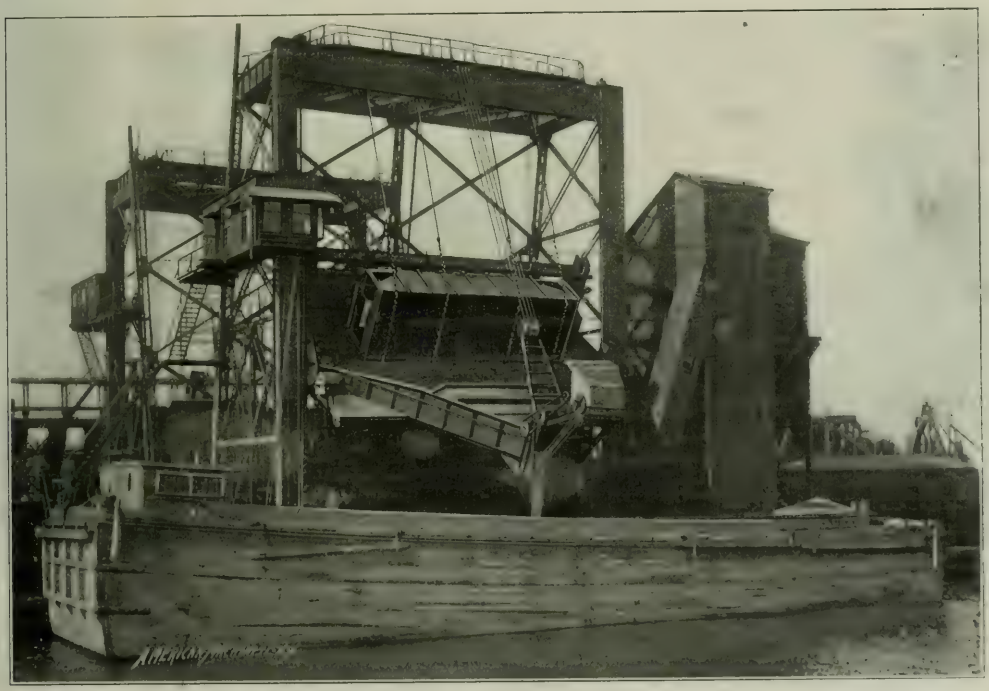


FIG. 1. MCMYLER CAR DUMPER AT HOBOKEN DOCKS OF THE DELAWARE, LACKAWANNA AND WESTERN RAILROAD COMPANY

Fig. 1 is a general view of the north machine, and it will be seen that up in the center of the structure there is a steel hopper bottom railroad car almost upside down which has just dumped its load of coal down upon the apron and chute leading into the canal boat alongside the dock. The impression given by the illustration is that this car-dumping machine is an affair of some size, and this impression is quite correct, for it is designed to pick up a car which will hold a load of 120,000 lb.

NOTE—Reprint from *American Machinist*, Aug. 19, 1909.

which, together with 50,000 lb. for the weight of the car, 85,000 lb. for the weight of the track and cradle which holds the car, makes a total weight lifted of 255,000 pounds.

The record unloading obtained by the Delaware, Lackawanna & Western Company with one machine was 265 cars in 12 hours, and during the month of March just past they handled 325,000 tons of coal on the two machines. As a matter of fact the capacity of a machine of this kind is limited by the kind of coal and by the rapidity with which boats can be pulled into place, one after the other as they are loaded.

Here are some records obtained from a similar machine at Toledo: 336 cars were handled by this one machine in a day, presumably 12 hours. Three hundred and twenty-six cars were handled by the same machine between 6.30 a.m. and 4.35 p.m., with 25 min. lost time waiting for boats. In these 326 cars there were 11,584 tons of coal. Another record is 206 cars holding 6390 tons of coal, unloaded in five hours. The average run for one machine at Hoboken is about 22 to 25 cars per hour, but one record of 42 cars in an hour was obtained on the machine at Toledo.

Operation of Contrivance

Cars are brought to the dumping machine up an incline, being pushed into place by a small steel car of peculiar shape and designed to push the gondola car up the hill by means of a cable which stretches up the track. The pushing car is of narrower gage than the standard railroad car and consequently there are four rails on the incline. This is illustrated very clearly in Fig. 2.

The pushing car is called by various names, depending upon the locality of its use. In western Pennsylvania, among the coal mines, where one of the principal means of locomotion is the old-fashioned mule, the pushing car is known as a mule. On the Delaware, Lackawanna & Western docks at Hoboken they call it a hog, or pig.

At Hoboken all the power to run the machine, as well as the pig, is obtained from steam, and the canal boats which lie alongside the dock are pulled into place by cables actuated by steam engines on the dock.

After the pig has pushed the car up into the cradle of the car dumper the cradle begins to rise, lifting the car but without turning it over. The cradle may best be described as a long platform carrying a section of the railroad track. On one side of this platform, that is the side next to the water, or the dumping side, there is a vertical steel wall extending up from the platform. The section of track in the cradle is mounted on rollers in the cradle itself in such a way that the track may slide over about 10 in. toward the dumping side.

From this sliding track there extend four heavy chains, which run horizontally from the track toward the water, then around four sheaves in the cradle, and then upward to the extreme top of the machine, where they again pass around slanting side of the machine to four sliding counterweights. The effect of these other sheaves, and finally down on the counterweights and chains is to continually tend to draw the section of track over toward the dumping side of the platform; that is, toward the vertical wall. When the platform or cradle is in its extreme lowest position the section of track is, however, held over to the opposite side in continuation with the rails leading up the inclined plane. This holding is done by two rocker arms, which, when the cradle is at its bottom position, rest upon blocks underneath.

Fig. 1 is from a photograph taken from a position half way up the structure, and looking down at the bottom of the cradle while it is in the act of dumping a steel gondola car over toward the right-hand side of the picture. The two rocker arms and their connecting shaft are clearly shown on the bottom of the cradle. The rocker arms are also shown in Fig. 4.

FIG. 2. PUSHING THE CAR UP INTO THE CRADLE

FIG. 3. TURNING THE CRADLE AND CAR

As soon as the cradle has been lifted sufficiently far to relieve the rocker arms from the blocks upon which they rest, the counterweights with their chains draw the track and the car over toward the vertical wall on the dumping side of the cradle. This makes the car rest firmly against the upright wall of the cradle.

As the car further rises, four large steel hooks, which up to this time have been standing over but not touching the car, begin to drop down, and finally hook over one side of the car. These hooks are also on the dumping side. The car continues to rise, still maintaining its normal upright position, but pressed against the side wall of the cradle.

Turns Cars Over

After the cradle has been lifted so far that the top edge of the upright side strikes against the hinge of the swinging funnel-shaped apron, the whole cradle begins to turn over by revolving about these hinges, causing the car to lean still harder against the upright side of the cradle. This is shown in Fig. 3 where the car is partially turned over. The turning action will be understood when it is said that the hoisting cables coming from the engine house, shown at the bottom left side of Fig. 4, after going to the top of the tower, come down again, pass under sheaves *A* at each end of the cradle at the lower left corners, as viewed in Fig. 4, before turning. From these sheaves the cables pass under the cradle to the sheaves *B*, shown at the lower right-hand corner of the cradle and from thence up the vertical side to other sheaves *C*, located on the under side of the apron. Passing around these latter sheaves the cables once more go downward and finally fasten onto the cradle itself.

It will be understood now that when the hoisting cable is drawn in by the hoisting engine the tendency is at first to lift the whole cradle in its normal upright position, but when the upper edge of the side wall of the cradle strikes upon the hinge of the apron already spoken of, it is easily seen that to continue to draw in the cable will cant the cradle over in a clockwise direction as seen in Fig. 4.

Cars Held Firmly

As the cradle tips over, the chains leading up the right-hand side wall of the cradle, being drawn taut by the counterweights and holding the track and car strongly toward the vertical wall, begin to wind over the top of the car. It is now that the real use for the hooks already spoken of is seen, for the chains are inside of the hooks, and as the car tips and the chains begin to wrap around, these hooks protect the side wall of the car from being crumpled in by the powerful pull of the chains. Fig. 5 is a view looking down upon the overturned car, and the four counterweight chains wrapping around the car are plainly seen. This action, which is also shown in Fig. 4, in dotted lines, clearly illustrates how the car is prevented from falling out, as it is literally bound into the cradle by these chains and their counterweights.

In Fig. 5, at the left, three smaller I-beams will be seen to be projecting through the sides of the heavy plate girder of the main cradle. It is upon these I-beams that the section of track rests, and they are mounted upon rollers in the cradle itself, as already described. In the position shown in Fig. 5 these I-beams are drawn down to their extreme position, as the track is held strongly over toward the dumping side of the cradle by the action of the chains and counterweights.

No Slack in the Barge

The coal in passing out of the car and down into the funnel-shaped apron, passes over a screen in the bottom of the apron. By means of this screen the slack and fine coal is separated from the larger sizes, which it is desired to load into the barge underneath. The mesh of this screen is adjustable by means of handwheels, and these wheels may be seen on the far side of the apron in Fig. 5.

Below the screen, that is in the pocket under the screen, there is a worm conveyer driven by a motor, which constantly traverses the slack and fine coal to the farther end, where it drops down a chute into a bucket conveyer, which carries it up into a bin in the building shown in the background of Fig. 5. Here the amount of slack is weighed and may then be dumped into other cars and carried off to the power houses, where it is burned under the boilers.

In this way, knowing the weight of a car of coal, the net weight of the car and the amount of slack separated out from the coal in the act of dumping, the net weight of coal actually transferred to the barge is known, and the coal actually loaded into the barge is of the proper size, as desired. For fine coal, which is not screened, the gratings are covered with steel plates and the dumping may be done very much more quickly than when dumping stove or egg coal, for in this latter case the coal must be dumped at such a speed that there will be sufficient time for the screening to take place effectively.

Fig. 6 is a view of the apron and its chute which delivers the coal into the barge. In the upper left-hand corner of the picture are the motor and gear driving the worm conveyer, and also the vertical chute is seen at the far end, which carries away the slack coal from the screen.

Unloads Where Desired

On the extension arm of the apron, overhanging the water, there is a protected platform where an operator controls a number of electric switches and hoists. By means of various motors and the cables shown leading downward from this platform the chute at the outer end of the apron may be raised or lowered, or turned inward or outward, with respect to the dock. Also the operator on this platform has control of a sliding gate at the apex of the funnel of the apron, so that he can almost instantly shut off the supply of coal passing through the chute down into the barge. In this way the coal may be loaded into the vessel in piles so placed as to balance the barge with considerable facility. As surmised, the apron itself may be raised and lowered on its outer end so as to give it more or less slant, depending upon the rapidity with which it is desired to pass the coal over the screen.

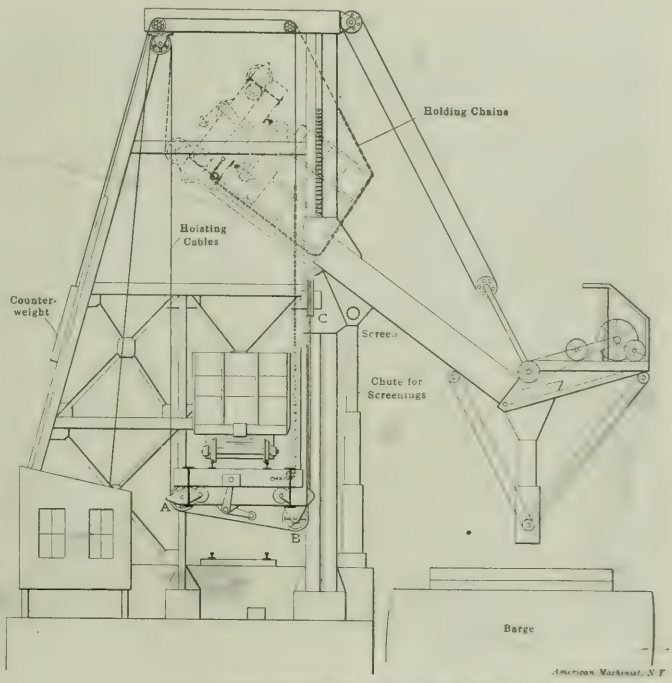


FIG. 4. SKETCH SHOWING OPERATION OF UNLOADER

Adjustable to Accommodate Varying Conditions

There is another adjustment for this apron, that is, a vertical rising and falling at the hinged upper end. In the exact center of Fig. 5, beyond the far end of the car, will be seen a vertical screw which is about 4 in. in diameter. This screw passes through a nut near the hinge of the apron, and by turning the screw and its mate at the near end, the vertical elevation of the whole apron may be adjusted. This adjustment in the machines at Hoboken amounts to 30 ft.; that is, the car turning in its highest position turns about 30 ft. higher than in its lowest turning position. The object of this adjustment is to accommodate the various hights of barges and ships to be loaded.

No matter how high or low the hinged end of the apron may be, the rising cradle always strikes against the hinge when it has been lifted sufficiently far, and begins to turn at this point, so that the side of the inverted car practically coincides with the bottom surface of the apron. The size of the car also, within wide limits, is immaterial as the sliding track and hooks and chains automatically adjust themselves to each condition.

Working costs of the Dolcoath mine, Cornwall, for the past half year were [illegible] Aug. 21, 1909, [illegible]

Methods for Assaying in Cyanide Plants*

In addition to the ordinary fire assays for silver and gold the assayer of a cyanide plant is called upon to determine the alkalinity of the solutions, the consumption of alkali by the ores, the strength of the solutions in potassium cyanide at various stages of the operations and the amounts of silver and gold held by the solutions.

Alkalinity—A standard solution of sulphuric acid is made so that 1 c.c. of it will equal 1 c.c. of a solution of caustic soda with 0.04 gm. of NaOH to the c.c. This is accomplished by dissolving 30 c.c. of concentrated sulphuric acid in a measured amount of a water, say, 900 c.c., and then standardizing it with 0.53 gm. of $NaHCO_3$. If the acid is of proper strength 10 c.c. of it will be needed to neutralize the sodium carbonate. If a less amount is required an additional amount of water is added to bring it to the required strength, this can be calculated by simple proportion. The caustic soda solution is made by dissolving 40 gm. of the pure caustic in a liter of water. Its exact strength should be determined, and it is always best to make the solutions so that 1 c.c. of the acid will equal 1 c.c. of the alkali. The indicators used are phenolphthalein and methyl orange.

To determine the alkalinity of the solution take an assay ton by weight, or measure out 29 c.c., which will be very close to that amount. If the solution contains cyanide, add silver nitrate in solution until a slight turbidity is produced. Phenolphthalein is then added and standard sulphuric acid is run in to the end point. Each c.c. of the acid consumed is equivalent to 40 oz. troy, or 43.9 oz. avoirdupois, of NaOH to the ton, as the equivalent alkalinity of the solution. Eighty parts of NaOH are equal to 56 parts of CaO.

Alkalinity, or Acidity, of the Ore—Ores are usually acid and seldom alkaline. Take 1 a.t. of the ore, finely ground, and shake it with water for half an hour in a flask; filter and wash with water until all soluble matter is removed from the residue. Test with litmus paper to see if acid or alkaline, and run in enough sulphuric acid or caustic soda, to end reaction. Each c.c. of NaOH used corresponds to 40 oz. troy, or 53.8 oz. avoirdupois of H_2SO_4 per ton of ore. If the solution is alkaline the standard sulphuric acid must be run in to neutral reaction, when each c.c. used will correspond to an alkalinity of 40 oz. troy per ton, expressed in NaOH.

Determination of Cyanide in Solutions—Take 10 c.c. of the solution, or more if weak, in a small flask, add 1 gm. [illegible]

FIG. 5. DUMPING THE CAR, SHOWING THE COUNTERWEIGHTED HOLDING CHAINS.

FIG. 6. THE APRON AND CHUTE WITH BARGES BENEATH.

*Abstract of a paper by W. H. Seamon, Chihuahua, Mexico, in West. Chem. and Met., August, 1909.

tated lead carbonate and shake thoroughly to remove any sulphides; it is then filtered off and washed, when the solution is ready for titration: 5 c.c. of a solution is then added as an indicator. This indicator solution is made by dissolving 1 gm. of potassium iodide in 1 l. of water. A standard solution of silver nitrate is then run in to the first faint permanent yellow color. Make the silver-nitrate solution by dissolving 6.519 gm. of $AgNO_3$ in 1 l. of water; use 10 c.c. of the solution, each c.c. of which will represent 1 lb. KCN per ton.

Determination of Silver and Gold—Take 1 a.t. or more of the solution in a beaker of sufficient size; place a V-shaped piece of aluminum in the solution and add sulphuric acid to acid reaction, and boil. In a few minutes of hard boiling all of the gold will be precipitated in metallic form, together with the silver. At first some of the silver will be precipitated in form of cyanide, but this changes to metallic silver by prolonged boiling. Remove the aluminum, washing off the precipitated metals with a strong jet of water, filter off the metallic residue, dry quickly and throw the filter into a scorifier with 60 gm granulated lead; scorify and cupel in the usual way. The precipitation of gold and silver by aluminum is complete, as I have determined by many experiments, and I think its use will be found a great improvement on the methods now employed.

Aluminum was suggested as a precipitant on a commercial scale for gold and silver from cyanide solution as a substitute for zinc by Carl Moldenhauer, who patented his process in 1893. The process failed for the reason that free acid was necessary in the solutions for the complete precipitation of the gold and silver, and as this was not practicable in the commercial extraction it was bound to fail. As a laboratory method it will be found a success.

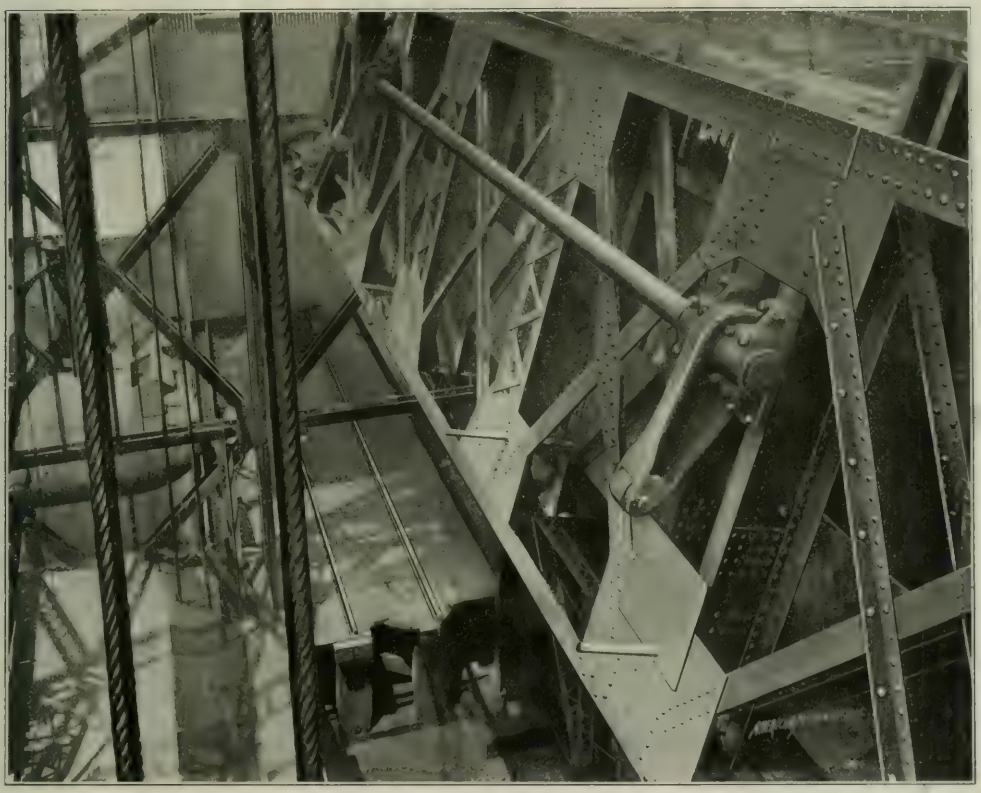


FIG. 7. LOOKING DOWN UPON THE OVERTURNED CRADLE

Analysis of Commercial Cyanide

Dissolve 20 gm of the substance in 150 c.c. of water and filter off from any insoluble residue, through an ashless filter, catching the filtrate in a graduated 250-c.c flask. Wash carefully. The filter is ignited and weighed and the percentage of insoluble matter, which is SiO_2, Al_2O_3, Fe_2O_3, calculated

Determination of Carbonic Acid—Calcium nitrate is added to the flask and after shaking, the flask is filled up to the mark with water, shaken again and allowed to stand for one hour. It is then filtered, the residue on the filter being $CaCO_3$, proportional to the carbonic acid in the cyanide; it is washed, ignited and weighed as CaO; the weight of CaO multiplied by 0.786 gives the weight of CO_2 in the 20 gm of cyanide taken

Determination of OH—The filtrate from the $CaCO_3$ is diluted to 500 c.c. of which 100 c.c. is taken for the OH determination. To this add a solution of magnesium nitrate and allow to settle for an hour; then filter off the precipitate of magnesium hydroxide, ignite in an annealing cup and weigh as MgO. This weight multiplied by 0.85 gives the weight of hydroxide in 4 gm. of the cyanide, from which calculate the percentage

Determination of Cyanogen—Take 50 c.c of the 500 c.c. and add 5 c.c. of strong ammonia and 5 c.c. of the potassium iodide indicator; then run in the standard solution of silver nitrate. The CN factor is obtained from the Cl factor by multiplying it by 0.7324 and it will be about 1 c.c. = 0.036 CN, when 1 c.c. = 0.005 Cl

Determination of Cyanate—Take 50 c.c of the solution and add an excess of a strong solution of silver nitrate which will

precipitate all of the cyanogen, cyanate and chloride combined with the silver; shake well, filter and wash with ice cold water. After washing place a clean flask beneath the funnel and pour over the filter 10 c.c. of standard nitric acid solution, made by mixing 100 c.c. of nitric acid with 900 c.c. of distilled water. The cyanate will act upon the nitric acid. The excess of nitric acid is determined by titration with a standard solution of caustic soda. Each molecule of HNO_3 corresponds to one molecule of CNO. Having determined the number of c.c. of the normal nitric acid that have been consumed by the silver cyanate, as well as the weight of HNO_3 in 1 c.c. of the standard solution, the weight of CNO is found by multiplying c.c. of HNO_3 by weight of HNO_3, multiplied by 0.6666, from which weight the precentage of CNO may be determined.

Determination of the Chlorine—Weigh out 1 gm. of the powdered salt into a small porcelain crucible and heat it, gradually adding a mixture of 5 parts of Na_2CO_3 and 1 part of KNO_3 until all of the cyanogen is decomposed. Cool and dissolve the mass in water, acidify with nitric acid and filter to clear the solution. The chlorine can then be determined by titrating with a standard solution of silver nitrate; or it may be precipitated with silver nitrate and determined in the gravimetric way.

Determination of Potassium and Soda—Decompose in a platinum dish 0.25 gm. of the powdered salt, with dilute hydrochloric acid, being careful to perform the operation under a hood with strong draft to avoid injury from the poisonous fumes; evaporate to dryness and ignite to drive off all salts of ammonia, cool and weigh as NaCl + KCl. Then determine the potassium with platinic chloride and the sodium by difference.

Remarks on Cyanide—Pure potassium cyanide contains 40 per cent. of cyanogen and in the trade corresponds to 100 per cent. cyanide. Ninety-eight per cent. cyanide contains only 39.2 per cent cyanogen and 125 per cent cyanide contains 50 per cent. cyanogen. It has been found that potassium cyanide carrying sodium cyanide is more efficient than the pure cyanide weight for weight, owing to the larger percentage of cyanogen. This is [illegible] to the reduction in freights and [illegible] the additional reason that the [illegible] cyanide can be made and sold [illegible] than the pure potassium cyanide.

Camp Bird, Ltd., Buys Santa Gertrudis Mine in Mexico

It is authoritatively announced that the Camp Bird, Ltd., of London has made a [illegible] option on the Santa Gertrudis lode at Pachuca, Mexico. The property, formerly known as Santa Gertrudis y Guadalupe, has been in negotiation for some months to a syndicate composed of John Hays Hammond, Cortland F. Palmer, Hugh Rose and Frank W. Royer. The option rights of the syndicate were transferred to the Camp Bird, Ltd., after an examination. This company made a rigid investigation under the direction of R. J. Frecheville, engineer of the Camp Bird company, William J. Cox, manager of the Camp Bird mine, Edwin E. Chase, of Denver, and F. J. Pope, of New York. The report of the vending syndicate was confirmed and the Camp Bird company made the deposit, subject to the formal ratification of the option by the Santa Gertrudis stockholders, which is now pending and will be given as a matter of course. The purchase price is 9,000,000 pesos and the option runs until Jan. 1, 1910.

If the purchase is completed a steel and concrete cyanide mill of large capacity will be erected and during the construction of the mill preparations will be made on surface and underground for obtaining an output commensurate with the capabilities of the property.

The Santa Gertrudis is the largest of the three properties (Santa Gertrudis, Barron and La Blanca) on an oreshoot exceeding 3100 ft. in length in the Santa Gertrudis vein.

In the event of purchase being completed it is expected that Hugh Rose, formerly general superintendent of the Guanajuato Development Company, will manage the property.

The above is in confirmation of the official notice in the last report of the Camp Bird, Ltd., which was as follows: "Cable advice has been received from R. J. Frecheville, in Mexico, that a deposit has been made, securing a four months' option on the Santa Gertrudis, a famous mine near Pachuca, Mexico. This option to purchase has been secured on the strong recommendations of Messrs. John Hays Hammond, R. J. Frecheville and W. J. Cox, after making a thorough examination of the mine. As soon as the option agreement and the reports of the above engineers have been received, the board will further communicate with the shareholders."

Dredging Men Win

SPECIAL CORRESPONDENCE.

The anti-dredging agitators of the Sacramento valley have met with rather a severe setback in the report of the committee recently appointed by Chairman Marshall Diggs of the anti-dredge convention held in Sacramento to investigate the operations of the dredgers on the American, Sacramento and Feather rivers. The report deals with the dredging conditions on these rivers, which had been condemned recently by the enemies of the gold-dredging industry. The committee finds, after investigation, that in each of the rivers, and at the lands near their mouths, the dredgers are really doing more good than harm, as, instead of sending down débris or sand, the machines are really impounding millions of cubic yards of the sand and keeping it from ever coming down the streams.

This is a conclusion which was to be expected by those who are familiar with the existing conditions and who are unprejudiced observers. When the mayor of Sacramento called the anti-dredge convention a few months ago, he did so at the desire of a lot of disgruntled farmers and the Anti-Débris association, who imagined that the damage done by the spring floods was more due to the operations of the dredges than the floods. In fact several dredges were totally wrecked and others badly damaged by these same floods, and the freshet water carried down the rivers and on to adjacent lands much débris in the rivers which had come there by natural erosion and by operations both by farmers and miners in turning over the soil at former periods. These experiences were not at all new ones and had been felt long before dredges were invented or set at work in this State, but opportunity was taken by dredge-mining enemies to make it appear that the dredge-mining industry was ruining lands and doing untold damage to the rivers.

A feature of the convention referred to was that no dredge miners were invited to take part in the discussion, but ex-parte statements were accepted without question and without proof. No mining engineers or other engineers were expected to speak, and what was really an engineering proposition was discussed by men without any knowledge whatever of engineering. The mouse brought forth from the labors of the mountain was in the shape of a committee to confer with the dredge men and with the California Debris commission. The latter declined to interfere, alleging that their duties were confined by law to matters connected with hydraulic mining only, and they had no jurisdiction over dredge mining, a fact which might have been appreciated before they were consulted. On conference with the dredgers themselves, the committee was taken to the dredge fields and shown the actual and practical conditions, and though prejudiced in advance against the industry, they were compelled by what they personally saw, to bring in the report referred to. The dredging industry is a prosperous and growing one, producing much wealth annually and bringing prosperity to the communities where it is carried on. It is, therefore, "fair game" to disgruntled men and those who do not wish to see others prosper. Lands worth nothing even for taxation have been made productive in gold, and extensive industries employing numbers of men have been established.

The Hydraulic Mining Cartridge

The most serious problem confronting coal-mine operators is the prevention of mine explosions. The elimination of all unnecessary dangers underground is the goal toward which modern coal-mining practice is striving. Mining explosives have been much improved in recent years, but they still possess great potential dangers, and accidents are constantly occurring during the firing of shots. More attention is now being paid to the possibilities of mechanical means for getting down the coal. Among several appliances that have been introduced for this purpose is the hydraulic mining cartridge.

The hydraulic cartridge consists of a cylinder of steel made in various sizes and strengths, but usually 20 in. long by 3 in. in diameter, and having eight duplex rams fitted radially along it. By a suitable arrangement of passages a communication is made between each of these rams, whereby simultaneous action can be obtained. By an ingenious contrivance a greater traverse is obtained by these rams than the diameter of the cylinder would appear to allow. This traverse is essential for the complete forcing down of the coal, and the duplex arrangement is a specialty of the present cartridge. Thin liners are used to prevent the rams from cutting into the coal.

The Pump

The cartridge is operated by a new and improved form of pump, now for the first time being put upon the market. Though small, it is extremely powerful, being capable of exerting a pressure of 7 or 8 tons to the square inch. It is of special design and is attached direct to the rigid pipe, with which it is connected to the cartridge. No stand is required so that the appliance can be used either for breaking down or lifting up the coal without special connection, and can be operated in holes drilled at any angle. The pump is fitted with a water tank, about 1½ pints being required for the operation, but most of this returns to the tank and can be used again. A pressure of three tons per square inch is usually required in seams up to 4 ft. thick and this gives a total pressure of 60, 110 and 150 tons respectively on the three sizes of cartridges made.

Preparing the Shot

After the coal has been undercut either by hand or coal-cutter, a hole 3¼ in. in diameter is drilled into the coal slightly less deep than the depth of undercut. This is done by means of an ordinary machine and a special drill. The hole is put in parallel with the roof, and as near as possible along the parting to which the coal ordinarily comes off, or just below it. It is then cleared out. The cartridge with one or more liners, and having the pipe and pump attached, is pushed to the back of the hole. The water tank is filled and hung on the pipe, the rubber suction pipe coupled and the taps turned. The coal sprags are all left in tight.

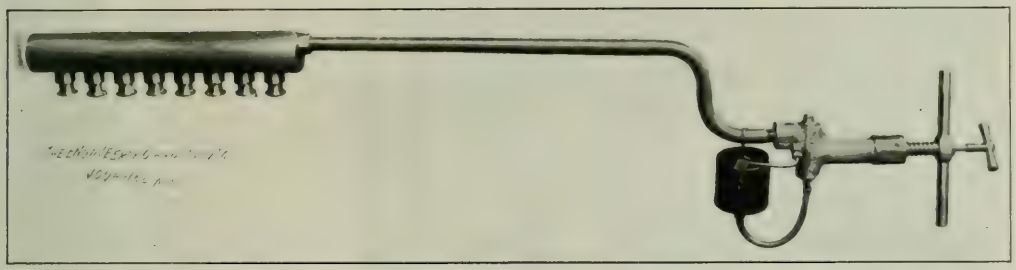
The small handle is first actuated slowly until pressure is reached, when the screw handle is turned. The pressure being fully on the power of the apparatus is soon apparent, for the coal is heard to be rumbling and cracking. This is allowed to continue until the back portion of the coal is broken off, after which the sprags are slightly slackened. By a continuance of the pumping, the pressure is brought to bear at the front of the face, and continues to spread until the operation is completed. The sprags are then withdrawn. The whole process occupies about ten minutes. The machine can be used either for longwall or room-and-pillar work; also for lifting up the coal or bringing down roof.

Every coal seam has its particular characteristics, and only by actual tests can it be discovered just what size of cartridge and what mode of application will be best adapted for the work at hand. Experience will teach as to whether the nature of coal requires a rapid application of pressure, or whether a slower application will be more effective. Actual use also, will show whether it is wise or not to continue the application of pressure while the coal is working on its own account. A careful manipulation of the sprags will always result in a greater proportion of coal being forced down.

The amount of coal brought down per thrust varies with the thickness of seam and the depth of the undercut. Usually on a longwall face, holes are placed 6 ft. apart, and if the seam is 3 ft. thick and the depth of undercut is from 4 to 5 ft. three tons per thrust would be brought down. The usual number of thrusts averages about 25 per day, giving a total tonnage of about 75 tons per machine per day. In several English mines each machine averages about 90 tons per day.

Cost of Repairs

At one European colliery where 10 machines were used and four standby cartridges were kept ready, 38,263 thrusts were performed in 12 months. The books of this company show that the total cartridge cost of renewals and repairs, aside from capital outlay amounted to $625. This cost was equal to 0.28c. per ton of coal obtained by the cartridge.



THE COMPLETE HYDRAULIC MINING CARTRIDGE. PRESSURE IS ON, AND THE DUPLEX RAMS ARE SHOWN AFTER HAVING COMPLETED THEIR TRAVERSE

The texture of the coal and the character of the roof and floor parting have much to do with the satisfactory use of the machine. If the coal has a strong tendency to adhere to the floor or roof the cartridge would not be likely to force the coal away. The presence of balls of iron pyrites or other foreign substances in the coal seam would not interfere with the efficient operation of the cartridge, but would affect the drilling of the holes. A hard seam is more preferable than a soft one, especially if the roof is strong and good. If the mine is developed with narrow rooms and the coal is strong and more than 5 ft. thick, a large size of machine is necessary.

Aside from the question of safety in the operation of mines, the use of the cartridge where conditions are favorable is accompanied by a considerable saving. The saving that results from the elimination of all powder charges is partly offset by the small additional cost incurred in drilling a larger hole than is necessary, when explosives are used. The real and important saving resulting from the use of the cartridge comes from the higher

percentage and better quality of the lump coal produced.

In European mines where the cartridge has been introduced, the percentage of round coal has increased from 10 to 20 per cent. At one mine, where 15 machines are employed, the saving per machine was $14.75 per day. This saving resulted from the production of 11 per cent. more round coal than was previously produced with explosives. The Hydraulic Mining Cartridge Company has examples of this machine at 42 Broadway, New York.

Illinois Coal Production in 1909

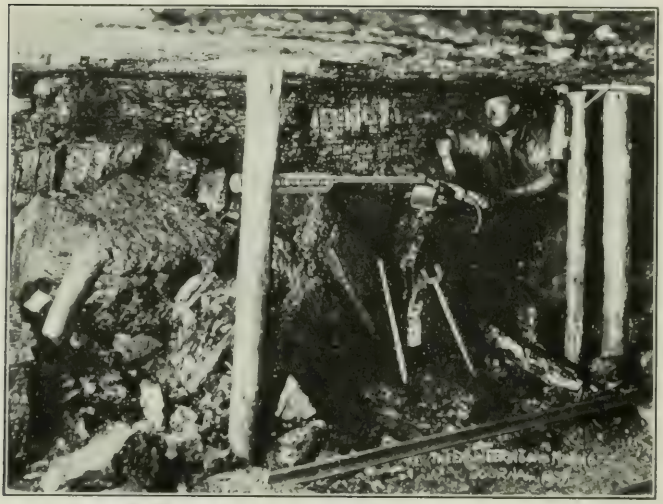
David Ross, secretary of the State Bureau of Labor, has received from the 10 district mine inspectors of Illinois, reports of the production of coal for the year ended June 30, 1909. The total output for the year was 48,025,885 tons, a decrease of 640,567 tons or 1.3 per cent compared with the tonnage of 1908. From a production standpoint the recent business depression throughout the country did not affect this industry in Illinois as seriously as many supposed it had. Allowing for the increase of normal years, the loss in tonnage is comparatively slight.

The 8th district, comprising the coal counties of St. Clair and Madison, reports a loss of 1,211,888 tons; the 6th (the central district) 152,132 tons, the 5th, (the eastern district) 78,255 tons, while the 2d and 3d districts in the northern field show losses of 87,000 and 90,000 tons respectively.

These losses were almost balanced by an increase of 3,278 tons in the 1st district, 11,000 tons in the 4th district, 885,618 in the 7th; 836,047 in the 9th and 430,093 in the 10th. With the exception of the 8th district, the most notable increases are in the counties lying south of Springfield, each producing from 6,500,000 to nearly 9,000,000 tons.

Fatal Accidents

The number of fatalities was 213 compared with 183 in 1908, an increase of 16.4 per cent., making the highest rate ever reached in this respect during any one year's operations. This regrettable increase comes from the 9th district reporting 78 fatal accidents as against 33 last year. Franklin county, made notorious by the Leiter explosions at Zeigler, is in this district and the repeated explosions at this mine being attended with heavy loss of life, were responsible for the increased casualties this year.



GENERAL VIEW AT FACE AFTER COAL HAS BEEN BROUGHT DOWN AND THE HYDRAULIC CARTRIDGE IS BEING WITHDRAWN

Colliery Notes

Cement was recently used in connection with the foundation of a set of coke ovens, and notwithstanding the high temperature, it remained as hard as flint.

Common mortar should never be used in damp situations, as it absorbs moisture freely, and does not harden, but remains rotten, and in course of time drops from the walls.

Investigation at a European colliery showed that where an electrical hoisting plant was installed, there resulted a saving of 22 per cent. in the steam consumption, as compared with the steam winding plant that was formerly used.

Cement and lime should not be mixed together, as the rate of setting in the two ingredients is not equal in point of time, and the molecules of the stronger, pull the weaker ones asunder, both being affected to their disadvantage.

Hydraulic lime mortar is reported to have been used by Vitruvius about the year 80 B.C., but we have no evidence to show how far it was successful in setting under water, nor have we any evidence that he understood the chemistry of lime. The properties of lime for setting under water remained unknown until the middle of the eighteenth century, when Smeaton first gave an impetus to its use.

At all American coal mines, where a suitable and sufficient electric supply exists, and where there is provision to prevent entire stoppage in case of failure in the power supply, hoisting by electricity is worthy the most careful consideration of all mine managers. At one German mine where electrical hoisting is in use, 3200 tons of coal are raised per day of 16 hours winding, with an average of 40 hoists per hour.

Longwall mining machines are now working in Scottish coal mines on an inclination of 27 deg., cutting uphill and downhill 130 yd. per shift regularly. At one of the mines on the Continent, a mining machine is operating in a bed inclined 38 deg. European mine managers claim that coal-cutting machines can be used on inclinations steeper than 38 deg. In America, mining machines are seldom used on even a 10 per cent. inclination.

In planning a system of underground haulage, it is impossible to fix any definite gradient upon which the haulage will self-act, or run back by gravity; this question depends largely upon the condition of the road and the size and manner in which the rails are laid. The style and size of the car wheel is also an influencing factor. When the cars are heavy and the wheels large, a trip of cars will run back on a gradient of less than 1 in 30. Such a light grade, however, is rather exceptional and it may be generally considered, where average conditions exist, that a gradient exceeding 2 or 3 in to the yard is about correct to apply in a main-rope haulage system.

The practice of mixing mortar varies considerably, but engineers who have studied the action of the hydrates know that rich limes require to be exposed to the air before being used, so as to enable them to take up the carbonic-acid gas present in the air and water, and in order that they may get rid of the unslaked particles and gain strength. When thoroughly cooled, both lime and cement lose the power to swell and lift masonry; but the exposure may be too long, in which case it weakens the material. Cement swells in consequence of too much silica being mixed with the alumina to form the compound; the trouble then rests with the burner, and not with the engineer or the architect.

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Mining to Keep the Mill Running

Our London correspondent in an article on Rand costs in this issue calls attention to an abuse that has crept into the methods of that district, this being the crushing of easily obtainable but unpayable rock in order to increase tonnage and inversely reduce the working cost per ton. This is a consequence of the recent mania to attain the minimum level of operating expense, which, of course, is highly praiseworthy *per se*, but rank nonsense if achieved at the expense of profit. This may seem paradoxical but it is not so. It has been shown repeatedly in discussions in the JOURNAL, and it is well known to mining engineers, that a reduction in the cost of mining is not necessarily commendable; and that an increase in the cost may be attended by a greater ratio of increase in the profit. This follows from the principle that the purpose of mining is to get ore, not barren rock.

The fallacy that is now engaging attention on the Rand is by no means confined to that district. There is more than one mine in the United States where the managerial mind is concentrated upon improving the record of cost per ton mined that would pay larger dividends if the same thought were directed to increasing the grade of the ore hoisted. The quarrying of rock can be done very cheaply, but the company that is mining for copper, lead, zinc, etc., is not doing so for the amusement of seeing the wheels of the mill go around.

If a large percentage of waste has to be supplied by an over-milled property to keep the mill going at full capacity it would obviously be cheaper to dig it by steam shovel from some convenient ledge than to obtain it from underground at a cost of $1@2 per ton. However, this expedient would appear like a *reductio ad absurdum* even to a low-cost maniac. One of the oldest, most successful and most reputable of the Lake Superior copper-mining companies abandoned a few years ago its practice of reporting the cost of mining per ton of ore. This was done because the publication of the figures inspired rivalry among the captains of the several mines of the company, each anxious to show the minimum cost, but the management figured that the leaders in that particular did not make the cheapest copper and that it was preferable to concentrate attention upon the latter point.

In the mining of most orebodies—even in the mining of coal—there are lean or barren streaks that must be taken in order to get the ore on either side. It sometimes happens that the outer streak of an orebody is rich and the inclosing rock must be cut into adequately to insure getting all of that rich streak. It is a common occurrence that in stoping a streak of ore at least twice its width of barren rock must be broken in order to make an opening large enough for the miners to work efficiently. But with allowances for such conditions, which, of course, constitute a large part of the art of good mining, it may be laid down as a principle that the less worthless rock be broken the better it will be for the balance sheet. The primitive miners generally had this principle well in mind, and so have the tributers of our own time.

The Journal as an Information Bureau

We received recently the following letter from an appreciative correspondent at Bisbee, Arizona:

"I beg to acknowledge your letter of the 5th inst., communicating to me most courteously and fully the information requested, and at the same time returning my check for $5 to pay for the same. I suggest that the JOURNAL establish an information bureau for the benefit of persons like myself who want immediate answers to inquiries for information, for which they would gladly pay a modest sum. I think that many of us, like myself, feel a delicacy about obtaining the benefit of the labor of someone else without giving something in return."

So appreciative a letter is naturally gratifying to us. We do not see our way clear, however, to inaugurate an information bureau of any different scope from that which we are conducting. We fear that our readers do not always realize the scope of the JOURNAL. The JOURNAL is itself the biggest and broadest information bureau that exists in the mining industry, and the reader who goes carefully over its weekly presentation of news, technical and commercial, and general information will not need to ask many special questions.

Our guiding principle is to tell our readers of the things about which they need to know. If any of our readers asks a ques-

tion that gives us the idea that here is something about which we ought to tell, but have previously neglected to do so, we feel like sending that correspondent a check instead of accepting one from him (except, of course, for his subscription), and are glad to spend as much in investigating the subject as in our opinion the subject is worth.

We receive many inquiries that are of interest only to him who makes them, and are neither of such importance nor originality as to lead to investigation, with a view to bringing out something of general interest, or even to be worth while answering through the columns of the paper. We are always glad to reply immediately to such inquiries by mail or telegraph when we are able to do so readily, or even if we have to take a little trouble, such as looking up some reference, making an inquiry by telephone, etc. This is a part of the mutuality that we conceive to exist between us and our subscribers. (We hope that all of these inquiries are from subscribers.) We do not want to start any coupon system, or ask anything extra for such friendly assistance, and do not intend to do so. We hope that our friends and subscribers will continue to ask us questions just as they always have been doing.

However, there are some inquiries at which we draw the line. First, there is the unreasonable inquiry from the man who wants too much. Not long ago we received a letter that in effect was as follows: "I see that you are willing to reply to questions in the JOURNAL. Will you please answer the subjoined:" Then followed four closely typewritten pages of questions of a highly special and professional character. We estimated that if an editorial assistant were detailed to this special matter, he might, with proper guidance from a superior, be able to answer these questions after about two months of investigation and study. Consequently, we had to ask this correspondent to excuse us. We object also to answering questions that should properly be addressed to an engineer in his professional capacity. We are annoyed to be asked to look up matters that our correspondents could just as easily do for themselves. We feel vexed to be asked to answer some question inspired by a certain article when the question was answered in the article itself as would have appeared if the inquirer had read the whole article. Finally, we are apt to lose our patience when we are asked to reply to the same inquiry that has previously been answered repeatedly in the columns of the paper.

But to the reader who is neither unreasonable, nor lazy, nor careless, to whom we can be helpful, we say that we are glad to lend a hand, and there need be no hesitation about asking us or accepting such assistance as we can give. If there be any feeling of delicacy, it certainly need not be entertained by anyone who is a subscriber to the paper.

The Lehigh Coal and Navigation Company

The ownership of anthracite coal lands has become so centralized and generally fixed that any important changes seem unlikely. The remaining independent companies, with one exception, are not only comparatively small in their operations, but are so widely scattered that any attempt to consolidate them would be exceedingly difficult. The only large block of anthracite coal remaining in the hands of a single company outside of the large transportation lines is that of the Lehigh Coal and Navigation Company in the Lehigh region. This company has been highly prosperous and has expended a large sum in drainage and other improvements which will enable it to increase its shipments whenever that may seem desirable.

Some three years ago holders of a majority of the stock in this company placed their stock in trust, with a view to selling the control should it seem advantageous. The stock at that time was bid for by several parties, but all the negotiations fell through, although the pool was continued and still exists. Recently the stocks of this company have been very active indeed in Philadelphia, and large blocks have been bought in, including stock represented by the pool or trust certificates. Naturally this movement has caused a good deal of comment and various rumors have been current regarding the buyers, though none of them seem to be based on really reliable information. The favorite report is that the control in the company is wanted by the New York, New Haven & Hartford Railroad Company, which was one of the bidders for the property three years ago, and which already controls the New York, Ontario & Western railroad and its mines.

Whether this report is true is a matter of considerable doubt. The Ontario & Western road is closely connected with the New Haven's Poughkeepsie Bridge line, by which its coal can be directly delivered throughout western New England. To make the connection with the Lehigh Navigation lines some 30 or 35 miles of railroad would have to be built, which, however, would not be a very difficult undertaking. The Lehigh Coal and Navigation Company, moreover, is to some extent hampered by a contract to deliver a large part of the coal which it produces to the New Jersey Central railroad which leases its Lehigh & Susquehanna line. It is doubtful whether the Jersey Central would be willing to give up this contract, which brings it a large tonnage yearly, much of which it would lose in case the coal went directly to New England.

It is altogether possible that the New Haven company is not the purchaser in the present case, and the control of the Lehigh company may be sought for speculative purposes entirely. Beyond question it is a valuable investment, even at the present high prices which are more than double the par value of the stock.

It is to be hoped that the President will adhere to his announced determination to see that the appointments of supervisors for the coming census shall be made without reference to political considerations. The taking of the census on the lines now laid down is a serious business matter, and requires considerable knowledge and some business ability on the part of those in charge. The statistics collected may be of great value to business men and manufacturers, if the work is properly done, and the information is arranged and given out by persons having some familiarity with statistics. If this intention is carried out, the figures collected and presented will be of very much greater value than those of some former censuses.

If the cyanide process be found generally applicable to the extraction of the silver of the Cobalt ore it will be a great boon to that district. We understand that some experimental work in this direction has been promising.

Views, Suggestions and Experiences of Readers

Comments on Questions Arising in Technical Practice and Debatable Points Suggested by Articles in the Journal

CORRESPONDENCE AND DISCUSSION

The Clinton Iron Ore in the Chattanooga Region

The following correspondence is self-explanatory. We need add only that upon receipt from Mr. Jones of copy of the letter that he addressed to Doctor Smith of the U. S. Geological Survey, we asked the latter for his side of the controversy, so that both might be presented at the same time. We have excised from the letters of both Mr. Jones and Mr. Burchard some personal matters that were not pertinent to the main subject.

The Director, U. S. Geological Survey, Washington, D. C.

Dear Sir: I have recently read Bulletin 380-E, and especially the article therein entitled, "Clinton Iron Ore in Chattanooga Region," by E. F. Burchard. Mr. Burchard's work is usually of such a character that myself and a few others to whom I have spoken, and who are acquainted with the principal deposits of Clinton iron ore in Chattanooga region, are amazed at the statements which he makes.

In that part of the article under the caption "Pigeon Mountain" he says for instance, "The three beds of ore occur just below the middle of the Clinton (Rockwood) formation. They are about 25 ft. apart but only the lowest bed, which is 2½ ft. thick, can be considered of much importance." This statement is wholly incorrect, and Mr. Burchard was shown exposures that amply proved to him that the middle seam is as well developed in the north end of Pigeon mountain and as thick as the lower seam; that each of them will average 3½ ft. of iron ore, exclusive of the partings contained in the seam. For sufficient proof of this, I refer you to "Fossil Iron Ores of Georgia," by Professor McCallie, State geologist for Georgia, and published in the latter part of 1906. Major Singleton, who was connected with the Georgia Iron and Steel Company for many years, reports over his signature during the past six months, 14 ft. of marketable ore in four seams of ore in the very place where Mr Burchard says there are 2.7 to ft. of ore parted by five or six seams of shale. I, personally, have been upon this property six or seven times, and I indorse fully the statement above as referred to, by Professor McCallie and Major Singleton.

Another statement made by Mr. Burchard is, "The iron content ranges from 25 to 32 per cent." This statement of his was supposed to include the ore at Estelle, as well as the ore west of Copeland station on the Central of Georgia Railway. This is also grossly incorrect, the proof being furnished by the furnace records of the Chattanooga Iron and Coal Company, the furnace of which is located here, and which used all the ore produced at Estelle. The average of the hard ore used in this furnace and mined at Estelle is 37 per cent. metallic iron, three years average.

I have a letter before me from the furnace chemist in which he says, "In reply to your recent letter, I would say he certainly is mistaken in regard to the analyses of the Estelle hard ore. I notice that the Roane Iron Company was given as authority of some analyses of Estelle ore. All I know is, I didn't give any such analyses. I know Mr. Burchard personally, and feel sure he was misinformed as to the analyses of this ore." He then gives me the analyses of the ore, and continues; "I am sure it never ran as low as 32, much less 28 per cent. as Mr. Burchard gives it in his pamphlet."

* * * * * *

Mr. Burchard indirectly, and the U. S. Geological Survey directly, is the cause of a great wrong being done to the Chattanooga district. The ore in the Chattanooga district is vastly better than is therein stated, and if Mr. Burchard had deliberately endeavored to do all in his power to injure the Chattanooga district with reference to the quantity and the quality of the Clinton iron ores found therein, he could not have done more than has been done by the Bulletin of which he is author.

E. M. Jones.

Chattanooga, Tenn., Aug. 11, 1909.

Mr. E. M. Jones, President, Cogar Creek Coal Company, Chattanooga, Tenn.

Dear Sir: The reply to your letter of August 11 has been delayed on account of both Mr. Burchard and myself being in the field. I take pleasure in forwarding herewith a copy of Mr. Burchard's reply. I am also sending a copy of his reply to the editor of the Engineering and Mining Journal, who requested it on account of receiving a copy of your letter containing the criticism of Mr. Burchard's report.

Before receiving Mr Burchard's reply I felt confident that he had not departed from the practice of the Survey geologists in examining and reporting on mining properties and districts. I believe that you will see that your criticisms are based upon misinterpretation of Mr Burchard's paper.

I should perhaps explain that the change in the title of the report by the chief geologist was in accord with a practice that I have urged of omitting the word "preliminary" from titles of reports except where more detailed work is already planned for. While I share Mr. Burchard's realization of the need of further work in the Chattanooga district, I would not feel justified in promising such work by the use of the word "preliminary."

Yours very respectfully,
Geo. Otis Smith,
Director.

Washington, Sept. 3, 1909.

Dr. George Otis Smith, Director U. S. Geological Survey, Washington, D. C.

Dear Sir: The letter of E. M. Jones, of Chattanooga, Tenn., with reference to estimates of Clinton iron ore in the Chattanooga district published by the survey in Bulletin 380-E, is received. Report on the same has been delayed until I could procure a copy of this paper.

Taking up Mr. Jones' criticisms in order, I find that he has misinterpreted the first statement that he quotes, viz., "Three beds of ore occur just below the middle of the Clinton (Rockwood) formation. They are about 25 ft. apart, but only the lowest bed, which is 2½ ft. thick can be considered of much importance." As is shown by the text immediately preceding and following, this statement refers particularly to the Estelle locality. The middle bed may be the thickest west of Copeland, and there is nothing in the text to indicate that it is not. In fact the average thickness given in the text, namely 27/10 ft., would indicate that this is the case. I have not my notes on that area with me, but it is my impression that it was the middle bed which appeared most promising near Copeland. This very fact lends weight to the probability that the iron-ore beds vary considerably from place to place, so that it would be unsafe to consider that the beds all continue uniformly from Estelle to the point west of Copeland. As to the measurement of the thickness of the main bed west of Copeland, I could not after careful study of my field notes, by any stretch of the imagination, make the workable ore in each of the two beds average 3½ ft. thick as Mr Jones states was proved to me. The estimate of 2.7 to ft. may be conservative, and Mr Jones is referred to the statement on page [illegible] of the paper to the effect that it is believed that the figures given are in the main conservative. No

exposures were shown to me that proved anything more than I have published. The field work was done in 1909, and there may have been development work done since then that has shown up more ore I sincerely hope so.

With reference to the iron content averaging from 25 to 32 per cent in the hard ore, and the analyses quoted, this was the best information I could get on the subject. In 1908 I made three visits to the office and furnace of the Chattanooga Iron and Coal Company, in Chattanooga, and asked for analyses of the ore from Estelle and vicinity. At first I was refused any analyses, and later was put off with promises, so I left with the manager addressed franked envelops and blanks to be filled out. No records were ever furnished me, however. In the autumn of 1908 when I was in Chattanooga, this furnace was shut down. Finally I secured the records as given, from the Roane Iron Company, and published them rather than leave a blank space for this locality. It is entirely possible that these may not be representative of the best ore in this locality, but if so it would appear to be the fault of the former Chattanooga Iron and Coal Company. In this connection it must be considered that the ore heretofore used from Estelle has been largely of the soft, or semi-hard variety, and doubtless such ores may have averaged 37 per cent. iron. It is significant that with the approaching exhaustion of these soft and semi-hard ores operations at the Estelle mines were temporarily discontinued.

* * * * * *

In general Mr. Jones assumes that this report has done a great wrong to the Chattanooga district. Doubtless it may disappoint the hopes of some who are accustomed to use extravagantly exaggerated figures in the hope of selling unprofitable holdings, or of attracting capital to a locality. For my part I think it makes the Chattanooga district compare very favorably with other districts of the South. The reserves of ore that will be available for future use are shown to be larger than those of the Birmingham district, judged by the same standards. Central location, water powers, railroads, and nearer markets all combine to favor Chattanooga, and the immediately available Clinton ore resources that have been shown by the reports are sufficient to last nearly 100 years, even though the present rate of production be increased.

Since publishing this paper I have expected just such criticisms from a number of sources, and have received several already. I suppose it is a penalty one has to pay for having nerve enough to attempt the delicate work of making estimates. Nevertheless, I am probably the strongest friend the Chattanooga district has at the Survey. I have never attempted estimates on preliminary geological work or that time, and stated that more detailed work by those better qualified may or may not [illegible] the estimates. The manuscript of the present report was entitled "A Preliminary Estimate of Tonnage, etc." When it had been revised by the chief geologist the title stood "Tonnage Estimates, etc." I still urge that further work be done in the Chattanooga district, so that the studies may be based on the same detail as those recently concluded in the Birmingham district. I have heard some suggestions of cooperation on the part of Chattanoogans, and if this could be adopted perhaps the interested parties would be more willing to abide by final results.

Very respectfully,
E. F. Burchard,
Assistant Geologist.

Beloit, Wis., Aug. 30, 1909.

The Director, U. S. Geological Survey, Washington, D. C.

Dear Sir:

* * * * * *

It is an error to leave out the word preliminary to any such examination as this one was. It explains something that needed explanation. . . I admit Mr. Burchard's first point in his letter, a copy of which you have inclosed to me; but, as to his other answers I wish to, if I may, offer some further information.

On the property west of Copeland referred to, Professor McCallie, who made his investigations about the time Mr. Burchard was on the property, in "Fossil Iron Ores of Georgia" printed in 1908, pp. 101 to 106, shows the upper of the two lowest beds to have an average ore content exclusive of partings of 42⅔ in.; the lower bed, 44⅔ inches.

In the same volume, pp. 99 to 100, you will find analyses of the Estelle hard and soft ores respectively as follows: Hard ores, metallic iron, 32.18, 37.85, 38.42; insoluble, 13, 12, 18; soft ores, metallic iron, 54.42, 53.83 per cent.

You will notice that I do not give myself as sole authority for any of the statements given, but only corroborate them; therefore, Mr. Burchard does not reflect on me in his statement, "Doubtless it may disappoint the hopes of some who are accustomed to use extravagantly exaggerated figures in the hope of selling unprofitable holdings . . ." Professor McCallie is very competent and others who corroborate him have standing in their profession.

With reference to Mr. Burchard's statement about the iron content, in which he says he failed to get the analyses from the Chattanooga furnace and says that he got them from the Roane Iron Company: The chemist of the Roane Iron Company wrote me under date of August 2: "and also noticed that the Roane Iron Company was given as authority for some analyses of Estelle ore. All I know is I didn't give out such analyses." Since Mr. Burchard failed to get any sort of information that could be relied upon about the iron content of the ore, he had no right to publish what he did. In my letter to you I stated: "The average of the hard ore used in this furnace (the Chattanooga furnace) and mined at Estelle is 37 per cent. metallic iron, three years average." Therefore, Mr. Burchard's remark "In this connection it must be considered that the ore heretofore used from Estelle has been largely of the soft, or semi-hard variety, and doubtless such ores may have averaged 37 per cent." is uncalled for. It is wrong to try to convey the impression that most of the ore mined at Estelle was of the soft variety, and of low iron content. They mined a great deal more hard than soft ore. The average analyses of the soft ore mined at Estelle and used in the Chattanooga furnaces was, metallic iron 49.45 per cent. and insoluble, 19.85. He is further in error when he states that the operation at Estelle was discontinued because of the "approaching exhaustion of these soft and semi-hard ores." He ought to know that the operations were discontinued because of the Southern Steel Company going into bankruptcy.

It is all well enough to say the report is "conservative," but it may be so conservative as to be damaging, and this point needs to be guarded against, especially by the U. S. Government.

I shall take up the matter of coöperation with you with the Chamber of Commerce, and, if I am successful, we shall try to get Mr. Burchard to return and go over the district with the desired care, but we hope that it will not take four years to print the results of that work, should it be done.

Yours truly,
E. M. Jones

Chattanooga, Tenn., Sept. 7, 1909.

Speed of Pelton Wheels

In an article on "Speed of Pelton Wheels," appearing in the Journal of Sept. 11, this appears: "To get the maximum efficiency from a Pelton wheel it should travel a third as fast as the water striking it."

Now in looking up this subject in my notebooks I find that by mathematical demonstration the speed of this type of wheel should be one-half the speed of the water. Reference to Bowies' "Practical Treatise on Hydraulic Mining," page 106, shows the same problem worked out with identical results.

Is the above quoted statement not erroneous? If not, I should like very much to be set right by a mathematical demonstration of the position inasmuch as this is an important point in water-wheel design.

New York, Sept. 13, 1909. Engineer.

[The quoted statement is incorrect. "Engineer" is right. Editor.]

The Carn Brea & Tincroft mines, Cornwall, during the past half year (Min. Journ., Aug. 21, 1909) stamped 21.2 tons of rock per ton of coal consumed.

Details of Practical Mining

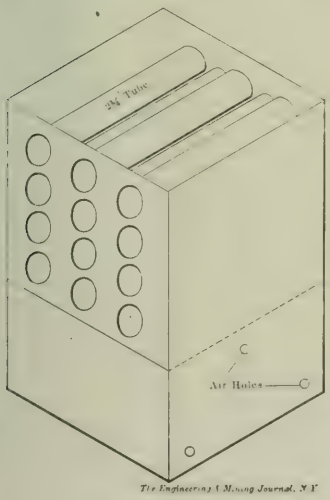
Notes of Interest to the Operators of Small Mines as Well as of Large Mines. The Things That Have to Be Done in Everyday Mining

REPORTS FROM EXPERIENCE

Readers of the JOURNAL are invited to contribute to this department. Articles should be brief, thoroughly practical, and preferably illustrated by drawings or sketches. Our draftsmen will prepare properly any kind of a pencil sketch that is intelligible. Something that is an old story in one district may be quite unknown in another. Articles accepted and published are suitably paid for.

Thawing Dynamite

The accompanying sketch shows a type of thawer used by the Oliver Mining Company, Hibbing, Mich., which has given excellent satisfaction. It is made of galvanized iron, about 10x10x16 in. high. Twelve 2¼-in. tubes are soldered in, giving the appearance of a tubular boiler. Six inches from the bottom is a water-

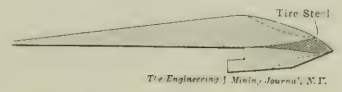


POWDER THAWER

tight partition, above which is water to cover the tubes. The ends of the tubes are open for the insertion of the sticks of dynamite. Two or three short pieces of candles placed below furnish heat for warming the water, unless hot water is available to start with. A metal cover is placed over the box. The candles are thoroughly inclosed beneath and obtain an ample supply of air through three ventilation holes on each side.

Steam Shovel Teeth

A new use for old locomotive-tire steel has been found in the Mesabi district, Minnesota. The wear and tear on shovel teeth is excessive, and many different kinds of steel have been experimented with in the hope of finding the most durable, and at the same time a steel that is not excessive in cost. The ordinary steel dulls easily in the heavy work required of the shovel, and it has been found that the best and most serviceable point is one made of old locomotive-tire steel. This steel is designed for rough usage and is both hard and tough. The tooth is made in three pieces, two of which are forged from ordinary steel billets. The tire steel is inserted between the other two, thus



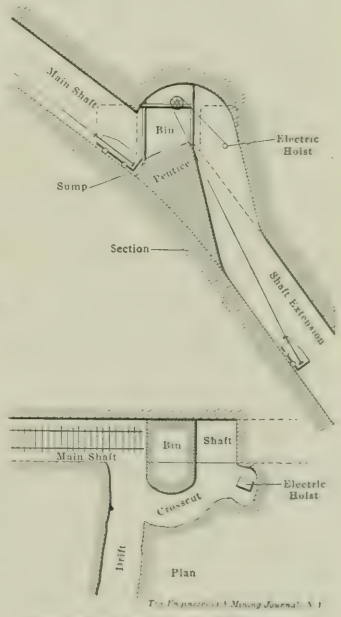
SECTION OF STEAM SHOVEL TOOTH

making a hard center. The outer steel being soft wears faster, and in this way leaves a thin cutting edge. Should the top or bottom become worn too much, it is then faced with tire steel, as indicated by the dotted lines in the accompanying sketch. On account of the different composition of the two steels, it is necessary to heat them in separate forges, as the tire steel does not seem to require as high a temperature for welding purposes as does the ordinary steel. A high-grade steel costs from 6 to 8c. per lb., while tire scrap may be purchased for $15 per ton. About 20 lb. of tire steel are used for each tooth, which means a saving of $1 to $1.25 per tooth. In addition to this it wears better and longer, and in this way gives an additional saving, as well as better satisfaction.

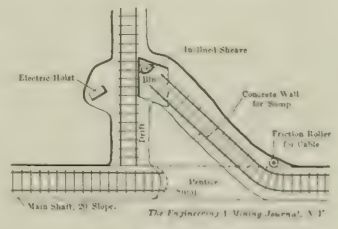
Shaft Sinking at Stella Mine, New York

The accompanying illustrations show the methods of shaft sinking as used by the St. Lawrence Pyrites Company, DeKalb Junction, N. Y. In each case it was desired to sink the shaft and at the same time continue hoisting ore. As there were no levels below the shaft sump, there was no opportunity for extending the shaft by means of a raise from lower levels. The Stella shaft is inclined at an angle of 18 deg.; the Anna at 45 degrees.

At the Anna shaft advantage was taken of an existing crosscut, and a stope in an upper branch to start the new section of the shaft, back of and above the sump.



DETAILS OF ANNA SHAFT EXTENSION



PLAN OF STELLA SHAFT

The hanging wall was taken out sufficiently to allow the construction of a small ore bin, as shown in an accompanying drawing, and at the same time provide space for the sheave. An electric hoist was installed in the crosscut a little to one side of the shaft. The ore bin is constructed just above the

incline shaft so that the ore can be dumped directly into the skip and taken to the surface. A small self-dumping skip is used in the shaft extension and all the material from the shaft is dumped into the ore bin.

The method employed at the Stella shaft is to drift out about 20 or 25 ft. from one side of the main shaft and then sink on the incline at such an angle as to meet the line of the permanent shaft at a distance of 30 to 35 ft. below the working level. One reason for not cutting out the hanging-wall, as was done at the Anna, was that the roof was barren. In the Stella, all of the work was done in the main orebody. When the line of the main shaft was reached, this auxiliary shaft was then deflected so as to be a continuation of the desired shaft. The ore from the auxiliary shaft is dumped into the bin and transferred by car to the main shaft.

Another advantage of sinking the shafts by these methods is that the sump was maintained in perfect condition and the pumps were able to take care of all of the water so that the work below was comparatively dry. The auxiliary shaft at the Stella is to be walled in with concrete at its junction with the main shaft and will then be used as a sump to catch all of the water from the upper levels.

Driving Inclined Raises with Stoping Drills

By Arthur O. Christensen*

In driving raises to connect levels for ventilation, or to prospect veins or the country above tunnels, it is customary to drive as small a raise as is possible to work in, to drive it perpendicular, and to timber it with pairs of stulls 3½ or 4 ft. apart. In the case of such work I have found two styles of raise easier, cheaper and safer to drive than the type mentioned.

The first is a type of inclined raise which is described below. The second is a type of vertical raise which will be described in a later issue.

The Inclined Raise

The inclined raise may be run at any desired angle in the vein, or may cut through the country rock. The advantages of it are that it requires no timber; it advances horizontally as well as perpendicularly; for short distances it prospects ground more cheaply, and is more rapidly driven than a drift or vertical raise. No machine is required and a "buzzer" chammer stoping drills can be used. By making the raise incline about 40 deg. the mock runs down into the chute at the bottom of itself. Occasionally it is necessary to scrape down some of the dirt which pulls on the bottom.

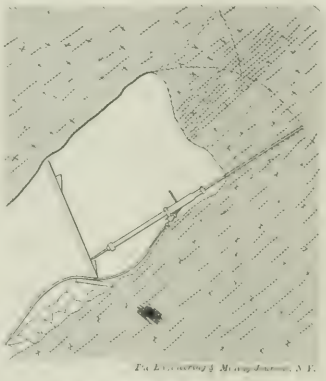
*Mining engineer, Dorchester P. O., Colo.

For raises steeper than 40 deg. it is well to put a light stull or piece of lagging across the bottom of the raise every 4 or 5 ft., and not over a foot above the bottom. Dirt fills in behind these and they form steps making it easier to climb up, and aiding in rigging up a brace for the machine at the breast. These steps also serve to catch steel and tools which are accidentally dropped by the miner.

Setting up the Machine

The materials required to make a set-up are a few pieces of plank of varying lengths, wedges and spikes. With these it is always possible to brace the machine for any hole, although frequently moiling has to be done to get a suitable hitch for the plank on the roof. The accompanying illustration gives an idea of the raise, how to rig up a plank to brace the machine against, and a satisfactory round of holes.

By frequent use of the scraper, or by using hollow steel, flat or even down



The Engineering & Mining Journal, N. Y.

MACHINE SET UP IN INCLINED RAISE

holes can be driven, although such holes are seldom needed in driving a raise.

Rate and Method of Advancing

To clean the face, set up at the breast and be ready to drill, need not take over an hour, and if the tools do not have to be carried far it is often possible to get started in half that time. To put in the round of about 8 holes, averaging 3 ft. deep, takes about 1½ or 2 hours. In good ground with no mishaps 3 ft. holes with a small sized Waugh require, on the average, only 10 min. each. The largest size drills, using larger steel, drive 4-ft. holes in the same time. If a nipper brings the powder to the miner it is possible for him to shoot twice, thus making 4 ft. a shift. Otherwise 2½ ft. is as much as can be expected for a daily average.

After advancing 30 or 40 ft. it is well to cut a station or pocket in the side of the raise in which to keep the machine tools, etc. To cut this pocket usually requires two rounds. Sometimes pockets are run 10 or 20 ft. in the form of inclined drifts from the raise with the purpose of prospecting the walls. Such drifts serve as very convenient stations in which to store planks, etc.

It is often well to timber the pocket to protect the tools kept in it, and to keep them from rolling out or getting buried. Where it is not attempted to shoot twice a shift all this is easily done after the regular round is put in. During two consecutive days rounds are shot out of the side, and on the third day the pocket thus formed is timbered. The timbering required is simple, and takes a man only a couple of hours to place.

By putting in a pocket every 30 or 40 ft. an inclined raise of this character can be carried up as far as 200 ft., although to climb up such a distance becomes difficult, and it requires time to keep the dirt from piling up on the bottom and filling the raise.

The vertical distance made by such a raise is only 60 or 70 per cent. of the total distance covered, yet, by being able to shoot two rounds in the breast each shift, except on those days when cutting or timbering a pocket, it is possible to get up faster than with a vertical raise. Then, too, ground is being prospected horizontally to the extent of 70 or 80 per cent. of the length of the raise. For these reasons, for prospecting a vein above a tunnel for short distances, this form of raise seems cheapest and most speedy.

Wrinkles for Ventilating Mine Workings

The schemes for aiding the ventilation of a tunnel or shaft in out-of-the-way places are, to say the least, interesting, and often effective. In a shaft the prospector often builds a fire at one end on the bottom. This is especially efficient in a two-compartment shaft when the timbers are close down. A little sheet-iron stove with a long chimney to the surface is an "improvement" over the open fire. Sails are sometimes rigged to deflect the wind down a sheet-iron pipe to the shaft bottom.

Ventilation at tunnel faces is helped by a simple sheet-iron pipe fitted with an elbow at the portal and having a vertical length of pipe set in the elbow. A small stove may be inserted at the elbow, which draws air from the drive and uses the vertical pipe as a smoke stack. Small wooden fans are fitted with footpower attachments like that used on grindstones.

Drunkenness in the underground employees of a mine is best detected when the men leave the dry or change house, preparatory to going into the mine. The high temperature of the change house is a severe test on a man who is carrying a "load" and trying to hide it.

Patents Relating To Mining and Metallurgy

A Selected and Classified List of New Inventions Described during the Past Month in the Publications of the Patent Offices

UNITED STATES AND BRITISH PATENTS

A copy of the specifications of any of these patents issued by the United States Patent Office will be mailed by THE ENGINEERING AND MINING JOURNAL upon the receipt of 25 cents. British patents are supplied at 40 cents. In ordering specifications, correspondents are requested to give the number, name of inventor and date of issue.

ALUMINUM

SOLDER for Aluminum. Zoltan Tamassy, Cleveland, Ohio, assignor of one-third to Zoltan B. Csiky and one-third to Etel Ots, Cleveland, Ohio. (U. S. No. 931,523; Aug. 17, 1909.)

SOLDERING—Process for Soldering Aluminum. Fritz Stalder, Ernst S. Scholl and Gottfried Dubach, Pieterlen by Biel, Switzerland. (Brit. No. 23,779 of 1908.)

COAL AND COKE

COAL CUTTING—Improvements in and Relating to Coal-Cutting Machines. A. Anderson and Anderson Boyes & Co., Ltd., Motherwell, Scotland. (Brit. No. 23,140 of 1908.)

COAL-HANDLING APPARATUS. George W. Freeland, Moline, Ill., assignor to Williams, White & Company, a Corporation of Illinois. (U. S. No. 928,595; July 20, 1909.)

COKE—Apparatus for Conveying Coke from Coke-Ovens. Erskine Ramsay, Birmingham, Ala. (U. S. No. 933,666; Sept. 7, 1909.)

COKE-LOADER. Charles H. Wright and Will K. Monroe, Cleveland, Ohio, assignors to the Brown Hoisting Machinery Company, Cleveland, Ohio. (U. S. No. 931,110; August 17, 1909.)

COKE OVENS—Improvements in or Relating to Horizontal Regenerative Coke Ovens. Harold W. Seymour, Leeds, England. (Brit. No. 21,249 of 1908.)

GASES—Apparatus for Removing Gases and Foul Air from Mines. Joseph C. Stirling, Bakerstown, Penn. (U. S. 932,916; August 31, 1909.)

PEAT-WORKING MACHINE. George Matthews, Riga, Mich. (U. S. No. 932,041; Aug. 24, 1909.)

COPPER

LEACHING—Process of Leaching Copper Ores. Georg C. Schneider, Freiberg, Germany, assignor to Eugen Abresch, Neustadt a. d. Haardt, Germany. (U. S. No. 932,643; Aug. 31, 1909.)

PYRITIC SMELTING FURNACE. Story B. Ladd, Washington, D. C. (U. S. No. 931,775; Aug. 24, 1909.)

GOLD AND SILVER

FILTER. Edwin Burt, El Oro, Mexico. (U. S. No. 931,267; Aug. 17, 1909.)

PLACER MINING—Portable Placer-Mining Apparatus. James M. Low, Los Angeles, Cal. (U. S. No. 932,037; Aug. 24, 1909.)

IRON AND STEEL

BLAST-FURNACE DUST—Manufacture of Agglomerated Bodies from Blast-Furnace Dust. Wilhelm Schumacher, Osnabrück, Germany. (U. S. No. 933,269; Sept. 7, 1909.)

BLAST-FURNACE DUST—Manufacture of Coherent Bodies from Blast-Furnace Dust. Wilhelm Schumacher, Osnabrück, Germany. (U. S. No. 933,270; Sept. 7, 1909.)

COATING WITH COPPER—Improvements in or Relating to the Coating of Iron or Steel with Copper, Copper Alloys, or Other Metal, such as Silver or Gold, which will Readily Alloy with Copper. William G. Clark, Gee Long, Victoria, Australia. (Brit. No. 16,820 of 1908.)

CORROSION—Improvements in or Relating to the Treatment of Iron or Steel for Preventing Oxidation or Rusting. Coslett Anti-Rust Syndicate, Ltd., and Thomas W. Coslett, Birmingham, Eng. (Brit. No. 15,628 of 1908.)

PIPING IN INGOTS—Apparatus for Reducing Pipes in Ingots. George L. Norris, Burnham, Penn., assignor to the Standard Steel Works, Burnham, Penn., a Corporation of Pennsylvania. (U. S. No. 931,792; Aug. 24, 1909.)

REFINING—Method of Refining Iron. Paul Sejournet, Paris, France, assignor to Société Electro Metallurgique Francaise, Froges, France. (U. S. No. 928,551; July 20, 1909.)

TREATMENT OF STEEL—Process for the Treatment of Steels for Industrial Purposes. Eugène Schneider, Le Creusot, France. (U. S. No. 931,499; Aug. 17, 1909.)

LEAD

RED LEAD—Improvements in and Apparatus for the Manufacture of Red Lead (Oxide of Lead). George V. Barton, Old Quay, Runcorn. (Brit. No. 13,458 of 1908.)

MAGNESIUM

ELECTROLYTIC PRODUCTION of Magnesium. George O. Seward and Franz von Kügelgen, Holcombs Rock, Va., assignors to Virginia Laboratory Company, New York, N. Y., a Corporation of New York. (U. S. No. 931,092; Aug. 17, 1909.)

PETROLEUM

WELL-DRILLING APPARATUS. Henry B. Walker, Mount Vernon, Ohio, assignor to Oil Well Supply Company, Pittsburg, Penn., a Corporation of Pennsylvania. (U. S. No. 931,101; Aug. 17, 1909.)

TIN

DETINNING—Improvements in or Relating to Apparatus for Extracting Tin from Tin Plate Waste. Dr. Heinrich, Kempen-on-Rhine, Germany. (Brit. No. 16,895 of 1908.)

ZINC

ORE TREATMENT—Process of Treating Zinc-Lead Ores. Frederick T. Snyder, Oak Park, Ill., assignor, by mesne assignments, to Electric Metals Company, Chicago, Ill., a Corporation of West Virginia. (U. S. No. 933,133; Sept. 7, 1909.)

SULPHIDE OF ZINC—An Improved Process of Manufacturing Sulphide of Zinc. J. C. A. Meyer, Lyons, France. (Brit. No. 25,965 of 1908.)

MINING—GENERAL

MINE-DOOR. Charles W. Carman, Mount Hope, W. Va., assignor of one-half to William E. Deegans, Glen Jean, W. Va. (U. S. No. 931,035; Aug. 17, 1909.)

SHAFT SINKING—Improved Method of Shaft Sinking and Lining by Ferro Concrete Tubing. Robert Johnson, John W. Johnson and George Johnson, Newbiggin-by-the-Sea, Northumberland. (Brit. No. 18,412 of 1908.)

WITHDRAWING MINE PROPS. R. Higginbotham and O. Murphy, Rotherham, Yorkshire, Eng. (Brit. No. 6539 of 1908.)

ORE DRESSING—GENERAL

CENTRIFUGAL SCREEN. William R. Cunningham, Bucyrus, Ohio, assignors to the American Clay Machinery Co., Bucyrus, Ohio, a Corporation. (U. S. No. 931,280; Aug. 17, 1909.)

CHILEAN MILL. William B. Easton, Chicago, Ill. (U. S. No. 931,186; Aug. 17, 1909.)

MAGNETIC SEPARATION—Improvements in the Magnetic Separation of Ores and Other Materials and Apparatus Therefor. George Ullrich, Alzenau, Germany. (Brit. No. 14,082 of 1908.)

MAGNETIC SEPARATION—Process of Treating Ores by Magnetic Separation. Alfred A. Lockwood and Marcus R. A. Samuel, London, England. (U. S. No. 933,717; Sept. 7, 1909.)

ORE CONCENTRATOR BELT. Thaddeus R. Brooks and George E. Bateman, San Francisco, Cal. (U. S. No. 931,991; Aug. 24, 1909.)

ORE GRANULATOR or Pulverizer. John G. Kirksey, Quincy, Ill. (U. S. No. 931,316; Aug. 17, 1909.)

RECIPROCATING MECHANISM—An Improved Reciprocating Mechanism for Trough Conveyers, Screens, Gold Washers and Other Apparatus Requiring such a Motion. The Hardy Patent Pick Company, Ltd., Heeley; and George Smith, Sheffield, Eng. (Brit. No. 16,195 of 1908.)

SCREENS—Improvements in or Relating to Screens Employed for Screening, Grading Crushed or Broken Stone, or Ore or Like Material. Wm. H. Baxter, Leeds, Eng. (Brit. No. 10,824 of 1909.)

SEPARATION PROCESS—Process of Separating Suspended Matter from Liquids Containing Mineral Value. Prosper J. A. Malignen, Philadelphia, Penn. (U. S. No. 932,795; Aug. 31, 1909.)

SEPARATOR—Dry-Ore-Separating Machine. William W. Bonson and Willson L. McLaughlin, Dubuque, Iowa, assignors to Highspeed Dry Concentrating Company, Phœnix, Ariz., a Corporation of Arizona. (U. S. No. 933,053; Sept. 7, 1909.)

STAMP MILLING—Improvements in Apparatus for Removing Dies, Heads and the Like from Stamp Batteries for Crushing or Milling Ores. Frederick Thomas, London, Eng. (Brit. No. 3251 of 1909.)

METALLURGY—GENERAL

METALLURGIC PROCESS to Produce Metals or Steels of all Qualities. Louis H. Baradue-Muller, Paris, France. (U. S. No. 933,357; Sept. 7, 1909.)

ORE REDUCTION—Method of Reducing Ores. George F. Rendall, New York, N. Y., assignor to American Reduction Company, a Corporation of New Jersey. (U. S. No. 932,175; Aug. 24, 1909.)

PURIFYING GASES—Process of Purifying Gases Containing Sulphur Dioxide. Herman Hegeler, Danville, and Nicholas L. Heinz, La Salle, Ill. (U. S. No. 931,868; Aug. 24, 1909.)

SMELTER SMOKE—Method of Treating Corrosive Gaseous Fumes or Smoke. Clarence B. Sprague, Salt Lake City, Utah, assignor to United States Smelting, Refining and Mining Company, a Corporation of Maine. (U. S. No. 931,515; Aug. 17, 1909.)

MINING MACHINERY AND APPARATUS

DRILLING-MACHINE. Charles B. Richards, Cleveland, Ohio, assignor, by mesne assignments, to the Cleveland Rock Drill Company, Cleveland, Ohio, a Corporation of Ohio. (U. S. No. 932,060; Aug. 24, 1909.)

HOISTING—Improved Means for Arresting Accidental Descent of Mine Cage Lifts and the Like. D. S. Fleetwood, C. W. Flack and Seth Lax, Barnsley, Eng. (Brit. No. 20,287 of 1908.)

PROP for Mines. Friedrich Nellen, Essen-on-the Ruhr, Germany. (U. S. No. 931,466; Aug. 17, 1909.)

PUMPING—Improvements Relating to the Raising of Liquids from Bore Holes by Means of Air-Lift Apparatus. C. Isher & Co., Ltd., and Frederick Broadhurst, London, Eng. (Brit. No. 27,159 of 1908.)

METALLURGICAL MACHINERY AND APPARATUS

FURNACE FOR VOLATILE METALS. Woldemar Hommel, London, England, assignor to Metals Extraction Corporation, Ltd., London, England. (U. S. No. 932,279; Aug. 24, 1909.)

ORE REDUCING FURNACE. George F. Rendall, New York, N. Y., assignor to American Reduction Company, a Corporation of New Jersey. (U. S. No. 931,145; Aug. 17, 1909.)

RABBLE ARM. Charles H. Repath, Salt Lake City, Utah, assignor to Frank Kleperko, New York, N. Y. (U. S. No. 932,496; Aug. 31, 1909.)

SLAG Apparatus for Handling Slag. David T. Croxton, Cleveland, Ohio. (U. S. No. 932,765; Aug. 31, 1909.)

Personal

Mining and metallurgical engineers are invited to keep THE ENGINEERING AND MINING JOURNAL informed of their movements and appointments.

H. C. Hoover, of London, arrived in New York on Sept. 21.

George Beebe has returned to New York from Sonora, Mexico.

J. Parke Channing is expected home about the end of September.

Oscar Adams Turner has opened an office at 42 Broadway, New York.

B. B. Thayer, president of the Anaconda Mining Company, is in Butte, Montana.

J. R. Finlay has returned from a professional journey of six weeks in the West.

Charles F. Rand, president of the Spanish-American Iron Company, has sailed for Europe.

W. A. Thomas, president of the Thomas Steel Company, Niles, Ohio, has returned from Europe.

Juan F. Brandes, of Denver, Colo., has gone to Mexico City and Parral, Mexico, on professional business.

J. J. Culley, manager of the Accord Mining and Milling Company at Georgetown, Colo., is making a business trip to eastern points.

Robert Hawxhurst, Jr., has resigned the management of the Poderosa Mining Company, Ltd., of Chile, and is returning to London.

W. E. Corey, president of the United States Steel Corporation, who has been confined to his home as the result of an accident, has fully recovered.

B. W. Traylor, vice-president of the Traylor Engineering Company, is now making a trip through Arizona and Mexico in the interests of his company.

Leonard Peckitt, president of the Empire Steel and Iron Company, Catasauqua, Penn., has returned from a visit to his native place, Thirsk, in Yorkshire, England.

H. A. Simpson, of London, formerly mining engineer in South Africa and Australia, has been looking at mining property in the Cear Creek district in Colorado.

C. H. Mousant has succeeded Robert Hawxhurst, Jr., as general manager of the Poderosa Mining Company, at Mina Poderosa (Chilahuasi), Antofagasta, Chile.

Manly B. Baker has been appointed head of the Department of Geology of the Kingston Ont. School of Mining, to succeed R. W. Brock, now director of the Geological Survey of Canada.

E. S. Lewis, of Philadelphia, vice-president, and J. N. N. Shainer and S. B. Mitchell, [illegible] of the Dominion Finance [illegible] Company, Ltd., recently visited the mine near Port Arthur, Ontario.

H. A. Hillman, erecting engineer for the Traylor Engineering Company, recently left Allentown for Cobalt, Ont., where he will superintend the construction of a concentrating mill for the Silver Cliff Mining Company.

Franz Schmacks, manager of the Aktien Gesellschaft fuer Kohlendestillation Gelsenkirchen, of Duesseldorf, and Dr. J. A. Roelofsen, manager of the Coal Distillation Company, of Middlesbrough, England, have arrived in this country. They represent the Huessener & Collin by-product coke ovens.

Thomas B. Dennen has resigned as mine inspector for the Pocahontas Consolidated Collieries Company, to accept a position with the Big Vein Pocahontas Coal Company at West Pocahontas, Va. Mr. Dennen had his early training in the anthracite coal region, but has been in West Virginia for 19 years, for seven years past with the Pocahontas company. He has been specially successful in rescue work at the Lick Branch and other accidents.

President Taft has appointed the new Tariff Commission, which is to assist him in the execution of the tariff law. The board consists of three members, as follows: Prof. Henry C. Emery, of Yale University, chairman; James B. Reynolds, of Massachusetts, now assistant secretary of the treasury, and Alvin H. Sanders, of Chicago. With the announcement of the selection of this new board, authorized by the Payne tariff bill, this statement was given out: "The President and the Secretary of the Treasury have agreed upon the plan that these three gentlemen are to constitute the board and are to be given authority to employ such special experts as may be needed in the investigation of the foreign and domestic tariff." Professor Emery has always been regarded as a radical tariff reformer. He succeeded Arthur T. Hadley as professor of political economy when Doctor Hadley was made president of Yale University. He has written considerably on economics. Mr. Sanders is a supporter of reciprocity.

Obituary

A. V. Temple, industrial commissioner of the National Railways of Mexico, died at Mexico City, Sept. 10. He was long identified prominently with Mexican mining.

W. B. White died at Salt Lake City, Utah, Sept. 7, aged 65 years. For nearly 40 years past he had been engaged in mining in Nevada and Utah, and was interested in many enterprises. Recently he had been engaged in the development of the Clear Creek mines in Utah.

Harold Heathcote Harvey, mining engineer, died at his home in Oakland, Cal., Aug. 24. He was 32 years old, and was a graduate of the University of California in the class of 1900. He was a member of the American Institute of Mining Engineers. Much of his professional work was in Alaska, where he contracted typhoid fever in 1906, which later developed into tuberculosis. He leaves a widow, formerly Miss Edith Goodfellow, of Oakland.

James Henry Covode died recently at La Paz, Bolivia, aged 45 years. He was born in Pennsylvania and graduated from the Rensselaer Polytechnic Institute at Troy, N. Y. He was employed as a civil engineer on the survey of the Nicaragua canal route in 1884-86, and later on the Pennsylvania railroad. In 1897 he settled in San Francisco and devoted himself to mining engineering. At the time of his death he was exploring mining prospects in Bolivia for a New York syndicate.

J. J. Hagerman, for many years a prominent business man of Milwaukee, president and manager of the former Milwaukee Iron Company, now the Illinois Steel Company, principal stockholder of the Mollie Gibson mine in Colorado, and a railroad and irrigation promoter and builder, is dead at Milan, Italy, where he, with Mrs. Hagerman, was seeking to renew his health. Mr. Hagerman, who was 72 years of age, became ill in 1882 and went to Colorado Springs. While there he became largely interested in the development of the Mollie Gibson mine at Aspen, which later became famous as a dividend payer. Later he became extensively interested in mining enterprises at Cripple Creek. While living in Colorado Mr. Hagerman built the Colorado Midland Railroad, a narrow-gage line in the mountains. In 1895 he built the Texas Valley Railroad and financed and built the canal of the Pecos Irrigation Company. One of his sons is Gov. Herbert Hagerman of New Mexico.

Societies and Technical Schools

Scranton Mining Institute—The first meeting of this society at Scranton, Penn., for the season will be held Oct. 19. It is expected that Dr. Holmes, of the United States Geological Survey, will give an illustrated lecture at this meeting. The institute has now about 400 members on the roll.

American Peat Society—The third annual meeting was held in Boston, Sept. 23-25. Papers were presented by practical peat men describing the peat plants in operation, and the various experiments made in all parts of this country and Europe. Arrangements for the meeting were in charge of a local committee, of which Wilbur F. Goodrich was secretary.

Special Correspondence from Mining Centers

News of the Industry Reported by Special Representatives at San Francisco, Butte, Denver, Indianapolis, Salt Lake City, Goldfield and London

REVIEWS OF IMPORTANT EVENTS

San Francisco

Sept. 17.—The hearing of the petition of the Selby Smelting and Lead Company for a new trial has again been put over until the latter end of the month when the lawyers will submit their affidavits and arguments. The attorneys representing the company claim that the noxious fumes which are complained of by the farmers and the citizens of Benicia come from the oil refinery on the shore of San Pablo bay, an upper arm of San Francisco bay. Affidavits to prove this contention have been submitted to the court and will later be considered.

Suit has been filed in the Federal court at Los Angeles which involves title to several millions of acres of oil lands in Coalinga, Midway and other oil fields of the central valley, now held under patent by the Southern Pacific Railroad Company. Patents were granted for this land many years ago. The validity of the government patents is attacked in the suit, the contention being that the land was granted as more valuable for agriculture than mining and that since the granting of the patents only mining has been carried on upon the land, none of it being fit for agricultural purposes. These facts have been well understood for many years but this is the first time that such a suit has been instituted, though the California Miner's Association endeavored long since to have the lands examined by the government and the mineral lands segregated, but the influence of the railroad company in Congress was too strong and they continued to get their patents without official interference. This was unjust, of course, but the railroad plan was carried out and the Miner's association was defeated in trying to have restored to the public domain the well-known mineral lands within the railroad grants.

The once famous mining camp of Brandy City, in Sierra county, which in years gone by produced large quantities of gold and was then virtually deserted for years is again becoming a comparatively lively place. Geo. W. Taylor has about 75 men opening some old gravel claims there and preparations are being made for work on a large scale. The town is again to have a post office and a telephone line is being brought in from Camptonville. The revival of the mining industry in the quartz mining sections of Sierra county has brought this change about.

The engineers of the Turlock and the Modesto irrigation districts have reported to the two irrigation boards certain details about finding reservoir sites in the Tuolumne meadows and Poopenaut valley. Then the engineers and officials of the La Grange Mining Company and the Tuolumne Mining Company made a proposition to the boards that the mining and irrigation companies unite in a search for suitable reservoir sites. The idea of an irrigation board joining with a mining company for any purpose was displeasing to some of the farmers present but it was finally decided to extend the reservoir sites into a little valley close by, on which the mining companies have an option and which had not before been considered by the irrigation engineers. The engineers from both boards and the engineers of the mining companies as well, have been instructed to look over the new district and report conclusions. This seems to be one instance at least of the farmers and miners "getting together."

The Cherokee mine, Butte county, is to be opened from the west end of the channel at Flag cañon, from which point over a mile of the channel may be worked. The mine was ground-sluiced in early years until 1872, when English capital was enlisted and hydraulic mining was conducted on a large scale until the anti-débris decisions closed it, since which time work has been conducted upon a small scale only. During its palmy days the mine yielded at one clean-up $70,000, which was cast in one gold bar and exhibited in this city. Subsequently the mine was drifted but for some reason this system was given up.

The Omega drift gravel mine on Oregon creek, Alleghany, Sierra county, has run into gravel in its channel which is yielding about $60 per cubic yard and the good people of Forest and Alleghany are excited over the prospects. The gravel is not cemented and is being crushed in a mill of 100 tons daily capacity. The rich gravel is being taken out 1000 ft. from the mouth of the tunnel and close to bedrock. This is encouraging news for the Slattery or New Jersey mine as well as the Corotoman, Young America, Lucky Dog and Maple Groove drift mines and the Rio Antupa in particular. These mines are supposed to be on the same channel. The Omega is owned by a company of San Francisco and San Jose people of which J. L. Green is manager.

There is to be a big "gold excitement" at Stockton in November in commemoration of the sixtieth anniversary of the "rush" to the mines of Amador, Calaveras and Tuolumne counties in the early days. At that time most of the miners from San Francisco passed through Stockton, having come there by way of the San Joaquin river in sailing vessels, boats, etc., whence the stage lines took them to the new diggings. It is proposed to enlist the aid of other counties to make this a good celebration and committies have been named to confer with the commercial bodies of other cities and towns. Stockton is again, after many years, a base of supplies for certain mining counties. It seems as if there was still some sentiment remaining in California connected with the early days of mining in the State but it has been dormant many years. Possibly the proposed celebration at Stockton may revive interest in these matters.

About three years ago the Bagdad-Chase Mining Company, operating mines in San Bernardino county, Cal., and also in Idaho, purchased the old Soulsby mine at Soulsbyville, Tuolumne county, the mine being one which had yielded some $5,000,000 or $6,000,000 above the 400 level before the ledge was "lost." The faulting of the vein in the '80s stopped production, but the company hopes to find the vein again, and spent three years' time and several hundred thousand dollars in the search and has now found it quite a distance west of the old workings in a territory passed by as barren by the company's predecessors. Superintendent Charles L. Pierce set men crosscutting in virgin ground and the ledge was found. It is of high grade, and there is plenty of it. A notable feature of this strike is that the company had about decided to quit operations and close the mine down, but Superintendent Pierce insisted on driving a north crosscut from the 400 level of the central shaft at his own expense. After going only 20 ft. the miners struck the Soulsby vein in virgin ground clear to the surface. In addition to free gold the ore is heavily shot with galena carrying high values.

Butte

Sept. 10.—The trouble between Newman Erb and F. A. Heinze over the management of the Davis-Daly Company has led to the resignation of the former from the board of directors, of which he was chairman. The trouble between the interests represented by the two is of long standing. Mr. Erb has been willing to let Mr. Heinze dictate the policy of the actual mining operations but has insisted that Heinze keep out of the financial and business

[illegible] concern [illegible] thing Heinze has been quite unwilling to do. Mr. Erb states that of the $1,200,000 paid into the treasury by the stockholders there remains but $200,000, and that he wished a change made in the control of the company at the annual meeting of stockholders to be held Sept. 28. For the purpose of voting the stock at the annual meeting Mr. Heinze and Mr. Erb were originally appointed a proxy committee. To this committee was later added Mr. Raborg, and immediately thereafter Mr. Erb tendered his resignation. This has necessitated the destroying of the original proxies and new ones are to be sent out at once. It is supposed that by this action of Mr. Erb, Mr. Heinze is left in control of the coming meeting and will completely dominate the actions of the stockholders.

The Copper Eagle Mining and Smelting Company has issued a call for a special meeting of stockholders Sept. 20 to vote on the giving of a lease on a portion of the company's property to the Mines Leasing and Developing Company.

Goldfield

Sept. 16—It is more than likely that the next meeting of the board of directors of the Goldfield Consolidated company will take under advisement the matter of enlarging the Consolidated mill in certain portions, increasing its capacity from 600 to 1000 tons per day. It will also be suggested that the old Combination mill, now treating about 90 tons per day, be abandoned and dismantled. Recent developments in the mine have opened such vast quantities of ore running less than the grade now maintained at the mine that it is deemed advisable from an economic standpoint to make the above changes. It is well known that the Combination mill is expensive to operate. It was built prior to the railroad and is not so substantially built or as well arranged as the new mill. Laboring under these disadvantages the cost of milling is nearly $4 per ton, while the Consolidated mill treats ore for less than $2 per ton. It is estimated the additional capacity of the mill can be made at an expense of not more than $100,000, as the present crushing, concentrating table, and cyanide tank capacity is sufficient to handle the product from an additional 50 stamps.

The [illegible] of the American Mining Congress will be held in the Hippodrome [illegible] and the headquarters will be at the [illegible] hotel. The railroads have given reduced rates from all points and the [illegible] will be well attended. Wednesday, Sept. 29, will be [illegible] and a special train has been arranged to transport the delegates [illegible] Millers station, thus [illegible] mill of the [illegible] Mining Company. When the [illegible] will provide entertainment for the members, and after adjournment an opportunity will be given to inspect the mines and mills of the district.

Denver

Sept. 17—Asbestos mining in the vicinity of Casper, Wyoming, on the line of the Chicago & Northwestern, is beginning to take actual and active shape, and it is asserted the district will be a competitor of the famed mines of Quebec, from which the United States derives its main supply. By a coincidence, the first and chief developers of this industry were sheepmen, who now combine the production of wool from the backs of that doubly useful animal, with that of the mineral wool which they dig from between the ribs of serpentine which inclose it, dikes of which rock are found in the Casper range skirting the North Platte valley. Henry C. Beeler, late geologist of Wyoming, has reported fully on these deposits, and advised the exploiting of the ground and erecting of mills, which is now being energetically done. The Wyoming Consolidated Asbestos Company, James H. Bury, manager, and the North American Asbestos Company, C. C. P. Webel, president, are the chief operators in the district. J. C. Ross, of Elyria, Ohio, has the contract for the building of the two mills.

The new tariff bill recently passed by Congress seems to have met with the full approval of the miners of zinc in the Joplin district, for the Zinc Ore Tariff club of the Missouri Kansas region has announced that having accomplished the good work for which it was organized, it now ceases to exist, and closes the club with thanks to the people of the United States who have coöperated with it in its efforts. Valuable deposits of zinc are reported discovered about 10 miles east of Plateau, El Paso county, Texas. The vein is said to be wide and rich, and as it is at shallow depth, and has no water to contend with, it can be mined most economically. The discoverer, H. Clegenson, of Dallas, is manager of a company which he has organized to operate the property.

The local daily press is asking the reason why the Japan Flora mines, in the Telluride district of the San Juan region, are so long idle, when "there is exposed, sampled and measured up 100,000 tons, having an average value of $14 per ton, exclusive of its zinc contents, which can be worked at a profit of $5 to $6 per ton." The reason perhaps is that it is a silver-lead [illegible] ore, and the silver [illegible] and gray copper [illegible] of the San Juan [illegible] and the [illegible] separated and [illegible] a problem [illegible]

With the rapid improvement in the mining industry and the resulting increase of "suckers" who get the speculative fever, the "wild catters" are getting very busy. Wyoming is just now a favorite stamping ground for these predatory animals, and it is stated that one man in Sundance has defrauded Eastern people of $30,000 through worthless mineral locations. Another big steal, perpetrated by a Philadelphia man, was by means of 300 fraudulent oil claims, the methods and the man being exposed by the former State geologist, Henry C. Beeler.

Cobalt

Sept. 18—In view of the persistent rumors that the government will reduce ore royalties levied on the mines, it is of interest to note what properties will be benefited. Those paying royalties to the Ontario government are: Chambers Ferland, 15; O'Brien, 25; Crown Reserve, 10; Temiskaming and Hudson Bay, 15 per cent. In addition to these properties all the lots in the Gillies Limit will have to pay royalty of 10 per cent. There are, however, also a number of companies that have to pay royalty to the Temiskaming & Northern Ontario Railway commission. These are Right of Way, Townsite, Nancy Helen, City of Cobalt, Station Grounds, Jackpot, Wright and Railway Reserve, all paying 25 per cent. It is, of course, not necessary that the Railway commission reduce its royalties if the government does, as these are entirely independent as far as the mining rights are concerned.

The report of the engineer and auditors of the Peterson Lake Mining Company in the dispute with the Nova Scotia has culminated in an action by the former company for the recovery of one million dollars from the Nova Scotia. The report of the engineer claims the Nova Scotia trespassed on the Peterson Lake property, and has removed a large quantity of ore. The report also claims there has been carelessness in the handling of the ore, and that the Peterson Lake interests were not properly looked after. It is also stated that no return was made to the Peterson regarding one car of ore shipped from its property, and that improper deductions have been made. These charges are denied by the Nova Scotia.

Another dispute has come up between the Coniagas mines and the town of Cobalt, which threatens to end in a law suit. The Coinagas have a number of lots adjoining the property on Prospect avenue which they bought from the owners, and these are assessed as town lots. The [illegible] appealed to the Court of Revision to have them assessed as mining property, but the Court upheld the commissioner, and now the company has decided to appeal to the courts to have the property assessed as mining lands at $10 per acre.

The further development on the veins recently found on the Nipissing hill is giving very satisfactory results. Vein No. 122 has been traced for over 800 ft. on the surface, and underground development has shown it to be in places about 15 in. wide.

Within the last week an automobile service has been started between the town of Cobalt and the Kerr Lake district. A large tally-ho has been secured and is now running five trips a day as far out as the Temiskaming.

Good progress is being made with the Nipissing Central Railway, the electric line which is to connect the towns of New Liskeard, Haileybury and Cobalt. The grading between Haileybury and Cobalt is nearly completed, and the rails are now coming in. The company hopes to have the rails laid some time in November.

Toronto

Sept. 17—The Ontario Government has sold by tender the Provincial mine on the Gillies timber limit south of the Cobalt area, comprising about 30 acres, to F. M. Connell, of Haileybury, for $113,111, reversing a royalty of 10 per cent. on the output. Fifteen other properties on the limit with an aggregate area of 319 acres, were also disposed of, the prices per lot varying from $2250 to $20,600. The total receipts from the sales, including the Provincial mine were $223,054—a 10 per cent. royalty being reserved in each case. The bids were considerably higher than when the properties were previously offered, owing to the important discovery at the Waldman mine.

I. Watters, formerly of Ottawa who was engaged by the Bacalieu syndicate, which comprises Montreal and American capitalists, to explore for minerals in Newfoundland has returned to Montreal and reports having located a number of valuable claims. These include iron-ore deposits on Little Belle island, near those of the Dominion Iron and Steel Company and Nova Scotia Steel Company; oil shale on the northeast coast and lead on the west coast. Preliminary tests of the latter have shown a good quality of lead and several tons of the ore will be brought to Montreal for further experiments. Should these result satisfactorily development will be commenced forthwith.

Mexico

Sept. 16—The flood situation in the Monterey district appears to be much more serious than the first reports indicated. The loss in life is appalling, and the property loss will reach many millions. The greater part of the property loss falls upon the railroad companies and upon individuals, but undoubtedly a number of the mining companies have suffered greater or less losses directly or indirectly. Smelter No. 2 and the steel plant at Monterey were materially damaged by the flood. Most of the mines in northern Mexico are situated above the flood plains in the isolated sierras, and consequently would not be directly damaged by the flood. However, in many cases the transportation systems for these mines have been completely wiped out, and the mines all have suffered a large loss from the incidental derangement of the railroad transportation system of the whole section. On the other hand, the abundant rains of northern Mexico this season will insure better crops for next year, and probably will forestall any suffering during the dry season similar to that which was experienced last year. The rains have been general and heavy all over northern Mexico, and aside from the direct damage from excessive floods this is an advantage for the mining industry of that section.

Notwithstanding the tariff on zinc ore, the August shipments to the United States were nearly up to the average. The railroads report 152 cars of zinc ore passing through Laredo and El Paso during that month. Many of these shipments were on contract, or to clean up stocks on hand at the mines. It is expected that the future months will show a decided falling off in shipments to the United States, as the new tariff is practically prohibitive for regular operations.

The zinc-mining interests of northern Mexico have united in a petition to the Federal railroad commission requesting a reduction in freight rates to the Gulf ports with a view to encouraging and permitting shipments of zinc ore to Europe. The present rail rates on zinc ore, as quoted by the National line, are as follows: In carloads to shipside Tampico, from Monterey, 6.90 pesos; from San Luis Potosi, 5.59 pesos; from Chihuahua, 9.72 pesos per 1000 kg. These rates control the rates for intermediate points which are all practically on a mileage-tonnage basis under the Mexican schedule system. The railroad rates in Mexico are controlled by a Federal commission, and it is in the power of this commission to grant this rate if it sees fit. Moreover, the government now practically controls all of the railroad lines of the country, and it can, therefore, exercise discretion in the matter which gives hope that the united efforts of the important zinc-mining interests may be successful.

Mexico is vitally interested in assurance of a continuation of Mr. Harriman's plans as to railroad building in the Republic. The important Guaymas-Guadalajara road is about two thirds constructed and will assuredly be continued to completion. Most of the trunk-line roads in Sonora are likewise so far under way that no change in the program as to them is likely. However, it is not so certain about the fate of several branch lines and of the proposed line to the City of Mexico from Guadalajara and of the projected connection with the Pan-American road to form a line from the United States to the Panama canal. These projects were supposed to be personally favored by Mr. Harriman, but his successors may see more important work to be done.

A corporation with $50,000,000 capital has been formed by J. M. Neeland, projector of the Pan-American railroad in Mexico, for the purpose of building a road in Central America to connect the terminus of the Pan-American at the southern boundary of Mexico with the Panama canal. Work will be started at La Union, Salvador, in January.

London

Sept. 10—Particulars have been published of a proposed transfer of the large claim area on the Rand, owned by the Rand Mines Deep Company and controlled by the Consolidated Goldfields of South Africa, Ltd., to the Rand Mines, Ltd., controlled by the house of Wernher Beit & Co. The property consists of over 1200 claims, lying immediately to the dip of the Nourse mines, Jupiter and Simmer Deep, the first of which is controlled by Wernher Beit & Co., while the other two mines are under the management of the Consolidated Goldfields. Taking into consideration the fact that the Consolidated Goldfields control by far the larger portion of the ground lying immediately above that owned by the Rand Mines Deep, it is surprising that the Goldfields should have allowed this ground to pass out of its hands and should not have kept it for extensions of the Jupiter and Simmer Deep. It is not known whether the Rand Mines Company has plans for working this deep ground by a separate company or companies, but having regard to the great depth of the reef on the Jupiter—over 4000 ft.—it does not seem probable that new shafts will be sunk. It is possible, of course, that an arrangement could be made with the Jupiter and the Simmer Deep for the shafts of the Rand Mines Deep, to be sunk on the ground of these companies and an approach made to the deep ground through inclines. However, what the policy is has not been disclosed and information on this point will be awaited with interest.

The last quarterly report of the Camp Bird, Ltd., states that an option has been taken on the mine in Mexico, which was recently recommended to the shareholders by John Hays Hammond and that R. J. Frecheville has made a report and is on his way home. The acquisition of the Mexican mine will have to be confirmed by the shareholders at a general meeting, but there can be little doubt that, if Mr. Frecheville's report is favorable, the mine will be purchased. The Camp Bird mine has been one of the most successful mining ventures ever put on the London market and any fresh business recommended by the engineers and directors will meet with support.

Mining News from All Parts of the World

New Enterprises, Installations of New Machinery, Development of Mines and Transfers of Property Reported by Special Correspondents

THE CURRENT HISTORY OF MINING

Alaska

Fairbanks—The Boone-Marley case, after four years' litigation, involving a partnership of creek claims Nos. 4 and 5 below discovery on Cleary creek has been settled out of court.

Cleary Creek—The output this season will be $2,000,000. Ross Drennan has completed a tunnel to drain an underground reservoir. Claims Nos. 8, 9 and 10 below discovery have all been drained by it.

Nome—Gold Run will be worked on a big scale next year as water is being brought to it.

Bartels Tin—This company expects to produce ore next season according to William A. Hesse.

Rush & Brewer and Mt. Andrew—These mines in the Ketchikan district shipped 1300 and 2500 tons respectively on Aug. 30.

Jerome Ledge—The test stamp mill, boiler and outfit on Jerome ledge in Bonnifield, belonging to Jerome Chute, was washed into Wood river by a cloudburst. The stamp mill was brought in over the trail last winter at great expense.

Arizona

Cochise County

Tombstone Consolidated—The sulphide orebody, accidentally discovered on the 700- and 800-ft. levels, is holding out. Work on the pumps for the 800 ft. level is being pushed so as to resume work at the 1000-ft. level.

Gila County

Old Dominion—The Massachusetts supreme court has decided in favor of the company in the suit against A. S. Bigelow. A rehearing has been asked.

Inspiration—Plans are being considered to [illegible] shaft on the orebody discovered in the Joe Bush shaft.

Mohave County

Tom Reed—Sinking operations have been suspended at 400 ft. on main shaft [illegible] Signal.

Golden Queen—The [illegible] will be [illegible] near.

Oatman—The Mammoth Silver Mining Company has [illegible]

Pima County

Imperial—Copper-bearing porphyry has been discovered outside the orebodies and explorations are being made.

Twin Buttes—Hoist and compressor will be moved to new shaft. Ore is being shipped from 400-ft. level.

Pinal County

Copper Creek—The 250 ton concentrating mill is started and the shaft continued to 500 ft. The mine is near Mammoth, Bunker Hill district.

Troy-Manhattan—The property has been bought in at trustee sale by a committee of the stockholders. Work will be resumed.

Santa Cruz County

Ajax—Operations have been commenced in charge of Harold R. Bacon. The same company has the Oceanic. Both mines are in the Arivaca mountains and have been long idle.

Yavapai County

Arizona-Central—An electric hoist and pump for the Shylock mine are installed. The mine is in the Black Hills district.

Yuma County

New Planet—Examination preparatory to extensive explorations is being made.

Yuma Copper—Ore has been struck at 130 ft. The mine is near Vicksburg. Ernest A. Haggott, engineer.

California

Butte County

Cherokee—A wagon road is being built to Enterprise. The mill has begun operations.

Feather River—The dredge was [illegible] between Palermo and Oroville.

Oroville—The old gravel mine which [illegible] very large producer [illegible] has been bonded to [illegible] C. Wilson who [illegible] drift mine.

El Dorado County

Shaw's Flat—[illegible] working [illegible] The channel had been prospected by drills and the south rim located. The mine, which is near Newtown, is to be drifted.

Brandon—J. T. Reynolds at Brandon has purchased a 10-stamp mill.

Pacific—Men are at work reopening the mine at Placerville.

Del Norte County

Klamath River—C. A. Sample is arranging to open this gravel property near Requa.

Mariposa County

Tyro—The mine, near Coulterville, has been taken over by Joseph Buttenback and is being put in operation. It is equipped with a 10-stamp mill.

Ward—This group of mines at Pinon Blanco has recently been placed under bond to John C. Wilson, and men have been set at work. These mines have been idle many years but now that so many old mines are being opened it has come to the turn of the Ward group.

Nevada County

Dana—Eighteen men have been set at work under Charles B. Smith, and excavations are being made for the machinery from the Sultana. The shaft will be sunk to 800 feet.

Native Son—Work will shortly be resumed at Blue Tent. J. H. Bishop, manager.

California—Thirty men are at work and the 10-stamp mill at Graniteville is running.

Golden State—Controlling interest has been purchased by J. T. Hennesey, Thomas Gill and others, and the property will be developed. The mine, near Grass Valley, is equipped with a 5-stamp mill.

Pittsburg—This old mine at Nevada City is being rapidly rehabilitated under the management of Mark B. Kerr. With the aid of the new compressor and pumping plant and the old Cornish pumps the water was taken out of the mine from the 800 to the 1000-ft. level in six days. Since the beginning of the reopening of the mine six months ago a new electric hoist of great capacity, compressors, electric pumps, etc., have been added and the mill has been put in order. The entire unwatering of the mine has now been set at work on the 500- and 700-ft. levels of the mine.

SHASTA COUNTY

Balaklala Consolidated—The August output was: copper, 1,288,421 lb.; silver, 74,144 oz.; gold, 1746 oz. The cost of production for the month is reported as 8.82c. a pound for the copper, crediting the gold and silver against copper costs. This is an increase over July of about 20 per cent.

National—This mine at Buckeye was some years ago equipped with a mill and cyanide plant but it did not pay a profit and was finally permanently closed and abandoned. It was relocated by G. M. Sleezer, who has reopened it and is now shipping ore worth $24 per ton to the smelters at Mammoth. The presence of the smelters in that county has encouraged numbers of men to take hold of old properties which would not pay when individual reduction works were necessary for every mine.

SISKIYOU COUNTY

Diamond—G. W. Nickerson, superintendent, China Gulch, Salmon River district, reports a two-foot ledge carrying $23 rock.

TUOLUMNE COUNTY

Yrma—The company is working the old Josephine mine under bond, and has put up a Huntington mill to be followed with a 5-stamp mill.

Harvard—Sixty stamps are dropping and ore is being blocked out.

Eureka—The mill at Big Oak Flat has been started.

YUBA COUNTY

California Mother Lode Mining Company—Warren C. Wilkins, manager, is showing up a rich body of ore. An electric power plant and ten more stamps will be added to the equipment.

Onken—This mine, also known as the Eagleville, a low-grade proposition at Strawberry valley, has been purchased by Doctor Lund, of Willows, and Mrs. Nora Haines, of Oakland.

Colorado

BOULDER COUNTY

Lincoln—A cyanide plant will be erected at Sugar Loaf. N. M. Nelson, manager.

Tambourine—The cyanide mill at Wall Street, recently burned, will be rebuilt.

Colorado Metal and Reduction—A 50-ton mill will be erected near Arapahoe peak. The company's office is at Boulder.

CLEAR CREEK AND GILPIN COUNTIES

Crescent—The new mill at Georgetown is running. G. D. Parks, manager.

Sun and Moon—Lease and bond has been taken by O. W. Lowell, Idaho Springs.

Astor-Stewart—A concentration mill will be built at Georgetown.

Gilpin-Independence—Milling ore has been found at 250 ft. in the Golden Flint mine, Perigo, and the mill is now running. W. A. Scott, Gilpin, superintendent.

David—New equipment is being installed on Searle shaft, Willis gulch. Max Boehmer, engineer.

Champion—Operations will be resumed. L. D. Bloomer, Rollinsville, manager.

Dives-Pelican—A diamond drill will be used to tap the Seven-Thirty shaft from the Burleigh tunnel, now in 5900 feet.

Walsh—E. F. Clark, of Minneapolis, Minn., has purchased this property in West Argentine district.

Newhouse—The tunnel in the Central City district, reports the cutting of more veins of ore and of water. The depth below the surface is 1500 feet.

CHAFFEE COUNTY

It is reported that a strike of gold ore has been made east of Salida, which from local accounts has incited 500 people to go there in autos, carriages, horseback, and on foot, and well-dressed men and women are all busy staking claims, five square miles having been covered in this way, and silly statements of "$15,000 assays" are made. Reliable news is awaited with interest.

LAKE COUNTY—LEADVILLE

Robert E. Lee—Shipments of zinc have been started. A daily output of 75 tons is planned.

New Monarch—The main shaft, now 825 ft. deep, will be sunk to 1000 ft., and connections made with the Yak tunnel as soon as the lateral is extended.

O'Donovan-Rossa—A new company will continue development.

OURAY COUNTY

Atlas—A new compressor is being installed and driving continued on Klondyke vein. A strike of good ore has been made 1500 ft. from Atlas shaft.

Legal Tender—Ore has been found in shaft on contact to cut Mineral Farm blanket vein. Ned Canavan, superintendent.

SAN JUAN DISTRICT

Continental Mining Company—On the Buffalo Boy, Howardsville, 700 ft. has been driven, opening up an ore shoot 500 ft. long and 5 ft. wide. Ore developed, 40,000 tons. Shipments are continuing from Old Abe and Tenderfoot. A concentrator will be erected in the spring. Martin J. Heller, manager.

Bonner—Sale has been made to Lutz Mines Company, Pittsburg, Penn. New machinery will be installed. G. Grossman, Silverton, manager.

Champion—The Pittsburg tunnel has cut the vein 1800 ft. from portal. Property is operated by Ross Mining Company, Silverton.

Camp Bird—Mill crushed in June, 18,703 tons dry ore; receipts were $721,176 and working expenses $162,944. Number of feet driven 2193, feet in raises and winzes 90, cubic feet stoped, 131,000.

San Antonio—The Eastern stockholders of the company owning the Carbon Lake mine (in the Red Mountain district of San Juan), which is mining such a large body of enargite, or arsenical copper ore, visited the mine last week. The silver contents of the ore are increasing with depth, and the owners are so pleased with results that a big consolidation of Red Mountain properties is under consideration. T. M. Chestnut, of Denver, is the manager.

TELLER COUNTY—CRIPPLE CREEK

Cripple Creek District—The Trilby 75-ton cyanide plant has commenced the treatment of the low-grade ores of that mine and the Gold Sovereign, the high-grade ores being shipped to the valley mills as formerly. A sublease on the Shurtloff is reported to have shipped 5½ tons of ore that yielded 9½ oz. gold to the ton, this being from a narrow streak. Surface water from the late heavy rains is interfering with the lower workings of the Isabella, Pinto and others, which are usually dry mines, and a great deal of bailing has been done. Superintendent Hines, of the American Eagles, of the Stratton Estate, reports the discovery at the 1100-ft. level of a streak of kaolin or gouge on the footwall which runs 40 to 100 oz. gold per ton. This is being saved and sacked underground. The Cresson company, of Raven hill, managed by Richard Roberts, produced about 30,000 tons of gold ore during the last fiscal year, the average value being $20 per ton.

Londonderry—Work will be resumed through the Wild Horse shaft of the United Gold Mines Company.

Jolly Tar—An important strike of quartz, carrying sylvanite and free gold in a phonolite dike in the granite, has been made. The property adjoins the Strong at Victor. J. B. Neville, manager.

Idaho

IDAHO COUNTY

Elk City—Two dredges are being erected on the placer deposits here.

Majestic—A tunnel 1½ miles long has been started to cut a vein at 3000 feet.

SHOSHONI COUNTY

Hercules—The mill in Gourge gulch, Burke, was burned Sept. 6. Loss, $100,000, no insurance. It will be rebuilt.

Idaho Los Angeles—Alexander McDonald has been awarded the contract for the crosscut tunnel now in 1100 feet.

New Hope—Four feet of iron carbonates are visible in the face of the tunnel.

Great Western—A contract for a 250-ft. extension of the tunnel at Burke has been let.

Blanchard Smelting—Work has been commenced on the buildings for the 25-

ton preliminary installation. F. P. Machette is in charge.

Indiana

VERMILION COUNTY

United States Steel Corporation—This company will acquire the entire holdings of the Oakhill Mining Company, the Hammond Coal Company and the Deering Coal Company; the latter two are among the best known companies in Indiana, and the Oakhill company is one of the largest in the Clinton field. It is said that 29,000 acres of coal land are involved in the deal, and that the money to be paid for the land, mine tipples and fixtures is estimated at upward of $2,000,000. Edward Shirkie, president of the Oakhill Mining Company and one of the leading operators in the Indiana bituminous field, will still maintain an interest in the field. Mr. Shirkie and his brother, Hugh Shirkie, are the principal owners of the Atherton Splint Coal Company, south of Clinton, and have been buying extensive tracts of coal lands within a radius of five miles from Clinton. J. K. Deering and R. R. Hammond, of Chicago, and W. S. Bogle, of Clinton, have been closely associated with the Shirkies and have been, until recently, supplying much of the coal used by the United States Steel plants. A few months ago a reorganization took place in Chicago, which has never been well understood by the public, whereby the Brazil Block Coal Company became the selling agents for the Deering Coal Company, which had had trouble with the Steel Corporation over filling orders for "Steel coal" under a 50-year contract. It has been known for several months that the Steel company has been busy buying coal lands from farmers in the Clinton district, but the plan of acquiring the big coal companies and operating their properties directly had not been heard of until now.

VANDERBURG COUNTY

A three days' convention of union coal miners of southern Indiana was held in Indianapolis, Sept. 15-17. The object of the convention was to urge the miners to stand together and attempt to improve conditions for mining in the southern part of the State. Because they are brought into competition with nonunion diggers in Kentucky, the southern Indiana miners say their condition is not so satisfactory as that of miners in the Terre Haute district, and they are asking special recognition in scale and working conditions. The convention advocated a change in the mining law of the State to permit the use of coal dust or wet slack for tamping shots where clay or other noninflammable material is not obtainable.

Kansas

CHEROKEE COUNTY

[illegible]—The company of Buffalo, N. Y., operating at Badger, has begun development work. Five drill holes show three runs of zinc ore.

Bonanza—An unusually shallow and rich run of zinc ore has been found at 28 ft. E. C. Matthews, Joplin, owner.

Omaha-Petersburg—The company owns 160 acres at Baxter Springs. The M. K. & T. mill has been purchased and started up.

McAllister—The property at Baxter Springs has been bought by L. Griffith for the Tennessee Metal Producing Company, Memphis. The mill is being increased and additional shafts sunk.

Common Law—The 40-acre tract at Baxter Springs has been purchased by T. F. Timothy.

Heap-O'Brien Company—The company has purchased a mill at Baxter Springs.

Michigan

COPPER DISTRICT

Larium—This company has encountered copper in its shaft on the Kearsarge. The lode shows a width from 12 to 15 ft. with stamp copper. This shaft is about 2600 ft. north of the Tecumseh on a tract of 275 acres.

Ahmeek—Sinking is going forward in the two new shafts. The stamp mill will be in shape to handle rock early the coming year. Shipments of about 2000 tons daily are being made.

Calumet & Hecla—Rock from the Osceola Amygdaloid lode will be sent to the Tamarack mills and the conglomerate rock to the Calumet & Hecla mills on account of the Tamarack mill being more efficient on the amygdaloid rock, and to avoid the necessity of changes to the mill.

La Salle—Preparations are being made to begin shipments from No. 1 Tecumseh shaft to the Allouez-Centennial mill.

Seneca—The crosscut from the 2nd level, 440 ft., has reached the Kearsarge lode, but no copper was found at intersection.

Oneca—The first drill hole is down 550 ft., and nearing the point where the formation should be encountered. The second hole is 100 ft. deep.

Lake—The crosscut from the 5th level shaft is in about 50 ft. and is nearing the point of intersection of the lode.

Section 12—A diamond drill outfit has started work on this property adjoining the Isle Royale on the south to expose the Baltic lode.

Isle Royale—Owing to the discontinuing of the handling of unproductive ground an increase of about 300 tons daily is being made to the mill. Shipments now averaging 1800 tons daily.

Atlanta—An assessment of $2 a share for development on Section 16 is likely.

IRON DISTRICTS

Richmond—The Consumer's Ore Company will use a steam shovel on this mine on the Cascade range.

Cundy—The report that this mine at Quinnesec would reopen is denied.

Verona and Calumet—The Verona company, Charles E. Lawrence, manager, will reopen these mines at Quinnesec and Metropolitan, respectively.

Mary Charlotte—A new hoist and electric haulage will be installed. The mine is at Nagaunee.

Minnesota

VERMILION RANGE

Vermilion Lake—Ore is reported in 16-62-14, northeast of Tower, near Murray. The company is exploring.

Missouri

JOPLIN—ZINC-LEAD DISTRICT

American Zinc Lead and Smelting Company—The company is drifting from No. 5 shaft at the American Davey to No. 4, and will start up No. 4 as soon as the drift is completed.

Koh-i-noor—The mine on the Continental land west of Joplin has again become a producer yielding 10 to 20 tons of concentrates per day.

McGee—All records have been broken with a production of 243,000 lb. of silicate the first 10 days of September. The mine at Duenweg has only an 80-to mill.

Montana

BEAVERHEAD COUNTY

Gold Leaf Group—The property near Bannack is being worked under a lease by Dunn and Hand, sinking and drifting on the Wadam.

BUTTE DISTRICT

Butte-Milwaukee—Word has been received from New York that operations on the Colonel Sellers, near the North Butte, will be resumed. The shaft is down 700 feet.

Davis-Daly—Newman Erb, recently resigned from the board, is soliciting proxies for the Sept. 28 annual meeting.

Butte & Balaklava—The stock has recently been accepted for listing on the Boston Stock Exchange. The shaft is now down 1400 ft., the upper 500 ft. being two compartment and the lower 900 three-compartment. Work of making the entire shaft three-compartment will be begun about Oct. 1. Steel ore bins of 500-ton capacity are being erected and should be completed within a week.

Tuolumne—The management states that the returns on the first shipment of ore from the mine showed 8 per cent. copper and 4.6 oz. silver. The ore which has been mined so far has been taken from the sill floor of the 1400 level, but when the

east-end line of the property has been reached stoping will be begun, and it is expected that the values in the ore will materially increase. It should take about a month to reach the east-end line, and when stoping is begun the management is confident that production will average 300 tons daily.

Amalgamated—At the Butte & Boston Company's West Gray Rack mine, the raise, started from the 1100-ft. level of the adjoining East Grey Rock, to connect with the shaft of the West Grey Rock, is up 100 ft., and the 1000-ft. station has been cut. There is still another 300 ft. to go before the raise will be through to the shaft. At the Silver Bow mine operations will be suspended several days to overhaul the hoist.

GRANITE COUNTY

Crescent—The company owns eleven quartz claims on Stony Creek, 20 miles west of Phillipsburg. A 20-stamp mill is being erected on the property.

JEFFERSON COUNTY

Boston & Alta—The new shaft is now down 80 ft. Thirty-two men are employed.

MADISON COUNTY

Conrey Placer—The three dredges are now being operated by electricity. It is planned to put in a fourth in the spring. Charles Kammerer, Alder, manager.

Nevada

ESMERALDA COUNTY—GOLDFIELD

Combination Fraction—The new ore shoot is well exposed between the 300- and 425-f. levels and varies from 9 to 11 ft. in width. The discovery has increased the average of the mill ore from $27 to $40 per ton.

Red Top—This company, operating on the Red Top Extension territory, has installed a 30-h.p. electric hoist to replace the one burned. Drifting will be resumed on the 475-ft. level.

Florence-Goldfield—A discovery has been made east of Florence, main shaft and ore running $100 per ton uncovered.

ESMERALDA COUNTY—RAWHIDE

Kerns—The lease will be operated by W. B. Wedell, of Ogden, Utah, the owner.

Grutt-Balloon—Ore has been found at 250 feet.

Victor—Ore is being treated at the new 10-stamp mill.

Portland—A lode, supposed to be the Victor, has been cut. The property is on Hooligan hill.

ESMERALDA COUNTY

Horn Silver—J. W. Crane, on the Sunset claim, has made a shipment of 14 tons. The ore was extracted from a 100-ft. shaft and the grade $27 per ton.

NYE COUNTY

Kawich Consolidated—Upon the Mascot mine a 25-h.p. gasolene hoist has been installed and a 30-ft. gallows frame erected. The shaft is now 70 ft. deep and in milling ore.

Cotter—Sinking has been resumed from 300 to 400 feet.

Golden Arrow—The plant is to be remodeled and used for the treatment of ore from the Cornforth mine.

NYE COUNTY—ROUND MOUNTAIN

Round Mountain—The gross production for August was $34,000 and the average daily mill tonnage 103 tons, a monthly total of 3193 tons. The depth of the mine is 785 feet.

NYE COUNTY—RHYOLITE

Crystal-Bullfrog—The first brick from the mill has been shipped. The plates made an extraction of 70 per cent., but no clean-up has been made in the cyanide department. The mill is working custom ore.

Montgomery-Shoshone—About $50,000 is the gross production for August from 5800 tons.

STOREY COUNTY

Ward—The pump at the 2475 station recently broke down and endangered the mine. The water is 165 deg. F. and the difficulties of controlling the situation by bailing were great. Extensive improvements to the pumping system are under way. Whitman Symmes, superintendent.

WHITE PINE COUNTY—ELY DISTRICT

Ely Central—Work has commenced on shaft east of Copper Flat which will be sunk 550 feet.

Nevada Consolidated—Drills are at work near Liberty line and are opening up steam-shovel ground according to report.

New York

Garnet Company of America—The company is planning to work the garnet deposits at Fort Ann, shipping to Newark, N. J.

North Carolina

Mitchell County Mica—Nearly 2000 acres of mica lands have been sold to Mrs. V. P. Cibotti and Mrs. E. B. Thompson, of Washington, D. C.

South Dakota

BLACK HILLS DISTRICT

Branch Mint—James D. Hardin has purchased the mine at sheriff's sale. Resumption is planned and an electric railroad between Galena and Spearfish via Deadwood projected.

Custer Peak—A strike at the 250-ft. level is reported. John H. O'Brien, superintendent.

Gold Eagle—Work has been suspended pending the installation of machinery.

Utah

BEAVER COUNTY

Newhouse—The work of improving and enlarging the Cactus mill is progressing rapidly and operations should be under way again in a few weeks. It is probable that the tailings, which were rushed through the old mill at the time copper was high, will be reworked. The mine is being put in shape to meet the requirements of the new mill. The resumption is awaiting legal reorganization of the company.

SALT LAKE COUNTY

Thor—The company has been formed to operate claims at head of Big Cottonwood. W. I. Snyder, president.

Rexall—The tunnel is in 700 ft. and developing is being pushed. Gus Malmborg, manager.

Utah Metals—Electrical equipment for the Bingham properties will be ordered.

Utah Copper—The caving system will be used for the upper end of the McIntosh tunnel. Difficulty from high banks for steam-shovel work has been experienced in other parts of the mine.

Bingham Midway Mining and Milling—The company, with a capitalization of $1,000,000, has incorporated to operate a group of claims in the Bingham district. It has taken over twenty claims comprising 193 acres of patented lands, 200 acres under mineral location and 113 patented acres on option. John McDonald, of Bingham, is president.

TOOELE COUNTY

Consolidated Mercur—Earnings for six months prior to June 30, were only $3080, due to low-grade ore. The net earnings for the fiscal year were, $34,005. The average daily tonnage was 773 tons, and average gold extraction, $2.70 from an ore averaging $3.58. The cost of leaching per ton was 41.4 cents.

Tooele Smeltery—This plant of the International company will be started Feb. 1. The contract for treating the Utah Consolidated ore commences March 1.

UTAH COUNTY

Picayune—The company has been incorporated at Provo to operate in El dorado district near Payson. R. F. Knowlder, president.

Washington

FERRY COUNTY

Blue Flag—Operations have been resumed in charge of John F. Gautenbein.

SNOHOMISH COUNTY

Northwest Consolidated—An aërial tramway, 7000 ft. in length, is being built to the property located on Weeden creek, 2½ miles from Monte Cristo. L. H. Markham, Index, is manager of the mine.

Wisconsin

ZINC-LEAD DISTRICT

Kohler-Moor-Blende—A two-jig mill is being erected at Platteville. F. E. Kunz, secretary.

Peaceful Valley—Three shafts have sunk east of Beloit-Elmo, on Henry Kettler tract. H. L. Hulburt, manager, Cuba City.

Klar-Piquette—The churn drill cut 15 ft. of blende at 163 feet.

St. Rose—Development will be commenced on Sentz lease near Platteville.

Frontier—A run of blende is proven on the Sedgwick land near Benton. A two-jig mill will be built.

Fields—A three-jig mill is being built at Benton. R. S. Landers, superintendent.

Hoosier—A mill will be built three miles north of Vinegar Hill. J. H. Billingsly, manager.

Canada

BRITISH COLUMBIA

Granby Consolidated—The enlarged smelting plant will treat 4000 tons daily, and it is claimed will produce copper at a reduced cost.

Kootenay Development—The Silver King compressor and terminals recently destroyed by fire will be rebuilt. R. S. Lemmo, Nelson, manager.

NOVA SCOTIA

Maritime Coal, Railway and Power—A contract has been let to the Canadian General Electric company for a 750 h.p. generator to be installed at Chignecto.

ONTARIO—COBALT

Silver Cliff—Work has been begun on the concentrator.

Chisholm—This property on Diabase mountain has been sold to the Meteor company and will be developed.

Lucky Strike—The shaft on Peterson lake is down 85 feet.

Coniagas—The 1000-ft. tunnel at Ragged Chutes was cut through Sept. 11.

Cobalt Lake—The plant is now running with good results.

Jane Lake—A new drill compressor has been installed and shaft will be continued to 200 feet.

Lawson—The stamp mill is in operation treating 50 tons daily. The sames are treated by mechanical and air agitation.

Pan Silver—The main shaft is down 200 ft., and from this level a winze is being sunk 20 ft., where another vein 8 in. wide has been discovered showing silver.

Ore Shipments—Shipments of ore from Cobalt for the week ending Sept. 11 were: Cobalt Central, 41,360; Crown Reserve, 180,030; Kerr Lake, 60,130; La Rose, 273,700; McKinley-Darragh, 42,810; Nipissing, 259,800; O'Brien, 64,450; total, 871,750 pounds.

Drummond—The new shaft is being sunk and water pumped from the old shaft, preparatory to continuing operations. The mine has been shipping to the Trout Mills concentrator.

Temiskaming—This mine will sink 50 ft. from the 300-ft. level. The concentrator will be completed by the end of the year.

ONTARIO

Dome Reserve Mines—This company, of which John R. Barber, Toronto, is president, owns 197 acres at the 77th mile post on the Temiskaming & Northern Ontario Railway. A vein yielding free-milling gold has been discovered and stripped for 160 ft. and is reported to assay very high.

ONTARIO—PORT ARTHUR DISTRICT

Hope Beaver—This property has been acquired by F. H. Keefer, who will proceed with development. The shaft is down 50 ft. in ore.

Mexico

CHIHUAHUA

Candaleria—Pumps are being installed to lift 5000 gal. per min. The mine is at San Pedro. George D. Laird, manager.

Compania Minera de Penoles—This company, which operates a large lead smeltery at Mapimi, Dgo., has obtained control of several properties in the Parral district, including La Perla group, La Rosalana and the Dewey. Additional men have already been put at work at La Perla group, near the Maturana station on the Mexican Central.

Reina de Plata—Development and productive operations will be resumed soon at this Santa Eulalia company's properties, of which Capt. Lindsay Brown is manager.

Tiro Fijo—Diamond-drill exploratory work is under way at the Verde mine at Cusihuiriachi.

Inglaterra—The English company has lately acquired the Guamera and Concepcion adjoining Santa Eulalia.

GUANAJUATO

Guanajuato Power—A new plant will be built on Angulo river to generate 20,000 h.p. additional. The company now distributes through an area 200x100 miles. Norman Rowe, Guanajuato, manager.

MEXICO

Seguranza—The mill at Zacualpan has not yet completed the cyanide installation. Power from Sultepec awaits transmission line.

El Oro—August production was $215,120 and the net profit $78,300 from 24,183 tons of ore. The railroad net earnings were $12,000.

OAXACA

San Juan—Denny Brothers are making an examination of this mine in Taviche for English interests.

PUEBLA

Teziutlan—The building of the railroad from Teziutlan to Nautla, a port midway between Veracruz and Tampico, is now assured. This will give a direct outlet for the large copper mines at Teziutlan.

SONORA

Greene-Cananea—Generators for central power are delivered. It will be three or four months before the installation is completed.

Cieneguita—The smelter has closed on account of rainy season and only development work is under way. H. A. Walton has been appointed manager.

ZACATECAS

Asturiana—Option on this mine on the Veta Grande and Los Campos, near Guadalupe, has been given George A. Wadill, of San Luis Potosi.

South America

ARGENTINE

Famatina—The furnace is treating 140 tons per day. Ropeway is now in use bringing down Upulungos and San Pedro ores. Briquetting machinery is being installed. Mine is in Rioja province.

South Africa

Nigel and Sub Nigel—Some time back an amalgamation was proposed by the Consolidated Goldfields of South Africa, but the terms were opposed by the shareholders of the Nigel Deep and the scheme was defeated. A new scheme has now been put forward, giving the Nigel Deep shareholders somewhat more favorable terms. The Nigel Deep Company owes a large sum to the South African Gold Trust and the Gold Mines Investment Company, companies controlled by the Consolidated Goldfields, and it is announced that these companies will, unless the new scheme is adopted, call in their loans, a proceeding which would force the Nigel Deep Company into liquidation, resulting probably in a total loss for the Nigel Deep shareholders.

Metal, Mineral, Coal and Stock Markets

Current Prices, Market Conditions and Commercial Statistics of the Metals, Minerals and Mining Stocks

QUOTATIONS FROM IMPORTANT CENTERS

Coal Trade Review

New York, Sept. 22—The coal trade in the West continues to show increased activity at all the larger centers. The demand for steam coal is evidently improving. The gain is good notwithstanding the dullness of the Lake trade. Dealers do not understand the present slowness of the Northwest in taking coal and say that there must be a rush up the Lakes in October or else heavy winter rail shipments.

The Eastern bituminous trade improves more slowly, though there is a gain evidently. Operators generally are encouraged and predict an active fall business.

The anthracite trade pursues its usual course with little variation. Operations at the collieries are not yet on full time. The working conditions are a little better, some rain having fallen so that water supplies are more abundant through the region.

Lehigh Coal and Navigation—There is still active buying of this stock in Philadelphia. It is known to be for New York account, but it is uncertain who the buyer is. All sorts of reports are current, the most persistent being that the New Haven company is seeking control.

Coal Traffic Notes

Coal and coke tonnages originating on Pennsylvania railroad lines east of Pittsburg and Erie, year from Jan. 1 to Sept. 11, short tons:

	1908.	1909.	Changes.
Anthracite	3,512,441	3,318,497	D. 193,94
Bituminous	22,657,420	25,014,474	I. 2,357,054
Coke	4,752,098	7,304,421	I. 2,552,323
Total	30,921,959	35,637,392	I. 4,715,433

The total increase this year to date was 15.3 per cent.

Coal shipments reported by Monongahela River Consolidated Coal and Coke Company for the nine months of its fiscal year from Nov. 1 to July 31, short tons:

	1908.	1909.	Changes.
River coal	3,979,679	3,719,995	D. 259,684
Rail coal	1,018,450	714,705	D. 303,745
Total	4,998,129	4,434,700	D. 563,429

The total decrease this year was 11.3 per cent. The great part of the loss was in rail coal.

Coal tonnage passing through Sault Ste. Marie canals, season to Sept. 1, short tons:

	1908.	1909.	Changes.
Anthracite	901,395	797,545	D. 103,790
Bituminous	4,895,403	4,803,168	D. 92,235
Total	5,796,738	5,600,713	D. 196,025

The total decrease this year was 3.4 per cent. The loss was in both anthracite and bituminous coal.

Coal receipts at Boston, eight months ended Aug. 31, reported by Chamber of Commerce:

	1908.	1909.	Changes.
Anthracite	1,401,282	1,103,518	D. 297,764
Bituminous	2,188,064	2,303,662	I. 115,598
Total domestic	3,589,346	3,407,180	D. 182,116
Foreign	357,705	167,454	D. 190,251
Total	3,947,051	3,574,634	D. 372,417

The foreign coal comes almost entirely from the Nova Scotia mines.

Anthracite coal shipments in August were 4,198,273 long tons, being 177,508 tons more than in July, but 400,820 tons less than in August, 1908. For the eight months ended Aug. 31, the shipments were, in long tons:

	1908.	1909.	Changes.
Reading	7,787,232	7,561,471	D. 225,761
Lehigh Valley	7,143,440	6,654,551	D. 488,889
N. J. Central	5,475,650	5,071,927	D. 403,723
Lackawanna	6,601,398	6,210,121	D. 391,277
Del. & Hudson	4,188,863	4,205,400	I. 16,537
Pennsylvania	3,833,603	4,719,715	D. 113,888
Erie	4,887,882	4,929,627	I. 41,745
N. Y., Ont. & West.	1,890,973	1,817,956	D. 73,017
Total	41,809,041	40,170,768	D. 638,273

The total decrease was 1.5 per cent. Two companies—the Delaware & Hudson and the Erie—showed small gains; the other companies had decreased shipments.

New York

Anthracite

Sept. 22 There is no change in the market, the usual demand being easily satisfied, while the fall business has hardly set in yet. The Hudson-Fulton celebration has served to postpone the question of winter stocks.

For domestic sizes schedule prices are $4.75 for lump and $5 for egg, stove and chestnut, f.o.b. New York harbor. For steam sizes quotations are unchanged, as follows: Pea, $3.15@3.25; buckwheat, $2.35@2.50; No. 2 buckwheat or rice, $1.70@2; barley, $1.35@1.50; all f.o.b. New York harbor.

Bituminous

There seems to be no material change in the Atlantic seaboard soft coal trade. Slightly improved conditions continue to prevail and a little better tonnage is being produced. Prices vary according to needs of operator and consumer.

Trade in the Far East continues to call for a little more coal than in previous months; fall business is beginning to show in this way and also in the shealwater ports, that are working to get winter stocks on hand before ice forms. Trade along the Sound exhibits a slightly improved demand, and although prices as a whole are unchanged, there is some improvement here and there where necessities arise. New York harbor trade shows an increase as the Hudson-Fulton celebration has created demand, warships and electric-light concerns calling for quite a block of coal.

Transportation is a little better than last week, although not yet quite up to schedule, and variable according to the individual roads. Car supply is practically up to demand, although the rules governing this matter, as applied on some of the lines, are very irritating to shippers when enforced to the limit.

The coastwise vessel market continues to show a good supply of ships at lower rates. Brokers are, however, beginning to talk of winter rates. New York harbor quotes on small-class vessels 50c. around the Cape, with 5 to 15c. higher to special points. Philadelphia quotes on large vessels 60@65c. to Boston, Salem and Portland, 65@70c. to Portsmouth, 70@75c. to Lynn, and 75@80c. to Newburyport.

Birmingham

Sept. 21—Several coal mines in the Birmingham district will resume operations in the next few weeks, and coke ovens will be started up. The Birmingham Coal and Iron Company will put 100 coke ovens in operation. The general coal trade is improving. The railroads in this State are beginning to get all empty cars off the sidings and run them to the larger centers to be ready. More cars are being handled by the railroads than for nearly two years.

Chicago

Sept. 20—Conditions in the wholesale coal market continue good from the dealer's point of view. All kinds of bituminous, except screenings, are in large and increasing demand. Many consumers and retailers are laying in stocks of domestic coals, and steam supplies are every day more in demand. Supplies are well adjusted to consumption in the chief supply of the market, Western bituminous; on some smokeless there is occasionally a sale at an exceptionally low price to escape demurrage charges. Otherwise the market is practically free from over-shipments.

Lump from Illinois and Indiana mines brings on cars $1.75@2.40 for the most part, some few shipments bringing 20@25c. more. Run-of-mine sells for $1.60@1.75, and screenings hold to $1.20@1.45. Lump and run-of-mine prices, probably, will advance slightly.

Smokeless is in good demand and prices are stiffening, the greater part of the Pocahontas and New River received selling at $3 for run-of-mine and $3.55 for lump. On demurrage sales these prices are occasionally cut by as much as 15c. Hocking is firm at the recently advanced price, $3.05. Pittsburg No. 8 at $2.55 for ¾ in., and Youghiogheny at $3.15 for ¾-in. gas, are quiet and firm.

Anthracite also is in increasing demand, though not active, and there is still some selling at cut prices. Consumers generally are laying in supplies of anthracite early, especially in the country.

Cleveland

Sept. 21—The Lake trade is dull and there is no sign yet of the rush that was expected in September. It has been postponed to next month—if it comes at all. Local trade, on the other hand, is very active, and deliveries are being rushed, both on steam and domestic coal.

Current prices show little change. For steam coal, No 8 district sells at $1.90@2.05 for lump, $1.70@1.80 for run-of-mine and $1.35 for slack; Middle district is about 10 or 15c. lower; Pittsburg, $2.10@2.25 for lump, $2@2.05 for run-of-mine and $1.15 for slack. For domestic coal, Massillon lump brings $2.95, f.o.b. Cleveland.

Indianapolis

Sept. 21—A distinctly stronger undertone was displayed in the past week's coal trade. Improvement in the demand and an enlargement of the output of the mines were reported from all sections of the mining territory. The present demand for coal is normal, and there is little doubt that it will continue to pick up for the next few weeks. One new mine, the Epworth, was opened in the first district near Evansville during the week; it will employ about 400 miners.

Pittsburg

Sept. 21—Demand for coal has continued to improve and mining operations are at the highest point in the year. Prices have stiffened and substantially the fall schedule prices are being obtained, with prospects of the usual season advance taking a short time. Meanwhile the market is quotable at $1.10 to large consumers and $1.10 to retail dealers for screenings, 4 mine, with slack at 65c. at mine.

[illegible] The market is largely [illegible] and prices have advanced by leaps and bounds. Several furnaces had difficulty in obtaining coke to run over Sunday, and bids of $2.50 and even higher have been made for prompt furnace coke without bringing out any material. Occasionally odd lots are picked up at $2.50, for but any regular supply for the near future $2.75 has to be paid. Inquiry for next year is heavy, and it is reported that many furnaces have made firm offers of $2.75 without getting the material. Some operators are predicting $3 for next year and do not seem to care to sell until that figure is reached. Foundry coke is quotable at about 25c. over furnace coke.

We quote furnace coke at $2.50@2.75 for prompt and fourth-quarter and at $2.75 for next year, with foundry coke nominally at about $2.75 for this year and $3 for next year.

The *Courier* reports the production in the region in the week ended Sept. 11 at 424,568 tons, or within 5000 tons of the greatest weekly production ever reported, in 1907. Shipments are reported at 5201 cars to Pittsburg, 7522 cars to points west of Pittsburg and 818 cars to points east of Connellsville, a total of 13,541 cars.

St. Louis

Sept. 18—The market is stiffening up all around. All the mines in southern Illinois have been practically tied up on account of car shortage, consequently high-grade coal has advanced in price and is scarce. This has been very beneficial to the lower-grade mines in the Central district, which are getting a better price and have a good supply of cars. On the whole the mines in southern Illinois on the Iron Mountain and Illinois Central did not average more than two days last week. The relief promised by the railroad officials did not materialize.

Carterville 6-in. lump or egg is now bringing $1.30@1.40 per ton f.o.b. mines, or $1.97@2.07 f.o.b. St. Louis; 3-in. nut is $1.10 f.o.b. mine, or $1.77 f.o.b. St Louis. Nut coal seems to be more plentiful this week than it has been for the past month. Franklin county coal brings 15 or 20c. per ton more than Carterville.

Standard coal brings $1@1.10 per ton f.o.b. mines, or $1.52@1.62 f.o.b. St Louis for 6-in. lump; 3-in. lump is 90c f.o.b. mine, or $1.42 f.o.b. St Louis, and nut is worth about 55c. per ton f.o.b. mine, or $1.07 St Louis. All the mines in the Standard district are practically operating to full capacity now. Staunton, Mt. Olive and Springfield district coals are about $1.25 f.o.b. mine, or $1.77 St Louis for 6-in. lump, with 3-in. lump 5c less.

Screenings have eased off a little more this week, though they are being absorbed readily at about 30c. per ton f.o.b. mines for Standard, and 15c. per ton f.o.b. mines for Carterville.

Anthracite coal is now moving readily. Dealers are complaining for the first time this year that they are not getting their coal as promptly as they should. Several of the large local jobbers report that since Sept. 1 the mines have fallen back on orders.

Foreign Coal Trade

United States Coal Exports—Exports of coal and coke from the United States, with coal furnished to steamships in foreign trade, seven months ended July 31, long tons:

	1908.	1909.	Changes.
Anthracite	1,587,299	1,709,401	I. 122,102
Bituminous	4,837,677	4,915,914	I. 78,237
Total exports	6,424,976	6,625,315	I. 200,339
Bunker coal	3,523,026	3,538,219	I. 15,193
Total	9,948,002	10,163,534	I. 215,532
Coke	368,392	547,434	I. 179,042

Canada took this year 1,685,395 tons anthracite and 3,424,795 tons bituminous; 5,110,190 tons, or 77.1 per cent. of the total exports. The coke went chiefly to Mexico and Canada.

United States Coal Imports—Imports of coal and coke into the United States, seven months ended July 31, long tons:

	1908.	1909.	Changes.
Anthracite	15,023	3,145	D. 11,878
Bituminous	912,820	636,939	D. 275,881
Total coal	927,843	640,084	D. 287,759
Coke	73,307	111,065	I. 37,758

Canada furnished this year 543,198 tons of coal and nearly all the coke; Australia, 75,429 tons of coal. Imports are chiefly on the Pacific coast, and in the northwestern States—Montana, Idaho and Washington.

Welsh Coal Prices—Messrs. Hull, Blyth & Co., London and Cardiff, report current prices of coal as follows, on Sept. 11: Best Welsh steam, $4.32; seconds, $4.08; thirds, $3.84; dry coals, $4.08; best Monmouthshire, $3.54; seconds, $3.36; best small steam, $2.22; seconds, $1.80. All per long ton, f.o.b. shipping port.

Iron Trade Review

New York, Sept. 22—The iron and steel trades continue to show activity and in some directions there is almost a boom.

This is especially the case in pig iron. In the Central West there has been large purchasing of bessemer and basic pig, indicating that some of the steel companies expect a greater demand than their own blast furnaces can supply. Bessemer pig has accordingly shown a sharp advance, as high as $17.50 having been paid for iron in the Shenango Valley for 1910 delivery. Basic has shown a parallel advance. In eastern territory there has been less activity in basic iron, but foundry sales have been large and also at advancing prices.

In finished material orders have been so heavy that there is some talk of a possible scarcity of steel and of delayed de-

liveries latter. This, however, is advancing matters a little. Prices are generally firm and small advances are noted in bars and in structural material. Special activity has been evident in rails, orders for something like 300,000 tons for next year's delivery having been placed during the week. While 1909 rail business has been small, the mills will begin next year with a very good quantity of orders on hand.

There are some reports of the placing of orders for basic pig iron in Germany, and it is rumored that quite a large tonnage has been taken there. This, however, must be accepted with considerable caution.

Lake Superior Iron Ore—Shipments of iron ore from the Lake Superior region in August were 7,193,199 long tons, being 500,174 tons more than in July. For the season to Sept. 1 the total shipments by ports are reported by the Cleveland *Iron Trade Review* as below, in long tons:

	1908.	1909.	Changes.
Escanaba	1,351,513	3,053,845	I. 1,702,332
Marquette	625,399	1,413,568	I. 788,169
Ashland	1,037,185	1,700,769	I. 663,584
Superior	1,723,208	3,686,323	I. 1,963,115
Duluth	4,583,987	7,713,377	I. 3,129,390
Two Harbors	2,663,644	5,020,667	I. 2,357,023
Total	11,984,936	22,588,549	I. 10,603,613

The port statements indicate that the larger part of the increase this year came from the Mesabi range.

Baltimore

Sept. 21—Imports for the week included 1937 tons ferromanganese, 100 tons silicospiegel and 2300 tons manganese ore from Great Britain; 17,350 tons iron ore from Cuba. Exports included 1,112,200 lb. steel billets to Copenhagen and 1,138,100 lb. pipe to Antwerp.

Birmingham

Sept. 21—The Southern iron market shows sales steady and of some size, while inquiries are being received right along for iron to be delivered into the first half of next year. No. 2 foundry is now selling at $14.50 per ton. Some of the furnace companies in this territory have withdrawn from the market, their probable make being pretty well sold up. Two furnaces have gone into blast this month. The Southern Iron and Steel Company is rapidly getting ready for a general resumption at all plants, furnaces, coke ovens, quarries and steel plant. The cast-iron pipe makers are still busy. The machine shops and foundries are receiving more work every week. It is announced that the American Radiator Company, which recently established a small factory here, will enlarge the works. The iron manufacturers are beginning to talk of $15 per ton for No. 2 foundry iron, delivery next year and a sale or two has already been made. Charcoal iron is in strong demand, the car wheel manufacturers having much business.

Chicago

Sept. 21—The iron market continues strong, with steady purchases of pig iron by foundrymen, generally, in medium-sized lots (300 to 1000 tons—and occasionally a larger sale. Both Northern and Southern coke iron are sought now chiefly for first-quarter needs; some sales extend over the whole first half of 1910. Northern continues to command $18.50 for both last-quarter and first-half delivery. Southern is no longer obtainable at a discount price for early delivery, the minimum holding to $14 Birmingham, or $18.35 Chicago. Northern charcoal is in very good demand at $19.50@20 per ton.

Confidence in the continuation of the existing large demand for pig iron and iron and steel products of all kinds is everywhere manifested. With no indications of an attempt to buy recklessly, melters and manufacturers are buying liberally, while the railroad demands continue strong for supplies of every kind. That pig iron will advance is prophesied by most sellers and many buyers, while advancing prices on manufactured products do not seem in any way to check consumption. Coke continues active, selling largely at $4.85, and being in plentiful supply.

Cleveland

Sept. 21—Small orders for iron ore are still coming in, though most of the larger contracts have been closed. Prices are unchanged.

Pig Iron—Foundry iron is quieter, but basic is in better demand. Prices are going up, and there is quite a range, depending mainly on time of delivery. No. 2 foundry is $16.75@17.25; gray forge, $15.25@15.50. There is quite a call for Lake Superior charcoal at $19.50@20, Cleveland.

Finished Material—Bars are quieter, but plates are active, and a number of orders for structural steel are pending. Small trade is active and jobbers have advanced prices, quoting 2c. for structural steel and 1.80c. for bars out of stock.

Philadelphia

Sept. 22—The pig-iron market has not developed during the past few days anything worth noting. Users of basic pig have purchased liberally during the past few weeks. Much more could be sold if the furnaces had it to spare. The next anticipated move is the placing of orders with Western basic makers for iron for delivery during the winter. The current quotation today is $18 with probabilities of a further advance. Foundry iron has gained in strength, but not in activity, and is quoted today at $18.50 for No. 2X. It transpires that many of the larger consumers of No. 2 foundry are not very well supplied. Gray forge iron has been quiet. Southern iron is being offered here at $17.50 for No. 2. Inquiries for late deliveries develop firm prices.

Scrap—Only the heavier kinds of scrap are meeting with any demand worth noting. Old rails have been asked for this week, and heavy cast scrap is cleaned up in several yards. Nothing is being done in railroad scrap at present.

Pittsburg

Sept. 21—The iron and steel markets show an even more rapid improvement than formerly; it appears now to be a genuine bull movement, with prospects for continued improvement in prices and tonnage for several months to come. Specifications on old contracts for finished steel continue excellent, while new buying is on the increase, and many steel interests are making new records for the year in bookings.

The trend of prices continues upward. Plates and shapes have advanced $2 a ton in a fortnight, and are quotable at a minimum of 1.50c., steel bars remaining at 1.40c. On desirable business mills will sell for first quarter at these figures, but not for later delivery. Sheets are still firmer. Tinplate premiums have largely disappeared, but it is regarded as certain that prices will be advanced for next year. While wrought-iron pipe has steadily advanced, steel-pipe prices have not changed and as it is late in the season nothing may now be done for awhile, despite the fact that iron pipe is six points, or practically $12 a ton, above steel pipe.

Pig Iron—Bessemer has continued to lead the pig-iron market. Last Thursday the market quietly advanced 50c. to $17.50, Valley, and since then sales have been made of 20,000 tons to the Lackawanna Steel Company, 10,000 tons to the Republic Iron and Steel Company and 3000 tons to the Midvale Steel Company, all at $17.50, Valley, for fourth-quarter delivery. Except as to some iron which has been under negotiation between a Youngstown steel interest and the Valley furnaces, and perhaps a few odd lots, the $17.50 price has been withdrawn and the market is fairly quotable at $18, Valley, for any delivery this year, and with the prospect that first-quarter deliveries will bring higher figures. September opened with bessemer iron at $16.75, Valley, and to date the sales actually reported, with details, total about 125,000 tons, with an advance of $1.25. Other grades of iron have followed the lead of bessemer. No. 2 foundry has advanced 50c. to a minimum of $16.50, Valley, for this year, while it is not certain that $17 can be done for first quarter. Forge is nominally about 75c. under No. 2 foundry. The National Car Wheel Company has bought a round block for first half at $16.50, furnace. Sales of foundry iron have been fairly large, but there has been no movement in basic since the bessemer advance. Last week $16 was quoted in this report while

in the absence of sales $16.50@17 may be quoted as nominally representing the value of basic.

Ferromanganese—The market has been fairly active, with prices advancing, and quotable at about $42.50 for prompt, $44 for fourth quarter and $45 for first quarter, all at Baltimore, the freight to Pittsburg being $1.05 per ton.

Steel—The scarcity in unfinished steel has become more acute, and it is not easy to arrange purchases at any prices. Quotable prices, largely nominal, are: Bessemer billets, $25.50; open-hearth, $26; sheet-bars, $26.50@27; bessemer rods, $31.50; open hearth rods, $32, all at mill, plus full freight to destination.

Sheets—The market has gained. Mills are well sold up and seem to be averse to making further commitments, on account of the advance in sheet-bars and the possibility of a definite advance in sheets. The market is firm at 2.20c. for black and 2.45c. for galvanized, with corrugated roofing at $1.55 per square for painted and $2.80 for galvanized.

St. Louis

Sept. 18—The pig iron market is very active and prices remain unchanged at $14 per ton Birmingham or $17.75 St. Louis. Local agents report inquiries numerous and several of the large companies have sold up their entire output for all of this year and have taken on all the business for the first quarter of next year they care about. Consequently they are turning down all orders. They report that they anticipate an advance of at least $1 per ton by the first of the year.

Iron Ore—The demand for 55 per cent iron ore is steady and strong at $3.50@3.75 per ton f.o.b. St. Louis; production does not seem to be quite up to the demand. Another indication that the iron business is picking up is the increased demands for foundry coke, which is now at $5.25 per ton f.o.b. St. Louis.

Foreign Iron Trade

German Iron Trade—Imports and exports of iron and steel in Germany, seven months ended July 31, metric tons:

	Exports	Imports	Excess
Iron and steel	2,216,777	257,102	Exp. 1,959,675
Manufactures	182,477	45,183	Exp. 137,294
Total	2,399,254	302,285	Exp. 2,096,969
Total, 1908	2,127,518	378,519	Exp. 2,058,799

Imports of iron ore for the seven months were 4,160,247 tons, exports, 1,202,987 tons. Imports of manganese ore, 214,001; exports, 22,814 tons.

Iron Ore Imports—Imports of iron ore into Great Britain for the seven months ended July 31 were 4,167,243 long tons.

Metal Markets

London, Sept. 16—The metal market is generally firm, both domestic and foreign, though there is some uncertainty as to increasing consumption. Prices are generally unchanged, or show only moderate fluctuations.

Gold, Silver and Platinum

UNITED STATES GOLD AND SILVER MOVEMENT

Metal.	Exports.	Imports.	Excess.
Gold:			
July 1909..	$16,661,782	$ 3,269,885	Exp. $13,391,897
" 1908..	4,845,272	2,949,179	Exp. 1,896,093
Year 1909..	80,496,119	23,405,477	Exp. 57,090,642
" 1908..	58,363,098	29,357,076	Exp. 29,006,172
Silver			
July 1909..	5,049,366	3,926,117	Exp. 1,123,249
" 1908..	4,030,746	3,039,581	" 1,891,165
Year 1909..	34,409,032	26,798,145	" 7,610,887
" 1908..	30,445,291	24,180,929	" 6,264,362

Exports from the port of New York, week ended Sept. 18: Gold, $25,260; silver, $792,940, chiefly to London. Imports: Gold, $75,368, principally from South America; silver, $48,691, from the West Indies and Mexico.

Gold production in the Transvaal in August was 611,537 oz., making for the eight months ended Aug. 31 a total of 4,868,989 oz., or $100,642,003. This is an increase of 296,764 oz. over last year.

Gold—The price of gold on the open market in London remained at the standard, 77s. 9d. per oz. for bars and 76s. 4d. per oz. for American coin. The chief demand just now is from Berlin, which has been sending a large amount to Russia. In New York no gold exports are reported.

Platinum—Demand is good, especially for the jewelry trade. The recent advance in prices is well held, dealers quoting $25.50 per oz. for refined platinum and $20.25 per oz. for hard metal. There is some talk of a further advance.

Silver—The market has been unusually steady, only one change having occurred during the week. It closes at 23 11-16d. in London.

SILVER AND STERLING EXCHANGE

Sept.	16	17	18	20	21	22
New York....	51	51½	51⅛	51⅛	51⅛	51¼
London.....	23¾	23¾	24⅛	23⅝	23⅝	23 11/16
Sterling Ex.	4.845	4.845	4.840	4.845	4.845	4.845

New York quotations, cents per ounce troy, fine silver. London, pence per ounce sterling silver, 0.925 fine.

Exports of silver from London to the East, Jan. 1 to Sept. 9, as reported by Messrs. Pixley & Abell:

	1908	1909	Changes.
India..	£ 6,458,344	£4,344,800	D. £2,114,533
China	516,400	1,555,200	I. 1,038,800
Straits	90,510	82,800	D. 7,710
Total.....	£ 7,065,444	£5,982,800	D. £1,083,643

Receipts for the week, £5,000 from Mexico, £5,000 from the West Indies and £210,000 from New York; total, £210,000. Exports, £27,000 to India.

Exports of copper from New York and Philadelphia for the week were 5014 long tons. Our special correspondent gives the exports from Baltimore at 486 long tons.

Copper, Tin, Lead and Zinc

Sept.	Copper. Lake, Cts. per lb.	Copper. Electrolytic, Cts. per lb.	Copper. London, £ per ton.	Tin. Cts. per lb.	Lead. New York, Cts. per lb.	Lead. St. Louis, Cts. per lb.	Zinc. St. Louis, Cts. per lb.
13	12¾			30⅛	4.32½	4.20	5.60
16	@13⅛	@13	58⅞	@30⅛	@4.35	@4.22½	@5.62½
13	12¾			30⅛	4.32½	4.20	5.60
17	@13⅛	@13	58⅞	@30½	@4.35	@4.22½	@5.62½
13	12¾		....	30¼	4.32½	4.20	5.62½
18	@13⅛	@13		@30½	@4.35	@4.22½	@5.65
13	12¾			30¼	4.32½	4.20	5.65
20	@13⅛	@13	59	@30½	@4.35	@4.22½	@5.67½
13	12¾			30¼	4.32½	4.20	5.65
21	@13⅛	@13	59¼	@30¼	@4.35	@4.22½	@5.70
13	12			30⅛	4.32½	4.20	5.67½
22	@13⅛	@13¼	59	@30⅞	@4.35	@4.22½	@5.70

London quotations are per long ton (2240 lb.) standard copper. The New York quotations for electrolytic copper are for cakes, ingots and wirebars, and represent the bulk of the transactions made with consumers, f.o.b. New York, cash. The prices of casting copper and of electrolytic cathodes are usually 0.125c. below that of electrolytic. The quotations for lead represent wholesale transactions in the open market. The quotations on spelter are for ordinary Western brands; special brands command a premium.

Copper—In spite of a further increase in the European visible supply for the first half of this month of 2000 tons, there has been an excellent inquiry from abroad, due to a decided revival in the business of the European consumers. Large sales have been made for export, and domestic consumers, when they found that the market would yield no further, also took hold on a more liberal scale. While the market has advanced somewhat, the demand has been freely met, the close being steady at 13@13.25c. for Lake copper, and 12¾@13c. for electrolytic copper in cakes, wirebars, or ingots. Casting copper is quoted nominally at 12⅝@12⅞ cents.

Copper sheets are 17@18c., base for large lots. Full extras are charged, and higher prices for small quantities. Copper wire has been reduced ½c. and is now 14.5c. base, carload lots at mill. Business continues on a good scale.

The standard market in London reflected the better feeling and advanced gradually during the week 15s. for both options, the close being steady at £59 7s. 6d. for spot, £60 5s. for three months.

Refined and manufactured sorts were quiet. English tough, £62 10s.; best selected, £60 10s. @ £62 10s., strong sheets, £73 10s. @ £74 10s. per ton.

Tin—A large buying movement developed early in the week, which quickly absorbed the parcels offering at less than the importation point. The feeling of both speculators and consumers is more friendly to the market, and a good business has taken place from day to day. London closes firm and higher at £138 for spot, and £139 5s. 6d. for three months, while business here is being done at 30.50@30.75c., f.o.b. New York.

Lead—The market is quiet and unchanged at 4.32½@4.35c., New York, and 4.20@4.22½c., St. Louis.

The London market has fluctuated within narrow limits, and closes steady at £12 12s. 6d. for Spanish lead, and £12 15s. for English lead.

Spelter—Under a relatively light demand from consumers, the market has advanced almost from day to day. Smelters are selling only their current production, as ore prices are still out of all proportion to the value of the refined metal. The close is steady and higher at 5.82½@5.85c. New York, and 5.67½@5.70c. St. Louis

New York quotations for spelter on Sept. 16 and 17 were 5.75@5.77½c.; 18, 5.77½@5.80c.; 20, 5.80@5.82½c.; 21, 5.80@5.85c.; 22, 5.82½@5.85 cents.

The London market is unchanged at £23 for good ordinaries and £23 5s for specials.

Base price of sheet zinc is now 7½c. per lb., f.o.b. La Salle-Peru, Ill., less 8 per cent. discount.

Other Metals

Antimony—Business is quiet and prices are steady at 8⅝@8¾c. for Cookson's; 8⅛c. for Hallett's; 8@8¼c. for U. S., and 7⅝@7⅞c. for outside brands.

Aluminum—No change in the market. No. 1 ingots can be had at 20@23c. per lb. in large lots, with the American maker holding to the higher figure.

Quicksilver—The market has been active and current supplies are virtually cleaned out. The New York price has advanced sharply to $46 per flask of 75 lb. Jobbers quote 63@65c. per lb. for small lots. San Francisco prices have advanced to $44@45 for domestic orders and $42@43 for export. The London price is now £8 5s. with jobbers quoting £8 per flask.

Magnesium—The price of pure metal has been advanced 25c. to $1.50 per lb. for 100-lb. lots f.o.b. New York. This advance is due to the recent increase in duty.

Nickel—Large lots, contract business, 40@45c. per lb. Retail, spot, from 50c. to 2000-lb. lots, up to 55c. for 500-lb. lots. The price for electrolytic is 5c. higher.

Cadmium—Current quotations are 75c. per lb. in 100-lb. lots at Cleveland, Ohio. In Germany 450@475 marks per 100 kg., at factory in Silesia.

Zinc and Lead Ore Markets

Platteville, Wis., Sept. 18—The highest price paid for zinc ore was $50 per ton; the base price of 60 per cent. ore, was $47@48 per ton. The base price of lead ore, 80 per cent., was $55@50 per ton

SHIPMENTS, WEEK ENDED SEPT. 18.

Camps.	Zinc ore, lb.	Lead ore, lb.	Sulphur ore, lb.
Benton	611,140	.....	.....
Highland	538,450	.....	.....
Cuba City	490,210	84,260	52,245
Platteville	440,150	.....	242,100
Hazel Green	334,400	80,000	.....
Galena	320,000	.....	.....
Livingston	140,000	.....	.....
Harker	96,000	.....	..
Days Siding	88,000	.....	.....
Rewey	59,700	86,000	.....
Total	3,118,050	250,930	294,345
Year to Sept. 18	94,596,080	5,870,300	8,429,125

In addition to the above there were shipped to the American Zinc Ore Separating Company, 683,590 lb. zinc ore.

Joplin, Mo., Sept. 18—The highest price paid for zinc sulphide ore was $52, the base ranging from $49 to $46 per ton of 60 per cent. zinc. Zinc silicate ore sold as high as $31 the base ranging from $25 to $26.50 per ton of 40 per cent. zinc The average price, all grades, was $44.58. Lead ore sold freely at $56 per ton, and no higher price could be verified, though persistently rumored. The average price, all grades, was $55.90 per ton. Practically only one buyer was in the market—the Picher Lead Company. The Galena company purchased very lightly and the Granby Mining and Smelting Company and the St. Louis Smelting and Refining Company shipped no ore.

SHIPMENTS, WEEK ENDED SEPT. 18.

	Zinc, lb.	Lead, lb.	Value.
Webb City-Carterville	3,854,950	1,031,990	$117,558
Joplin	1,368,060	156,700	37,180
Prosperity	461,190	403,060	21,893
Galena	817,390	50,540	20,213
Duenweg	527,180	45,690	12,445
Aurora	469,940	.....	9,268
Badger	369,500	.....	9,052
Alba-Neck	308,750	.....	7,564
Spurgeon	255,780	74,430	6,559
Granby	378,700	980	5,925
Oronogo	157,180	57,570	4,474
Miami	264,280	.....	4,228
Carthage	144,850	.....	3,548
Quapaw	153,110	.....	3,305
Zincite	70,050	.....	1,751
Carl Junction	63,020	.....	1,575
Cave Springs	63,290	.....	1,550
Stott City	62,660	.....	1,503
Sarcoxie	54,890	.....	795
Totals	9,844,770	1,820,860	$270,385
38 weeks	427,329,600	64,730,800	$10,070,590

Zinc value, the week, $219,483; 38 weeks, $8,306,733
Lead value, the week, 50,902; 38 weeks, 1,763,857

MONTHLY AVERAGE PRICES

Month.	Zinc Ore. Base Price. 1908.	Zinc Ore. Base Price. 1909.	Zinc Ore. All Ores. 1908.	Zinc Ore. All Ores. 1909.	Lead Ore. All Ores. 1908.	Lead Ore. All Ores. 1909.
January	$37.00	$41.25	$45.56	$48.16	$46.88	$52.17
February	36.63	36.91	44.92	44.47	49.72	50.50
March	36.19	37.40	44.19	44.71	49.66	50.82
April	35.40	38.63	44.08	45.01	52.47	55.64
May	34.19	40.06	43.49	47.42	55.05	56.59
June	33.06	44.15	42.07	49.45	60.48	57.52
July	34.55	44.06	41.67	44.11	59.80	55.74
August	36.54	48.25	43.42	44.54	60.34	57.60
September	37.60	.....	44.44	.....	54.54	.....
October	36.19	47.40	44.19	.....	52.66	.....
November	39.14	.....	45.62	.....	54.56	.....
December	42.75	.....	49.64	.....	49.68	.....
Year	$36.63	.....	$44.31	.....	$53.93	.....

NOTE—Under zinc ore the first two columns give base prices for 60 per cent zinc ore; the second two the average for all ores sold. Lead ore prices are the average for all ores sold

With the buoyancy knocked out of the ore market, both zinc and lead, with the continued lower price offerings the output is being materially curtailed, and still the stock in bins continues to increase

Chemicals

New York, Sept. 22—The chemical market shows a slight weakness and is quiet, except in futures on white arsenic.

Copper Sulphate—The market is weaker, quotations being $4.10 per 100 lb. in carload lots and $4.35 per 100 lb. in smaller parcels.

Arsenic—The spot market for white arsenic is very dull at 2.70@2.95c. per lb. The future market has been strong during the past week and about 600 tons changed hands at quotations around 2⅞c per pound.

Imports and Exports—The imports and exports of chemicals and raw materials in the United States, seven months ended July 31, were as follows:

	Imports.	Exports.	Excess.
Copper sulph. lb.	.....	2,081,181	E. 2,081,181
Bleach. lb.	49,618,436	14,964	I. 49,604,532
Potash salts, lb.	217,668,404	1,857,886	I. 215,810,518
Soda salts, lb.	8,918,889	394,465	I. 8,524,424
Acetate lime, lb.	.....	47,433,731	E. 47,433,731
Nit. of soda, tons	216,613	5,509	I. 211,104
Phosphates, tons	6,202	633,613	E. 627,411
Sulphur, tons	18,427	13,166	I. 5,261
Pyrites, tons	399,810	.....	I. 399,810

Estimating sulphur contents of pyrites the total imports of sulphur this year were 178,351 tons. Exports include reëxports of foreign material.

Mining Stocks

New York, Sept. 22—The Stock Exchange has shown no very definite tendency during the week, some advances in quotations being offset by decreases in other securities. Conditions of business and crop prospects are not unfavorable and the advance in interest rates has not been sufficient to effect any serious check. Fluctuations have not been very heavy, in either direction There was much activity in Vulcan Detinning, a stock not usually much traded in, but persons interested deny the existence of any special cause

On the Curb trading was quite active. The copper stocks, as a rule, were rather firmer than in the preceding week, although the advances were small in amount The Nevada gold stocks were rather quiet and inclined to weakness Cobalt stocks were active and firm, this tendency being assisted by two dividend declarations—Nipissing, 7½ per cent., and LaRose 4 per cent quarterly. Industrial stocks on the Curb were [illegible] and advances were recorded in Standard Oil and in Southern Iron and Steel

Boston, Sept. 21—Copper shares have had a fair market of late and, although it is erratic specialties, the tone to the whole list inspires confidence.

Amalgamated has had a $5.50 advance, to $84.87½. Allouez spurted $8 to $61.50, although it is now below $60. The so-called Calumet & Hecla stocks attracted attention a week ago, but the market shows a broadening tendency and has worked away from their influence to an extent. Atlantic is weak on the likelihood of an assessment some time this year. This company has managed to pay its way for the past 30 years and, as a matter of fact, has paid back in dividends about the original amount paid in.

Nipissing attracted attention with its advance to $13, due to the increase in the dividend rate.

North Butte has been quiet and steady, while Butte Coalition rose to $27. Osceola touched $151, and Tamarack was also strong in sympathy. Lake has fluctuated about $2 during the week and closed at $37. U. S. Smelting common has advanced $4.37½ to $59. There is a strong pool at work in this specialty. U. S. Coal and Oil also rose $2.75 to $35, on the acquisition of the remaining holdings of the late R. D. Evans by the president of the company. American Zinc is now stronger, and is selling around $32 per share.

Curb trading has been largely in Davis-Daly, First National, Chino and Rhode Island Coal. Prices are generally above those of a week ago.

STOCK QUOTATIONS

NEW YORK Sept. 22 Name of Comp.	Clg.
Alaska Mine	‡.11
Amalgamated	84¾
Anaconda	50⅛
Balaklala	‡2⅛
British Col. Cop	6⅛
Buffalo Mines	3⅛
Butte Coalition	26⅞
Colonial Silver	1⅛
Cum Ely Mining	7⅛
Davis Daly	6⅞
Dominion Cop.	7
Douglas Copper	1½
El Rayo	2¼
Florence	2¼
Foster Cobalt	‡.32
Furnace Creek	‡.05
Giroux	9¼
Gold Hill	⅜
Goldfield Con.	7
Granby	101
Greene Gold	‡⅛
Greene G. & S.	‡9
Guanajuato	1⅜
Guggen. Exp.	215
Hanapah	‡15
Kerr Lake	8⅛
McKinley-Dar.	80
Miami Copper	1[illegible]
Micmac	[illegible]
Mines Co. of Am.	[illegible]
Montezuma C. R.	.04
Mont. Sho. C.	[illegible]
Nev. Utah M. & S.	1[illegible]
Newhouse M. & S.	[illegible]
Nipissing Mines	11¼
Old Hundred	[illegible]
Silver Queen	[illegible]
Stewart	[illegible]
Tennessee Cop'r	[illegible]
Tri-Bullion	[illegible]
Trinity Copper	[illegible]
Utah Apex	4
Utah Copper	[illegible]
Yukon Gold	[illegible]

BOSTON Sept. 22 Name of Comp.	Clg.
Adventure	6⅛
Allouez	60
Am. Zinc	32
Arcadian	4⅝
Arizona Com.	45½
Atlantic	9⅞
Boston Con.	15
Calumet & Ariz.	104½
Calumet & Hecla	685
Centennial	42⅛
Copper Range	81
Daly-West	8
East Butte	11⅜
Franklin	17¼
Greene-Can.	9½
Hancock	11¼
Isle Royal	24
Keweenaw	3
La Salle	16
Mass.	8
Michigan	10¼
Mohawk	6[illegible]
Nevada	24½
North Butte	5[illegible]
Old Colony	9
Old Dominion	6[illegible]
Osceola	150
Parrot	31[illegible]
Quincy	92[illegible]
Rhode Island	‡4¼
Shannon	1[illegible]
Superior	[illegible]
Superior & Bost.	1[illegible]
Superior & Pitts.	1[illegible]
Tamarack	[illegible]
Trinity	1[illegible]
U. S. Smelt'g & Ref.	[illegible]
U. S. Sm. & Re. pd.	[illegible]
Utah Con.	4[illegible]
Victoria	[illegible]
Winona	8
Wolverine	1[illegible]
Wyandotte	[illegible]

‡Last quotations. [illegible]

N. Y. INDUSTRIAL	
Am. Agri. Chem.	45⅞
Am. Smelt. & Ref.	100¾
Am. Sm. & Ref., pf.	113
Col. Fuel & Iron.	46
Federal M. & S., pf.	‡91½
National Lead	90¾
National Lead, pf.	‡112
Pittsburg Coal	22
Republic I. & S.	44¼
Republic I. & S., pf.	108¾
Sloss-Sheffield	89¼
Standard Oil	‡685
U. S. Steel	85
U. S. Steel, pf.	128¾
Va. Car. Chem.	48⅛

BOSTON CURB	Low.
Ahmeek	230
Chemung	17
Chino	8¾
Globe Con.	‡4½
Gila	9⅜
Mason Valley	2
Ray Central	2¼
Ray Con.	21¼
San Antonio	8
Yuma	2⅜

Furnished by Hornblower & Weeks, N. Y.

ST. LOUIS Sept. 18 N. of Com.	High	Low.
Adams	.40	.30
Am. Nettie	.09	.07
Center Cr'k	1.80	1.60
Cent. C. & C.	86.00	84.00
C. C. & C. pf.	85.00	83.00
Cent. Oil	115.00	100.00
Columbia	9.00	7.00
Con. Coal	19.00	17.00
Doe Run	115.00	105.00
Gra. Bimet.	.30	.25
St. Joe	12.50	11.00

LONDON Sept. 22 Name of Com.	Clg.
Dolores	£1 5s 0d
Stratton's Ind	0 3 3
Camp Bird	1 10 6
Esperanza	2 18 0
Tomboy	1 1 3
El Oro	1 5 6
Oroville	0 14 0

Cabled through Wm. P. Bonbright & Co., N. Y.

NEVADA STOCKS. Sept. 22.

Furnished by Weir Bros. & Co., New York.

Name of Comp.	Bid.
COMSTOCK STOCKS	
Belcher	.90
Best & Belcher	.55
Caledonia	.45
Chollar	.25
Comstock	‡.28
Con. Cal. & Va.	‡1.42
Crown Point	‡1.20
Exchequer	.34
Gould & Curry	.25
Hale & Norcross	.40
Mexican	1.37
Ophir	1.20
Overman	‡.46
Potosi	.59
Savage	.51
Sierra Nevada	.48
Union	.63
Utah	.06
Yellow Jacket	1.57
TONOPAH STOCKS	
Belmont	.75
Extension	‡.57
Golden Anchor	..
Jim Butler	.12
MacNamara	.29
Midway	.18
Montana	.95
North Star	.02
Tonopah Mine of N.	6.87½
West End Con.	.26
GOLDFIELD STOCKS	
Adams	.01
Atlanta	.13
Blue Bell	.02
Booth	.12
C. O. D. Con.	.08
Columbia Mt.	.09
Comb. Frac.	.71
Cracker Jack	.02
Dia'dfield B. B. C.	.01
Florence	2.93½
Goldfield Belmont	.04
Goldfield Daisy	.12
Great Bend	.06
Jumbo Extension	.15
Kendall	.02
Lone Star	.02
May Queen	.04
Oro	.05
Red Hill	.05
Sandstorm	.05

Name of Comp.	Bid.
Silver Pick	.12
St. Ives	.09
Triangle	.01
BULLFROG STOCKS	
Gibraltar	.02
Homestake King	.01
Mont. Shoshone C.	1.87½
Tramp Cons.	.04
MISCELLANEOUS	
Cumberland Ely	7.00
Giroux	9.62½
Greenwater Copper	.04
Nevada Con.	24.25
Nevada Hills	.70
Nevada Smelting	.87½
Nevada Wonder	.70
Nevada-Utah	1.50
Penn-Wyoming	...
Pittsburgh S. Pk.	.58
Ray Central	2.25
Ray Con.	20.50
Round Mt. Sphinx	.05

COLO. SPRINGS Sept. 17 Name of Comp.	Clg.
Acacia	.08
C. C. Con.	‡.03½
Dante	‡.07
Doctor	.09
Elkton	.74½
El Paso	.65
Findlay	.11¼
Gold Dollar	.13
Gold Sovereign	.04½
Isabella	.22
Jack Pot	‡.08½
Jennie Sample	.08
Jerry Johnson	‡.06¾
Lexington	‡.01¾
Mary McKinney	.49
Pharmacist	.03½
Portland	.83
U. G. M.	.08
Vindicator	.75
Work	.07

Assessments

Company	Delinq.	Sale.	Amt.
Alta Consolidated, Utah	Sept. 15	Oct. 20	$0.00
[illegible]	Sept. 24	Oct. 5	0.10
[illegible]	Sept. 1	Sept. 31	[illegible]
[illegible]	Sept. 7	Oct. 7	0.001
[illegible], Wash.	Aug. 31	Sept. 30	0.01
[illegible]	Oct. 1	[illegible]	0.02
[illegible]	Sept. [illegible]	Oct. 18	0.10
[illegible]	Sept. 7	Oct. 4	0.001
[illegible]	Sept. 10	Oct. 10	[illegible]
[illegible]	Oct. 10	[illegible]	1.00
[illegible]	Aug. [illegible]	Sept. 25	0.005
[illegible]	Aug. 23	Sept. 21	[illegible]
[illegible]	Aug. 31	Sept. [illegible]	[illegible]
[illegible]	Sept. 1	Oct. [illegible]	[illegible]
[illegible]	[illegible]	[illegible]	[illegible]
[illegible]	Sept. [illegible]	[illegible]	[illegible]
[illegible]	Oct. [illegible]	[illegible]	0.10
[illegible]	Sept. [illegible]	[illegible]	[illegible]
[illegible]	Sept. [illegible]	Oct. 5	[illegible]
[illegible]	Sept. 14	[illegible]	1.00
[illegible] Copper, Utah	Sept. 10	Sept. 27	0.01

Monthly Average Prices of Metals

SILVER

Month.	New York. 1908.	New York. 1909.	London. 1908.	London. 1909.
January	55.678	51.750	25.738	[illegible]
February	56.000	51.472	25.855	[illegible]
March	55.365	50.468	25.570	[illegible]
April	55.505	51.428	25.133	[illegible]
May	52.795	52.905	24.377	[illegible]
June	53.663	52.538	24.760	[illegible]
July	53.115	51.043	24.514	[illegible]
August	51.683	51.125	23.858	23.588
September	51.720	......	23.877	......
October	51.431	......	23.725	......
November	49.647	......	22.933	......
December	48.766	......	22.493	......
Total	52.864	......	24.402	....

New York, cents per fine ounce; London, pence per standard ounce.

COPPER

	NEW YORK. Electrolytic 1908.	Electrolytic 1909.	Lake. 1908.	Lake. 1909.	LONDON. 1908.	LONDON. 1909.
January	13.726	13.893	13.901	14.280	62.386	57.688
February	12.905	12.949	13.098	13.295	58.786	61.198
March	12.704	12.387	12.875	12.826	58.761	56.231
April	12.743	12.56½	12.928	12.93½	58.331	57.363
May	12.598	12.893	12.788	13.238	57.387	59.338
June	12.675	13.214	12.877	13.548	57.842	59.627
July	12.702	12.880	12.933	13.363	57.989	58.556
August	13.462	13.007	13.639	13.296	60.500	59.393
September	13.388	......	13.600	......	60.338	......
October	13.354	......	13.646	......	60.139	......
November	14.130	......	14.386	......	63.417	......
December	14.111	......	14.411	......	62.943	.....
Year	13.208	......	13.424	......	59.902	.....

New York, cents per pound. Electrolytic is for cakes, ingots or wirebars. London, pounds sterling, per long ton, standard copper.

TIN AT NEW YORK

Month.	1908.	1909.	Month.	1908.	1909.
January	27.380	28.060	July	29.207	29.125
February	28.978	28.290	August	29.942	29.966
March	30.577	28.727	September	28.815	......
April	31.702	29.445	October	29.444	......
May	30.015	29.225	November	30.348	......
June	28.024	29.322	December	29.154	.....
			Av. year	29.465	.....

Prices are in cents per pound.

LEAD

Month.	New York 1908.	New York 1909.	St. Louis 1909.	London 1908.	London 1909.
January	3.691	4.175	4.025	14.469	[illegible]
February	3.725	4.018	3.868	14.250	[illegible]
March	3.838	3.986	3.835	13.975	[illegible]
April	3.993	4.168	4.051	13.469	[illegible]
May	4.253	4.287	4.214	12.938	[illegible]
June	4.466	4.350	4.291	12.600	[illegible]
July	4.744	4.321	4.188	13.000	12.563
August	4.580	4.363	4.227	13.375	12.475
September	4.515	......	......	13.125	......
October	4.351	......	......	13.375	......
November	4.330	......	......	13.538	......
December	4.213	......	......	13.156	......
Year	4.200	......	......	13.439	.....

New York and St. Louis, cents per pound. London, pounds sterling per long ton.

SPELTER

Month.	New York 1908.	New York 1909.	St. Louis 1908.	St. Louis 1909.	London 1908.	London 1909.
January	4.513	[illegible]141	4.363	4.991	20.563	[illegible]
February	4.788	[illegible]	4.638	[illegible]	20.875	[illegible]
March	4.665	[illegible]	4.527	[illegible]	21.[illegible]	[illegible]
April	4.645	[illegible]	4.495	[illegible]	21.[illegible]	[illegible]
May	4.608	5.124	4.458	4.974	19.906	[illegible]
June	4.543	5.432	[illegible]	[illegible]	19.[illegible]	[illegible]
July	4.485	[illegible]	[illegible]	[illegible]	19.[illegible]	21.[illegible]
August	4.702	[illegible]	[illegible]	[illegible]	19.[illegible]	22.[illegible]
September	4.769		4.619		19.563	.....
October	4.801		4.651		19.750	.....
November	[illegible].059		4.909		20.875	.....
December	[illegible].137		4.987		20.625	.....
Year	4.726		4.578		20.163	.....

New York and St. Louis, cents per pound. London, pounds sterling per long ton.

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Reminiscences of Mining in Durango

Improvements in Railroad Facilities. Establishment of Law and Order. Some Data about a Crude but Profitable Smelting Practice

BY WALTER D. BEVERLY

My first visit to Mexico was in 1892. At that time the American invasion was well under way. Since 1886 the mines of Sierra Mojada had been exporting large quantities of lead ore to the United States, and in 1889 the McKinley tariff bill, making lead in ore dutiable at the rate of 1½c. per lb., had led to the establishment of a silver-lead smelting industry at Monterey and San Luis Potosi, the development of which greatly reduced the supply of Mexican ore available for reduction by American smelters and gave a great impetus to mining in Mexico in general. The trunk lines of railway from El Paso, Eagle Pass and Laredo, to the city of Mexico had been constructed, affording a vast improvement to the means for transportation in the republic. The construction of branch lines was already being undertaken, but as yet these had not progressed far, wherefore, traveling away from the main lines of railway was slow and tedious. We were able to go on a construction train from Torreon to Pedriceña, where we spent a part of the night. Being awakened shortly after midnight, we entered the *diligencia*, which left at 1 a.m. to make a continuous run to the city of Durango. The stage was of the regulation Concord type, but the harnessing of the horses was novel to me. There were two wheelers, three "swings" and three leaders. Besides the driver there was a "whipper," who rode on the footboard, but jumped off and ran along with the team when whipping was required. Horses were changed about every 15 miles and the stage made good time. There were nine persons inside, and every seat on top was occupied. I had a seat inside, which I chose as the more comfortable in the cool hour of the early morning when we departed from Pedriceña, but as the day wore on I became very uncomfortable, and felt like a sardine in a tin box, so tightly were our arms and legs packed inside of the coach. We arrived at Durango at midnight, and I alighted from the stage with the feeling that 23 hours of continuous traveling in a *diligencia* with nine persons inside was an experience that I did not care to repeat.

A HARD BIT OF TRAIL

THE SANTIAGO STAGE

Early Lawlessness—Hard Times

From Durango we went to Santiago Papasquiaro, again by stage, but in a more leisurely manner, being two days on the road. Our mines were near Santiago. This was a more or less troublous time in that part of Mexico, which was still remote from the railways and from the strong hand of law and order. The famous bandit, Heraclio Bernal, who infested this part of Mexico, had been killed only a short time previous, and the remnants of his band were still active. Highway robbery and murder were common, as was generally the case in hard times, as these were. Consequently, it was necessary to take precautions for safety at which anyone in Mexico at the present time would laugh. Often our *hacendado* would be aroused by the warning that the bandits were coming (although they never did), and no one ventured on a journey without going well armed and well guarded. The murder of one of our own superintendents on his way out to the mines manifested that these precautions were not idle.

I have previously remarked that this was a period of hard times in this part of Mexico. This was due to the failure of the corn crop, because of the lateness and deficiency of the usual rains. The government of the State sought to relieve the distress by importing corn from the United States, and on my way to Durango I saw poverty-stricken and hungry women pick-

ing up, kernel by kernel, corn that had dropped from the Government wagons. At our own camp, the mules in the *corral* were fed regularly under the guard of men armed with rifles to prevent the people from stealing the corn. It wrenched the heart to see lean women and ill-fed children gazing longingly through the bars at the mules enjoying the corn that was only for them; but this was not a matter for false generosity, because all of our hoisting was done by *malacate*, and if the mules were not kept in proper condition, we could not operate the mines that employed the people, in which event, of course, they would have been much worse off. We paid one peso per day to miners and 75c. to *peones*. Since then wages have risen materially, especially in some camps like Cananea.

In this camp, we did not experience any great hardships, there being a fairly good wagon road all the way into Durango. We built a large concentrating mill and had no difficulty whatever in bringing in the heavy machinery on ox-carts. This was not done, however, until after the mines had been developed, which, as I have remarked above, was accomplished by the aid of *malacates*. Previous to the construction of the concentrating mill, we did not have any steam engine. We had abundant timber from which we could saw good lumber, and we had some fairly good material with which to make brick. When I returned to the United States after a little more than a year, the railway had been completed to Durango, and it was a great relief after the stage journey of three days to be able at that place to step into a Pullman car.

A SMELTERY IN THE SIERRA MADRE

A TARUJUMAR INDIAN

In the Sierra Madre

My next visit to Durango, for a long sojourn, was in 1895. At this time I was engaged at mines to the west of Durango, which we reached by a four-days' journey on mule back from Durango, or by two days of staging to Santiago Papasquiaro, and thence three days southwesterly by mule back. The mines were situated in a rough country, which can never be reached by wagon road—much less by railway—and we were solely dependent upon mule transportation. During the rainy season we were quite cut off from communication with the outside world, the trail being impassable, wherefore it was necessary to lay in an ample stock of supplies in advance. It would generally happen, however, sooner or later, that we would run out of some necessary article. One summer, I remember, our supply of lucifer matches gave out long before we could hope to replenish it, and we were then obliged to resort to the use of flint and steel whenever we were away from the camp where a constant fire was maintained. This gave us an idea of the inconveniences with which our ancestors had to put up.

Our camp was situated in the midst of the main ranges of the Sierra Madre, at the bottom, and on the western side of a *quebrada*, or cañon, leading into a larger cañon that was the course of a considerable stream. The smeltery and *hacienda*, at the bottom of the cañon, were about 3300 ft. above sea level, the adjacent mountains rising to an elevation of about 8000 ft. The country was exceedingly rough, the mountain sides pitching at a slope of 35 deg. or more, with only a few mesas, or shoulders, that were so much as comparatively level. Wagon roads were quite impossible, and communication was necessarily done by pack animals.

The climate was healthful. During two years of observation, the maximum temperature was about 95 deg. F., and the minimum about 32 deg. The rainy season began about July 1 and continued to about Oct. 1, during which time there were heavy showers every day. During the remainder of the year there was no rainfall except occasional light showers in February. At this latitude (about 24 deg. north) there was never any snow at the elevation of 4000 to 5000 ft., but in the sierras above the latter elevation there were frequently falls of 12 to 18 in., and snow to the depth of 3 or 4 ft. could be measured on the ground during what was said to be an unusually severe winter.

Even in the short time that had elapsed since my previous residence in Durango there had been a marked change in conditions. There was no longer any general fear of bandits and no one took the trouble to go armed unless he was bound on a long journey away from home. In the course of two years, but one of our supply trains was held up, and this was for robbery only, without the accompaniment of murder. As soon as this was reported, our *rurales* started in pursuit and eventually killed all of the robbers, together with those who harbored them. These were harsh measures, but it was by such that Diaz in his wisdom made it possible to conduct business in Mexico. The country experienced what has been appropriately called civilization by bloodshed. The traveler is now able to go almost anywhere in Mexico with perfect safety. In my last visit to the Republic, I went into the Yaqui country without any concern whatever.

Description of the Mine

Our mine was opened on a fissure vein

containing a rather narrow but fairly persistent streak of ore composed of quartz, pyrites and blende, with a little chalcopyrite and galena. Near the surface this ore had been oxidized and leached, leaving a silicious residue containing an ounce or so of gold, which had been worked by the natives. When they got down to the mixed sulphides, they could not, of course, do anything with it. The attention of the American owners of the property was originally called to it by a Mexican miner. The Mexican is the best of prospectors, and through long generations has scoured carefully over his mountains. In all of my experience in Mexico, I have never known of the discovery of a really new ore deposit (except some blind lode). All of the mines that I have seen have been old workings, exploited by the natives to the limit of their capacity, mining and metallurgical, and their ability and ingenuity have been no mean things as everyone who has lived in Mexico knows.

Our sulphide ore contained about 50 oz. silver and 1 oz. of gold per 2000 lb. It was essentially a mixture of pyrite, blende, galena and chalcopyrite, with a gangue of quartz. In addition to the above sulphides there were arsenopyrite and jamesonite in small quantities. The gold of the ore occurred chiefly in the pyrite and chalcopyrite. The silver occurred in the form of tetrahedrite, sometimes so abundantly that the ore could be sorted for direct shipment, but the amount of this class was small. The galena occurred chiefly in a distinct band in certain parts of the mine and could be easily separated by sorting; it carried no gold, but was richer in silver than the average ore, containing from 75 to 90 oz. per 2000 lb. An analysis of 15 tons of the pyritous ore, which was a representative sample, gave the following results: 18.1 per cent. silica; 1.12 alumina; 1.28 ferrous oxide; 29.8 iron; 13.3 zinc; 1.18 copper; 0.4 lead; 34.18 sulphur; traces of antimony and arsenic; total 99.51. This analysis indicated a mineralogical composition approximately as follows: 20 per cent. quartz; 27 per cent. blende; and 53 per cent. pyrites, chalcopyrite and arsenopyrite. The blende was uniformly black and ferruginous, pure selected specimens showing a content of only about 50 per cent. zinc. The basic character of this sulphide ore enabled us to smelt along with it a considerable portion of the silicious ore from the upper part of the vein. This silicious ore contained about 65 oz. silver and 0.8 oz. gold, per 2000 lb., 22 per cent. ferric oxide, 1.7 per cent. zinc, 0.3 per cent. copper, 5.4 per cent. lead, 3 per cent. sulphur, and 51 per cent. silica.

SMELTERY IN BLAST

THE SLAG DUMP

Working Conditions

The mine was so situated that it could be worked to a depth of 300 or 400 ft. through adit levels. In Colorado it would have been a good little property, but at a place in Mexico whence freight to the nearest railway station cost about 54 pesos per ton, it was not so good. However, we were able to make money out of it, and if we had had more means to increase the scale of our operations in the earlier stages we could have done much better. This is a case of a mine which paid for itself from the grass roots, and we were not able to install improved working appliances until we obtained from the mine itself the money to pay for them.

The vein dipped at an angle of about 85 deg. The country rock was a hard, finely crystalline granite. The pay streak, although clearly defined, was rarely separated from the inclosing rock by an actual parting, and being very hard, as was also the country rock itself, it was not easy to break the ore cleanly from the wall, and a subsequent sorting was consequently necessary. The average thickness of the pay streak throughout the mine was about 20 in., the maximum being about 50 in. The cost of production per 2000 lb. of hand-sorted product was about 25 pesos. Transportation by burro from the *patio* to the roasting stalls cost 53c. per 2000 lb. In the development of the mine the ground did not require any timbering, except occasional stulls. Driving drifts, 6x4 ft., cost 6 to 9 pesos per linear foot, according to the ground; raising, 4x4 ft., 6 to 8 pesos; sinking winzes, 6x4 ft., 8 to 12 pesos. All of this work was done by contract. Everything possible, both in the mine and about the *hacienda*, was done by contract or by stint. Either of these methods brings out the maximum efficiency of the Mexican, and under their conditions he is an admirable workman.

The Smeltery

Obviously, the only thing that we could do with the ore was to concentrate its value into a matte. We had a little smelting furnace, 30x30 in., which was largely of homemade construction. It was a brick shaft (bricks made on the ground) in the panels of which were placed four wrought-iron water jackets, obtained in Durango. We had a little teakettle of a boiler (15 h.p.) riveted up on the ground, a 12-h.p. slide-valve engine, and a No. 6 Sturtevant fan, together with a few slag pots, and some cast-iron spouts for matte and slag. Almost everything else was homemade. For our lumber we began with the trees in the forest, whipsawing them into planks and boards, and we used earth that we tried to make ourselves believe

was [illegible] suitable for brick making. The [illegible] as a whole was similar to those [illegible] at Eureka, Nev., in the early '70s. [illegible] forgotten what the plant cost us, but it was only a few thousand dollars. After it was running, the only supplies [illegible] brought in from Durango were [illegible], pipe, bar iron, and the like. The fuel was charcoal and the product of the furnace was matte.

TREATMENT OF THE ORE.

We could not cash, much the run of [illegible]. It contained too much zinc, and [illegible] roasting stalls (built of *adobe*, by the way) we could not oxidize the blende [illegible] enough. As everyone knows, raw blende does not smelt well in a furnace [illegible], so we used to sort the ore by hand on the *patio*, culling out a little that was rich in gray copper, rich enough in [illegible] to be a direct shipping product, [illegible] and roasting aside the blende. [illegible] our slags were dirty and partly because we had no means for collecting flue dust. From some points of view, our metallurgical practice was not very good, but it enabled us to develop the mine and make some money, so that later we were able to improve the works. Probably there are many mines at remote places in Mexico, even today, which could be profitably developed, without any great requirement for capital, by some rough metallurgy such as we practised.

HAND SORTING.

The sorting of the ore on the *patio* was a source of high expense. At first this was done in the regulation Mexican fashion, the men and boys sitting around the *patio* on their haunches, each with a little pile of ore in front of him, laboriously breaking up the pieces by means of a small cobbing hammer. This expense was greatly reduced by the introduction of [illegible] sorter there was a series of small holes, through which he dropped his product into sacks hanging below. When a sack was full there was nothing to do but remove it, tie it up, and put it aside, pending the time when it would be taken by burro to the roasting stalls, or other destination.

STALL ROASTING.

At the roasting stalls the sacks of ore were dumped directly into the stall to be filled, the burro train passing through the house on a bench at the back of the line of stalls. The roasting stalls were, of course, unloaded by hand, the product being shoveled into wheelbarrows, by which it was carried across the yard in front of the stalls to the head of a gravity tramway (of homemade construction) by which it was lowered to the feed floor of the blast furnace. In the stall roasting the sulphur in the ore was burned down to about 8 per cent., which was about

[illegible]

[illegible]

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Foreman	75.00
1 man 26 days at 1.50	39.00
1 man 26 days at 1	26.00
10 cord wood at 1	10.00
10 cord spent wood at 1.8	18.00
1 mule-car 26 days at 2.40	75.00
Total = 1.25 per ton =	273.00

SMELTING.

Our cost of smelting per month was approximately as follows, all the values being in pesos. We could make a monthly campaign of about 20 days, smelting 220 tons a day.

		Pesos
1. Salaries:		
1 furnaceman at 145 per month	145 00	
1 machinist at 105	105 00	
1 machinist at 45	45 00 =	295
2. Transport:		
1 man, 20 days, at 1.50	30 00	
2 men, 20 days, at 1	40 00	
Supplies, wear and tear, etc	10 00 =	80
3. General Expense:		
1 carpenter, 25 days, at 2	50 00	
1 smith, 25 days, at 1.50	39 00	
1 watchman, 10 days, at 1	10 00	
Material	40 00 =	139
4. Assaying:		
1 man, 26 days, at 1.75	45 50	
Charcoal, 2500 lb. at 1c	25 00	
Supplies	25 00 =	95 50
5. Matte House		
Breaking 22 tons matte at 2	44 00	
Sacking at 10c per sack	28 00	
Sacks, twine, etc	15 00 =	87
6. Furnace Labor:		
4 furnace men, 20 days, at 2	160.00	
4 helpers, 20 days, at 1.25	100 00	
1 slag-dump man, 20 days, at 1.25	25 00	
2 slag-dump men, 20 days, at 1	40 00 =	325
7. Fluxes and Fuel, etc.:		
140,000 lb. charcoal at 1c	1400	
40 tons lime at 5	200	
53 cu.yd. wood at 1	53	
Miscellaneous supplies	50 =	1703
8. Furnace Repairs.		
80 sacks bam at 5c	4	
500 brick at 32 per M.	16	
20 firebrick at 40c each	8	
3000 lb clay at 10c per 300 lb	4	
20 sacks charcoal dust at 25c	5	
10 sacks yellow clay at 5c	2	
Labor	20 =	59
Total = 12.70 per ton =		2783 50

The pots full of matte from the furnace were run to the matte yard, where they were dumped when cold, the cones of matte then being taken into the matte house, where it was sledged to about macadam size, sampled by reserving every 10th shovelful, and put up in cotton sacks over which *sacate* was sewed, each sack holding 150 lb. and two sacks being the load for a mule. The freight rate to Durango was generally eight pesos per *carga* of 300 Mexican pounds, or 138 kg., which was equivalent to $29.44 gold per ton, figuring exchange at $1.07. We seldom had any difficulty in securing transportation, inasmuch as the *arrieros* coming to our camp obtained loads each way, bringing in mining, smelting and general supplies and carrying out ore and matte, and sometimes we were able to obtain a rate of only seven pesos per *carga*. At Durango the matte was sold for 95 per cent. of its silver content at current New York quotation, gold at 61c. per gram and copper at 15.4c. per kg., less a treatment charge of $12 (gold) per metric ton. This rate did not allow for the Federal tax of 3 per cent. of the gold and silver.

Cost of Labor and Material.

The cost of labor and of mining, smelting and general supplies is of some interest, as given in the following list:

Wages.	Pesos.
Carpenters	1.50@ 2
Smiths	2
Masons	2
Laborers	1 00@ 1 25
Miners	1 50
Furnacemen	2

Contract Prices for Work.	
Driving, 6 × 4 ft	6@ 9, according to ground
Raising, 4 × 4 ft	6@ 8, according to ground
Sinking, 6 × 4 ft	8@ 12, according to ground
Unloading roasting stalls	2.50 per stall
Splitting cordwood.	35c. per cubic yard
Sacking ore and matte	10c. per sack

Mining and Smelting Supplies.	
Charcoal	64c. per 100 lb., delivered
Cordwood	1 per cu.yd., delivered
Plank, 8½ ft. × 12 in. × 12 in	70c. each, delivered
Board, 8½ ft. × 12 in. × 1 in	50c. each, delivered
Shingles, 7 in. × 36 in	1.50 per C, delivered
Round Poles, 16 ft. × 5 in	75c., delivered
Round Poles, 8 ft. × 8 in	75c. each, delivered
Adobe brick, 18 × 9 × 4½ in.	20 per M, delivered
Red brick, 9 × 4½ × 2½ in	20 per M, delivered
Dynamite	15 per 50 lb., Durango
Caps	13.50 per case, Durango
Fuse	65 per 6000 ft., Durango
Candles, stearine	10.50 per box, Durango
Candles, tallow	2 per C.
Kerosene	8@ 9 per 10 gal., Durango
Lubricating oil	10@ 12 per 10 gal., Durango
Steel	13@ 17c. per lb., Durango
Round iron	8c. per lb., Durango
Castings	7c. per lb., Durango
Firebrick	18c. each, Durango
Slag pots	30 each
Ore sacks	24 per C

Staple Store Supplies.	
Corn	6@ 7 per 300 lb., delivered
Beans	11@ 12 per 300 lb., delivered
Sugar	9@ 10c. per lb., Durango
Lard	24@ 26c. per lb., Durango
Coffee	12@ 15c. per lb., Durango
Tobacco	18@ 10c. per lb., Durango
Cotton cloth	9@ 12c. per meter, Durango

We were not able to obtain any board or plank of greater length than 9 ft., this being the limit for transportation by burro. With any greater length the burro was unable to negotiate safely the sharp turns of the trail. A 2-in. plank, 8 ft. 4 in. long, freshly sawed, weighed 54 lb. Mexican, and four planks constituted a load for a burro. Round poles, 5 in. in diameter at the larger end, could be obtained of length up to 16 ft. These were cut in the mountains and were carried by men to the edge of the *quebrada*, where they were pushed over and allowed to slide down a matter of 1000 or 2000 ft. to the *hacienda*. Under these conditions it will be perceived that construction work involved some difficulty and afforded an ample exercise for ingenuity.

I have gone into these details with the idea that they may be of interest to persons who are developing similar mines with small means in Mexico, even at this late date, because in spite of the great improvements in transportation and metallurgical facilities, there are still many districts in the sierras that are remote and are capable of exploitation only by such rough methods as we used 15 years ago. It is always a satisfactory achievement in mining to make a property pay for its own development from the grass roots downward, and avoid the tedious begging for capitalistic assistance, which anyway is apt to be costly.

Chronology of the Gold and Silver Industry in Mexico, 1521-1890

1521—Conquest of Mexico by Hernando Cortes.

1522—The first silver sent to Europe from the mines of Mexico was obtained from Tasco, discovered by the Spaniards this year. These mines, together with those of Pachuca are considered the oldest in Mexico, some of them having been long worked by the Aztecs at the time of the arrival of the Spaniards.

1540—Work was begun by the Spaniards in the silver mines of Zacatecas.

1548—First discovery of silver at Guanajuato.

1555—The silver mines at Sombrerete, Zacatecas, began to produce.

1557—Invention of the patio process of silver amalgamation by Bartolomé de Medina, of Pachuca.

1632—Discovery of the silver mines of Batopilas, Chihuahua.

1666—Discovery of the silver mines of Cusihuiriachic, Chihuahua.

1704—Discovery of the silver mines of Santa Eulalia, Chihuahua.

1762—Discovery of the great silver bonanza of Real del Monte.

1778—The silver mines of Catorce were opened and proved to be rich.

1783—Zambrano discovered the famous silver mines of Guarisamey, Durango.

1792—The famous bonanza at Sombrerete, Zacatecas, was discovered this year, the mines at that place having been worked for more than two centuries.

1793—Mules and horses were used in Mexico, for the first time, for mixing the pulp, mercury and chemicals in the patio process, saving 75 per cent. in the cost of this branch of working; prior to this time, the operation had been performed entirely by human labor.

1798—Discovery of the great bonanza (silver) at Ramos.

1810—Discovery of silver at El Rosario, Chihuahua.

1824—Discovery of silver at Palmilla, Chihuahua. The silver mines of Fresnillo, Zacatecas, were opened.

1878—Discovery of the silver deposits of Sierra Mojada, Coahuila.

1890—Establishment of the silver and smelting industry in Mexico.

Hand jigs, operated by two men and treating from six to seven tons of coarse or four tons of fine material per day are used with success (*Min. Mag.*, London, Aug., 1909), at the Progreso mine at Triunfo, Baja California. Little water is required, and wages are only 1.25 pesos a day.

San José de Gracia, a Great Mexican Gold Camp

Discovered by Some Early Spanish Missionaries and Has the Remarkable Record of 90 Years' Continuous Production of Bonanza Ore

BY E. A. H. TAYS*

About 1630 a group of missionaries traveled north and west from Guadalajara along the coast plain to what is now known as the Culiacan river, and founded the town of Culiacan at the place now known as Culiacancito. From Culiacan as a base, new expeditions were started out to explore and presumably civilize the surrounding country.

Ten years later Captain Montoya returned to Sinaloa with a strong company of Spaniards and allies, and this time founded the present town of Sinaloa. With the aim of colonizing the native tribes, expeditions were sent up the river. These were headed by priests, backed by a strong escort, and their work was to preach their religion and, at the same time, spy out the mineral resources of the region, it being rumored that much gold was to be found in that section.

SAN JOSÉ DE GRACIA

One party, headed by a Spanish captain named Montoya, founded the old town of Sinaloa, building a fort, which he called Fort Sinaloa, in order to protect the party from annihilation by the warlike tribes that populated the river valley, and who called themselves Sinaloas. As this party was small, there being but 25 Spaniards, many attempts were made by the natives to [illegible]. Finally they [illegible] the [illegible] the fort. The remnants of the party made its way north to the [illegible] to the [illegible] of Culiacan, [illegible] another party [illegible] had founded a mission [illegible].

Hardships and Perils of Early Explorations

This exploration was carried on slowly, for the natives made frequent attacks upon the parties and at times forced them back upon their base at Sinaloa.

In one of these attacks Montoya was killed, which for a while put a stop to further exploration by the Sinaloa missionaries. After receiving a new supply [illegible] from Guadalajara, new [illegible] campaigns were undertaken and by 1650 the Chicorato mission was established. Later on the Santa Maria mission was founded.

After many years of assiduous proselyting, the confidence of the native tribes was gained to a certain extent, and the missionaries established a convent and mission at Bacubirito in 1710. Many persons of local note, both ecclesiastical and civil, resided here, though Sinaloa was the mainstay of all these missions. At this time all the Sinaloa missions were under the control of the Durango see and all tithes were sent to that place.

About 1730 there was a general uprising of the native tribes along the Sinaloa river, in which those of the Fuerte Mayo and Yaqui joined. This forced the missionaries to seek refuge in the fortified towns, and thus caused a cessation of mission work for many years. But, finally becoming strong again and reinforced by others from Durango, the missionaries once more bent their energies to civilizing the natives and, incidentally, to exploring the country for precious metals.

The work was reorganized with greater

*[illegible]

enthusiasm than ever before, for it had been learned from passing Sierra Indians that gold was to be found up the river, some of these showing valuable gold nuggets. This fired the ardor of the Spaniards, and the Chicorato and Santa Maria missions were reëstablished. From there the missionaries worked their way up the river to San Ignacio. All these places were lonely Indian villages, isolated in the hills and without local resources for sustaining life.

First Discovery of Gold in 1828

At San Ignacio, today as primitive as when the first Spaniard missionaries stopped there, the Alisos, or San José de Gracia arroyo as it is now called, empties into the Sinaloa river. Up this arroyo the untiring explorers plodded to an Indian village occupying the site of the present mining town of San José de Gracia.

This was in 1828, and the small group of gold-seeking friars, together with a goodly following of so-called tame Indians from the older missions, had without knowing it, after 75 years of following the many vague rumors of wealth in the mountains, arrived at their Mecca.

On the top of a rounded hill in a large arroyo that empties into the Alisos just below San José de Gracia, the explorers found a few Indian huts. The men ran away at sight of the Spaniards, but a few of the women and children remained. The Spaniards spoke to these, asking for the men and explaining that their mission was friendly and peaceful, and that they were looking for precious metals. They got no answer from the women. They then turned their attention to a nearby pen, built of stone and filled with sheep and goats, with the intention of appropriating a few for their own use. What was their surprise to find that the rock of which the pen was built was quartz, and that in much of it gold could be seen at a casual glance. A closer inspection showed that the Indian huts were built on the outcrop of a rich gold-bearing ledge.

Upon this discovery the camp on the main arroyo was made a permanent mission and called San José de Gracia.

First Mine was the Mina Grande

Work was started at once on the ledge and the mine was called Mina Grande, a name it bears to this day. Although this ledge at the surface proved to be a veritable bonanza, the workings are not over 100 ft. deep at present, and, though always owned by some one, it has been held on its past reputation. Once in a while a little work will be done on it with the hope that favorable results may be obtained.

This is the history of the discovery of the camp, and for this data I am indebted to Señor Manuel J. Esquer, of Mocorito, Sinaloa. The common version is that some packers, having camped near the spot en route to the new bonanza camp of Guadalupe y Calvo, while hunting for their mules in the morning on the tops of the nearby hills, noticed that the goat pens were built of quartz, and, upon examining the rock, found it to be rich gold ore.

The fame of San José spread rapidly and in a short time it became a thriving town. In a list of the men who made fortunes in the camp occur the names of Irizar, Olguin, Estrada and Alvarez, all well known Spanish names.

Other Finds Followed Quickly

After the discovery of "Veta Grande," Todos Santos, Carpinteria, Veta Tierra, Los Hilos, Dulces Nombres, La Gloria and Los Muertos were found in rapid succession and within a radius of half a mile.

All these mines were famous for their rich surface bonanzas. Todos Santos is in bonanza ore today, and Los Muertos and La Gloria, under the new name of Rosarito, have produced over $5,000,000 in gold with a 30-stamp mill since 1895. Carpinteria and Veta Tierra have merely been scratched, and in the future are destined to become great mines.

REDUCTION PLANT AND OFFICES, ANGLO-MEXICAN COMPANY, LIMITED

The country is much faulted, with throws of 2 to 50 ft. This phenomenon was not understood in early days, the current belief being that the cutting out of the ore was due to the "cutting in" of a "horse", and the belief became fixed that these gold bonanzas were purely superficial. Therefore when a "horse" cut out the ore work was usually abandoned in that place. For this reason much prospecting was done and all the ledges known today were discovered and worked at that time.

The fame of San José de Gracia later became so great that about 1833 the place was assaulted by a large band of Indians, led by Spanish bandits, with the

object of carrying off the gold then accumulated. Considerable booty was secured, but to this day it is not known who headed the attack or what was done with the bullion carried off.

The great bonanza of Guadalupe y Calvo was then in its prime, and the owners, not being able to prevent local stealing, bought all bullion offered for sale as a protection. On this account it is supposed that the gold carried away from San José de Gracia found its way to Guadalupe y Calvo.

Many Left San José for California in '49

The discovery of bonanzas at San José de Gracia was constant up to 1849, or for a period of 21 years.

In 1849 most of the claims had been abandoned or had come down to ore of normal grade, and, the glory of California beginning to be heralded generally by the next spring, many caravans were made up that traveled overland via Guaymas and Yuma, meeting untold hardships and dangers. Thus, by the end of 1850, San José de Gracia was practically abandoned.

One of the leading mining men of that time in San José was Don Francisco Peraza, a man of humble birth but great natural ability as a miner. Peraza caught the California fever and spent several years there. The cholera epidemic of 1851-1852 also contributed to the complete suspension of all work, during those years, at this famous gold field.

About this time Don José Manuel Peña settled at San José. He, being a man of more than ordinary sagacity, and being well acquainted with the history of the camp, during this period of stagnation, acquired possession of several of those claims which he considered the best as they became open to location, due to abandonment, under the old Spanish law then in force. Upon their return from California a few years later, many of the old mine owners found Señor Peña in possession of the claims they had abandoned, and most of them left the camp.

A Revival of Activity

About 1870 Don Francisco Peraza returned to San José and started work on a new lead near the summit southwest of the camp and in a short time had opened up a small mining. He also struck a rich pocket in Santa Rita, another find in the vicinity of the [illegible]. He and Señor Peña worked with indifferent success and [illegible] all the mine owners of the camp until 1884.

During the years between 1877 and 1877 little work was done on the mines, owing to continued unfavorable conditions. No one seemed to care, the mining was thought to have [illegible] completely [illegible] the [illegible] southwest the [illegible] belligerents. The success of Diaz in 1876 put an end to these conditions the following year, and since then property rights have become more secure every year.

By 1878 Don Francisco Peraza had become possessed of the claims along the Guadalupe ledge for half a mile, under the names of Guadalupe, Muertos and Jesus Maria.

Don Manuel Peña had by this time sifted his holdings down to Todos Santos, Santa Eduwiges, Veta Tierra and La Ceceña. Peña, being a close man and calculating, was very careful, and most of the time did but little work on his properties, letting them out to leasers, and in this way complying with the law in order to hold them.

Guadalupe Company's Mill and Bunk Houses

Rich Pocket in San Juan

Peraza, on the other hand, had faith in the permanency of the camp and in a small way continued working on Jesus Maria. During this time, being pressed for money, and his own claim being barren, where he was working, the idea struck him to do a little work on a ledge called San Juan, a being one that had given several rich bunches of ore in the few feet of surface work done. He told me that it took him three days to unwater the old shaft and one to get a new face started. He immediately ran into a bonanza pocket, and in the two days following took out $25,000 in gold. His pocket cutting out, he did no more work there, nor has any more work been done up to this day. However, since that time the Peña family have owned the property.

Peraza worked away on his Jesus Maria claim, running in a small 385-ft. drift along the ledge, and managed to just keep the work going.

When his small drift became so hot he could not work he started an air shaft without the aid of a survey, and, after a year or two of zigzagging around, finally made connection near the end of his drift and continued his search for the ore shoot he felt sure existed.

Discovery of Carpinteria Bonanza

In 1888 an Italian and a local Mexican miner started work on a ledge now called Carpinteria, with such good luck that they ran into a bonanza.

Neither, being poor, could stand prosperity, and in a few years both died from excessive debauchery. In the meantime Peña and Peraza had acquired the mine.

First Mill Built in 1887

Up to 1887 all ore taken out of the mines was treated in arrastras run by mule and water power. In that year an American by the name of George Davis took up the Purisima property, the poorest in the Camp, and installed a small Huntington mill run by steam. This venture proved a failure and the mill was later acquired by Peraza and put up on the main arroyo below the town.

Jesus Maria-Guadalupe Bonanza Found 1893

After years of patient work, all too poorly recompensed, in the summer of 1893 Peraza's drift reached the main ore shoot.

Just at this time H. H. Hughes was closing up the old Trigo mine (owned by The Anglo-Mexican Mining Company). at Las Yedras, on the boundary between Sinaloa and Chihuahua, about 50 miles east of San José de Gracia. Hearing that Peraza had struck a body of good ore in the Jesus Maria mine, he sent over and had some samples taken. The face was about 4 ft. wide and the drift extended into the orebody probably 50 ft. These samples ran from $50 to over $400 per ton, and on the strength of this Hughes sent for Peraza and closed a deal with him, buying all Peraza's claims in the Guadalupe group for $75,000 gold and $75,000 Mexican silver, paying $30,000 silver down and the balance in easy payments.

4-ft. Vein Averaged $70 per Ton

Hughes took charge at once for the Anglo-Mexican Company and started to open up the mine, putting W. C. Wilkins in charge. The body of ore continued good and proved to be about 400 ft. long. The ledge averaged 4 ft. in width and contained about $70 gold per ton, not including the "chispa" (high-grade rock). Much rich ore was encountered, and shipments of 10-ton lots were made from time to time, averaging from $10,000 to $14,000 gold per ton. About the center of this shoot on the level of the Peraza drift, afterward called the Guadalupe level, a winze was sunk on a rich body of ore. This was about 150 ft. deep and it was claimed at the time that the ore that came from the winze paid for the mine.

By June, 1895, Hughes had opened up the mine to the extent of having fully a million dollars blocked out and had a 60-ton milling plant in good running order, together with offices, laboratories, machine shops and all other needed buildings, and had been shipping over $50,000 per month for 6 months.

Mill Heads Averaged $72 for 3 Years

The shipment for June, 1895, was $129,000 gold. The mill heads ran $30 to $300 per ton. So rich was the ore at that time that the average of the mill heads was $72 for three years.

Early in 1895, in raising, a fault was encountered which displaced the ledge more than 30 ft. An air shaft had been run to the surface, and from this shaft, above the fault, crosscuts were run each way.

The one toward the footwall ran into the ledge and rich ore, and when opened up, this proved to be 400 ft. long, averaging over 4 ft. in width and $64 gold per ton. The ore contained about one ounce of silver to the ounce of gold, but the bullion always ran between 700 and 750 fine gold.

By the end of 1895 there were about 30,000 tons of tailings on the dump averaging better than $25 gold per ton, so experiments were started early in 1896 to treat these by cyaniding, under the charge of Henry R. Batcheller.

Discovery of the Great Rosario Bonanza

Less than 2 miles northeast of the Jesus Maria a claim was taken up on the old Los Muertos ledge, under the name of El Rosario, by Don Antonio Echavarria and associates in 1894. This was a large well defined ledge, and a little rich ore had been taken from near the surface in the early days of the camp though the ledge only averaged about $5.

JESUS MARIA MINE, SAN JOSÉ DE GRACIA, SINALOA, MEXICO

Early in 1895 a short crosscut adit was run which tapped the ledge about 100 ft. from the surface and exposed a width of 7 ft. of bonanza ore. So rich was this ore, that by the middle of 1896 they had a 30-stamp mill running with all necessary accessories, all paid for out of the mine. This mine has been a steady producer up to the present time, and for over five years from the start averaged an output of half a million dollars in gold per year.

Location of the Camp

The camp of San Jose de Gracia is situated in the northeastern part of the district of Sinaloa, state of Sinaloa, Mexico, about 100 miles east of the Southern Pacific Railway station at San Blas and is almost on the boundary line between Sinaloa and the state of Chihuahua.

The general elevation of the camp is 1200 ft. above sea level, with ranges on all sides rising to 4500 ft.

Geology—Faulting a Feature

The formation at San José de Gracia is andesite and rhyolite. However, the Rosario mine is on a contact of diorite with a siliceous slate. The Jesus Maria Guadalupe vein is entirely in andesite. This is much altered and decomposed. Much faulting has taken place and many of the ledges are faulted both with the strike and dip. A fault of but 8 ft. stopped work on the San Nicolas claim, afterward part of the Guadalupe, and left the main part of the big bonanza to be exploited by the Anglo-Mexican Mining Company in 1895. Had the early miners sunk a little and then crosscut to the hanging wall, a distance of 10 or 12 ft., none of the upper part of the rich body taken out by the Anglo-Mexican Company would have been left.

There is no regular course to the ledges of the camp as they have all strikes and dips, but the Guadalupe system runs slightly northwest with dip to west, and the Rosario group strikes strongly northeast and dips northwest. Between and around these two main groups, ledges run in all directions, no two dipping alike.

Though the faulting is intense, still no [illegible] are to be seen and the [illegible] is probably due to a large uplift [illegible] of the rhyolite to the north.

[illegible] Sold by Peraza

[illegible] the summer of 1895, Don Francisco Peraza went to the City of Mexico to be cured of some chronic internal malady. Although this is said to have been successfully accomplished, the climate of the city was too much for the old gentleman and he died there before he could return home.

In November, 1895, Don Salvador Malo, of Mexico City, appeared at San José de Gracia, having bonded the Santo Tomas group from young Francisco Peraza before leaving Mexico City. Malo was a distinguished looking, well educated and, in a way, brilliant man, but ignorant concerning mining matters. His operations were not successful.

La Purisima Group

Between the Jesus Maria and the Rosario groups lies the Purisima group, occupying a ridge between the Barranca Grande arroyo and the Barranca Chica. Early in 1895 a company was formed in the City of Mexico to work this group. A large amount of money was spent in development and a mill was constructed. The mill ran but a few months when the ore gave out and, though the company spent large sums in trying to find a permanent orebody, it finally had to give up, charging a fortune to experience.

End of the Anglo-Mexican Company

In 1897 the Anglo-Mexican Company bought the Todos Santos property from the Peña estate against the advice of its consulting engineer. Development work along a mile of ledge was carried on until 1900, when the mine and mill were closed down, as the mine had reached a point where more money was needed to open up new bodies of ore than these bodies would produce.

The next 18 months were devoted to treating a pile of slimes by agitation and cyaniding. This was successfully done and the pile cleaned up by April, 1902.

The lowest level in the Guadalupe claim was but 900 ft. below outcrop, with the dip, and 250 ft. was the deepest working on the Todos Santos.

A plan for deeper exploration was submitted, but it was decided to sell out and liquidate the company.

In May, 1902, I sold the property for the company to Messrs. Peraza and Tarriba for a nominal sum. These gentlemen formed the Compañia Minera Jesus Maria y Anexas and gophered the mine until 1904, at which time they found themselves about 130,000 pesos poorer.

At this time they were fortunate enough to take out a small pillar in which they encountered a bunch of bonanza ore that gave them about 400,000 pesos in 40 days. A description of this find was published in the *Min. and Sci. Press*, June, 1906—that for the first week, I believe.

Success of the Anglo-American Company

In the winter of 1905-6 the writer was employed to study a plan of development work, and the plans submitted to the Anglo-Mexican Company were carried out, though, in justice to Norman Tracy, who was the manager at the time, it

MINERS AT THE JESUS MARIA MINE, SAN JOSÉ DE GRACIA

must be stated that he had already decided upon the same system and had started a preliminary survey with the idea of laying out the adit that was eventually run. This work involved a cross-cut of about 500 m. and a drift of 1000 more, and was run for the purpose of tapping three of the known ore shoots.

Where this adit cut the ledge it was found to be of high-grade ore and the mine has been in bonanza ever since, or about three years.

The Peraza in the new company, is Don Francisco Peraza Martinez, the only son of old Don Francisco Peraza who fought hard luck for so many years at San José and finally sold to the Anglo-Mexican Company. The fortune left him by his parents, young Peraza has, by judicious investments and a continuous streak of good fortune, greatly enhanced and today he is one of the wealthy men

ENTRANCE TO TUNNEL, ANGLO-AMERICAN COMPANY, LIMITED

of the state. Both he and the Messrs Tarriba are interested in the Rosario, the other bonanza mine of the camp.

In spite of 90 years' almost continuous production this camp is practically virgin as the deepest workings are barely 700 ft. vertically below the surface. There are probably 50 known ledges within a radius of 1½ miles, many of which have given one or more bonanza bunches at surface.

Now that the railroad has made this section accessible to the world, although there is still a wagon and pack haul of 75 miles, in a few years more we should see twenty producing mines instead of two.

The new Guerrero mill of the Real del Monte y Pachuca Company, at Pachuca, Mexico, uses 1050-lb. stamps, dropping 106 times a minute through 7 inches.

Oxidation and Cyanidation

By Hubert A. Megraw*

One of the most important reactions in the field of treatment by cyanidation, is that of oxidation. In the very beginning of work with cyanide solutions it was recognized that oxygen, according to Elsner's equation, was a necessary element in the solution of gold. Elsner's equation was made the object of frequent attacks by metallurgical chemists, but it outlived all the criticisms and is still recognized as a true expression of the operation of dissolving gold in cyanide solutions.

In view of this fact there have been many attempts to introduce oxygen into working solutions, largely by the use of oxidizing agents consisting of chemicals. Probably one of the first to be used in this way was BaO_2. Some measure of success followed the use of these agents, but it has finally come to be the general opinion that air itself is the cheapest and best oxidizing agent to be had.

Oxidation More Difficult with Silver

With gold, results which are satisfactory and prompt have been accomplished. In working with silver, however, the complications multiply and the point of satisfactory results has not yet been reached. The volume of silver in a commercially economical ore is so great, compared with a gold ore of equal value, and the reactions so much involved, that a much longer time of treatment has come to be considered proper and necessary. While oxygen does not play the direct part in the dissolving of silver, as in gold, it is no less necessary.

It is admitted that oxygen is necessary in dissolving silver and a glance at the reactions involved will show that a good deal of it is necessary. In the treatment of silver sulphides, of which by far the larger portion of treatable silver ores consist, the lead acetate necessary for removing soluble sulphides from solution, is responsible for a large part of the consumption of oxygen. The following reactions, suggested by Caldecott (*Journ. Chem. Met. and Min. Soc. of South Africa*, March, 1908), show the different steps in the process and illustrate the function of oxygen:

$$2\ Na_2S + 2\ O = Na_2SO_3 + NaO,$$

$$Na_2S_2O_3 + Na_2O + 2\ O = 2\ Na_2\ SO_4,$$

$$Na_2S + NaCN + O = NaCNS + Na_2O,$$

$$Na_2S + PbO = PbS + Na_2O,$$

$$PbS + NaCN + O = NaCNS + PbO.$$

These reactions illustrate the use of oxygen at every stage of treatment.

Numerous experiments made by metallurgists in close touch with the actual operation of the process, all seem to point in the same direction. A series of experiments published by Caldecott (*Min. and Sci. Press*, Aug. 29, 1908) gives the comparative results of the treatment of a silver-gold ore by a good many different chemical combinations. From this series it was found that the best results in the case of the gold came from the use of BaO_2, having accomplished an extraction of 89.7 per cent. in six hours using 0.1 per cent. of the chemical. In the case of silver the best results were obtained by the use of oxygen under 100 lb. pressure. In this case an extraction of 79.4 per cent. was accomplished in the same time.

Utilization of Free Air

The theory that a sufficient quantity of oxygen for the completion of the necessary reactions will permit of treatment in a shorter time than is now allowed, is very attractive. Free air is not a particularly active oxidizing agent, and it is upon this that silver treatment rests almost entirely at present. Air under pressure is more active and better results can be obtained by its use. A series of experiments made with these facts in mind seems to show this clearly.

The accompanying diagram shows the plotted results obtained under identical conditions, except that the curve *a* shows the result of treatment by agitation and oxidation by free air alone, *b* shows the result of circulation with a centrifugal pump after 48 hours of treatment by free air agitation, and *c* shows the result of the use of the centrifugal pump alone during the entire time of treatment.

The experiments were made on slime charges in round, flat-bottom tanks, the air agitation being accomplished by introducing air from a compressor through a number of jets fixed in the bottom of the tank and, in addition, an air pipe introduced into the charge and handled by an operator in order to reach parts of the tank upon which the jets did not have a thorough effect. The centrifugal pump used had a gland loosely packed in order that air might be drawn in during the pumping, the idea being that even this small amount of air under light pressure is advantageous.

Experiments along the line of oxidation have been made during the last two years. Some of the results are given in an accompanying table as averages. The amount of oxidizing agent used was calculated to furnish an amount of oxygen equal to 10 per cent. of the weight of silver contained in the ore. A short time of treatment and low grade of ore was used in order to show any differences in results as sharply as possible.

Comparison of these results seems to show that the use of oxygen does have a definite effect upon the rate of solution of silver.

Oxidation by Chemicals Not Practical

After making a long series of experiments the conclusion is reached that the

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use of chemicals as oxidizing agents is not likely to become common practice, nor is it advisable because of the expense and also because of the introduction into solutions of other and useless chemicals, further complicating the already sufficiently complex solutions. The idea that oxidation is beneficial, however, is so undoubtedly true that it is very desirable to evolve some method of supplying oxygen for the prompt completion of the reactions. In the work of Julian and Smart, "Cyaniding Gold and Silver Ores," a good deal of attention is given to the subject of oxidation and a number of experimental results are given. Quoting from page 75:

"It is obvious . . . . that it would not be economical to apply strong oxidizers to an ore direct, as, owing to the rapidity of the reaction, the effect lasts too short a time to facilitate the dissolution of the gold to any extent. The only case in which strong oxidizers are of benefit, when applied to ores as such, is where the gold is so fine extremely fine state of division and so exposed to apply as in the treatment of slime by agitation."

In the same chapter we have . . . . .

It is therefore advisable when employing conditions to select one which introduces only oxygen or oxygen and water. The same conclusion applies to permanganate and bichromate. The formation of some complex compounds, but in very dilute solutions . . . . . it might be . . . . . that it would be . . . . . the oxygen . . . . . which . . . . . the . . . . . of the . . . . . .

adding it to a fine stream to the slime pulp under treatment. The cost of this system would not be great and its application especially simple. It is necessary only to introduce a small pipe leading from the oxygen tank into the suction of the centrifugal pump used for circulation, or into the air lift in case the Brown tank is used. By means of a valve, the amount of oxygen used can be definitely regulated and the speed of its admission made to conform to the speed of the reactions.

Mr. Mosher recommends the use of ozone from air and while this might be used in the same way and accomplish the same results, I can make no comparison of costs at present. It seems that the oxygen from water might be produced at least as cheaply as from air, and it certainly would introduce no extraneous elements into the solution. The comparative merits of each method may be determined only by experiment, and possibly location and advantages in other ways may have some effect upon the cost. The oxygen from water requires no expensive apparatus to generate it, and a small current would be ample for ordinary plants.

The question of oxidation presents some interesting features in that its successful use may show the way toward shortening the time of treatment of silver slimes, thus reducing the cost of treatment materially. It is hoped that metallurgists having the necessary facilities will give some attention to the matter for the ultimate good of the profession. The writer is working on the scheme and hopes in time to have other interesting results to offer.

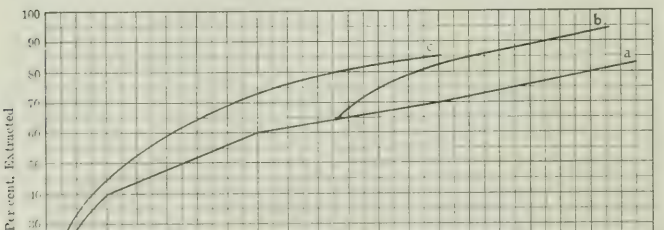
Recommends Oxygen Derived from Water

Authorities seem united as to the advantages of oxidation in some form. Since the formulation of this paper, an article in the *Min. and Sci. Press*, May 15, 1909, by D. Mosher, has set forth much the same facts as herein stated. Mr. Mosher gives a list of experiments with different oxidizing agents and also notes the comparative costs of each. Mr. Mosher, however, has suggested a form of oxidation which differs slightly from that which it was the purpose of this paper to advocate.

I had devised a method of deriving oxygen electrolytically from water and

TABLE OF EXTRACTION OF SILVER WITH VARIOUS OXIDIZING AGENTS.

Heads Gm. Ag.	Solution, KCN Per Cent.	Ox. Agent	Time Treated, Hours.	Tails, Gm. Ag.	Extracted, Per Cent.
143	0.1	none	24	62	56.5
143	0.1	$KMnO_4$	24	42	70.6
143	0.1	H_2O_2	24	40	72.1
143	0.1	$Ca(OCl)_2$	24	38	74.4



History of La Luz Camp, Guanajuato, Mexico

It was on the La Luz group of veins that the first discovery of silver and gold in the Guanajuato district was made as early as 1548. The legend is that in that year, a pack train while on its way from the coast to the already known mining camp of Zacatecas camped one night at a point which is now the entrance of the Bernabe tunnel on the old La Luz mine. The camp fires, built on what proved to be the outcrop of the La Luz vein, melted out some of the silver. The news soon spread and attracted hordes of prospectors. Soon other deposits were discovered, and about 10 years later the celebrated Veta Madre of Guanajuato was opened upon. The enormous bonanzas of the Valenciana and Rayas, on the Veta Madre, threw into shadow the more moderate riches of the La Luz district, which remained practically undeveloped until about the year 1832. In this year, Conde Pere Galvez, the chief proprietor of the Mother Vein mines leased all these to some English companies, and then turned his attention to this new field. A tunnel had been started, nearly three centuries previous, at the point of discovery, by the original workers. This tunnel was cleaned out and pushed forward along the vein for a distance of over 4000 ft., and from the appearances at the present time the whole length was driven in what today is profitable ore. It was, however, only about 20 years later that the tunnel reached the rich bonanza orebodies which since that date (1842) have yielded according to all the most reliable data available, not less than $130,000,000. When the value of this discovery was understood, active work on a large scale was commenced, and 12 working shafts of large size and of depths now reaching from 600 to 1200 ft. were started. Most of the shafts are today in good condition.

A Hot-blast Furnace for the Small Operator

Continuous Runs Are Possible; Can Be Used without Choking or Freezing; Low Labor Cost; Recovery of over 90 Per Cent. Secured

BY PERCY ANDRUS BABB*

Of inestimable benefit to the mining men of the Republic of Mexico would be a smelting furnace, practical in small capacities, built for rough mountain transportation, and in price within the reach of the prospector and small operator. Such I believe the New Model hot-blast furnace may be.

Dry ores in isolated camps are readily treated by familiar reduction processes and their final and concentrated products of bullion, rich precipitates or high-grade concentrates will stand high freight charges, but not so at the small lead or copper prospect. A medium-grade lead property, unless it should be most materially assisted by accompanying precious metals, is not an attractive venture under the present commercial conditions of this in the Cordillera Oriental, and still more so in the Cordillera Occidental, that the copper miner is encompassed with difficulties. Here the ores occur in acid eruptive rocks and, therefore, assay high in insoluble material; the copper usually occurs in the form of chalcopyrite and, although conditions may be ideal for concentration, the final product will hardly carry over 20 to 25 per cent. copper; long broken mountain trails lead to the railroad, and then an additional freight charge must be paid before the shipment is even on the trunk line. On the other hand, if limestone is to be had, as usually is the case, a proper sorting of the ore or perhaps a simple jigging will so bring up the copper and iron and at the same time so reduce the acid content that an easy-smelting and well-fluxed material will be secured for reduction in the blast furnace. By resmelting the first-grade a matte carrying 50 per cent. copper and able to pay its way to the market can be turned out.

GENERAL VIEW OF FEED-FLOOR ARRANGEMENTS

TAPPING FLOOR, SHOWING AUXILIARY CRUCIBLE

metal. Such a property, and even one of low grade, may well have an altogether different aspect if it be feasible to roughly dress and then smelt the ores, thus concentrating the metallic content into bars and a relatively small amount of matte containing together about 90 per cent. of the lead and 90 to 95 per cent. of the silver and gold.

Demand for Small Furnaces

Eliminating geologically and geographically the "Central Plateau" of the Republic, throughout which copper properties generally are happily situated with reference to the custom smelters and railroads, and whose ores possess good fluxing qualities through immediate contact or close relation with limestone, we find

STANDARD SIZES OF THE NEW MODEL HOT BLAST FURNACE

Diameter of Wind Space In	Capacity per 24 Hrs Tons	Shipping Weight Kgs	Power Required. H P
10	5	2000	11
14	10	3000	22
17	15	4000	4
20	20	4500	5
22	25	5000	6
24	30	6000	10
28	40	7000	20
31	50	8000	25

An accompanying table gives the standard sizes of the New Model hot-blast furnace, but my experience with the 10-in. or 5-ton size leads me to believe these capacities will be found to be over estimated; personally, I would be disposed to figure on 10 per cent., and on very "dry" low grade copper ores even 20 per cent. less than the capacities given in the accompanying table.

Tuyeres Dispensed With

No startling innovations are encountered in these furnaces nor is radical change necessary from the usual blast-furnace practice. The customary water-jacket vertical stack with hosh, the fire-brick lined crucible with slag and matte taps, air under blast entering the stack at the fusion zone, the feeding of the charge into the top of the stack, the separation through gravity of the slag and the matte or metal in the crucible—all are as we have witnessed many a time before. There are to be noted, however, certain salient improvements which assist greatly in the smooth running of the furnace, reduce the fuel consumption, and make possible uninterrupted campaigns in capacities of 5, 10 and 15 tons per 24 hours. This latter, to my knowledge, has never before been accomplished. Again, the circumstance that such a furnace, which will actually produce results, can be placed aboard cars in a couple of months' time, is manufactured in Mexico City where it can be seen in operation and changes in construction personally supervised, and is designed for mountain trails, tends to let us view the promising, but isolated lead or copper prospect with more ease.

The real and essential novelty connected with the furnace is a clever improvement to provide for delivering the blast to the stack. The usual tuyeres have proved

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from the stack, but it is called the "wind box" inasmuch as the tuyeres have been dispensed with, and in their stead there is a continuous opening of an inch or two in hight forming the blast way into the stack and located, of course, between the crucible and stack. The crucible during operations is set into the wind box and extends to within the above inch or two of the stack. Its top defines the lower boundary of the wind space, the upper boundary being the bottom of the stack. This continuous wind space is a pronounced advantage over individual tuyeres, at least, in furnaces of smaller capacities, and it is by virtue of the same (doubtless assisted somewhat by the hot dry blast) that it is feasible to operate continuously with stacks of capacities of 5, 10, 15, etc., tons per 24 hours.

No Chilling of Slag

The chilling in furnaces of small capacities usually starts between the tuyeres where it is so awkward to bar away accumulations that in spite of all a "freeze down" is inevitable. Who has not seen this occur in the demonstrating stack of the University metallurgical laboratory, and, in a vigorous but futile effort to save the furnace, gotten an acquaintance with muscular metallurgy? In my experience with the 5-ton furnace not once did chilled slag choke up this opening, nor on the other hand was there an overflow of slag into the wind box. "Peep-holes" of a diameter to accommodate a bar are conveniently placed about the wind box, and should any noses form in this region they can easily be barred away. Having in mind furnaces of large capacities, i.e., 100 tons and more, it has been wondered if the greatly increased amount of slag might not occasionally overflow through the wind space and bring disaster upon the "run." I fail to see why an overflow of slag in this type of furnace need wreck a campaign any more than in the case of a rising of the slag into the tuyeres of the standard furnace; surely the wind box opening directly into the stack through the wind space offers an escape to any overflow of slag that is not open in tuyeres.

An ingenious and logical method, hardly new in principle to metallurgists, is introduced for heating the blast. The slag overflows into a brick-lined chamber (wind tunnel) at the opposite end of which the blast enters and passes along the chamber above, and in contact with, the molten slag, thus becoming heated and entering the stack as hot blast. Small overlapping cars receive the stream of slag from the tap, the cars traveling on an endless track toward the blast end of the chamber or tunnel. The cars with their burden of slag spill the slag into cool water on making their turn for the back trip, causing it to granulate and fall off. An elevator picks up the slag at the bottom of the well of water and delivers it on the outside of the tunnel where it is dumped. The well of water furnishes a medium for removing the slag to the outside without leaving any escape for the blast except through the stack.

Crucibles Quickly Changed

The crucible is separate from the stack, is easily and quickly detached by lowering a jack, and is interchangeable with an auxiliary crucible kept on hand warmed for use. This is certainly a great convenience should a furnace be lost, as in half an hour the stack can be cleaned of any foul charges, the auxiliary crucible set up and operations resumed. In an hour and a half the ore charge will again be down to the slag tap. A short track, 15 to 20 ft. long, extends from directly under the stack to a turntable and spur track where the auxiliary crucible, already warmed for a case of emergency, awaits on trucks. This arrangement is a departure from the usual relation of the crucible and stack, and is to be recommended on small furnaces; but it is not altogether new as it has been employed in the Northwest on oblong furnaces of large capacities.

The hot dry blast and the continuous wind space give to the furnace an excellent driving power once it is well under way. In order to obtain a good separation in the crucible and produce clean slags, reasonable care should be taken to make up a properly fluxed charge and to feed it uniformly. One good point about the furnace is its ability to recover from the results of an error in feeding or an oversight or neglect on the tapping floor, and this applies to even the 5-ton furnace; but naturally mistakes here as in standard furnaces involve a dropping off of the driving rate of smelting and require a few charges of slag with perhaps extra fuel to warm up and clean out rebellious or chilled accumulations in the stack.

High-silica Slags Possible

Slags of higher silica than good practice in the standard furnaces requires have been successfully made in the New Model hot-blast furnace without any bad results in the separation in the crucible, or any material increase in the fuel. With the ore on which a run herewith reported was made, slags were tried carrying 44.2 per cent. insoluble, and the lime reduced to 10 per cent.; yet the furnace ran smoothly, but a trifle slower, and the slags were clean. Experiments are to be made on still higher-silica slags using 10 per cent. coke fuel and charcoal sufficient to give a good fuse to the charge.

To be sure, 13½ per cent. of coke was added in the run considered, yet on the same ore the furnace has successfully smelted on as low as 6 per cent. coke and 4 per cent. charcoal. This is certainly remarkable, as the ore carries but 1¼ per cent. sulphur. Extensive experiments are to be made having in mind the elements which can be utilized along the Cordilleras, such as an abundance of excellent wood for charcoal, but an expensive mule carry to add to the cost of coke. The purpose is to learn how small a percentage of coke can be successfully employed when combined with different proportions of charcoal, and even with squares of hard wood dressed with lime to hold back their combustion. Some work has already been done along these lines, and it is safe

GENERAL VIEW OF TAPPING FLOOR

MATTE TAPPING IN PROGRESS

to state that the operator is going to reduce his coke to under 10 per cent. on copper ores and considerably less on lead ores. This reduction of coke is doubtless going to curtail somewhat the capacity of the furnace, yet this is a sacrifice of little importance, as instead of purchasing a furnace, for instance, of 10 tons capacity, a size larger would be the choice at but a small difference in cost.

Results of Test Run

An experimental run was made before me on copper-carbonate ores from the Eldorado mine at Amatlan de Cañas. No care had been given in sorting the ore for smelting, but only to bring up the copper. The ore assayed as follows: Gold, 5.5 gm.; silver, 530 gm.; copper, 9.6 per cent.; insoluble, 59.7; FeO, 16.7; CaO, 0.6; sulphur, 1.33. The necessary amount of lime and iron was added in the form of a pure limestone and scrap iron, making a slag that would smelt easily. The coke gave 14.7 per cent. ash in which was 6.6 per cent. silica. The smelting mixture of ore, iron, lime and a little slag, gave a charge assaying 2.86 gm. gold, 292 gm. silver, 4.94 per cent. copper, 37.7 insoluble, 32.5 FeO, and 13.8 CaO. To this was added 13⅓ per cent. by weight of coke.

The charges were fed approximately of 60 kg. each. The rate of smelting in periods of four hours was: First four hours, 450 kg. of charge; second, 580; third, 480; fourth, 829; fifth, 760; sixth, 809; total, 3908 kg. of charge. The dropping off during the third period was due to a laborer feeding a few charges containing zinc shavings, which through rank ignorance was supposed to be iron shavings. The total weight of coke was 521 kg. The labor necessary per 12-hour shift consists of one furnaceman, one assistant furnaceman, one feeder and one supplier. In addition to this operating force there should be included an intelligent technical man capable of calculating smelter charges, assay slags and products, and making repairs and adjustments to the plant.

A No. ½ Root Standard blower produced the blast. A No. 4 Acme blower would have been large enough, and is the size recommended with a stack of 5 tons, the dimension of that in which this run was made. The blower ran at the rate of 360 r.p.m., receiving 1½ cu.ft. of free air per revolution. The water jacket received 1 cu.m. of water per hour, and no attempt was made to save it; thus about 24 cu.m. of water were actually consumed. In places where water is scarce 25 per cent. of the above amount of water would be sufficient for a 5-ton plant.

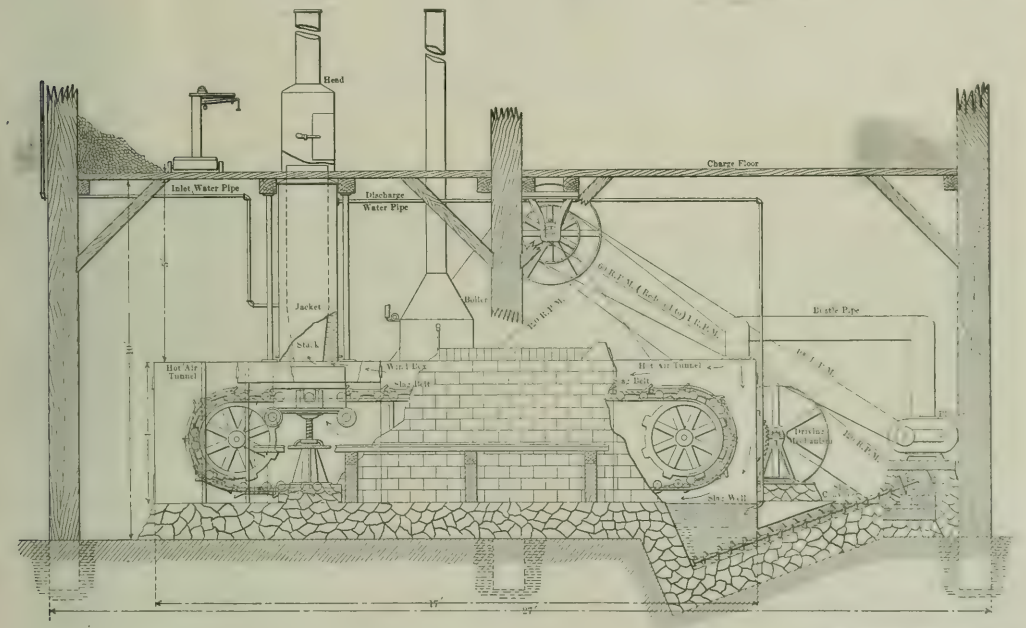
Large Radiation of Heat at Test

A full benefit of the hot blast was not secured, as the capacity of the furnace is such that it falls just short of providing a continuous stream of slag to the wind chamber; only about 75 per cent. of the time the slag was running. Due to this the furnace must have been slightly held back through the temperature of the air not being evenly maintained. Then again, the wind chamber was not lined inside with brick, as it should be, and on the outside for only a foot or so above the floor; thus, the top of this sheet-iron chamber radiated heat at such a rate that at no time could the hand be held on the upper part of the chamber.

While on this same ore I have seen slags carrying but 30 gm. silver and 0.3 per cent. copper, yet the average of the run was 45 gm. silver and 0.38 per cent. copper. The slag contained 39.6 per cent. of insoluble, 34.4 of FeO, and 14.6 of CaO. A product was obtained of (1) 170 kg. of matte assaying 55 per cent. copper, 34¼ gm. gold, 2859 gm. silver, 18.4 per cent. Fe and 21.2 per cent sulphur to the ton, and (2) 100 kg. of metal assaying 83.55 per cent. copper, 50 gm. gold and 4900 gm silver. A recovery in matte and metal was realized at 96 per cent. of the gold, 85.5 per cent. of the silver and 91.7 per cent of the copper.

Sorting and Jigging Advised

It is interesting to note that only 1054 kg. of actual ore figured in the 3908 kg. of charge. Among the ranges scrap iron cannot be had for flux, and its price by purchase would be prohibitive; nor is it to be expected that a practically pure limestone is near at hand. Therefore I would make the point already indicated in the early part of this paper, that it will be found profitable to carefully sort oxi



The Engineering & Mining Journal, N.Y.

ELEVATION SHOWING ARRANGEMENTS OF HOT-BLAST SMELTERY

[illegible] copper ores, and to the sulphides [illegible] simple jigging. In this way per[illegible] no iron at all will be necessary as flux, and considerably less barren lime will suffice. In adding any small amount of iron which may be lacking, usually oxidized iron minerals can be found carrying some gold or silver, which very likely will [illegible] the cost of the fuel represented by the weight of the iron flux and the cost of placing it on the feed floor.

A plan of a 5-ton furnace is shown herewith. Neither space nor time has been taken up in describing completely the construction of the furnace, as this plan with the description of the modifications encountered in the furnace was thought to adequately cover the purpose of the paper. I believe the furnace will fill a long-felt want in certain sections of the country, and I have in mind particularly the western parts of the states of Jalisco, Michoacan, Guerrero, Sinaloa, Colima, T of Tepic, etc. There is no reason why the furnace should not in some cases be an economical investment for properties located along the national and central lines. The gain, as compared to marketing through the custom smelters, is practically nothing for properties directly adjacent to the railroad. On properties more remote it closely corresponds to the cost of the freight on the silica in the ore from any particular property to the custom smelter. To many operators in the Cordillera Oriental y Occidental, the New Model lead blast furnace promises to satisfactorily solve their problem.

Loreto Mine and the Pinguico District, Guanajuato

By C. W. Bertrand

The Loreto mine is situated in the Pinguico district of the Guanajuato camp. Mexico, about 1000 m. to the west of the Pinguico mine. The shaft on the property was down about 40 m. on the dip on the San Carlos vein at the time of my visit, and was equipped for prospecting with a horse whim and buckets. By building a short piece of road, the mine can be very easily and cheaply connected with the [illegible] wagon road and railroad now under construction. The Loreto contains [illegible] of 188 [illegible]

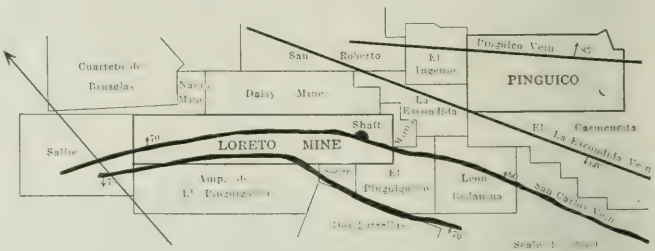
Geology of the District

The Pinguico district is peculiar in that the veins do not outcrop. This is due to some extent to faulting, but mainly to the fact that the mineral-bearing solutions did not [illegible] to the surface, although [illegible] and an occasional fair ore [illegible] can be obtained above this elevation. There is considerable doubt in the direction of [illegible] concerning the solution

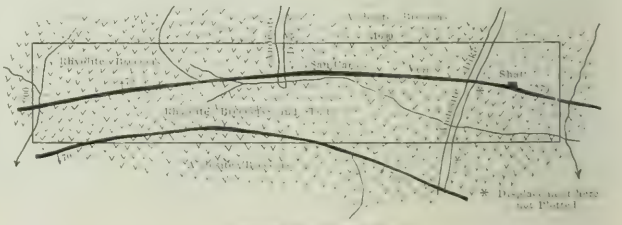
[illegible] Guanajuato, Mexico.

incapable of replacing the country rock. It is, therefore, evident that conclusions regarding the unexplored properties must be largely based on the geological conditions and similarities between them and the known conditions as proven at the Pinguico and Carmen mines which have been developed.

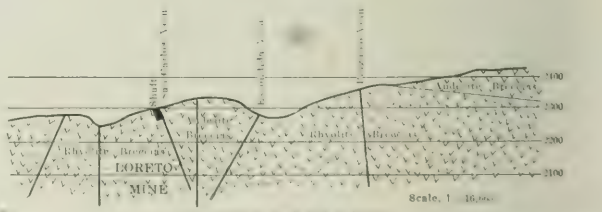
The Pinguico vein is in a fault-fissure zone and during the faulting its walls were much broken up. The faulting was followed by the ascending mineral-bearing solutions which replaced the broken and fissured country rock, depositing at the same time the gold and silver. The ore bodies lie entirely in rhyolitic breccias and tuffs. The overlying andesitic breccias seem to have been an unfavorable rock for replacement and ore deposition.



General Plan of District.



Geological Plan - Loreto Mine.



Cross Section, South End of Loreto.

PLAN AND SECTION SHOWING CONDITIONS AT LORETO MINE

Geological Conditions at the Loreto

Conditions on the Loreto are precisely similar to those at the Pinguico. There is a well-marked vein fault crossing the entire length of the property, 1000 m. This is called further south the San Carlos vein, and is a fault fissure of approximately 300 m. throw. It has a dip of 70 deg. to the east, as shown on the accompanying plan and section. This is the principal vein of the property and is the one upon which the shaft was sinking at the time of my examination. It is easily traceable for about 3 km., as the fault has made it the contact between the andesites and rhyolites. These rocks show by their cracking and fissuring near the principal fault the presence of crushed areas similar to those of the Pinguico vein. Also in the shaft, the contact shows a large amount of brecciation and ground up rock or mud range similar to the Pinguico mud ores.

At the Loreto mine as at the Pinguico are found the large well defined fault fissure crossing the property, the well marked crushed zone along this fissure, and also the presence of small amounts of gold and silver, proving the former presence and action of mineral-bearing solutions. It does not seem reasonable to assume that the ore bodies of the Pinguico are the only ones in this district and therefore I consider that, with careful attention to surface indications and by sinking on the most promising crushed zones, new ore bodies are likely to be encountered.

Operations of Guanajuato Development Co.

Cyaniding of Concentrates Being Tried with a View to Eliminating Smelting Charges. Peregrina and Pinguico Important Subsidiary Properties

FALL IN SILVER REDUCED REVENUE

The Guanajuato Development Company was organized in February, 1906, to supplement the operations of the Securities Corporation, Ltd., of New York, by acquiring, developing and operating mining and other properties in Mexico. Its operations have thus far been confined to the state of Guanajuato and the principal subsidiary properties at the present time are: The Pinguico Mines Company, operating the Pinguico mine and mill; Peregrina Mining and Milling Company, operating the Peregrina mine and mill; Mexican Milling and Transportation Company, planned to construct and operate a belt-line railroad and large custom mill (this company at present owns two small mills, one of which it is operating); San Isidro ranch, with important water rights giving an adequate supply for milling purposes as well as for the irrigation of ranch lands; La Central group and mill and El Cedro mine are also among the subsidiary properties of the Guanajuato Development Company, all of which will be described in further detail in this report.

Revenue and Profits

Under the conditions prevailing last year it was hardly to be expected that the Guanajuato Development Company could show large earnings, especially as the abnormally low price of silver prevented the subsidiary companies from paying back the monies loaned them by this company. Had the price of silver for the year remained at the average for 1907, the increased profits of the Peregrina and Pinguico companies alone would have amounted to $536,278, which would have nearly extinguished their debt to the Development company and this money would have been available for legitimate business extensions and earnings.

The revenue from operations during the period from May, 1908, to April 30, 1909, was $1,155,013. Operating expenses for the same period were $1,084,055, leaving a profit for the year of $70,054. The receipts from other sources were $137,160, which added to the net operating profit totals $207,217. Deducting the dividend of $60,000 paid during the year, there remains a surplus of $147,217. property, tools, supplies, etc., were depreciated $25,963, leaving a net surplus of $121,254. Previous to April 30, 1908, the company earned, over and above all expenses and dividends, the sum of $342,484, which

CYANIDE MILL OF THE PINGUICO MINES COMPANY AT GUANAJUATO, MEX.

added to the surplus for the present period, makes the total surplus to date $463,738. In addition to this there is in the treasury of the company a stock profit in securities of other companies amounting at par value to $6,097,666. All dividends accruing on the preferred stock since the organization of the Development company, amounting to $154,365, have been paid.

Cyanidation of Concentrates

The treatment of concentrates from the Guanajuato mills has been under consideration for several years. Early in 1908, J. B. Empson, a cyanide metallurgist, was engaged to conduct a series of tests on the concentrates from the mills of the subsidiary companies. These tests indicated that a high extraction of the gold and silver content, viz., 98.5 to 99.5 per cent., might be obtained. Following these experiments a small plant was erected at the San Prospero mill of the Mexican Milling and Transportation Company to treat these concentrates, limiting the construction expense as much as possible until practical success on a working scale was demonstrated.

Previously all the concentrates from the mills were sold to the smelting company at Aguascalientes, and were subject to a freight and treatment charge of $24.95 per ton, in addition to deduction from the gross assay value of the shipments, the smelting company paying for only 95.7 per cent. of the gold and silver contained. At the present time the mills operated by the Guanajuato Development Company are producing about 150 tons of concentrates per month, having a gross assay value of $610 per ton. A comparison of the returns from the smelting company with those from the cyanide plant shows that there is a substantial saving by cyaniding over shipping to the smeltery. This treatment will also permit of quicker realization by saving one-half to three-quarters of the time now taken by the smelting company before remitting for shipments received by them. The results thus far obtained are very encouraging and it is expected that during this year the successful outcome of the project will be fully determined.

Pinguico Mines Company

The report of the consulting engineer [illegible] and a careful personal examination made by the president of the company show this property to be in excellent condition and indicate that the ore reserves on May 1, 1909, plus the ore that the opening of the ninth level will probably put in sight, make reasonable the assumption that there is available above the ninth level over 148,000 tons, worth at the present price of silver over $2,[illegible] and which should yield a net profit of nearly $[illegible]. The past history of the [illegible] and a study of the geology of the camp afford reason to expect that the mineralization of the Pinguico vein will continue to much greater depth. The dividends on the Pinguico Mines Company preferred stock, owned by the Guanajuato Development Company, amounted during the last year to $48,753, equivalent to a little more than four-fifths of the dividends for the current year on the preferred stock of the Develment company.

A great deal of development work has been done in the mine since the last annual report, and while a large portion has been on the vein and in ore, much dead work has also been done. Both the Fortuna and Pinguico shafts have been sunk to greater depths during the year. The seventh level has been greatly extended to the north and the entire eighth level has been opened up during the year, until it now has a length of about 1300 ft. from the shaft.

Diamond-drill holes from the Fortuna shaft to the vein located its position, and a crosscut from the fourth level has now reached the vein, which shows the same conditions existing as upon the upper levels in the old portion of the mine. There is every reason to expect that further work at this point will give as good results in the way of ore as was found in the older workings.

The eighth level of the mine, as opened from the Pinguico shaft is entirely in ore, but of varying value, a portion being barely pay ore and the remaining portion being very profitable. At the southeast end of this level there have lately been found intrusions of ore bearing so great a resemblance to the new ore shoot of the adjoining Carmen mine, that it appears certain that this valuable ore shoot is dipping directly into the Pinguico mine, and that below the eighth level there will be found a valuable body of ore distinct from that which is now being worked. The continuance of the older orebody in depth seems well assured and preparations are being made to open up the ninth level as quickly as possible.

Mine Conditions

The mine plant is in first-class condition as regards buildings, machinery and underground workings. It was hoped that the cost of mining would have been reduced toward the end of 1908, but due to extensive development work this did not occur. At present the cost of mining [illegible] ore, now going to the mill, is much reduced and during the period of more limited development work, mining costs will unquestionably be less.

The amount of water has greatly diminished until it is now only about 50 gallons per minute, but sinking to the ninth level may release large quantities of water, and preparations have been made to handle it. A contract has been made with the owners of the adjoining Carmen mine permitting the introduction of air and the exit of water through the tunnel of their mine, thereby relieving the company of large expense for elevating water to surface and for pumping air into the mine. In compensation for this the Pinguico company has deeded a small piece of ground belonging to its Calderones ranch to the Carmen company for a mill site.

The transportation of the ore from mine to mill over the railroad of the Mexican Milling and Transportation Company has been satisfactory and the cost has steadily decreased as better equipment has been provided, both by the road and in the dumping arrangement of our own bins. The cost has decreased from a maximum of 43c. per ton, to a present cost of 12.5c. per ton.

Pinguico Mill

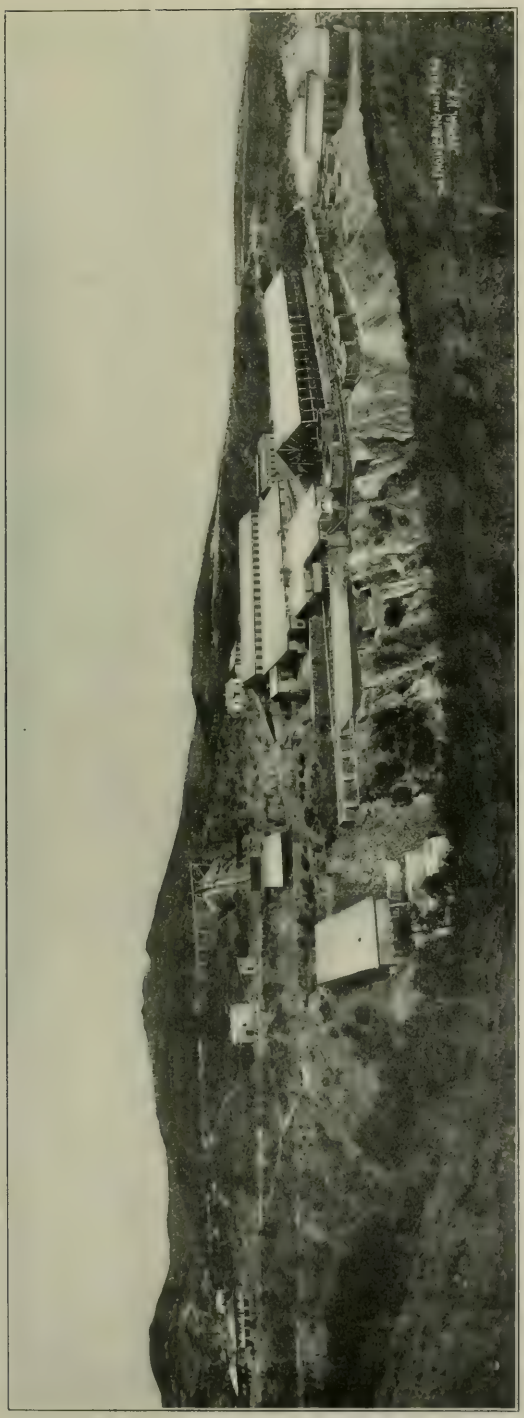
An automatic sampling plant has been added to the mill for the purpose of obtaining more reliable mill head samples of the ore. No other equipment or improvements of consequence were installed during the year. All of the machinery is in good working order, but there is no doubt that the changed condition of the ore in the mine, since the mill was first designed, would make tube mills of more benefit for regrinding than the present Chilian mills and it is to be hoped that financial conditions will permit a change in this respect.

The gross value of the product recovered by the mill and sold was 85.45 per cent. of the value of the ore put into the mill, as based upon head samples taken. The actual tail samples would indicate a slightly higher extraction, which is to be partly accounted for by the metals in suspense in the mill.

While milling lower-grade ores for the last six months, a larger tonnage was being forced into the mill in order to procure larger commercial results, and the effect has been a poorer extraction during that period. Higher grade ore is now being milled and the extraction based upon actual tailings going out would seem to show about 90 per cent. recovery. The cost of milling last year was $2.11 per ton and with higher grade ore and the necessity of using more cyanide, the milling cost per ton will probably be somewhat higher for the next few months. At present the mill heads are being kept at about $20 per ton and so long as this grade of ore can be maintained, excellent profits will be realized.

Financial Statement

The company shipped to the smelters 536 metric tons of high-grade ore, upon which was realized $127,105. The receipts from bullion and concentrates sold were $956,982 and from miscellaneous revenues $135, making the total revenue from all



PEREGRINA MINING AND MILLING COMPANY'S 500-TON CYANIDE MILL AT GUANAJUATO, MEX.

sources $1,084,222. The total mining, milling and general expenses were $688,533, leaving the net profit over operations, $395,689, and after deducting $120,000 paid in dividends, the remaining surplus amounts to $275,689. Property, options, franchises, etc., were charged off or depreciated $93,646, which leaves a surplus for the year of $182,043.

During the year, in addition to paying interest, the company reduced its obligations $180,335. There was also expended on construction and asset accounts, $92,473. The previous surplus of $33,917, added to that for the present period, made a surplus of $215,960 at the end of the fiscal year.

Peregrina Company

The Peregrina Mining and Milling Company realized during the year $743,701 in gross earnings. The mining, milling and general expenses for the period amounted to $649,686, leaving a profit of $94,015, and after paying dividends of $70,000 there was added to the surplus $24,015. In addition to paying its interest charges and general expenses, the company reduced its obligations $6,775, expended $34,820 on construction and $7,620 for equipment.

It was hoped that a better grade of ore would be obtained from the mine and that the value of the ore entering the mill would be correspondingly increased, but because of the greater width of vein broken, the grade of the ore has been about 39.5c. per ton less than during the previous year and the profit has been correspondingly less.

The development work during the year showed the existence of large orebodies on La Cruz parallel vein, and in depth below the most southerly blocks on the main vein, and more recent work shows the undoubted northerly extension of the main vein, as well as the continuance of its orebodies in depth in the end of the mine. While these tonnages are not measurable at once, there is every reason to consider them available for the future working of the property, so that no fear of lack of ore supply need be felt. The accompanying table shows the value, costs and profits, per dry ton, for the last two fiscal years.

This indicates a decreased value of ore per ton of 39.5c., of which the depreciation in silver accounts for 31c., so that the difference in metal content per ton is very slight. The metallurgical loss during the last year has been less than in the previous year and the net value recovered has consequently been greater in proportion.

The total production cost, including realization of values, has increased 23c. per ton over the previous year, chiefly because of the larger quantity of mine ore sent to the mill, with the correspondingly greater expense. The difference in profit per ton in favor of the previous year is

also due to the same causes—less gross value and greater cost per ton. It is believed that the cost of production can be decreased during the coming year, and every economy will be practised with that end in view.

Recovery of Metals

The recovery for the year shows a gain. This would have been much larger if it had not been for large metallurgical losses during September, October, November and December of 1908, caused by an effort to improve and cheapen the extraction process. The recovery for the first four months of the fiscal year shows 78, 79, 83 and 84 per cent., for the second four months, 65, 74, 72 and 80 per cent., a return to former methods shows a recovery for the last three months of 83, 87 and 92 per cent. There is excellent reason to believe that the recovery can be kept at about 90 per cent.

The later months of the fiscal year also show a gain in the grade of ore entering the mill and, judging by the grade of ore available in mine, dumps and fillings, the present grade should be maintained and possibly increased. The continued profitable operation of the mine and mill necessitates the most careful attention and economy, and the results obtained during the most successful months of last year indicate what may be expected during the present year.

Milling and Transportation Company.

The original plan upon which the Mexican Milling and Transportation Company was formed is not only attractive but thoroughly sound as a business proposition. If the financial depression of the past two years had not delayed the completion of the railroad and the enlargement of the milling capacity, the project would undoubtedly have resulted in large profits. There is a large tonnage of ore along the line of the proposed railroad which will be available as soon as a large mill is built and cheap railroad transportation is provided. It is proposed to complete the railroad and build the mill as soon as the necessary funds are provided by completing the financing of the company. This will stimulate the production of ore from mines which are now idle because their ores will not yield a profit over the present high cost of transportation by burros and mules.

Water Supply.

At the time the Guanajuato Development Company was organized the cyanide treatment of ores as then developed required about ten tons of water per ton of ore. The plans of the Development company, in connection with Pinguico, La Central, El Cedro, Mexico and other mines, and with such well considered plans for development as might warrant expenditure, and the proposed construction of mills by other companies in the immediate neighborhood, indicated that the question of a suitable water supply was one of vital importance.

Careful investigation of the surrounding country had demonstrated that the only drainage basin from which a large constant flow of water could be economically obtained was the San Isidro ranch. The Development company accordingly purchased this ranch as an aid to the large development and milling projects which it had in view.

The following year preparations were made to build the proposed dam but the improvements in cyanide milling, which greatly reduced the amount of water required, together with the effects of the panic of 1907 caused a suspension of work on the dam and it has not been resumed. However, the past season has demonstrated the necessity of an ample and steady outside supply of water for the Pinguico and other mills planned or under construction in this district. Without this supply, milling operations are impossible.

In addition to water for milling purposes there is a large area of land to which water from the proposed dam can be supplied for irrigation at a good profit. It was estimated that the cost of the dam and pipe line would be about $100,000 and that the sale of water would yield $50,000 annually. In view of these facts the Development company, as soon as it has funds available for the purpose, will give careful consideration to the question of completing the dam and pipe line.

COMMERCIAL ASPECT OF PEREGRINA ORES.

	Gross Value	Net Loss	Net Value Recovered	Cost, Inc. Realization	Profit
1908	$7 09	$1 65	$5 44	$3 77	$1 67
1909	6 695	1.325	5 37	4.00	1 37

The revenue from the ranch for the year from the sale of lime, charcoal, firewood, timber, barley, alfalfa, etc., was 130,879 pesos and the expenses for the year were 119,130 pesos, leaving a profit of 11,749 pesos. It is proposed to stock the San Isidro ranch with sheep and hogs which should be exceedingly profitable. The yield of barley, alfalfa, etc., can be largely increased so that in a few years the income from the ranch will pay good interest on the investment, in addition to the revenue from the sale of water when the proposed dam is built.

La Central Mines.

This group of mines has produced a large amount of ore in the past, averaging over 2 oz. of gold per ton, in addition to the silver content. The development work upon the mines was mostly done previous to thirty years ago and indicates the presence of a large number of veins, some of which are of sufficient value to warrant the belief that if properly developed, a group of paying mines will result. The former owners of the Pinguico mines spent $150,000 before finding any ore of value, and the La Central group, judged by surface indications, the number of veins carrying pay ore, and the cheap method of development, offers far better results than did Pinguico. The veins as far as they occur in rhyolite, and most of them do, bear a strong resemblance to the Pinguico vein, both in the walls and the soft wet character of the ores, and there is good reason to believe that development work will result as well as it did in Pinguico. When the Development company has available funds it would certainly be good policy to further develop this group of mines and demonstrate their value.

El Cedro Mine.

This mine has been worked at various points for over a hundred years and several distinct ore shoots have been found and partially worked. It is a large, low-grade mine, and to be made profitable requires an equipment of mining machinery, and the expenditure of a considerable sum of money to put it on a paying basis. The small amount of ore now being mined by hand work cannot be made profitable under the present conditions and while depending on other mills for treatment. But if properly developed and equipped with a mill of its own of sufficient capacity to treat with the greatest of economy the immense bodies of low-grade ore which are known to exist, this property could undoubtedly be made to pay a reasonable profit. The project, in brief, can be stated as a mine extending about 1½ miles along the Mother Vein of Guanajuato, with five vertical shafts and one incline shaft and about five miles of workings connected with these shafts. The vein varies from 30 to 60 ft. in width, and with sufficient ore to warrant building a mill and commencing development work.

In the light of the business conditions which have prevailed during the last two years, the stockholders of the Development company may congratulate themselves on the good results of the year's operations. The dividends on the preferred stock have been paid and a substantial surplus remains after a liberal allowance for depreciation. There is every reason to expect continued dividends from future earnings and with an advance in the price of silver, the company will be able to show a large increase in its business and profits.

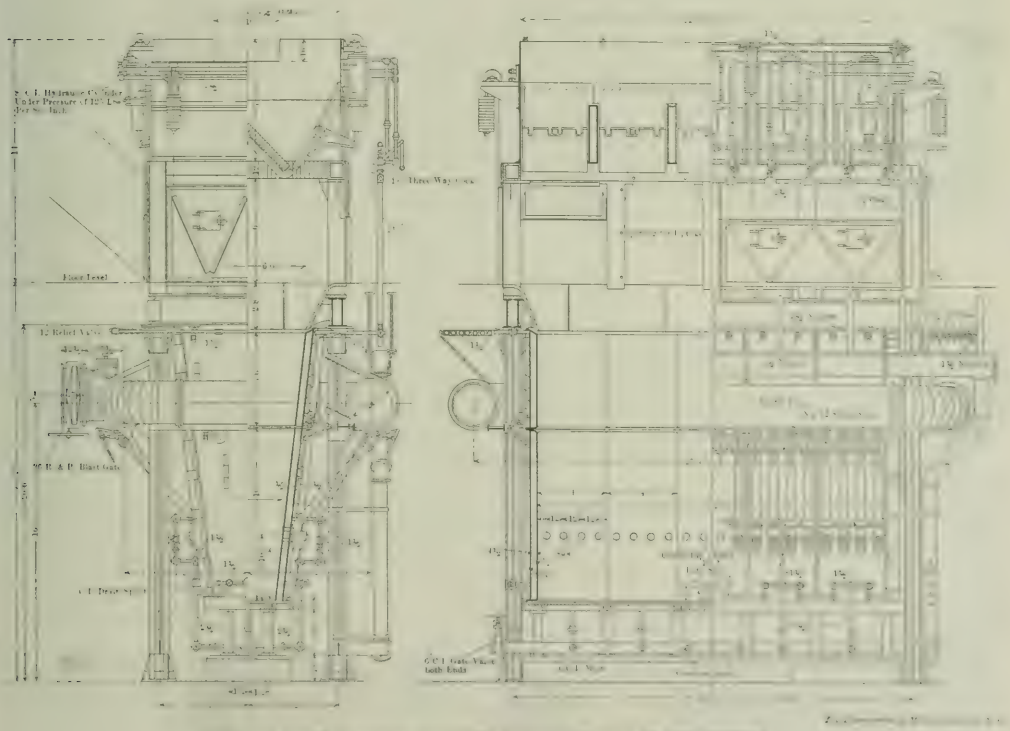
At the El Bote mine, Zacatecas (*Mex. Min. Journ.*, Aug., 1909), Chile mills crush 186 tons of hard dense ore through 180 mesh, 70 per cent. passing 200 mesh, in 24 hours.

New Copper Blast Furnaces at Teziutlan Smeltery

Each Furnace Charged Mechanically at Five Points. No Brickwork Used in Construction. All Piping Fitted with Cross Connections

BY CYRUS ROBINSON*

These notes are intended to briefly describe the Robinson copper blast furnaces just installed at the Teziutlan Copper Company's smeltery situated near Teziutlan, Mexico. The accompanying drawing shows the end and side details, and gives the principal dimensions and the general arrangement of the furnaces. The new furnaces, shown in end and front view in the accompanying illustrations are a development from the design worked out by me at El Paso, at the time of the rebuilding of that plant, after the fire about eight years ago. It was decided at the time of rebuilding to install mechanical charge for the lead furnaces, and later to put in two copper furnaces. The normal feed floor of the copper furnaces was 10 ft. below the feed floor of the lead furnace, and it was desired to charge all the furnaces from the same system, hence the use of a bin intermediate between the lead feed floor and the copper furnace. The charge was taken up to the lead-furnace feed floor in electric charge cars and dumped into the bins directly over the copper blast furnace, being fed from these bins to the furnace as required. The system worked so well that it was adopted on other furnaces at El Paso and later, I believe, has been adopted at Cananea.



END AND FRONT ELEVATION DRAWINGS SHOWING DETAILS OF CONSTRUCTION

Bins and Charging Mechanism

The Teziutlan furnaces are a further refinement of this principle, there being located over each furnace a 65-ton bin, the charge car running directly over the top of these bins. The bins over the furnaces have five dividing plates, practically cutting the bin into five sections, these dividing plates extending about halfway up the bin, as shown in the drawing. Each of the compartments has two gates, each gate operated from a hydraulic cylinder, the gate being opened by allowing the water to escape from above the hydraulic cylinder piston and the weight of the ore to force the gate to open. All of the 10 cylinders are controlled from one bank of levers in front of the furnace and by looking into the furnace it can be seen at what point it is desirable to feed a charge and the corresponding gate is opened. There are, therefore, 10 points at which the furnace can be fed from this bin. This gives practically the same control as feeding by shovel, as the item of charge is directed to the point where required and as required.

The efficiency of the charge handling for one or two furnace plants is materially im-

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SMELTERY OF TEZIUTLAN COPPER COMPANY, NEAR TEZIUTLAN, MEXICO

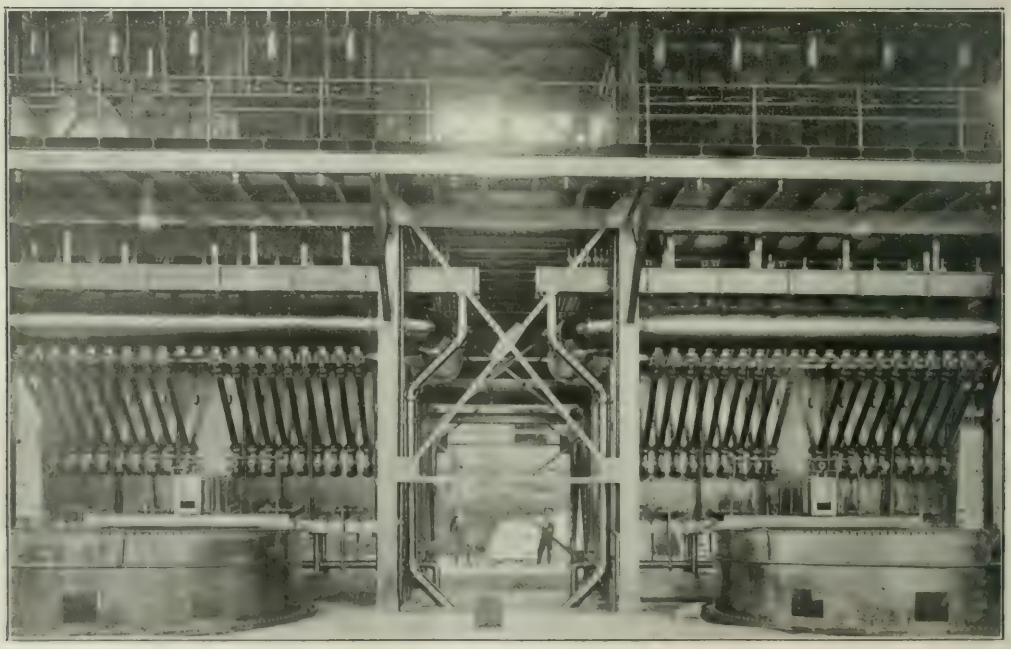


FIG. 2. VIEW OF NEW COPPER BLAST FURNACES AT TEZIUTLAN SMELTERY

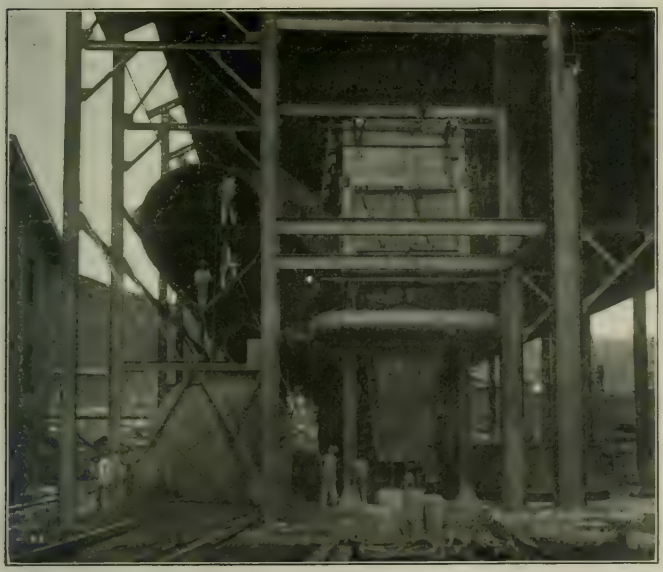
proved, as the delivering of the charge to the furnace bins can go on, within the range of the bin capacity, without regard to the feeding of the furnace, and the furnace can be kept full to the top mantel plate keeping a uniform burden as against the intermittent feeding of the furnace by charge car directly into the furnace.

General Construction and Water-jacket System

In the construction of the furnace no brickwork is used, the bin being supported on hollow cast-iron columns, through which air circulation is provided. The furnace is equipped with a system of jacket piping whereby a discharge from every jacket is seen from the furnace house by simply looking up over the water launder; it is not necessary to go from the front of the furnace to ascertain whether a jacket is running or not, the stoppage of the circulation from any jacket being noticeable at a glance.

Another departure is the use of cast-iron launder instead of the usual steel one for carrying the water to waste from the jackets. All of the piping is fitted with bronze cross-connections so it is possible by taking out the plugs from the crosses to run a rod through any piece of pipe without taking the same down or unscrewing elbows and connections.

The drawing shows the system of holding in the jackets by heavy crucible flange plate and wedges, and I-beams carried by mantel columns with thrust turnbucklers, making it possible to take out any jacket without disturbing any other part of the furnace.



END VIEW OF FURNACE SHOWING STEEL CONSTRUCTION AND BINS

Changing Conditions in Mexico

By H. A. Megraw

That times change, and that circumstances alter cases are well known facts. The duties which the mining engineer is called upon to perform, in the carrying out of his mission in various parts of the world, are steadily altering in one way or another. These changes are not uniform over the whole field of mining, as would be supposed, but vary locally, and although in some cases they may not be noticeable over short periods, a comparison of conditions at widely different dates will be likely to show the changes forcibly. In order to take a familiar example of this fact, examine the case in Mexico. And the forces which are at work here will be found to be at the same work, in a greater or less degree, in other parts of the world.

In the beginning, the engineer from home, wherever that might be, was obliged to carry the burden of his whole operations on his own back. He had to formulate his policies and devise methods and means of applying them. The things he learned from the natives, while interesting and instructive, rarely were of such nature as to be economically of great importance.

All the skilled assistance which he found necessary had to be imported from home and a goodly price paid for it. His directions were given to these men, and upon them he had to depend for the intelligent carrying out of his schemes. Upon them rested the success or failure of his work, for it was not an easy matter to replace one of these assistants whose work was not all it should be. The natives were used as the machine, furnishing the motive power for strictly mechanical movements. The more skilled men from home soon found out that it was an easy matter to delegate all physical work to the native, he furnishing the brain for its proper carrying out.

These men imported from home were of several classes. Some of them were intelligent and ambitious; others intelligent enough but not in the least ambitious and content to perform the day's work in a routine way, to learn what little was absolutely necessary, taking it for granted that the supply of work of this class was always before them.

Natives Taking Better Positions

Meanwhile, in the course of time, the native laborer began to realize his position and to see that he was being used as an unthinking machine, and that labor of that class commanded the lowest possible price in the market. He began to take pains to observe what was going on about him and to learn all he could about the work he was doing.

As time progressed he went farther than this. The younger generation began to serve a sort of apprenticeship in the shop, mill and mine, until a great many of them were more or less competent to undertake the kind of work which paid better. This class of worker found that his pay increased in direct proportion to his efficiency.

This kind of education is the most effective that can be devised. To one who finds that his services command more money as he learns more, the incentive to go on learning and earning is well nigh irresistible. The native has now learned enough so that he can run a shift in the mill or in the mine, operate a machine in the shop and do a number of other things which he never thought of doing ten years ago. Perhaps he can do none of these things yet as well as his foreign competitor, but still in many cases acceptably, and, under capable supervision, satisfactorily.

The prospect is that some day, not so very far in the future, he will be in a position to entirely supplant the skilled laborer from home. The native can work for less money than the man who is imported. This holds good in almost all cases. The native can live entirely on the products of his country, and almost always does, while the imported man finds it difficult and uncomfortable, if not impossible. The imported man is very

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apt, in these cases, to decry the work of the manager who supplants him with a native. It is considered an unpatriotic move and the manager comes in for some forcibly uncomplimentary language, while the imported man has to hunt another job. At the same time the work is being performed just as well and for less money, which is certainly the thing to be desired. The move is not unpatriotic, for the aims of the company owning the property are better fulfilled, and, at the same time, justice and fairness seem to point to the fact that the native ought to be recognized when he is capable of doing the work.

The laborer from home fails to go into the psychology of the situation. Its inevitableness does not appeal to him. He fails to consider that he is a machine which has been used for a certain purpose, which, while still intact and doing good work, is being, and naturally will be, replaced by the new machine which will do the same work for less money. It is the same with men as with machines.

Manager Must Serve His Company's Interests

The uptodate manager will put in a new machine the minute it is clear to him that he will save money by doing so. The same happens with men. The manager in justice to his company and his reputation cannot afford to overlook the chance to reduce expenses.

The greatest objection to the use of the lower classes of foreign labor up to the present time has been their lack of honesty. The uneducated native has an inborn proclivity for stealing anything he can get away with, no matter of how little value, and regardless of the fact that it may be of no use whatever to him either to use or to sell.

Conditions in the past are largely responsible for this tendency. There was a time when the lower class necessarily had to steal to live. Education and experience, however, are rapidly proving to the native that it is bad policy to steal and that he can get along much more successfully by being honest. There are many years of education before some of them before this principle becomes universally acknowledged, but many of them have already learned it and it is not such a difficult matter to pick out the ones who have.

The manager who realizes all these things, these changes which are constantly [illegible] and makes use of the native with [illegible] and intelligence, [illegible] the best of his opportunities, getting the best possible results for the [illegible] and doing his [illegible] to the fullest extent. He [illegible] to make work for anyone but to secure the most economical possible results, and he is undoubtedly expected to use his brains to that end.

Getting the Viewpoint of the Workmen

For the man who cannot converse intelligently in the native tongue it is very difficult to accomplish the best results. It is not necessary that a mine manager should be able to use all the flowers of some of the foreign tongues, nor absolutely be able to always use the right word in the right place. It is advisable, though, that he should be able to understand the meaning of the colloquial speech and to be able to give intelligent answers. It is not alone the difficulty of actual speech that makes the difference. Anyone can have an interpreter, but not by any such means can one understand the point of view of the native.

The Anglo-Saxon has a peculiar point of view and an idea that everyone else in the world ought to learn English for his particular benefit. The man taking this stand cannot possibly hope to establish anything like a bond of sympathy with the native. That is where the fault of language comes in. The viewpoint of the native cannot be understood, he cannot be handled in the most efficient manner, and often chaos is the result.

In such cases the manager has no alternative but to keep on with his imported labor at a high price. Many men have that natural faculty of sympathy which enables them to understand the views of others often disregarding the spoken word. These men are doubly fortunate and doubly valuable, for they will always achieve results completely out of the power of the man who does not possess it. Such men get along well with natives, understand their ideas and have the faculty of getting the best work out of them. They never make themselves familiar with their employees, for when that begins, the end of profitable work is in sight.

The laborer from home is on the horns of a dilemma. It is impossible for him to accept the native wage scale. Therefore he must either rise in his profession and fill the higher places, or he must get out. The vacant places are higher up. At the bottom there is no room.

Many men formerly occupying the lower places in the profession have made it their business to study conditions and fit themselves for the better places. Many have succeeded and are reaping the reward of stability which can hardly fail to come to one really in earnest. The trifler are disappearing, many have gone already and others are going. Those who study changing conditions closest and make the best use of their knowledge are, and will always be, the ones who progress most rapidly.

Small Smelting Plants in Mexico

By R. W. Perry*

The small blast furnace played a most important part in the early development of the lead and copper deposits of the West, and the experience gained in their operation paved the way to the present high state of efficiency of the art of smelting.

Much of this advance has been made possible by the increased size and capacity of the furnaces and the employment of the best metallurgical talent while the small furnace has been neglected accordingly and very little progress has been made in its management. The majority of such plants installed during the past 20 years have been lamentable failures; in many instances due to the fact that the character of the ore was unsuited to smelting, but in more cases to the lack of knowledge of those in charge. As a consequence, suggestions as to their use are looked upon with suspicion by many mining men, except in the case of simple oxidized ores where an abundance of iron flux is available.

I wish to describe several successful plants which have come under my observation during the past few years' operating under unfavorable conditions, and showing conclusively that the small furnace is capable of being adapted to a greater variety of ores and, consequently, to a much more extended use than is generally thought possible.

Two Small Smelteries in Successful Operation

The smelteries of Socavon and Linguna are the property of O. & T. Braniff, of Mexico City, and are situated near Maconi in the southeastern part of the state of Queretaro. Maconi is about 50 miles from the station of Bernal, on the main line of the National Railroad of Mexico, with which it is connected, for the greater part of the distance, by a good wagon road. Supplies must be packed over the last 15 miles to the smeltery at Socavon, and to Laguna, 15 miles farther. The smeltery and mines at Socavon have the benefit of cheap electric power developed at the company's own plant and, at the time of my connection with it, the line was being extended to Laguna.

The ores smelted at Socavon are chiefly oxidized silicious ores of the following approximate composition: SiO_2, 46 per cent.; Al_2O_3, 18; CaO, 10; Fe, 10; Sb, 5. Silicious lead ores carrying considerable lime are brought from the mines of San Entierro, at Laguna, to make up the deficiency in lead when necessary.

The ore occurs in a limestone formation, probably of Cretaceous age, and the

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deposits are very irregular both in form and value. Sulphides occur at variable depths and become common at a depth of 1500 ft. They contain a much higher percentage of iron and antimony than the oxidized ores, and, as a general rule, more silver.

Although out of place in this article, some mention of a body of mercury ore encountered at a depth of 1000 ft. may be of interest. About 100 tons of ore running high in mercury were extracted from a stope of ordinary oxidized ore. Some of this ore assayed as high as 20 per cent. mercury, which was present principally as livingstonite accompanied by native mercury, cinnabar and other rarer minerals. Traces of mercury have been also found in other parts of the mine. Numerous deposits of mercury ores are reported from the district.

The Socavon Plant

The equipment of the smeltery consists of two square 36-in. water-jacketed furnaces made by the Colorado Iron Works. The jackets are 3 ft. high with a 6-in. bosh, and have three 3-in. tuyeres on each side and one at the back. Blast is supplied by a Connersville blower. The sides of the furnace are straight, and the distance from tuyeres to feed floor is 15 ft. There is no dust flue, the furnace gases being discharged directly into the atmosphere. An auxiliary steam plant is provided in case of accidents to the electric plant.

The ore as brought from the mine is dumped over grizzlies and the fines reserved for future treatment, anything smaller than ¾ in. being regarded as fines. Mining is done on the *buscone* system and each miner sorts his coarse ore, throwing out all waste possible. During this operation the larger pieces are broken to a maximum size of 4 in., in which condition it goes direct to the beds. The sulphide ores are separated into coarse and fines, the coarse ore being heap-roasted, and the fines briquetted and roasted in kilns.

The different classes of ore, briquets, roasted matte, etc., are added to the beds in 6-ton layers in a certain definite order, and enough litharge added at intervals to keep the lead content up to 8 per cent., or higher when sufficient lead is available. The object of always preserving this order in forming the beds is to be able at any time to know their approximate composition and, if necessary, to send ore from any bed to the furnace without waiting for the chemist's analysis. Charges made up in this way need only a slight correction after the complete analysis is at hand. Analyses of different beds vary within somewhat narrow limits, chiefly dependent upon the amount of roasted matte on hand at the time of forming the beds. These limits are as follows: SiO_2, 36 to 28 per cent.; FeO, 22 to 32; CaO, 8 to 5; Al_2O_3, 12 to 8; ZnO, 2 to 4; S, 2 to 4; Pb, 8 to 10; Sb, 6 to 7.

Iron Ore Must Always Be Added

Whatever matte is produced at Laguna is roasted and brought to Socavon to make use of its iron content. However, there is always a deficiency in iron and some flux is necessary.

The ore from the beds and the fluxes are mixed on the feed-floor and fed to the furnaces in charges of 400 to 500 kg.; 15 per cent. fuel is used, of which ⅓ is charcoal and ⅔ coke. The limestone is quarried near the smeltery and is very pure, running 97 per cent. $CaCO_3$.

The iron is mined from two veins a few miles distant. Its average composition is given in an accompanying table:

IRON-ORE FLUXES.

	SiO_2	FeO	CaO	Al_2O_3	Ag
	Per Cent.	Per Cent	Per Cent	Per Cent.	Gm.
Espolon mine.	20.0	55.0	2.0	2.0	40
Poblano.. ..	13 0	40 0	11.0	11.0	100

The charge is carried at a hight of 9 to 15 ft. above the tuyeres. A blast pressure of 8 oz. is maintained at the blower, which is provided with a valve to keep the pressure constant irrespective of the condition of the furnace. The lead is carried low in the well so as to leave a thick layer of matte below the tap-hole. By leaving this matte in the furnace any tendency of the lead to run out of the tap-hole when crusts begin to form, is avoided. Campaigns of several months are the rule, the furnace being generally blown out from some external cause rather than on account of difficulties within. The slag and matte are tapped together into small slag pots and allowed to cool on the dump. They are then broken up and the matte sent to the roast heap and the dirty slag returned to the furnace.

Daily Capacity of 25 to 35 Tons

From 25 to 35 tons of burden are smelted per day, and approximately 2 tons of bullion and 1½ tons of matte produced. The matte contains 1600 gm. silver, 12 per cent. lead and 8 per cent. antimony per ton. The combined percentage of lead and antimony in the charge seldom exceeds 10 per cent. and is generally below that figure. I append an approximate analysis of the slag produced: SiO_2, 34 per cent.; FeO, 32; CaO, 20; Al_2O_3, 8; ZnO, 3.5; Pb, 0.7; Sb, 1.5; Ag, 70 gm.

Slags carrying as much as 36 per cent. silica and 24 per cent. lime have been made. The lead and silver contents of these slags were low, but the antimony was much higher and the loss of antimony by volatilization was greatly increased. This loss by volatilization is evident in the decrease of the antimony content of the bullion. Whenever, from any cause, the furnace is running irregularly, the same variation in the assay of the bullion is noticed. The bullion assays: Pb. 55 to 82 per cent.; Sb, 42 to 16.

All coarse sulphides and matte are roasted in heaps of 20 to 50 tons and allowed to burn as long as possible. Any poorly roasted ore is returned to a fresh heap. This method is most unsatisfactory as the matte sinters easily and a large proportion must be reroasted. The loss of lead and antimony is large. Comparative analyses are given in an accompanying table.

The sulphide fines are mixed with water and made into bricks in ordinary brick molds, thoroughly dried and charged into kilns with a little brush on the bottom to start combustion. These kilns are about 15 ft. in diameter and 20 ft. high, and take a charge of 30 tons at a time. Thirty days are needed to roast a charge, at the end of which time the sulphur contents are reduced to 6 per cent. The total cost of briquetting and roasting is 60 centavos per ton.

35 Tons of Bullion Refined in 8 Days

The refining plant consists of an octagonal cupeling furnace 12 ft. in diameter, capable of taking a charge of 35 tons of bullion. The bottom of this furnace is of clay, well tamped down and sloping from a point 2 ft. below the top of the bridge to the center at the bottom of the furnace. There is an opening in the front of the furnace 2 ft. wide extending from the floor to the top, through which the litharge is withdrawn. Blast is supplied by a small Baker blower delivering to the back of the furnace through two 3-in. tuyeres.

The furnace receives its full charge of bullion and, when completely melted, is cooled and the dross raked out through the opening in front. This dross, which contains 30 to 35 per cent. lead and antimony respectively, is returned to the blast furnace. As the surface of the lead bath is lowered, the clay is gradually cut away from the opening in front to allow of the withdrawal of the litharge. This is continued until the cupellation is finished. After the furnace has cooled sufficiently to permit it, the silver is taken out, cut into pieces of sufficient size and melted in graphite pots. Great care is necessary at the end of the cupellation to keep the enriched lead from freezing, but experienced workmen have no difficulty in producing bullion assaying 990 to 995 fine. About eight days are necessary to finish a charge of this size, and less than a cord of wood is consumed per ton of bullion cupeled. The litharge

produced assays 160 gm. silver per ton and 90 per cent. lead.

High Silica Slags at the Laguna Smeltery

The smeltery at Laguna is of interest chiefly on account of the high-silica slags made there. The furnace is a circular, water-jacketed furnace 36 in. in diameter. It has three 2½-in. tuyeres, and smelts 15 to 20 tons of charge per day. On account of the scarcity of iron flux the slags are very high in silica, ordinarily running as high as 38 per cent. silica, but sometimes rising to 44 per cent. No difficulty is experienced in keeping the furnace in blast with 44 per cent. silica in the slag, but the silver and lead losses increase rapidly when the silica rises above 38 per cent. The loss by volatilization is not known as no analysis is made

PARTIAL ANALYSIS OF RAW AND ROASTED MATTE.

	Ag	Pb.	Sb.	Fe.	S.
	Gm.	Per Cent.	Per Cent.	Per Cent.	Per Cent.
Raw matte	1600	11 0	8 0	44 0	23 0
Roasted mat	1000	8 0	4 0	40 0	9 0

of the charge fed to the furnace, but it must be high even with the lowest-silica slags. The following is a typical analysis of a slag from the Laguna plant: SiO_2, 38 per cent.; FeO, 32; CaO, 18.5; Al_2O_3, 3; ZnO, 2; Pb, 1; Ag, 90 gm. The bullion assays 92 per cent. lead and 5 per cent. antimony.

Smelting Copper Ores at Zimapan

The Equitativa smeltery at Zimapan, Hidalgo, is situated 25 miles from Maconi and 50 miles from the station of Sayula on the National Railroad.

At the time of my visit a 36-in. circular furnace was running on copper ores; 9 per cent. coke was used as fuel and a concentration of 12 and 15 to 1 was made on ores carrying 3.5 per cent. copper and 9 per cent. sulphur; 14 oz. of blast was used and 30 tons of charge were smelted per day, the average slags running 48 to 50 per cent. silica, 16 per cent. lime and 20 per cent. iron. I was told that slags carrying as high as 60 per cent. silica had been successfully produced. The slag and matte were tapped together and separated on the dump.

While no claim can be made for high metallurgical efficiency in these plants, the losses are within reasonable limits and compare favorably with those at many larger reduction works. The preparation of the ore for the furnace plays as important a part as the smelting, and the recent improvements in the roasting of lead ores which can be utilized by small as well as by large plants make possible the successful smelting of sulphide ores which formerly could not be treated by [illegible]

Oil Developments in Mexico

Special Correspondence

The action of the Mexican Central Railway in changing some of its locomotives back from oil to coal is in the line with the reports that the Mexican oilfields of the Tampico district have not given promise of longevity and large production. It is difficult to get reliable information on the subject. A report says that the Ebano wells of the Mexican Petroleum Company are pumping an increasing amount of salt water, and that now some of them are carrying up as much as 8 per cent. of brine. The famous Dos Bocas well, over which there was so much excitement owing to the great difficulty in controlling it, is now a prolific producer of brine, and the oil has become of small proportion in its large daily artesian flow. It is also known that the results obtained by the Pearson oil interests near Veracruz were disappointing.

It is not meant to convey the idea that the Mexican oil developments on the gulf side are not important and large, or that the fields will be a failure, but to point out that the generally accepted claim that Mexico would soon have a surplus of crude oil and be a factor in the markets of the world is not yet substantiated. This is in corroboration of the semi-mysterious report made to the United States Government by Messrs. Hays and Day, of the Geological Survey, who were sent into Mexico officially last winter. Efforts to locate oil in other parts of Mexico than the Gulf coast have not been successful as yet.

The Hearst interests have some deep wells in the northeastern part of Chihuahua on which they are continuing exploration, which fact leads to a conclusion that the work done has been at least encouraging. On the Isthmus of Tehuantepec and in Chiapas are indications of oil and the results obtained by the Pearson explorations in the isthmus region have been fairly satisfactory. There have been no results so far from the limited attempts to develop oil on the Pacific slope. There seems to be no reason why oil may not be expected from the Sonora and Sinaloa coast region, as in California. Farther south along the coast there has been such intense vulcanism that the conditions for oil are not considered very good. So far no oil has been found in the vast limestone beds of the central Plateau region of the country, although there has been little deep drilling. Recently the railroads and some private interests have been sinking many deep drill holes in various parts of the plateau with the expectation of obtaining water, and it has been hoped that some of these might disclose oil strata. So far there have been no results from this work.

The oil business of Mexico has been in the control of the Waters-Pierce company for many years until recently, when the Mexican Petroleum company became a producer, and later the Sir Weetman Pearson concern became interested in the oil explorations under special concessions granted by the Mexican government with the hope of dividing the oil interests in the country and also of increasing the prominence of British investments to offset the growing preponderance of the American interests. The Waters-Pierce company is an adjunct of the Standard Oil Company, and held the Mexican field on a contract to control it for the Standard. This was easy before the discovery of oil at Ebano. The Mexican Petroleum Company was controlled by Doheny, Canfield, *et al.*, of California, who were, in a measure, independent of the Standard.

When the Ebano field came in, it was expected that there would be competition in Mexico, but the Mexican Central Railway, then controlled by the same people who were in the Waters-Pierce adjunct of the Standard, made a contract for all of the oil of the Mexican Petroleum Company for fuel for the locomotives. When the Pearson interests discovered oil and commenced to produce and to refine it, the situation changed and the Waters-Pierce company was unable to dominate the powerful British interests back of this new producer, and last winter a more or less cruel war was inaugurated, particularly in the city of Mexico, and prices were greatly cut, principally in the newspapers and on enormous bill boards.

This was the cue for the Standard to come in on the grounds that the Waters-Pierce company had failed to control the field. Recently a Mexican company has been announced to acquire the business of both companies. The capital of the new company is 25,000,000 pesos, and the governor of the federal district is at the head of it. This seems to be the last stage in the commercial development of the Mexican oil business. It is a question now of the production and grade of the developing fields and of the results of the explorations for new wells. The Pearsons have discontinued the policy of promiscuous drilling and lavish expenditure for refinery and equipment. The oil war is over, apparently, also. Meanwhile there has been but little benefit to the country from the oil discoveries so far made, and the prospect of a cheap supply for industrial purposes is not yet assured.

At Cananea, it is stated in the *Mex. Min. Journ.* Aug., 1909, wages are from 3 to 3½ pesos per day, and a premium of 50 centavos per day is paid those who work 28 days a month.

In the Guanajuato district of Mexico gold and silver ores are mined and treated for less than $4 a ton, and over 90 per cent. of the value is extracted.

The Coal Industry in Mexico

Important Coalfields Have Been Discovered and Are Being So Developed that Mexico May Soon Be Independent of All Foreign Fuel Supplies

BY EDWIN LUDLOW*

There are at present three developed coal basins in the state of Coahuila. These basins are all traversed by the Mexican International railroad. The first district lies 7 km. south of the town of Porfirio Díaz, and is known by the name of "Bassin de Fuente." The second field is situated 117 km. south of Porfirio Díaz, and is called the "Bassin de Sabinas." The third basin lies near the station of Barroterán, 145 km. south of Porfirio Díaz, and is in communication with the main line of railroad by a 10-km. branch, running north easterly to Las Esperanzas, which is at the southern end of the "Bassin de Las Esperanzas," and where are situated the mines of the Mexican Coal and Coke Company.

Bassin de Fuente

The Bassin de Fuente, according to the examinations that have been made there, has an area of 5000 hectares. It seems to be a small basin parallel to the coal deposit which extends along the Rio Grande, which is exploited at Eagle Pass and near Laredo, in the state of Texas, and which has been recognized and studied near the town of Mier, in the state of Tamaulipas, Mexico.

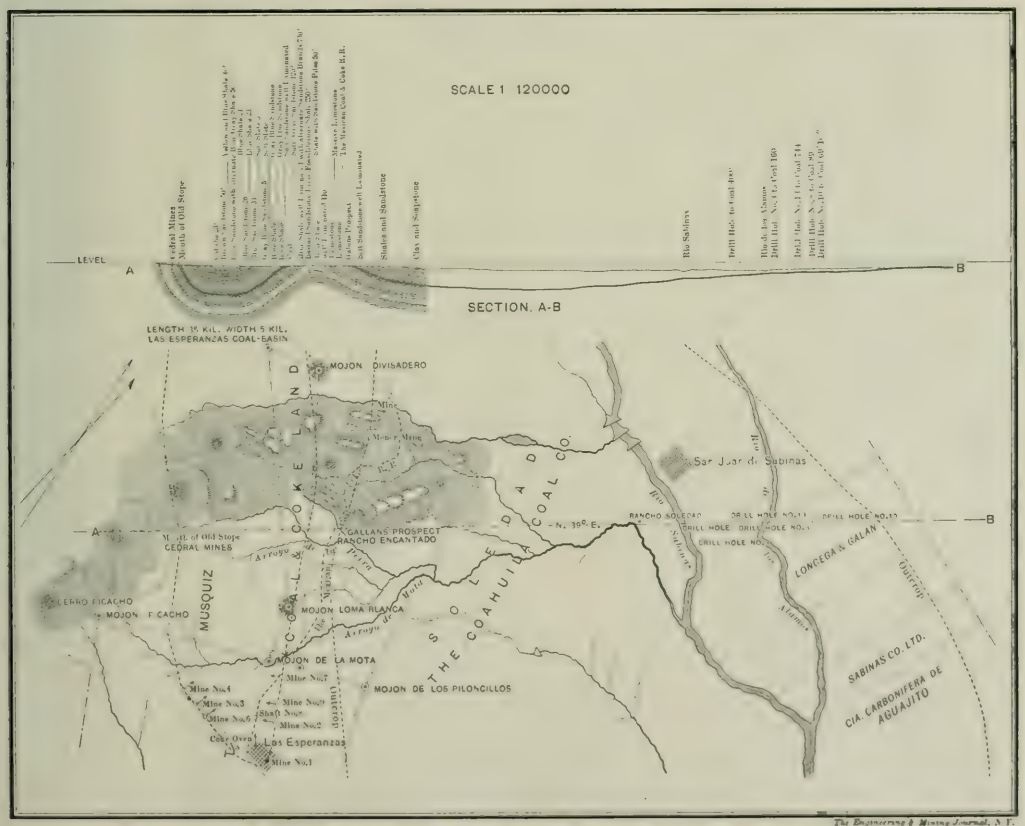
The coal of Fuente, although presenting the same general characters as the coals of Eagle Pass and Laredo, contains less carboniferous slate and ash, as shown by the following analyses:

COAL ANALYSES.

	Laredo.	Fuente.	Eagle Pass
Moisture	3.20	1.40	3.49
Volatile matter	37.35	39.40	36.87
Carbon	39.90	40.20	34.00
Ash	25.55	19.00	25.64
	100.00	100.00	100.00

The high proportion of volatile matter gives the Fuente coal a special value for roasting purposes and gas manufacture, and it contains at the same time sufficient carbon to be employed for steam generation.

The coal of this basin is mined by the



MAP AND SECTION OF PORTION OF LAS ESPERANZAS AND SABINAS COAL BASIN

NOTE—A paper read at the session of the International Geological Congress, Mexico, D. F.

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Fuente Coal Company, which has effective and preponderant rights over all these lands, and is allied to the Mexican International railroad.

Sabinas Basin

At the south of the Fuente field the railway crosses the summit line of Leyotes, and then descends into the Sabinas basin, which extends along the Sabinas river. This basin is 55 km. long by 25 km. wide; its general direction is northwest to southeast. The Sabinas coal is entirely different from that of Fuente; it is richer in carbon and consequently better for steaming, as shown by the following analysis:

ANALYSIS OF SABINAS COAL.

Ash	14.60
Carbon	64.20
Volatile matter	21.20
	100.00

If well cleaned the Sabinas coal will give quite a good coke, which is not true of the Fuente coal.

The carboniferous formations of the fields of Sabinas and Las Esperanzas belong to the Upper Cretaceous and correspond to a part of the Laramie formation, in the United States. The great part of the Sabinas basin extends to the west of the river and belongs principally to the Coahuila Coal Company, which is under the predominant influence of the Mexican International railroad.

The Sabinas basin extends over a vast surface; but since it is broken up by faults, which generally are not manifested by any exterior sign, the workable parts in which the coal is thick enough and pure enough to be mined with profit, rarely exceed 500 hectares in a single body, and are separated by great distances in which the coal is too thin, or stratified with too great a proportion of slate or other mineral substances, to have any marketable value whatever.

Under the most favorable conditions, the coal varies from 1.37 to 1.52 m. in thickness, with an interlying seam of shale of from 15 to 30 cm. The lower seam, which lies below the shale, is usually clean, and measures from 0.5 to 0.61 m. The coal which covers the shale, and which is usually about 0.61 m. thick, is more often mixed with ribbons of carboniferous slate, which are being separated when mined, affect the purity of the coal and increase the proportion of ash when clipped.

The Sabinas Coal Deposits as Observed in 1884

The Sabinas and Las Esperanzas basins are separated by a straight summit line. At the southern end of the former basin, the outcrop crosses the river near the ranch of San Felipe, 40 km. south of Sabinas, runs and follows the eastern bank. It was probably the first coal seam discovered north in Mexico, in 1884. The outcrop runs from the river about 3 km. higher up and follows the western shore to a point at about 2 km. above the bridge of the International railway, where it again crosses the river to the eastern bank, remaining there until it turns south at the upper end of the basin.

The workings at San Felipe proved that the seam dipped slightly, consequently it was opened by shafts sunk in the western bank, in 1887, and the mining center of Hondo was established by the Coahuila Coal Company. The mines Nos. 5, 7 and 8 are still worked. The workings have shown that the ground is broken by faults; a fault 27 m. high has been found between shafts Nos. 2 and 6.

The Coahuila Coal Company

The Coahuila Coal Company is opening mines higher up the river; the first, at Mezquite, where the International railway meets the outcrop on the western side of the river, opposite the town of Sabinas. It is a mine of small importance, intended to supply the locomotives of the Mexican International railway as they pass.

A shaft, called the National, has been sunk at a point 10 km. north and 762 m. from the shore of the Sabinas river. In this shaft the coal was encountered at 260 ft. deep and two seams were found. The upper seam, 1.98 m. thick, is divided by two layers of slate, which reduce the thickness of the coal to 1.22 m. The lower seam is only 1.06 m. thick, but is much cleaner. These two layers are separated at the bottom of the shaft by 2.44 m. of slate, but the development work carried on from this point in the direction of the river, ascending the slope of these two seams, shows that the two beds approach so near together as to be separated only by a layer of slate about 0.61 m. thick; on the contrary, in descending, the seams diverge so much that, in an air shaft 213 mm. away from the principal shaft, they are found separated by 30 m. of hard strata, and in a bore hole 120 m. deep, at more than a kilometer from the same principal shaft, there are 49 m. of strata between them.

Bore holes in the vicinity of this shaft have demonstrated the existence of more than 2000 hectares of workable coal; but the presence of slate and slaty coal renders it doubtful if a cleaning of the coal as will make it acceptable to the market.

Surveys made by B. W. Robinson, manager of the Coahuila Coal Company, have shown that there are vast areas of exploitable coal which may be proved when the demand arises, but a large part of the Sabinas basin is controlled by this company, but not yet been explored.

The eastern outcrop of the Sabinas basin crosses the Sabinas river immediately above the town. A triangular tract of about 200 hectares situated on the eastern bank has recently been opened by the Mexican Coal Company.

A section of the coal seam made in gallery No. 1, in the spring of 1905, has given the following results:

SECTION OF SEAM.

Coal...	0.33 m.
Slate	0.05 "
Coal.....	0.25 "
Slate	0.08 "
Coal	0.28 "
Carboniferous slate	0.05 "
Coal.....	0.38 "
General total.....	1.42
Total of impurities	0.18
Net coal....	1.24 "

Adjacent to this tract is the domain of W. B. Cloete. Prospecting has been done, but the coal was found so mixed with slate that it was hardly possible to purify it sufficiently for sale. To the north of these holdings, on the two sides of the Rio de los Alamos, and near the village of San Juan de las Sabinas, are the properties of Ernesto Madero and Arturo Longega. They possess a total of 3000 hectares of carboniferous lands; but borings carefully made there have discovered several important faults. They have, nevertheless, a certain area of at least 500 hectares of workable coal, varying from 1.37 to 1.52 m. thick.

A section made in their gallery No. 1 in the spring of 1905 gave:

COAL SECTION NEAR SAN JUAN DE LAS SABINAS.

Coal	0.08 m.
Carboniferous slate.....	0.05 "
Coal	0.28 "
Slate	0.10 "
Coal.....	0.41 "
Carboniferous slate.....	0.05 "
Coal	0.41 "
General total....	1.38 "
Total of impurities	0.20 "
Net coal	1.18 "

The upper part of the basin, where it turns, has not yet been studied; the nearest point where investigations have been made is on land held by the Monterey Coal Company. The exploration of these lands has shown the existence of considerable areas rendered valueless by faults; but in the neighborhood of the galleries that are being opened borings have established the existence of about 500 hectares, under which there is nearly 1.52 m. of workable coal.

Las Esperanzas Basin

This basin, which extends parallel to that of Sabinas and is separated from it only by a line of hills of about 3 km., belongs, in great part, to the Mexican Coal and Coke Company, which concern has carefully studied the carboniferous lands in this vicinity, and began mining at the southern extremity of its holdings in the autumn of 1891.

The coal is similar in quality to that of the Sabinas field, but its thickness is double, and in some places reaches a thickness of 5 m., including a 0.30 m. layer of shale, which extends through the middle.

The Esperanzas field is 35 km. long by 5 km. broad. Of this area the Mexican Coal and Coke Company possesses about 8000 hectares. It has established its prin-

cipal working center in the southern part of the field, where the outcrop in turning reduces the inclination of the seam to about 8 deg. The channel of the basin descends with a slope of about 7 deg.; and since the basin does not broaden, the sides become very abrupt in the middle.

Well made borings have, however, shown that the thickness of the seam reaches its maximum at the south end of the basin, where the mines of the Mexican Coal and Coke Company are in operation; while at the upper end of the field, the seam becomes so thin that the borings give it no more than 0.76 to 1.06 m., until it passes south of Múzquiz town. Although faults have been encountered in the workings of this basin, they are not so extensive, and the dislocations are not so great as in the Sabinas basin.

The plan of development of the Mexican Coal and Coke Company has consisted in a series of seven galleries, opened on the two sides of the basin; the coal is clean at the southwestern outcrop, and is opened by galleries 3, 4 and 6, where the seam is perfectly regular and a section gives the following figures:

SECTION OF COAL SEAM

Coal	0.25 m
Carboniferous slate	0.05 "
Coal	0.76 "
Shale	0.30 "
Coal	1.06 "
General total	2.42 "
Total impurities	0.36 "
Total coal	2.06 "

In the eastern part of the basin the coal is thicker, but it is neither so regular nor so pure. A section in this district gives:

Coal	0.27 m
Carboniferous slate	0.06 "
Coal	0.12 "
Parting of pyrite	0.03 "
Coal	0.19 "
Carboniferous slate	0.09 "
Coal	0.30 "
Parting of slate	0.24 "
Coal	0.03 "
Carboniferous slate	0.03 "
Coal	1.03 "
General total	2.69 "
Total coal	2.23 "
Total impurities	0.46 "

The coal in this same eastern part of the basin contains also a soft vein of what the miners call "mother coal." This coal turns into dust and is a serious obstacle in the manufacture of coke. No trace of this "mother coal" is found on the west side of the basin. Experience has shown that on the west side of the basin a coke of superior quality may be made with the fine dust that passes through a screen of ⅛-in. mesh.

The Mexican Coal and Coke Company is the only coke maker in this district. It uses this dust in 226 ovens, which produce a total of 7000 tons of coke per month.

A sample of coal, mined in pit No. 3, according to the rule formulated by the U. S. Geological Survey, and analyzed at its laboratory at the St. Louis, Mo., exposition, 1904, gave the following results:

COAL ANALYSIS.

Moisture	0.12
Volatile matter	21.83
Carbon	69.84
Ash	7.91
	100.00
Sulphur, determined apart	0.70

An average sample of the coke made with coal from these same mines, and taken at the same time, gave:

COKE ANALYSIS

Moisture	0.14
Volatile matter	0.76
Carbon	85.95
Ash	13.15
	100.00
Sulphur, separately determined	0.74
Phosphorus	0.001

An average sample of the mine, taken near gallery No. 1, more than 1000 m. from the surface and at a point where the seam was 2.69 m. thick, was taken to the Ohio State University and there analyzed by Prof. N. W. Lord, June 29, 1905. The analysis was as follows:

COAL ANALYSIS.

Moisture	0.95
Combustible volatile matter	19.73
Carbon	69.86
Ash	9.45
	100.00
Sulphur, separately determined	0.997
Calorimetric value in British thermal units	13,995

This sample had been taken conformably to the rules laid down for taking "samples of mines," by the U. S. Geological Survey, according to which a V-shaped cutting should be made from top to bottom of the seam. In this cutting are comprised a portion of the small partings of foreign material, less than an inch thick, but not the thicker seams of slate and slaty coal, which may be separated in cleaning.

This Mexican coal, when suitably prepared, gives effectively 14,000 B.t.u., while the different coals of the United States examined at St. Louis in the laboratory of the American Government by Professor Lord, maker of the foregoing analysis, have given the following figures:

HEATING VALUE OF AMERICAN COALS

	British Thermal Units
Colorado	9,767
Alabama	12,865
Illinois	12,046
Indiana	11,822
Indian Territory	12,787
Kentucky	12,283
Missouri	10,505
Texas	7,267
West Virginia	13,918 and 14,614

Consequently, if we except the best coal from West Virginia, the Mexican coal, when well prepared, is more than equal to the American coal in heat units—a generally accepted measure of a coal's value and if it be true that the elimination of the carboniferous slate, a portion of which is intimately mixed with the coal, renders it almost impossible to produce large lumps of this fuel, still this coal has been proved to yield smaller sizes, such as nut, pea, and buckwheat coal, and to furnish a good fuel for Mexican steaming purposes.

A single test was made with measured coal at Monterey, in the works of the American Smelting and Refining Company; this test showed that the smallest of the above grades gave 12,748 British thermal units.

Before the opening of the Mexican Coal and Coke Company's mines at Las Esperanzas, in 1900, the only coal worked was that of the companies in Coahuila, Fuente and Alamo, where the administration is under the influence of the Mexican International railroad, and the products thereof were almost entirely consumed by that line and by the Southern Pacific, then its ally. The Mexican Coal and Coke Company opened Las Esperanzas basin, began shipments July 1, 1900, and pushed work in its coal deposits so far that in 1904 their production reached 512,362 metric tons. The success of this coal company provoked the formation of three others, which probably have commenced to ship coal before this.

The first coal in this part of Mexico was extracted in February, 1884, from the Sabinas coal mines, situated on the west side of the Sabinas river, about 1 km north of the town of San Felipe.

These mines were worked until July, 1886, and gave a total of 101,000 tons. The operations there were suspended for some time by reason of legal difficulties, but were resumed in January, 1888, the new name of the concern then being Alamos Coal Company, and were continued until September, 1901, at which time they had produced 1,017,000 tons.

The Coahuila Coal Company was organized to work the coal deposit situated in a grazing land belonging to the Mexican International railroad, on the west and south bank of the Sabinas river, and designated the "Domain of Solitude." Operations were commenced at Hondo in January, 1887.

PRODUCTION OF IMPORTANT MEXICAN COMPANIES

Working of the basin of Fuente was commenced by the Piedras Negras Coal Company, about the month of November, 1891, and continued to May, 1894. The production was inconsiderable and did not exceed 30,000 tons.

The Fuente Coal Company was then put into possession of this concern's properties and commenced to ship in June, 1894. From this time to December 31, 1904, the products reached a total of 912,000 tons.

The Mexican Coal and Coke Company began its operations in November, 1899; its first shipments of coal were made July 1, 1900, and from this date to December 31, 1904, it shipped 1,650,814 tons.

The above concerns, adding to them the Mexican Steel Company, of Monterey, which has extracted a little coal from a section of the outcrop abandoned by the Alamos Coal Company, are the only ones that have mined coal in Mexico up to this day.

The total coal produced by the deposits in the state of Coahuila up to December 31, 1904, amounted to 5,218,894 tons, and 550,888 tons of coke. The shipments made in 1904 may be summed up thus: Fuente Coal Company, 62,400 tons; Coahuila Coal Company, 256,500 tons; Mexican Coal and Coke Company, 512,862 tons; giving a total for these mines, in 1904, of 831,762 tons. The tonnage of coke the same year reached: For the Coahuila Coal Company, 13,150 tons; for the Mexican Coal and Coke Company, 52,737 tons, making a total of 65,887 tons.

Commercial Conditions

In the northern part of Mexico, which is accessible to the product of these mines, the native coal has almost closed the door against foreign coal. But in the south, where outside products are imported by water, at Tampico and Veracruz, and where reduced rates are allowed by the railways from these ports to the industrial centers, the coal of the country cannot compete with the purer American coals from West Virginia.

The costs of extraction are excessively high in the mines of Coahuila. The roof is weak and must be supported by props; these supports cost dearly, for they must be imported from the United States, the carboniferous zone not producing such trees. Water also occasions considerable expense. In all these mines the entries encounter considerable feeders of water, some permanent, others temporary, and to overcome this problem, powerful, costly pumps have been installed in most of the mines.

It will never be possible to extract the coal of this region at a price so low as in the coalfields of the United States, and it is almost impossible, because of the slate partings mixed in the coal, to produce a commercial fuel with as little ash as in those that come from the purest seams worked in certain parts of the United States. The railways, however, understand the value of Mexican coal lands, and by rate reductions, are aiding the mining companies to extend their development further toward the interior of Mexico.

There is today a sufficient area known in the region of Coahuila to meet the need of all Mexico, and with suitable transportation rates, the production of the district may be considerably increased. Until now the extraction was limited only by the demand.

General Geological Conditions

The two fields of Sabinas and Las Esperanzas are the important ones that have actually been explored and proved available. There are other fields parallel and contiguous to these belonging to the same geological formations, but the exploration made in them have not hitherto revealed coal seams big enough to be [illegible] and worked. There is without doubt entirely possible that other fields may be discovered, in which are extensive and workable coal deposits—the geological constitution of the country permits this supposition—but the borings that have been made almost interruptedly for the last three years in adjoining and parallel fields have not yet revealed bodies of coal pure enough or thick enough to pay the cost of extraction.

One of the characteristic marks of the geology of this region is the flow of lava which was produced by the craters of the Santa Rosa mountains, situated west of these fields, and which occurred, as may be observed, a short distance behind the outcroppings. This lava spread in a sheet 1.20 to 3.04 m. thick, and forms a covering of the mountains that rise above these fields. The sides have undergone erosion, so that the shales and sandstones of the carboniferous formations, distinctly appear under this covering of lava; and the lava, being of more recent date, has evidently been deposited after the faulting of the basins with no visible effect upon their formation.

Some of these lava streams have traversed the whole width of Las Esperanzas basin and have covered the Sabinas basin as far as the river. There exist also traces of old craters, which have erupted across the Sabinas basin. The influence which they have exerted upon the neighboring carboniferous formation has not yet been practically determined, the workings of the nearest mines, at Hondo, not having been pushed far enough to show any disturbance due to its action.

The carboniferous territory already examined shows the existence of a body of coal sufficient to furnish a good supply for an unlimited time, and through a modification of slow-speed transportation rates, permitting native coals carried by railways to compete with foreign coals arriving through seaports, Mexico may produce all the fuel necessary for its present and future needs and become completely independent of a supply of coal and coke from abroad.

Rock Temperature at the Witwatersrand

At the annual meeting of the Transvaal Chamber of Mines, Feb. 25, 1909, Lionel Phillips made the following statements:

I thought it would be interesting, as we now have shafts down to a depth of over 3000 ft. vertical, to have some further temperature tests made, and some rather striking results have been obtained. Rock temperatures have been taken in the Cinderella Deep, Knights Deep, Robinson Deep, Simmer Deep, Jupiter and the Brakpan mines. I need not go into details, but may say that the experiments show that the temperature rises at the rate of 1 deg. F. in every 255 ft. of vertical depth. The normal increase of temperature elsewhere in the world, is, I understand, about 1 deg. for every 65 ft. of vertical depth. At the bottom workings of the Brakpan and Jupiter mines, 4400 ft. from the surface, the rock temperature is only 82 deg. F. At the depth of 7000 ft. vertical the temperature at this rate of increase would be between 92 and 93 deg. Fahrenheit.

The present knowledge of the outcrop of the Main Reef series covers a length of over 60 miles. Down to a depth of 7000 ft. vertical the beds would, at an average of the present dip, taken at 30 deg., measure no less than 10,012 ft. on the incline. I dare not make calculation of the life of the mining industry on this basis, but anyone wishing to amuse himself may multiply 60 miles (reduced to feet) by 14,000 ft. and again by a thickness of reef to suit his fancy, say 6 or 8 ft., dividing the product by 13 to produce tons. He will arrive at stupendous figures of the tonnage yet to be worked.

Without venturing to be as sanguine as that, I may say that the present indications point to the probability of mining being continued upon the Rand in the next century. No stronger evidence than this of temperature could be found that mining in the sedimentary deposits of this region is likely to be carried on to a depth far in excess of anything hitherto known in mining. It is a curious thing that the temperature of the earth here appears to rise in depth so much less rapidly than elsewhere in the world.

Mexico holds the fifth position in the production of quicksilver in the world but falls short by a considerable amount of producing enough to supply the home market. Prior to the introduction of the cyanide process for the treatment of the silver ores the importations of quicksilver, known in the Spanish as *azogue*, was very heavy and the necessity of having this metal for the patio process was so great that the government removed all taxes from quicksilver mining, both federal and state, and provided for the free admission of quicksilver into the country. This same law is enforced today and is one of the causes stimulating the new developments in the Mexico quicksilver districts. The falling off of production in other parts of the world has turned attention to the Mexican districts and the prospects of greater activity in quicksilver mining in Mexico are very good.

It is reported by U. S. Consul Thomas W. Voetter, Saltillo, Mex., that since the imposition of the duty on zinc ore imported into the United States producers of these ores in Mexico are considering shipping to other countries. Claims are made that such ores may be profitably shipped to Germany and already some shipments have been made.

Important States of Central and Southern Mexico

Review of an Interesting Part of the Republic Covered in the Accompanying Maps Compiled from the Most Recent Data Obtainable

BY H. A. HORSFALL*

The two sketch maps reproduced herewith show sections of Mexico which, at the present time, are commanding the attention of capitalists seeking investments in profitable new enterprises. In the map of a part of central Mexico is shown the state of Jalisco in which the mines are being exploited in a constantly increasing degree. The mines of this state were worked extensively by the early Spaniards, and tradition recounts many bonanzas having been encountered in the early days of Spanish possession. The change in the character of the ore as depth was obtained, the depreciation in the value of silver, the presence of considerable quantities of water in the lower levels, the absence of transportation facilities and, lastly, the increased cost of labor are causes which resulted in the abandonment of many mines. This has been largely changed during the last few years owing to increase of transportation facilities and improved methods of ore reduction. Today a greatly increased activity, with the investment of a large amount of new capital, is taking place.

Gaudalajara, the capital of the state of Jalisco, is a beautiful city with wide streets and shaded avenues, and is surrounded on the south and west by an extensive agricultural area. It is the second city in the Republic in population and is a place of manufactures. With large banking and mercantile facilities, it has become the central point for the control of mining operations covering a large area.

Jalisco Mining Districts

The principal mining district of Jalisco lies a few miles north of the town of Hostotipaquillo, on the south bank of the Santiago river. In this vicinity, the river has cut through and exposed the formation for a length of over 30 miles. The mines of the Hostotipaquillo district contain large quantities of milling ores of which silver and gold are the valuable minerals. Most of the mines were *antiguas* and have recently been largely worked for the development of the lower-grade orebodies. A number of modern mills are being constructed and several of them are nearly ready to operate. The high-grade ore is shipped to the smelteries at Aguascalientes, and other points.

Copper ores are found and are being actively developed in the Etzatlan, Ameca, Autlan and other districts; copper-reduction plants are in operation at Ayutla and near Ameca. Extensive deposits of iron ore are found in several places; at Tula, in the southern part of the state, iron furnaces have been operated for many years. Coal, a semi-anthracite of good quality, is also being exploited. The deposit is in the southeastern part of the state, 18 miles east of Zapotlan station on the Manzanillo branch of the Mexican Central Railway.

The Santiago river, known in Mexico as El Rio Grande de Santiago, is the largest and longest river lying wholly in the Republic. It is said to have a total length of nearly 800 miles and is divided at about the middle of its course into two nearly equal parts by Lake Chapala, a beautiful sheet of water 70 miles long and 20 miles wide. The surface of the water in the lake is 5159 ft. above sea level. The upper portion of the Santiago river is called the Rio Lerma. Its headwaters are a few miles southeast of Toluca, in the state of Mexico; it flows north until it reaches the 20th degree of north latitude; thence it runs in a general westerly direction with many twists and turns until it empties into the eastern end of Lake Chapala.

Santiago River Power Development

The river leaves the lake on its northern side a few miles northwest of its point of entrance, flows north a short distance, then westerly, nearly paralleling the north shore of the lake, from which it is separated by a low range of mountains, thence it takes a northwesterly course. At the falls of Juanaca, about 15 miles southeast of Guadalajara, the river enters a deep cañon; at this point it makes a single drop of nearly 100 ft., forming an immense cascade. It continues to fall very rapidly for about 15 miles to Las Juntas, the total drop being over 1800 ft. A company has been formed to construct a canal along one side of the gorge, and convert the water power into electricity, which will be distributed by high-tension lines to nearby and distant mining centers. It is also intended to furnish power to the Lake Chapala district, to elevate water for irrigation. The river continues in a northwest direction to 20 deg. 50 min., north latitude, where it turns west and runs to the Pacific ocean. The area drained by the Santiago river is approximately 60,000 square miles.

In the territory of Tepic, there is considerable activity in mining at the present time. A few mines are producing, many more are being developed and a number have commenced the construction of mills. The Southern Pacific railroad has entered the territory with its construction work and the rails are laid to a point about 22 miles north of the Santiago river. It is expected that the road will be in operation, from Mazatlan to the Santiago river, some time during the present year. Some of the principal mining districts are Acaponeta, Tepic, Compostela, Ixtlan del Rio, Santa Maria del Oro, and Amatlan de Cañas.

Agricultural Sections

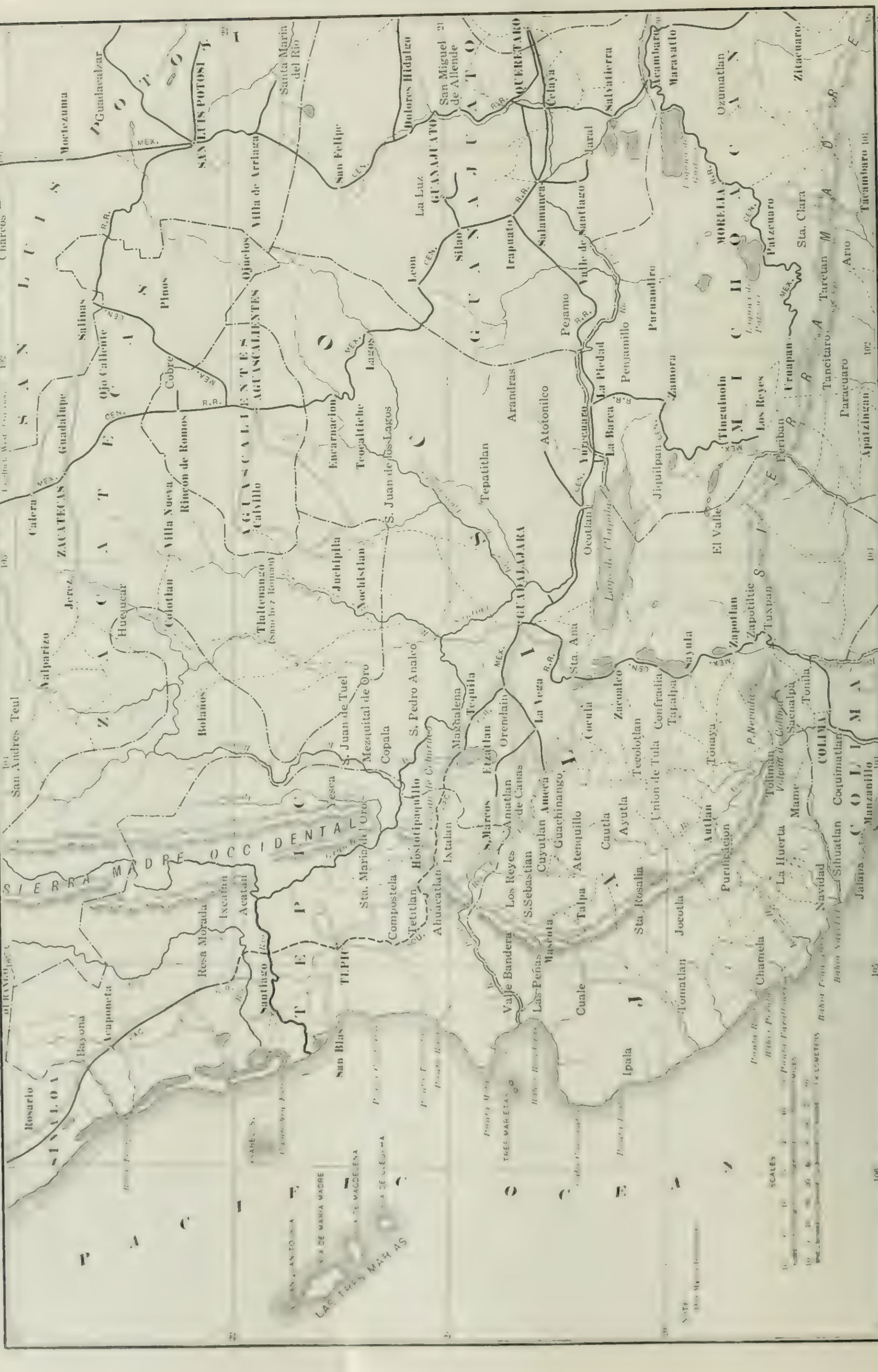
The state of Colima is principally devoted to agriculture. The port of Manzanillo, on the Pacific, is the terminus of a branch of the Mexican Central Railway and promises to become an important place, as the Mexican government has spent a large amount of money in dredging the harbor and constructing piers. On the northern boundary where it adjoins the state of Jalisco is situated the active volcano of Colima.

Owing to the absence of transportation facilities the state of Michoacan is not especially prominent in a mining way; it is, however, one of the leading states of the Republic in the production of agricultural products. The principal mining district is Tlalpujahua, situated in the extreme northeastern part of the state; it adjoins the El Oro district, which is situated in the state of Mexico. Other districts are the Sunda, 25 miles east of Morelia, Ario de Rosales, Zitacuaro, Carrizal de Arteaga and Tacambaro. There are a number of mines in the southern part of the state along the Balsas river, which do not come within the limits of the map.

There are many other mining camps situated within the limits of this map in the states of Zacatecas, San Luis Potosi, Aguascalientes and Guanajuato, want of space, however, precludes their enumeration.

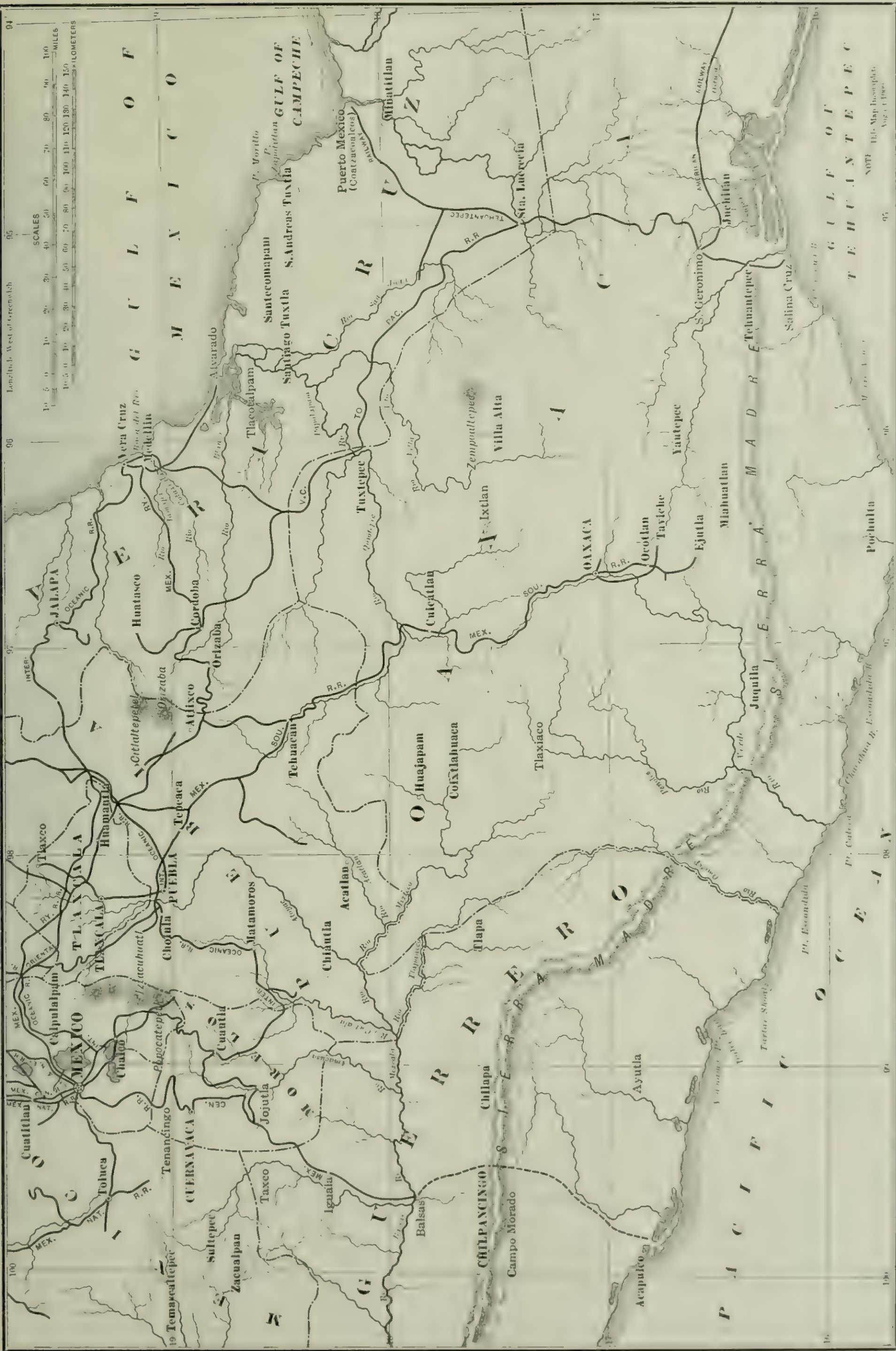
State of Mexico

In the map of a part of southern Mexico is shown the location of the City of Mexico, the capital of the Republic; it is an attractive city with a population of over 400,000 and is situated in a beautiful valley at an elevation of 7350 ft. The principal mining camp in the state of Mexico is situated in the northeastern part of the state and is known as



MAP OF A PART OF CENTRAL MEXICO

Compiled by H. A. Horsfall.



MAP OF SOUTHERN MEXICO

Compiled by H. A. Horsfall.

El Oro; it is a large producer of gold and in connection with recent improved methods introduced into its cyanide plants has attained a world-wide reputation. Other prominent mining camps in the southern part of the state are: Zacualpan, Sultepec and Temascaltepec.

The mines of Taxco, said to be the place where silver was first discovered and worked by the Spaniards in the time of the conquest, are situated in the northern part of the state of Guerrero, along the Balsas river. East and west of the Mexican railroad are several producing mining camps. Campo Morado, situated about 45 miles southwest of Balsas station, has large deposits which are now being worked extensively. There are many other localities where valuable minerals are known to exist. The country is very broken and has large areas in the central part that are entirely unprospected, and of which little is known. During the latter part of July this section was visited by a destructive earthquake. Many buildings in the towns of Acapulco, the seaport on the Pacific coast, and Chilpancingo, the capital city, were destroyed.

Diverse Resources of Oaxaca

The state of Oaxaca is now claiming considerable attention from mining investors. It was one of the earliest Spanish settlements in Mexico. Many of its mines were worked with much profit in the early days. Of late years, owing to its remoteness from lines of travel, its possibilities have been overlooked until very recently. At present a large amount of work is being done in the opening up of old properties, and prospecting for new mines. The principal producing mines are situated in the vicinity of the city of Oaxaca near the towns of Ocotlan, Taviche, San Jose, Zimatlan, Tlacolula and Ejutla. Coal and iron deposits are found in the northern part of the state in the vicinity of Huajapan. In the southern part of the state near the Pacific coast, petroleum deposits are being exploited.

The state of Puebla has few notable producing mining districts, Acatlan in the southern part and Teziutlan in the northeastern part of the state being the principal producers. A few miles from the town of Teziutlan is the extensive smelting works of the Teziutlan Copper Company.

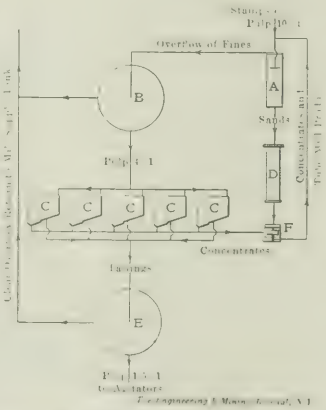
The maps presented herewith have been compiled from the most recent data obtainable, consisting of astronomic observations for latitude and longitude of the principal cities and towns, as published by the Mexican government, charts of the coast lines, location survey maps of the several railroad lines and state maps and present additional data not heretofore published.

Notes on the Cyanide Treatment of Concentrates *

By A. Grothe†

Concentration before cyaniding has the double object of removing cyanicides from the ores, and of obtaining part of the valuable contents of the ore in a form in which it can be sold without any further treatment. This paper is more particularly intended to study the circumstances connected with the second of these two objects.

Ores which have not previously been concentrated require a longer treatment by cyanide and the extraction falls short of that obtained from pulp from which the concentrates have been removed. This is due to the circumstance that the concentrated particles, on account of their greater hardness, have not been reduced to a sufficient state of fineness, consequently requiring a longer period of contact



ARRANGEMENT SUGGESTED BY F. C. BROWN

with the solutions, so that the action is not only retarded, but re-precipitation can easily take place. This can only be overcome by strengthening the cyanide solution during the process, otherwise the extraction will be lessened and the consumption of cyanide increased. A part of the gold and silver is generally incased in the crystals of pyrites, and receives no treatment at all unless the latter have been reduced to a fine state of division, for this reason previous concentration is to be recommended even for the cleanest and least refractory ores.

Mills favorably situated in regard to smelteries generally sell their concentrates to these direct, but those situated at some distance from the railroad work under a disadvantage in this respect, while to the danger of loss in transit is added the usual difficulty of agreeing with the smelter as to weight, moisture and contents. Many mills, therefore, can only ship their richest concentrates, and all suffer from their inability to obtain the contents of the ore in some more convenient form. This consideration and the wish to become independent of the smelteries, have induced many mill operators to adopt a system for the local treatment of their concentrates, in which the first step consists of thorough regrinding, followed by agitation, either with ordinary cyanide solutions, or with the addition of other chemicals which are supposed to accelerate and intensify the action. In this manner the Goldfield Consolidated Mines Company of Nevada treats its concentrates in three tanks of the "Pachuca" type, with satisfactory results. At the mill of the Batopilas Company of Chihuahua, the same method is employed.

Experience with Silver Sulphide Concentrates

With silver sulphide concentrates containing 13,422 grams Ag and 365 grams Au, M. J. B. Empson adopted the following scheme: After regrinding to 200 mesh the material was agitated 72 hours in 1.56 per cent. cyanide solution with a plentiful supply of air. The extraction was 96.7 and 98 per cent. respectively, the consumption of cyanide being 6.9 kg. per ton. During the last 12 hours there was no increase of extraction and probably some reprecipitation had taken place.

The difference between these concentrates and the valuable metal in the tailings from which they had been derived was simply physical and not chemical, and they should therefore be equally amenable to cyanide treatment provided they had been reduced to the same degree of fineness, possibly to 1000 mesh. This fine grinding constitutes the chief difficulty in this treatment; if the concentrates are ground by themselves they pack in the mill, and the result is unsatisfactory; grinding them together with coarse sands obviates this difficulty but even then it is not possible to make sure that the desired degree of fineness has been attained, as the separation by screens or overflow is not delicate enough.

Concentration as an Aid to Fine Grinding

F. C. Brown of the Waihi Grand Junction mine in New Zealand, who has proved himself an earnest and successful investigator of cyanide problems, made a communication to me which seems well worth the notice of mill operators. For some time past he has returned his concentrates to the tube mills, mixing them with the ordinary pulp, and grinding them until they are so fine that they do not settle on the tables but float off with

*A paper read before the Mexican Institute of Mining and Metallurgy, July 12, 1909.
†Mining engineer, Mexico, D. F.

the tailings. In this system coarse concentration has no place, seeing that the object is not to recover the contents of the ore, but simply to use the concentration as an aid to fine grinding. He then goes on to suggest the following arrangement, illustrated in the accompanying diagram, for the convenient carrying out of this idea:

The ground pulp from stamps or mills, containing about 10 of solution to 1 of ore, goes to a "Dorr" classifier *A*, the overflow from which is condensed in the pulp thickener *B* to 4 to 1, or any other proportion suitable to the kind of slime tables used. This overflow consists of particles all passing 150 mesh, only a small percentage being retained on 200 mesh.

The coarser part of the pulp, constituting the underflow of the classifier, goes to the tube mill, or other regrinder, with the proper degree of moisture to obtain the best grinding results. It contains the sands from which the metal has not yet been completely liberated, the pyrites, and the coarser particles of silver sulphides and gold.

The overflow of the classifier, after having been properly thickened in *B*, is concentrated on slime tables *C*. The concentrates from these tables, instead of being sacked and sold as usual, are returned to the pump *F*, joined to the tube-mill discharge, and with these enter the classifier again.

It will be seen that the concentrates are thus kept in circulation until they are so fine that they will not settle on the tables but float off by surface tension and are then carried with the tailings to the second pulp thickener *E*, which produces the proper density of pulp for treatment by cyanide in agitation vats.

The fineness of these concentrates, which after repeated grindings, at last pass off with the tailings, surpasses of course anything that can be separated by the finest screens or by the overflow from cones or classifiers. In this state they will behave exactly as the metals in the ordinary pulp; the extraction will be completed in 24 hours or less; there will be no reprecipitation, and the consumption of cyanide will be in proportion to the metallic contents of the ore.

Possible Objections to the Scheme

The objection might be raised that an accumulation of concentrates will take place on the tables, and that additional work will be thrown on the tube mills. Both are no doubt correct to a certain extent, but as to the first, accumulation will not proceed indefinitely, because, as more particles are presented to the grinding apparatus, a greater effect will be produced, and after a short time a state of equilibrium will be established and the quantity of fine concentrates flowing off the tables will equal that of the coarse concentrates contained in the ore. As to the extra work thrown on the tube mills, this cannot be correctly estimated, but supposing the ore to contain 2 per cent. of concentratable matter, which thus requires regrinding, and that it were necessary to pass it 5 times through the mill before it is fine enough, then the loss of the capacity of the tube mill would be 10 per cent. The additional cost for regrinding would therefore be insignificant when compared to that of disposing of the concentrates to the smelter or subjecting them to a special treatment.

A further advantage of the system is that the action of the solution on the concentrates passing several times through the tube mill is considerable, and shortens the time necessary for agitation. It can easily be tried and its economic value for every case determined, in any existing mill, without making important changes or the addition of expensive plant.

Labor Troubles in the British Coal Industry

Special Correspondence

On two occasions during the present year the coal trade of Great Britain has been threatened with a serious crisis on account of disputes between the owners and the miners on the subject of wages. In the first case the trouble was in South Wales, the friction arising out of the coming into force on July 1 of the act limiting the hours of the labor to eight. In this case a general lockout or strike was only averted at the last minute. The second occasion on which a crisis arose was in July, when the trouble centered in the Scotch coal-mining districts. The dispute in this case was on a question of wages and the interpretation of certain agreements and was not directly due to the eight-hours act. Happily this dispute, like that in South Wales, was also adjusted, but only at the eleventh hour and a disastrous struggle, into which other colliery districts would have been drawn, averted.

The peace, which the settlement of these two grave disputes seemed to have secured, has now again been threatened. In South Wales a serious situation has arisen, owing to difficulties created by the eight-hours act. In a communication to *The London Times* of Sept. 17, the causes of the trouble have been well described by one evidently well informed. It appears that the act hits the collieries in South Wales more than in other districts of England and Scotland, on account of the longer hours worked, previous to the passing of the act.

In South Wales the average working day for six days' labor in each week was about 9¾ hours. The average bank-to-bank day for the rest of the country was a little under 8¾ hours. In Scotland an eight-hour day had practically been the custom for many years and in Northumberland and Durham the average has only exceeded eight hours by a few minutes. The effect of the passing of the act in South Wales has been to reduce the time service per day by 18 per cent. while in the rest of the country the reduction averages only 8 per cent. Since the act was passed the output of the collieries in South Wales has declined from 10 to 20 per cent., and the working costs have increased from 6d. to 1s. 6d. per ton. In order to counteract the burden imposed on the coal owners by these altered conditions new methods of working the pits have been proposed and it is on this point that differences of opinion have arisen between the owners and the miners.

One of the most important changes proposed by the owners is the establishment of the double-shift system, which has been in successful operation in the collieries in the North of England. Under this system an afternoon shift is established, involving the employment of about 10 per cent of the number of men employed at a colliery, to clear away the coal left over from the morning shift. The pay for this shift offered by the owners is the ordinary pay of the morning shift, but the miners will not accept this rate, demanding exemption from the second shift on Saturday and claiming six days' pay for five day-work.

This is how the matter stands. Neither side will give way and there is a prospect of a lockout on Oct. 31 at those collieries where the afternoon shift is in dispute. The South Wales Miners' Federation has intimated that the quarrel of individual collieries will be supported by the miners generally, and that further support will be asked from the Miners' Federation of Great Britain, thereby threatening a general crisis in the coal trade throughout the country.

Correction

The article on page 100 of the Journal of July 31, 1909, entitled "Zinc Dust Precipitation at the Homestake Mine" was erroneously credited to Robert Linton instead of to T. Lane Carter, who presented the matter as a discussion of Mr. Linton's paper, before the Chemical, Metallurgical and Mining Society of South Africa on the subject, "Zinc Dust Precipitation at Cerro Prieto."

The Mexican mines are finding it advantageous to offer a premium for continuous work during the month. This method is resorted to to overcome the numerous holidays to which the Mexican is prone.

Santa Gertrudis and La Blanca Mines, Pachuca, Mexico

The Santa Gertrudis and La Blanca mines, together with the Barron mine, belonging to the Real del Monte & Pachuca Company, are on an isolated vein in the southeastern part of the Pachuca district in the State of Hidalgo, Mexico. The vein was not developed by the colonial miners as it showed no silver or gold at the surface and was not apparently conntcted with any of the proved veins of the Pachuca district which lies to the east about two miles. About 50 years ago, local companies undertook the prospecting of the vein and at a depth of 600 feet found pay ore which developed into large and very rich orebodies. The first two mines have been continuously worked by local companies to the present time.

The Barron passed to the control of the United States Smelting, Refining and Mining Company through the purchase of the Real del Monte & Pachuca Company, about five years ago, and is now being extensively operated and is one of the best paying mines in the district.

La Blanca mine is in charge of Capt. Francisco Rule, one of the English pioneers of the district, and for many years has been paying monthly dividends of $50,000 on the capital of 12,500 shares of a par value of 200 pesos. This mine is equipped with 14 chilean mills, John [illegible] concentrators and electric power. Much of the ore is shipped to the Mexican smelteries. Formerly it was shipped to Europe. The company employs about 2000 men.

Santa Gertrudis Uses Patio Process and Pan Amalgamation

The Santa Gertrudis mine also belongs to a Mexican company, Compañia de Santa Gertrudis y Guadalupe S. A., which has a capital of 6,000,000 pesos, divided into 60,000 shares. The mine has paid several millions in dividends. Sr. Jose de Landero y Cos is president. The company owns 243 hectares and has two reduction plants, one equipped with the Boss system of amalgamation and another using the patio process. The patio plant has a capacity of 2000 tons weekly. Recently the company has let a contract for a modern cyanide mill of 300 tons daily capacity. Electrical power is used in mine and mills. There are five shafts, the deepest of which is about 500 meters. The bonanza ore is shipped to the smelteries in Mexico or to Europe.

The ore in these mines is chiefly silver from 1 kg. upward in content and carrying from 5 to 6 grams of gold to the kilogram of silver. In the Santa Gertrudis the gold content is in one vein very high.

La Blanca and Santa Gertrudis are now under negotiation to an English syndicate for a large price, said to be 14,000,000 pesos for both mines. In the case of the Santa Gertrudis a contract to purchase has recently been closed and the property will doubtless be sold to the Camp Bird company.

SAN GUILLERMO AND SAN FRANCISCO SHAFTS, COMPAÑIA DE SANTA GERTRUDIS Y GUADALUPE, NEAR PACHUCA

The Zacualpan District, Mexico

By James M. Platt*

The old silver camp Zacualpan is in the southeast corner of the State of Mexico, latitude 18 deg. 41 min. N., near the boundary of Guerrero, and midway between Sultepec, Mex., and Taxco, Gro., also historic camps.

Fourteen Hours from a Railroad

From ten to fourteen hours' steady horseback riding is necessary between Zacualpan and the railroad. Three routes are used: from Naranjo, a station on the southern branch of the Mexican Central, thence coming by Taxco, Gro.; from Tenango del Valle, near Toluca, coming by Malinaltenango; and from San Juan de las Huertas, via Sultepec. A coach has come to Zacualpan from San Juan, but horseback riding is much more comfortable. Supplies are packed in by mules and burros, and heavy machinery is brought on two-wheeled carts. Ore is packed out, either to the smeltery at Los Arcos, eighteen miles north, or to the railroad for shipment to San Luis Potosi, Aguascalientes or Monterey. The country is deeply cut by V shaped barrancas, and the trails follow mountain ridges.

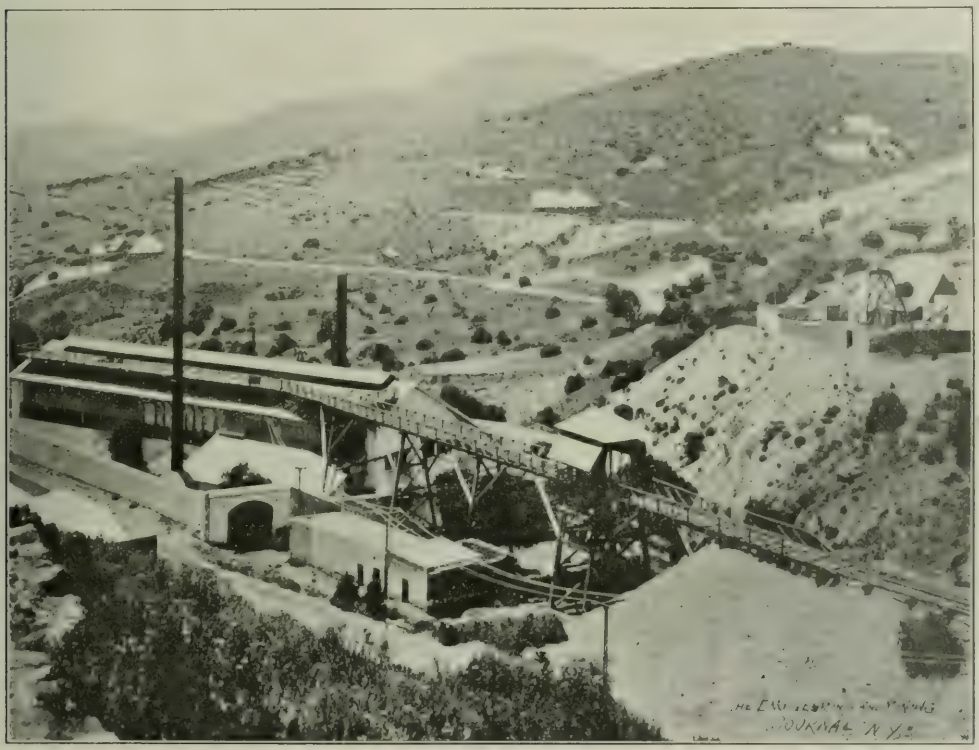
Several engineers have classified the

*Superintendent Guadalupe Arcos, Zacualpan, Est. de Mexico, Mexico.

heavily bedded "somewhat calcareous" shales of this district as Middle Cretaceous. In the entire absence of fossils it is impossible to form any judgment except by analogy. I have observed but one isolated occurrence of a distinct porphyry in the district, and this apparently had no influence on ore deposition. The shales are carbonaceous, and the ore black. In the northeast section of the district, in the mines of the Los Arcos Smelting and Mining Company, the rock is more silicious and white to gray-green in color, though on the north border of the district the black shales are very heavily developed.

Ore deposition seems to have been effected by two main causes, the precipitative action upon ascending orebearing solutions of the organic matter in the shales; and the interaction of mingling solutions from intersecting or joining fractures. The latter condition, aided by the former, produces the result, observed in many cases, that the widest portions of the veins, usually at junctures, are very likely to be much richer than the narrower portions. The orebodies are lenticular in form and irregular, as is to be expected from the country rock. In the western section of the district, as in the Coronas and Carboncillo mines, the and all over 2.5 kg. is shipped to the smelteries.

Miners earn from sixty-two centavos to a peso per day, and are somewhat inefficient. In Guadalupe Arcos three hundred meters of development was put through rock of varying hardness, at an average contract price of fourteen pesos per meter. The prices range from eight to thirty-five pesos per meter, contractors buying their own caps, fuse and dynamite, native oil for their lamps, and moving muck from fifteen to eighty meters in baskets. An ordinary wheelbarrow laid down here costs about twenty-four pesos. Average dynamite consumption is about



REDUCTION PLANT OF COMPANIA GERTRUDIS Y GUADALUPE

Fissure veins and also replacements along shear zones are encountered, and the gangue is usually quartz. The most notable exception as regards gangue is on the south border of the district in the Chontalpa mine, where a calcite gangue is found in an extensive shear zone. That some veins are true fissures is unquestionable. In a vein in Guadalupe Arcos a piece of wood was found embedded at a depth of 150 m. Faults with horizontal displacement across the strike of veins seem to be notably absent, but great vertical movement has taken place along the fault planes.

veins are more regular in dip. The veins are very much more regular in strike than in dip, and rolls in the dip are common. In the northeast portion of the district the varying dip seems to have had little effect on ore deposition.

The ores of the district are stephanite, pyrargyrite, argentiferous lead in small quantity, and pyrite which sometimes carries precious metals. No mines have commercial amounts of zinc and few have enough to affect treatment charges.

The low-grade ores of the camp are usually well adapted to cyaniding, but as yet only one mill is running in camp

8.5 lb. per meter, of 40 per cent. powder (native).

As usual in old districts of Mexico, there are only accidental ore reserves in the camp. The future depends on development in both old and new mines. As far as known the deepest working in camp is approximately three hundred meters, on a fissure vein. At that depth the ore still holds in width and the average value in the mine continues. Pumping is not expected to be a serious problem.

In general the outlook is encouraging, and judicious investment after technical investigation promises good returns.

Geologic Study of the Sierra of Guanajuato

The Veta Madre and other Argentiferous Deposits Occur as Brecciated Veins Deposited in Pre-existing Cavities in Fracture Zones

VEINS ARE IN UPPER NEOCENE

[illegible] city of Guanajuato, the capital of [illegible] state of the same name, is situated [illegible]93 m. above sea level. The part of the [illegible]a richest in minerals extends from [illegible] city 11.3 km. north, 3.7 south, 8 east and 9 west. Silver was discovered in [illegible] sierra as long ago as 1548, the San Bernabé mine resulting from the discov[illegible] of muleteers [illegible] route to Zacatecas. The Veta Madre was found in 1550 by [illegible] muleteer, Juan de Rayas, who gave [illegible] name to the Rayas mine. The [illegible]ious-metal production of Guanajuato [illegible] 1701 to 1800 was 279,690,689 pesos, [illegible]ing about one-quarter of the total Mexican output; from 1800 to 1900 it [illegible]ounted to 231,137,013 pesos. Signs of past grandeur are to be noted in the old [illegible]tures of the district.

Physiography.

[illegible] state of Guanajuato is crossed by [illegible] high mountain ranges. One, the Sierra Gorda, lies mainly in the northeastern part. The other, the Sierra de Guanajuato, extends in the central part from southeast to northwest. North of [illegible] sierra rise the mountains of San [illegible]dro and El Cubo, which with the Sierra Gorda, bound on the north the [illegible]at plains of Allende, Dolores Hidalgo and San Filipe. In the region south and [illegible] of the sierra of Guanajuato is El Bajio, a vast and rich plain limited at the south by the mountains of Penjamo, the [illegible]ita and the Gabia.

[illegible]he foothills of the sierra are lost in [illegible] great plains which surround it. In the different directions are important peaks [illegible]ong which are some that are from 2000 [illegible] 3000 m. high. Deep ravines and narrow defiles are common. In going from Silao to Marfil, the traveler has before [illegible]m the southeastern part of the sierra [illegible] Guanajuato, which is the richest in [illegible]aluable minerals. He may easily distinguish the profile of this group of mountains, with tops apparently one above another, giving an idea of steps ascending [illegible]m the escarped wall of the Grandes [illegible]fas toward the high peaks of the [illegible] of Santa Rosa. One perceives also the structures of Valenciana and Rayas as well as those of Cerro de Sirena and [illegible]. One can thus form an idea [illegible] the length and situation of the famous [illegible]a Madre.

[illegible]—Abstract of a paper presented in [illegible] before the International Geological [illegible] by [illegible] D. Villarello, F. Flores and [illegible]

The literature of Guanajuato geology is voluminous and begins with Humboldt, in 1827. One of the noteworthy modern contributions[1] was that of Robert T. Hill, who in addition to other observations, classified the volcanic rocks. Our own study of the Sierra of Guanajuato has led to the conclusions presented herewith.

Schists.

The oldest sediments, which in petrographic character are identical with those of Zacatecas, are argillaceous and other schists and calcareous conglomerates. The argillaceous schists, carbonaceous in several places, were in other places metamorphosed by igneous rocks, but the absence of fossils in these sediments leaves their age uncertain.

The sediments that we have mentioned outcrop at *el bajo* of the Veta Madre, from Peñafiel to Valenciana.

At the surface the schists are sericitic, and of varying color, being greenish-yellow, grayish, and sometimes red. We occasionally find thin strata of bluish gray limestone intercalated.

In the metamorphic schists are also found intercalated strata of calcareous conglomerate, known locally as *frijolillo*, and which crops out in the gorge of the Calera and elsewhere. The argilo-calcareous schists, black and carbonaceous, divide into thin leaves, which fact has occasioned the native name *hoja de libro*, or leaf of a book. These black schists are found under ground, especially in *el bajo* of the Veta Madre, and appear at the surface in the gorges of Calera and Jolula. The metamorphic schists were observed under the black schists by Humboldt in the principal shaft of Valenciana, which is the deepest vertical cut, 535 m., in the locality.

This enormous mass of schists is extremely wrinkled and forms little folds, variable in direction, but inclined toward the west and the metamorphic schist, according to microscopic examinations made by Ezequiel Ordóñez (who has microscopically examined and classified the rocks mentioned in our study), is composed of sericite with fragments of feldspar crystals and grains of quartz.

Diabasic Rocks.

The schists that we have described are in several places intruded and even covered by igneous rocks which have been designated as greenstone and *vacia* in this article. The greenstone may be divided into two parts: one, intrusive, formed of gabbro, diabases of olivine, quartziferous diabases (also designated as syenite) and andesitic diabases of ophitic structure; the other class is effusive and formed of rocks of similar composition to the diabases, although presenting different types of structure, such as the andesitic porphyrites which, in the region in question, are accompanied by porphyritic tuffs, breccias and diabasic tuffs.

The diabases, partly quartziferous by segregation in the magma, and with variations of structure due to the different conditions of cooling, appear in the ravines of Esperanza, Calera and Concepcion, where they present banks of diverse colors, dark and clear, and often green or gray. The same diabases occur in the workings of the Victoria, as well as in the Protectora, Cata, Tepeyac and other mines. There one also sees injections of diabases in the schists, or sometimes they form intercalated benches, as is observed at the surface in many places. Erosion has uncovered the benches of diabase which appear at the bottom of several ravines, for example, those of Jolula and Rayas. This intercalation of diabase benches in the schists was remarked by Humboldt.

After the intense folding of the schists, the intrusion of diabases and a period of erosion, there appeared the porphyrites with their accompaniment of breccias and porphyritic and diabasic tuffs, covering a wide area. This flow covered the schists in many places, as may be seen in the vicinity of Santa Ana and Esperanza. It filled up certain depressions, since we find the diabasic breccias in the mines of San Amado, Santa Brigida, and Peregrina, in the north and east of the region, as well as in *el alto* of the Veta Madre in the Rayas mine. The porphyrite or *vacia* is the predominant rock in the vicinity of La Luz, where it also occurs intercalated in the schists, this being the case in the San Cayetano and other mines. Moreover, it is found at the surface in different places.

Rhyolites.

After the formation of the greenstone, appeared the rhyolites, partly spherulitic by reason of their slow solidification, and varied in coloration but with red pre-

[1] "The Guanajuato Mining District," Eng. and Min. Journ., Vol. 77, pp. 600-601; 1904.

dominating. The rhyolites are usually accompanied by breccias and rhyolitic tuffs, gray in color and containing fragments of diabase or of porphyritic tuffs. These breccias occupy a large area at the surface, but they are also found underground, for example, in the Peregrina mine, at 222 m. and at 180 m. in El Cedro.

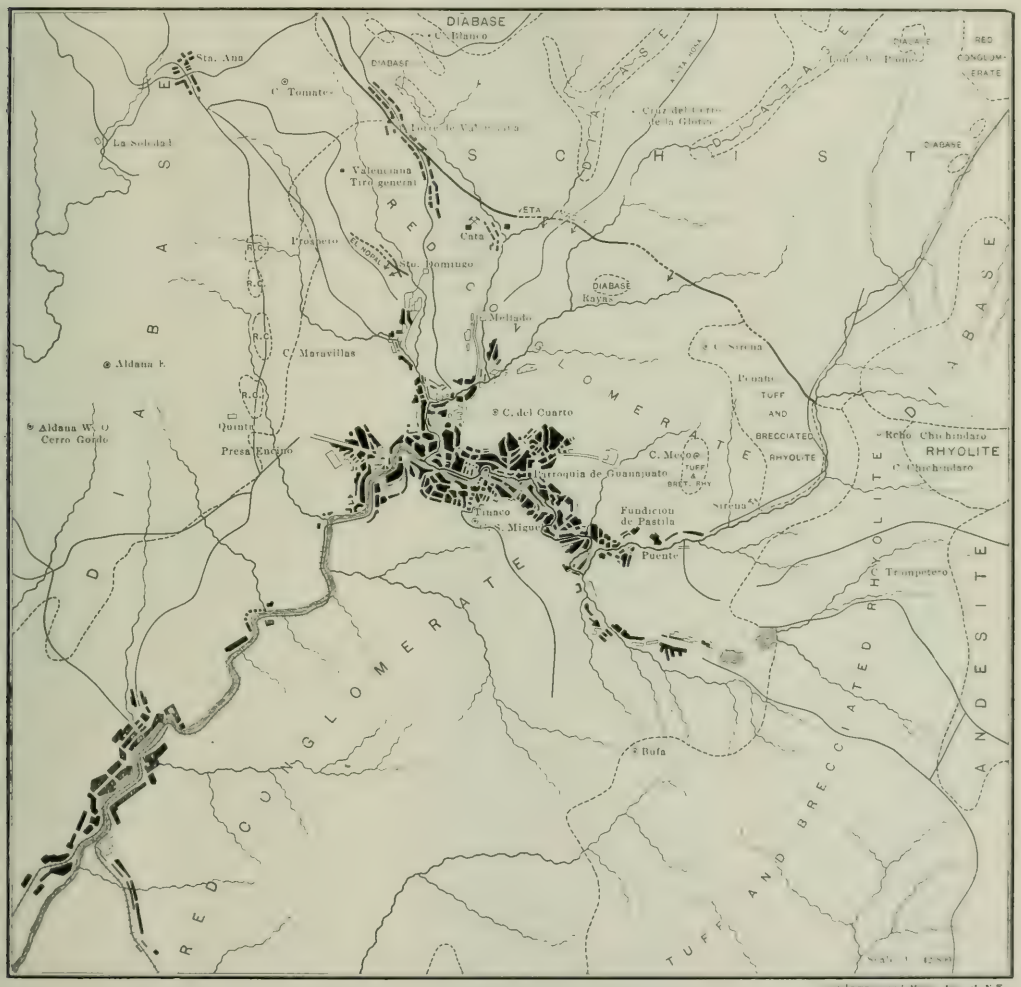
basaltites are found at the surface in numerous localities where erosion has uncovered them.

Red Conglomerate and Losero.

After the formation of the volcanic rocks that have been mentioned, there occurred in the depressions of the ground a formation of detritic rocks lo-

fragments are of variable size, sometimes large, but generally only a few cubic centimeters in size. Some of them are so small that they give to the detritic rock the appearance of sandstone.

No classification is followed in respect to the shape and density of the fragments, which, in general, are not rounded, but angular, with blunt edges. This in-



GEOLOGICAL MAP OF GUANAJUATO DISTRICT

Across the preceding rocks occur andesites of hypersthene and augite, sometimes so modified that they approach the basic types represented by labradorites and basaltites. These rocks are regarded as anterior to the red conglomerate because in the latter, fragments of old basaltite have been found in the Cerro de La Bolita. The foregoing andesites and

cally known as red conglomerate and *losero*. These depressions being surrounded principally by schists and diabasic rocks, the red conglomerate is largely formed of such materials. Thus we find fragments of argillaceous schists, diabase, porphyrite, blue stinkstone, felsitic rhyolite and, rarely, pieces of basaltite united by ferruginous clay. These

dicates that the breccia is due to torrential erosions, and that the materials have been transported only a short distance.

The red conglomerate occurs in strata of variable thickness, strike and dip, yet in certain places it forms very extensive folds, as may be seen in the vicinity of Pantéon de Guanajuato and the Mellado mine.

PANORAMIC VIEW OF COUNTY SURROUNDING GUANAJUATO

Conformably, and without abrupt transition, we find on the red conglomerate the *losero*, formed by thin layers of sandstone colored red at the bottom, with different tones of green above, and containing sometimes grains of quartz and fragments of feldspar.

These sedimentary rocks which, by reason of the elements composing them, are considered as forming part of the Neocene, occupy an extensive area to the north and south of Guanajuato.

As a last rhyolitic manifestation one may note an extensive flow, divided up by erosion, of rhyolitic tuffs covering much of the rocks already mentioned, even the red conglomerate and the *losero*. Across the conglomerates and the rhyolitic tuffs that cover them, there are thin, short dikes of pyroxenic andesite (camptonite) greenish in color and of ophitic texture. There may also be mentioned the basaltic emission of Cerro Cubilete, which is west of Marfil. The Pleistocene basalts extend for a considerable distance along the gorge of Aguas Buenas.

Historical Geology.

The geological facts already indicated may be summed up as follows: The marine strata composed of argillaceous and other schists, and calcareous conglomerates having once been formed, there commenced the continental period that reaches to our day. In fact, the only sediments later than the schists are the red conglomerate and the *losero*, the breccia and the sandstones which are the product of the destruction of pre-existing rock under action of torrential erosions, deposited in the depressions of the ground. After the intense folding of the schists and the intrusion of the diabases, which metamorphosed the former in irregular zones, came a period of erosion, after which appeared the Tertiary volcanic rocks, commencing with the porphyrites accompanied with breccias and with porphyritic and diabasic tuffs, which partly covered the schists and filled some depressions.

After the porphyrites appeared the rhyolites, accompanied by rhyolitic breccias, and then the andesites of hypersthene and augite which cut the rhyolitic breccias and covered then in different places. During a period calm from eruptions, were formed breccias and the Neocene sandstones composed of elements from the preceding rocks, which were transported a little distance and deposited in depressions of varying depth. Upon these last sedimentary rocks was spread a very extensive stream of rhyolitic tuffs which was divided up and furrowed, like the other rocks, by subsequent intense erosions. These erosions are in great part the cause of the numerous irregularities that are noticed in the present outline of the sierra of Guanajuato.

Subsequently to the formation of the red conglomerate, of the *losero* and of the superposed rhyolitic tuff, pressure has caused the inclination of the strata of red conglomerate and *losero* and has fractured the ground. Of these fractures which, perhaps, are contemporary with the basaltic emission of Cerro Cubilete, some have been filled by argentiferous minerals, thus forming the veins of the region. The basaltic eruption was followed by hydrothermal manifestations. Even in our day there exist at Aguas Buenas and in the hacienda of Chichimequillas, near Silao, springs of sulphurous water at temperatures from 35 to 96.6 deg. Centigrade.

The forces that fractured the ground were several times repeated, for there are fractures more or less narrow, some mineralized and others not filled, which cut the veins of the country. Finally, as very recent manifestations of these orogenic movements, we may cite the underground rumblings that were heard at Guanajuato at various times up to 1874.

Tectonics

Tectonic action combined with strong lateral pressure produced grouped fractures forming zones of diaclases, among which are distinguished four conjugate systems. The one most developed has a mean strike of 45 deg. northwest, this varying between 30 and 60 deg. northwest, with a dip of 45 to 75 deg. toward the southwest, and sometimes at the northeast there exists another system perpendicular to the former. There are two other systems of conjugate fractures, also at right angles.

The sliding of the walls of these fractures was relatively too small to merit the name of faults, and we therefore consider them as grouped diaclases, which fractured the ground in zones of regular width, slightly dislocated but much broken, and in which remained cavities with branches of irregular forms and sizes. These open spaces, of later date than the readjustment of the fragments of fractured rock, were filled with the minerals of which mention will be made later.

The zones of diaclases that were most extended in respect to their direction are those of the 45 deg. northwest system and a few of the north-south system. The latter have had a considerable influence on the distribution of the metalliferous wealth with which the former were filled.

Minerals

The most common primary minerals encountered in the veins of the sierra of Guanajuato are: polybasite, stephanite, argentite, and pyrite. There are also found, but more rarely: pyrargyrite, miargyrite, galena, blende, chalcopyrite and panabase. Among the very rare minerals are: freieslebenite, naumannite and proustite. The latter, however, abounds in the mines of La Luz.

The minerals of secondary origin that are most common are: iron oxides, argentite and native silver. Siderite, manganese oxides and native gold are less usual, though the latter is found in the mines of La Luz, El Carmen, El Cedro, El Nayal and others in greater quantity than in the mines of the Veta Madre. The rare secondary minerals are: Copper carbonates, cerargyrite, bromyrite, cerussite and chrysocolla.

The most common gangues are: quartz, compact or porous, amethyst, chalcedony and calcite; more rarely, ferriferous dolomite, valencianite and [illegible]ianthus. The rarest gangue minerals are: Fluorite, gypsum, and barytine. In some mines of the district of La Luz, especially in El Refugio, apophyllite and stilbite are found in abundance.

Beside the valuable minerals mentioned there are occasionally encountered the following: Cinnabar, in the superficial zone of some argentiferous seams; guanajuatite, in the sierra of Santa Rosa; molybdenite, in El Nopal mine; alluvial tin, in the streams which descend from the foot hill north of the sierra of Guanajuato and in the vicinity of the hacienda La Sauceda.

Metalliferous Deposits

Some of the fractures of which we have already spoken are mineralized, especially those of the 45-deg. northwest system and a few of the north-south and east-west systems. These veins are so grouped as to form three zones: The first, which we shall call the central zone, is that where lies the Veta Madre; the second is to the north and east of the preceding and comprises the districts of Santa Rosa, San Nicolas Del Monte, Peregrina, Villalpando, Cubo and El Nayal; this is also referred to as the eastern. The third, or western zone, reaches from San Cayetano to the district of La Luz.

The central zone is the most interesting. It extends from northwest to southeast, from the *barranca* of Calera, near Santa Ana, to the plateau of Venadero, south of La Unión and La Torre mines, thus having an extent of 12½ km. in length and from 1 to 2½ km. in breadth. In this zone occur veins belonging to the 45 deg. northeast, the north-south and the east-west systems. These veins are inclosed in the sedimentary rocks and also in volcanic rocks.

Among the veins of the 45 deg. northwest system may be mentioned: The Veta Madre, which is the longest; those of Nopal, southwest of the Veta Madre; those of Avispero, La Juanita, El Caliche, northeast of the Veta Madre; the veins of Esperanza and Protectora in the northwestern part of the central zone also, some small veins of the southeastern part of this zone, such as those of La Zorra, La Unión, Santa Isabel and El Refugio mines.

The Veta Madre

The Veta Madre extends from the *barranca* of the Presa de Esperanza to the northwest of the Valenciana, passing through the mine of the same name and those of Tepeyac, Maravillas, Cata, Mellado, Rayas, La Aparecida and Sirena, as far as the *barranca* of Peñafiel or Mata to the west of Cerro Chichindaro, a length of almost 5 km. The mean strike of this vein is 50 deg. northwest, with dip to the southwest varying between 45 and 60 deg. The vein shows two considerable enlargements at the surface; one between the mines of Valenciana and Tepeyac, where the breadth of the outcrop is 25 m., the other being found in the vicinity of the Fausto shaft, where it reaches a breadth of 45 meters.

The Veta Madre is situated in a zone of diaclases, fractures of unequal length and breadth, and grouped in diverse ways. They may be very near together, and in this case the vein forms only a single body, or they may be separated one from another, and the vein is then formed of different bodies divided by the mass of rock that constitutes the walls. In consequence, the sizes of the veins are decidedly variable, and there is a marked tendency for them to subdivide into different branches. The miners of Guanajuato class these bodies in three principal groups to which, according to their position, they give the names *el alto*, *en medio* and *el bajo*.

These orebodies are not found all along the Veta Madre, nor at all depths, for sometimes there is only one of them, and that is often quite narrow. On the other hand, since the Veta Madre does not fill a free fracture with well determined walls and with considerable dislocation of the ground, that is to say, a paraclase, but on the contrary fills the empty and irregular spaces which remain after re-establishment of the rock fractured by numerous diaclases, it results that the available size of the metalliferous filling is exceedingly variable, both in respect to length and depth. In fact, in certain parts of the fractured zone, the wall rock dominates; in other parts there is an abundance of metalliferous filling, because in these latter places there are large open spaces.

The Veta Madre, at the surface and along a great part of its course, is found between the red conglomerate and the schist. At the bottom it cuts the schists and the diabasic rocks which are there intercalated. At some points it follows in contact with these rocks, while at others it is inclosed only in the diabasic rocks or in the schists. The presence of

GENERAL PANORAMIC VIEW AND SECTION SHOWING PRINCIPAL EXPLOITATIONS ON THE VETA MADRE

these two rocks, so different in hardness, and the presence of the igneous rock in jected into the sedimentary rock, cause frequent changes in strike, dip and size of the diaclases when they pass from one rock to another. In consequence, the various orebodies and mineralized branches comprised in the fractured zone exhibit similar changes.

Distribution of the Ores

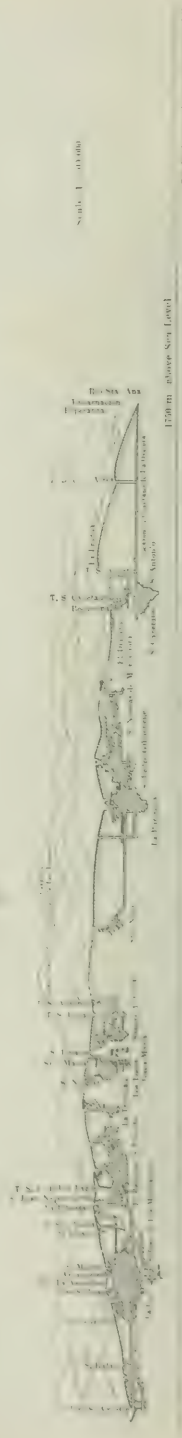
The empty irregular spaces, which remain between the fragments of wall rock broken by the diaclases, are later filled with the ores already indicated and these cementing the fragments give to the veins a brecciated structure. In many parts of these veins, the mineral cement does not assume the form of crusts, and this is why generally the structure of the veins is simply brecciated. However, in other places, as in the mine of Peñafiel and especially in that of Cata, the mineral cement occurs in the form of concentric crusts, forming what are called at Guanajuato *cintas de reata,* and among which may be mentioned, as an excellent example, those found in the Chiripa workings of the Cata mine.

The chemical history of the deposits in these open spaces is obscure. The chemical composition of the rock forming the walls appears to have had an influence on the nature of metalliferous fillings, but not upon the concentration of this filling in the zones of enrichment. The concentration seems to be due principally to the physical character of the wall rock, its hardness, and permeability. The first influenced the size of the cavity which later became filled with metalliferous deposits. The second, due principally to the crevassing of the rocks, played its part in the differentiation and concentration of the minerals in zones of enrichment. Thus, in almost all the mines of Guanajuato, it is observed that the richest parts are situated near the crossing of the veins with transverse diaclases of the north-south system; on the other hand, in the parts where these diaclases do not exist, the filling of the veins is poor in precious metals, or destitute thereof.

Age of the Veins

The veins of the Sierra de Guanajuato cut the red conglomerate and also the *cero;* consequently, they are later than the Neocene sedimentary rocks, and we shall consider them as belonging to the Upper Neocene, and to the same period perhaps as the basaltic emission of Cerro Cubilete.

The ascending thermo-mineral waters, by metasomatic substitution with the surrounding rock, and especially by mixing with solutions of different chemical composition, and under lowered temperature and pressure, deposited minerals in the empty spaces through which they passed, concentrating the useful metals in the zones



PANORAMIC VIEW OF REGION AND SECTION SHOWING EXPLOITATIONS ON LA LUZ VEIN

of enrichment, particularly, near the crossings of the principal fractures with the transverse diaclases of the north-south system. This mineral deposit cemented the fragments of rock and limited the circulation of water. The cementing material formed concentric crusts in various places where perhaps the circulation of water was more active.

In regard to the classification of the deposits, it may be said that they are epigenetic primaries filling preëxisting cavities in fractured zones; they have the form of brecciated veins and are due to the circulation of ascending thermomineral waters; the deposits are argentiferous, with an alloy of gold, and they are incased in argillaceous schists and in diabasic and rhyolitic rocks.

Exploitation of the Deposits

It is only in our day that improvements have begun in the mining methods of Guanajuato, which were previously exceedingly imperfect and uneconomical. The zones of enrichment called *clavos* have been mined in great part by opening for each of them a vertical shaft, sometimes very deep, such as those of El Cristo, San Antonio and Guadalupe in the concessions of Valenciana. These were costly workings that might have been avoided by economic and improved underground haulage, which would have allowed a great reduction in the number of vertical shafts. Underground haulage was done on the backs of men from the workings to the shaft, and sometimes to the entrance of the mines; but at present this service is by underground railway. The hoisting of ore and removal of water were formerly done by means of the old winding machines which have been replaced to a considerable extent by modern hoisting engines and electric pumps.

The quantity of water in the mines at Guanajuato is inconsiderable, and it may be said that the average flow is 7 liters per second in the deepest mines of the Veta Madre. The rock forming the walls of the veins offers no great resistance to drilling, while it is sufficiently firm to obviate timbering in many places. The ventilation of the mine is in the main effected by natural means.

The rich ores extracted from the mines are sent to the smelteries of the country; the poor ores or "azogues" which were formerly treated by the patio process or by pan amalgamation are today handled by cyanidation, this system of reduction being employed particularly for the ore contained in the old dumps.

Mine taxes in Mexico are levied by the Federal and State governments. They are practically a percentage tax on gross output.

Analysis of Babbitt Metal*

P. H. Walker and H. A. Whitman have made a careful study of the various rapid methods for the analysis of babbitt metal. Their investigations were carried on at the Contracts Laboratory, U. S. Bureau of Chemistry, and the method adopted if followed out and the proper corrections applied will yield as accurate results as those obtained by the tedious alkaline sulphide process, in a far shorter time and with much less labor.

Copper

One gram of the alloy is dissolved in a 250-c.c. beaker with 20 c.c. hydrochloric acid and 5 c.c. water, with the aid of heat and small amounts of nitric acid. Solution can usually be attained in a few minutes and without using more than 1 or 2 c.c. of nitric acid.

The solution is evaporated nearly to dryness, all of the acid practically driven off and the residue left in a pasty condition. To the residue is added 25 c.c. of a solution containing 200 grams tartaric acid and 260 grams potassium hydroxide in 500 c.c. of water. The whole is then heated on a steam bath until solution is complete, 25 c.c. of water added, boiled, 25 c.c. of a 0.2 per cent. invert sugar solution added, boiled two minutes and filtered through asbestos.

The precipitate of Cu_2O is washed with water, dissolved with nitric acid into a 200-c.c. flask and the copper determined volumetrically. Any of the good volumetric methods may be used. A plus correction of 6 per cent. should be added to the results due to the incomplete precipitation of the Cu_2O

Lead

From 0.5 to 1 gram of the alloy is dissolved in a 250-c.c. beaker as in the copper determination and when solution is complete, evaporated to dryness on the steam bath. The residue is treated with 5 c.c. strong hydrochloric acid, warmed for a few minutes, then removed from the steam plate and 150 c.c. 95 per cent. alcohol added with stirring. The precipitate is filtered on a Gooch crucible after two hours' standing at room temperature, washed with about 100 c.c. of 95 per cent. alcohol, sucked dry and the crucible dried in an air bath for one hour at 105 deg. C. The lead chloride is then weighed and a correction of 0.0085 gram added to the weight obtained; the factor 0.74473 is used. The conditions should be strictly adhered to and with the exception that if as much as 10 per cent. of antimony is present, 10 c.c. hydrochloric acid is used.

Antimony

A slight modification of W. H. Low's method is followed. One gram of the alloy is heated in a 450-c.c. Erlenmeyer flask with 10 to 15 c.c. of strong sulphuric acid until it is thoroughly decomposed, which takes about 30 min.; when cool, 200 c.c. water and 20 c.c. strong hydrochloric acid are added, any sulphur dioxide expelled by boiling, and the solution rapidly cooled and titrated with potassium permanganate which has been standardized against metallic antimony. The first pink color that shows after agitation is the true end point. The results are from 0.3 to 0.4 per cent. high.

Tin

W. H. Low's method is also followed in the determination of tin. An amount of the alloy is taken that contains not more than 0.2 gram tin. The alloy (0.2 to 1 gram) is dissolved in a 450-c.c. Erlenmeyer flask with 10 to 15 c.c. strong sulphuric acid and when completely decomposed and cooled 200 c.c. water, 30 c.c. strong hydrochloric acid and 1 gram of steel turnings are added. The solution is again heated and when the reduction appears to be complete, but before all of the steel is dissolved, the flask is stoppered with a two-holed rubber stopper. One hole of the stopper should carry a tube which reaches below the surface of the liquid and the other hole should carry the short arm of a tube; the long arm reaches nearly to the bottom of a 100-c.c. Erlenmeyer flask containing a solution of sodium bicarbonate.

The small Erlenmeyer is held on the long arm by a cork having a notch in it to act as a vent. A stream of carbon dioxide is passed through the straight tube and the boiling continued until all of the steel is dissolved.

The flask is cooled as rapidly as possible, still continuing the flow of carbon dioxide. The stopper is loosened without interrupting the flow of gas, some starch solution added cautiously and the solution titrated with N/10 iodine. Air should absolutely be excluded and the iodine standardized against pure tin. The results are accurate.

The method has been carefully tested both against pure metals and against alloys which have been analyzed by the alkaline sulphide method, and been found to yield satisfactory results.

*Abstract of an article from *Journ. Ind and Eng. Chem.*, Vol. 1, pp. 519-522.

The copper deposits at Jiminez in the state of Chihuahua, Mexico, occur in a contact between overlying Cretaceous limestones and a granite mass, presumably intrusive. It is estimated that the overlying strata before erosion did not exceed 2000 ft. in thickness.

The Mexican department of Fomento (interior department), Mexico City, is now preparing good maps of several of the states. These maps are for sale at moderate prices.

The Mineral Wealth of the Cordilleras

Prospecting Is Inspired by the Desire to Obtain Gold and Silver. Base Metals Mining Is the Foundation of Permanent Industry

BY R. W. RAYMOND AND W. R. INGALLS

All history testifies that the mineral resources of a region have furnished both the impulse for its first development by man, and the foundation for its subsequent occupation by civilized and prosperous communities. In the pre-historic ages, the hunters, fishers, shepherds and gardeners of the world may have wandered or tarried without regard to the attractions of the mineral deposits which they could not utilize, and therefore did not value. But with the rise of civilization, as expressed in manufactures and commerce, the national value of such deposits began to be realized. Barbarous and remote tribes, possessing the sources of such supplies, won recognition in trade, long before they could attain it through any other means. Thus the North American Indians of Lake Superior exchanged their native copper for the mica of North Carolina, the ships of Tyre sailed all the way to Spain for lead and to Britain for tin, and the fleets of Solomon brought gold from Tarshish.

In modern times, it has been chiefly the precious metals that have stimulated exploration and conquest. The inherent qualities and the traditional value of gold and silver sufficiently explain this historic fact, the continued existence and potency of which is evidenced, even in our own times, by the occasional rush of eager adventurers to new districts where gold and silver have been discovered. The history of North and South America has been peculiarly influenced by this factor.

It was the prospect of obtaining gold and silver that led the Spanish adventurers to the shores of America, and the conquests of Mexico by Cortez and of Peru by Pizarro were inspired by the stories of the wealth of the Aztecs and the Incas. The explorations of the successors of these *conquistadores* discovered many famous bonanzas of the precious metals. The first silver sent to Europe from the mines of Mexico was obtained from Tasco, discovered by the Spaniards in 1522, only a year after the conquest. These mines, together with those of Pachuca, are considered the oldest in Mexico, some of them having been long worked by the Aztecs at the time of the arrival of the Spaniards. In 1530 work was begun by the Spaniards in the silver mines of Zacatecas, Mexico. In 1548 the first discovery was made at Guanajuato, Mexico. An event of great importance occurred in 1557, when Bartolome de Medina, of Pachuca, Mexico, invented the patio process of silver amalgamation. In 1793, mules and horses were used in Mexico, for the first time, for mixing the pulp, mercury and chemicals in the patio process, saving 75 per cent. in the cost of this process; prior to this time the operation had been performed entirely by human labor.

The Greatest Deposits of Precious Metals Found in the Cordilleras

All these great discoveries and developments were made in the mountain chain, or series of ranges, locally known as the Rocky mountains, the Sierra Madre, the Andes, etc., but generally as the American Cordilleras, which extends, almost without interruption, from Alaska to Patagonia. Without claiming geological accuracy, we may include as a part of this great and complex continental back-bone the Sierra Nevada of California. Whatever the Alps, the Urals, the Carpathians, or the Balkans may have shown of mineral wealth, and whatever may be hereafter revealed in the Himalayas, the Mountains of the Moon or other of the imperfectly charted ranges of Asia and Africa, it may be safely declared that the American Cordilleras have not been and are not likely to be paralleled in continuity, extent and variety of mineral wealth, including in all parts of their amazing geographical length deposits of gold and silver. These two metals are so closely associated in nature that neither is ever found without some alloy of the other. The great mineralogist, Breithaupt, classified them together as a single mineral species, ranging in composition from almost pure gold to almost pure silver. We may at least confess that, in their attraction upon mankind, they have acted as one.

The Spanish conquerors happened to attack the continent where this great metalliferous range was nearest to the sea. Hence the earlier exploitation of Mexico and parts of Central and South America. The English colony at Jamestown, Va., and the expeditions of Ponce de Leon and other explorers in the Appalachian region, though equally inspired with the hope of finding rich deposits of gold, achieved no success, because they were far from the Cordilleras. It was reserved for later centuries to reveal the riches of the Rocky Mountains and the Pacific States and Territories, British Columbia, the Yukon Territory, and Alaska, through which these mountains extend. Even yet, the American Cordilleras cannot be regarded as thoroughly explored. Especially in Central and South America, they will doubtless be found to contain mineral deposits equal to the famous bonanzas of the past.

The Base Metals are the Basis of a Permanent Mining Industry

But the history of four centuries emphasizes one principle which may well be seriously considered, namely: that while mining in every new region may be originally inspired by the wish to obtain the precious metals, no permanent mining industry is established, and no substantial commercial development is secured, until the mining of the base metals and of the bulky minerals, especially coal, is begun. Precious-metal mining is characterized by the ephemeral camp; base-metal mining is distinguished by the growth of permanent towns, often cities, and an enduring population. This has been the history of the United States; it is becoming the history of Mexico; it will be the history of the countries of South America. We do not have to seek far to find the reason.

The precious metals are capable of extraction by crude methods, as gold is washed from gravel in Alaska at the present time with the aid of nothing but the pan. For more than three centuries the gold and silver of Mexico and South America were extracted by the patio process, which required the labor of men and animals, but little or no machinery, and the bullion product could stand transportation for long distances over mountain trails passable only to a man or a mule. The next stage of mining development is that wherein crude machinery is laboriously carried to the mine to aid in the working of the ore, the product of the ore still being gold and silver bullion. This was the situation in the United States when the mines of the Comstock Lode were being worked previous to the advent of the Pacific railway. Prospectors had roamed over many parts of Colorado, Utah and Nevada, and found outcrops of veins of lead ore and copper ore, but without the means for cheap transportation these discoveries were useless. The construction of the Pacific railway was anticipated as the supreme event in mining in the country west of the Rock Mountains, and this view was clear and far

Note.—This article is composed of excerpts from a paper in the *Transactions* of the American Institute of Mining Engineers.

seeing as the future showed. The railway enabled the base metals to be taken to the markets of the world, developed great smelting centers, a permanent mining industry, and finally the agriculture and the manufacturing industry required to support the miner. Virginia City, dependent alone upon the gold and silver mines of the Comstock, has waned to a sickly shadow of itself, but Denver, Salt Lake City, and Helena, each of them a great smelting center because of the mining of the ores of base metals which are brought to their furnaces, have become permanent centers of population.

The Rejuvenation of Mexico

The rejuvenation of Mexico as a mining country dates from 1886, when Mexican lead ore, especially from Sierra Mojada, began to be imported into the United States in important quantities. It was only three years later, in 1889, that the mining of this base ore led to the establishment of silver-lead smelting in Mexico. This stimulated, nay compelled, the construction of railways and promoted the mining of ores of the precious metals required by the smelters for fluxing purposes. For example, the mines of Parral produce highly silicious silver ore, that is amenable to treatment by the process of hyposulphite lixiviation. In that way, the ore of the district was formerly worked on a small scale, but now Parral is one of the greatest mining towns of Mexico in respect to tonnage, the ore being shipped in bulk to the smelters who need it for mixture with other ores and treat it more cheaply than can be done by the old process of lixiviation. Along with this economy it is obvious that the railways and many other branches of industry are being supported by the work offered them to do. Although in the case of some ores the smelters are now having to meet the competition of the process of cyanide lixiviation, nevertheless it cannot be gainsaid that Monterey, San Luis Potosi, Aguascalientes, Torreon, and Velardeña, the smelting centers, are the real nuclei of Mexican mining prosperity.

Our purpose in emphasizing the importance of base-metal mining has been to call attention to the intimacy of the relation between that kind of mining and the development of improved means of transportation and the corollary that the industrial interests of a country can obtain no real advancement until comparatively cheap transportation for commodities is available. In the absence of such cheap transportation, the mining of base metals and the bulky minerals is generally impossible, but the possession of resources in such metals and minerals inspires the building of railways, after which other developments follow in the natural order of events. In especially favored regions the mining of base metals has been possible from a very early time. Thus an important mining industry for lead, copper and iron was established in the interior of the United States at a comparatively early date and without the stimulating influence of deposits of the precious metals, because the waterways of that region enabled the products to be carried out to the markets of the world.

The natural sequence to the establishment of base-metal mining is the creation of a demand for a great variety of minerals. The production of the base metals develops manufacturing industry, which requires such minerals as asbestos, borax, graphite, mica and many others unnecessary to mention. Thus the importance of any country as a mining and manufacturing country is well indicated by the variety of commercial minerals that it produces.

What Discoveries Will Be Made In the Future

In an essay upon the mining industry, the question of paramount interest concerns the future, and not the past, or even the present. Yet, to a large extent, the future hangs upon the past and the present. It has been the experience of the world through many centuries that deposits of valuable minerals in certain districts have been workable for long periods of time, although at any given time the remaining resources could not be estimated for more than a few years ahead. We are able to form a good idea of the unworked iron resources of Michigan, Wisconsin and Minnesota, which lie near the surface and are superficially extensive, so that this extent may be determined with comparative cheapness by surface pits and by drilling; also we are able to measure approximately the remaining resources of coal, a mineral which appears in seams of extraordinary extent and regularity, marked by well known geological phenomena. On the other hand, even in a country where mining is so well developed as in Mexico or the United States, no one would venture to indicate quantitatively the country's resources of copper, lead and zinc ores. Yet, although we cannot foretell the life of the copper mines of Lake Superior, or the lead mines of Bonne Terre-Flat River and the Cœur d'Alene, or the zinc mines of Joplin, experience has shown during the history of many years that they have been able to increase their outputs and we have no doubt that this ability will continue for a long time to come. Individual mines play out, but new ones take their place and thus the extent and productive capacity of the districts is increased, as in reflected by the statistics.

But as to new districts. From one point of view the chances for the discovery of new deposits of ore diminish constantly as explorations become more minute. From 1849 to 1879 new discoveries in the United States were common. Since 1879 they have been less and less frequent. Obviously, this is because the surface has been so carefully scanned that few of the prominent outcrops remain overlooked. However, this must by no means be accepted as a sweeping generalization. The pioneers who went to Colorado in 1859 inscribed on their wagons the legend, "Pike's Peak or Bust." Pike's Peak, one of the giants of the Front range, was the beacon whither they headed. Nevertheless, after more than 40 years, Cripple Creek, at present the greatest gold-mining district of the United States, was discovered in the very shadow of Pike's Peak, in a country which must have been trod repeatedly by the feet of the early pioneers. Prospectors overlooked the veins of gold ore occurring there because those veins were not of a character that they had learned to know as valuable. There are other districts where surface prospecting is extremely difficult. For example, in the Cœur d'Alene the mountain-sides are steep and densely wooded. Beyond doubt there are many hidden veins of silver-lead ore remaining to be found in that region. In these respects, or in analogous ways, we conceive that conditions are somewhat similar in Mexico and South America.

Advances In Geological Knowledge

But in spite of the keenness with which the surface of many parts of North and South America has been prospected, it is probable that only a small part of the mineral wealth of these lands has yet been disclosed. The many deposits of valuable ore occurring in the form of what may be typified as "blind lodes," i. e., veins that do not come to the surface, are not discoverable by superficial examination. Furthermore, there are cases of deposits appearing at the surface as ore of no value, which with depth change in character and become valuable. In the interpretation of these mysteries of Nature, the art and science of mining geology is contributing assistance of a character that our predecessors of a single generation ago could not even dream.

The discovery of ore is largely fortuitous. The ore exists where Nature has placed it. It remains for man to find it. When and how he may find it is more a matter of chance than anything else. But, although the discovery of ore deposits is chiefly fortuitous, the practice in the science of economic geology has greatly improved the ability of the prospector to prosecute successfully his search for ore and of the miner to estimate the value of his discovery. A few examples of how the advance in geological knowledge has been a factor in the development of our mineral resources may be usefully mentioned.

Only five years ago Ely, Nevada, which had been known since the '60s, was still regarded as a low-grade gold-mining dis-

trict, and efforts were being made to operate by improved methods the mines, which as gold mines had been failures for more than 30 years. The original exploitation for gold of districts which subsequently became famous for great deposits of base metals is no new thing. Mining began in that way at Leadville, Colo., at Bingham, Utah, and elsewhere. However, no one dreamed five years ago of the immense deposits of copper ore which underlaid the lean, copper-free gold ore of Ely. That discovery was analogous to the nearly contemporaneous discovery that the great bodies of gold ore at the Mount Morgan mine, in Queensland, Australia, were also underlaid by immense deposits of copper ore. These discoveries, to our mind, are of more importance than the development of the particular supplies of copper, inasmuch as they lead to a knowledge of new facts in the science of ore deposits which perhaps will be of immense value. History presents numerous precedents.

THE FUNCTION OF THE MINING GEOLOGIST

For example, the discovery of rich silver ore at White Pine, Nev., in a limestone formation was the prime cause of redirecting attention to the mineralization of the same kind of rock at Eureka, Nev., and ever afterward prospectors looked especially for great deposits of lead ore in limestone formations; not that limestone had not previously been known as a kindly rock for the deposition of lead, but that it remained for the discovery of the Eureka bonanzas to impress the fact on all minds. Similarly, the discovery of gold in the andesite and phonolite of Cripple Creek, Colo., in 1891, was followed by the rich discoveries at Tonopah, Goldfield, and Bullfrog, about 10 years later. Previous to 1891 American prospectors did not know that gold occurred in the andesite class of rocks, and were ignorant of the kind of ore indistinguishable by the eye from the mother rock, which could be determined as ore only by the pan or the crucible, but the prospectors of today have learned this lesson. The "heavy" rock that led A. B. Wood to the discovery of the carbonate deposits of Leadville troubled the placer miners of old Oro from the very beginning of their operations in 1860. Where was the prospector of 1880 who would not have identified it?

Now we conceive that the discoveries at Ely and Mount Morgan are likely to prove of a similar epochal character. Attention will be redirected to deposits of lean gold ore and drill holes will be put down through them to discover if they be underlaid by copper ore, while after the experience at Mount Morgan no manager of an old mine of similar occurrence will be safe until he has prospected the bottom of the deposit. In cases where the geological conditions are similar to those at Ely and Mount Morgan, prospecting of this character will be likely to develop the existence of similar deep deposits of copper ore. It is the function of the mining geologist, whose importance in the economics of mining is now well recognized, to study the conditions with a view toward such similar prospecting. It is immaterial as to whether this last discovery was first made at Ely or Mount Morgan. Its scientific importance is that in two cases great deposits of copper ore have been found under extensive bodies of gold ore, one of good grade, the other of low grade, neither of which at the surface or even at moderate depth, showed any indication of copper that would attract more than casual attention. It is in the deduction of generalizations from such new discoveries and their application to future prospecting that the mining geologist becomes the guide of the prospector and the mining engineer.

We anticipate that in coming years the triumphs of the mining geologist will become more and more frequent. Perhaps our successors of the next generation will be able to say that whereas the discovery of ore was once a matter of chance, or persistence in following venturesome speculation, it has become a problem of purely scientific deduction. But whatever may be the progress in this direction, we feel sure that the mineral wealth of North and South America, after four centuries of exploration, is still far from exposed, and that in the course of time the mines of South America will contribute to its countries a material development of the kind that Canada, Mexico and the United States have already experienced.

Transportation by Animals in Mexico

Anyone who studies a map of Mexico, with the routes of the different railroads marked thereon, now totaling about 25,000 km. (15,500 miles), says a correspondent of the *Iron Age*, will not fail to note that, with one or two important exceptions, they consist of lines running from north to south. Very large areas of the country, by no means unsettled or undeveloped, seeing that important mining enterprises are there carried on and large bodies of land are regularly cultivated, are still without modern transportation facilities. Between these settled districts and the railroads, be the distance far or short, the products, whether of mine or *hacienda*, have to be carried by either horse, mule or donkey. The same methods are employed in the transportation to the cities of the varied commodities brought in daily from the country, such as wood, charcoal, etc. Mules and donkeys also are employed in very large numbers at the mines and ranches at the regular daily work. It would be a mere guess to estimate the proportion of the actual carrying business of the entire country which is today performed by four-footed freighters, but it is undoubtedly large, notwithstanding the activity of the railroad companies in making new extensions yearly into virgin territory.

According to statistics of the Direccion General de Estadistica, the number of freight animals in Mexico in 1902 was as follows:

States.	Horses.	Mules.	Donkeys.
Aguascalientes	4,991	3,248	3,042
Baja California	8,655	3,429	2,179
Campeche	2,969	3,031	944
Coahuila	55,825	10,978	6,487
Colima	4,321	2,453	874
Chiapas	42,427	5,896	561
Chihuahua	59,667	9,401	25,544
Distrito Federal	834	1,135	466
Durango	104,674	32,931	28,109
Guanajuato	31,596	15,547	40,948
Guerrero	16,154	1,348	6,330
Hidalgo	8,636	8,382	4,553
Jalisco	70,877	27,497	16,990
Mexico	11,317	9,365	3,029
Michoacan	54,548	26,390	15,106
Morelos	9,255	7,830	4,210
Nuevo Leon	28,088	7,514	15,969
Oaxaca	12,554	3,214	15,515
Puebla	9,526	25,602	6,661
Quer taro	8,333	5,378	5,778
San Luis Potosi	36,340	12,219	21,905
Sinaloa	6,594	5,618	6,989
Sonora	52,033	11,354	13,338
Tabasco	20,160	3,276	259
Tamaulipas	69,611	14,447	10,291
Tepic	13,086	8,968	5,399
Tlaxcala	2,682	14,877	2,146
Vera Cruz	40,914	10,574	5,988
Yucatan	15,700	13,318	537
Zacatecas	56,764	25,735	29,844
Total	750,217	334,435	287,991

The above total is undoubtedly an under estimate, as any one at all familiar with the habits and manner of thought of the Mexican small proprietor, who has ever before him the fear of more taxation, will at once understand. The total could be increased one-third, probably, without exaggerating.

Chrome ore is now being imported into the United States from Portuguese East Africa; 294 tons in 1907 and 2200 tons in 1908. According to U. S. Consul W. Stanley Hollis, Lourenco, Marquez, the ore is mined in Rhodesia and sent by rail from Selukwe to Beira for shipment. During 1907 chrome ore valued at $22,694 was declared at the Beira agency for New York and Baltimore which, however, went to England for transshipment.

According to an official report the silver production of Missouri in 1908 was 25,000 oz. The production for previous years has been as follows: 1907, 25,300; 1906, 31,300; 1905, 12,900. Practically all of this is refined from the lead bullion produced by the lead mines of the southeastern part of the State.

At the San Rafael mill, Pachuca, Mexico, the consumption of chemicals per ton of silver gold ore treated by cyanidation is reported to average 1 kg. sodium cyanide, 0.2 kg. acetate of lead and 12.2 kg. lime.

Recent Mining Developments in Chihuahua

Conditions Improving with Principal Mines Operating and Further Pearson Investments. Drought Broken but Zinc Ore Tariff a Serious Blow

BY A. P. ROGERS*

Chihuahua suffered from the effects of the financial depression most keenly, and is only now beginning to feel the general revival in business conditions. Added to the financial stress this State has had an exceptionally dry season this year, which has proved to be a very serious matter to many mines which depend upon water for power; and finally, the United States has imposed an almost prohibitive tariff upon zinc ores imported into that country. This zinc tariff has been a heavy blow to many mines which were formerly shipping a large tonnage to the zinc smelteries in the Middle West, and which are now obliged to find other markets for these ores as Mexico has no zinc-smelting plants. In spite of all these setbacks, however, work at the large going mines and numerous prospects has been quietly progressing with good results, and the present indications are that conditions will soon assume a normal aspect. Chihuahua is so rich in natural resources and has such varied mining, timber, ranching and railroad interests that a stimulus in one direction cannot help benefiting all the others in some degree. Such a stimulus is now being felt from the large investments of the Pearsons in the pine-timber tracts of western Chihuahua, and the consolidation by these same interests of the Chihuahua & Pacific Railroad with the Sierra Madre & Pacific Railroad under the name of the Mexico & Northwestern Railway. This company has an authorized capitalization of $40,000,000, of which $15,000,000 has been issued, and a bonded debt of £5,000,000, of which £3,000,000 is issued, bearing 5 per cent. interest. The Pearson syndicate also has engineers in the field surveying a route from Casas Grandes to Madera, which will connect up the two lines, giving a total of 612 miles, which will be in operation by Jan. 1, 1911. The same syndicate is putting the large sawmill at Madera in condition to work. This plant has a capacity of 250,000 ft. a day, and a larger one is planned to be built at El Paso, Texas. The timber lands acquired from the Greene Gold and Silver Company, and the Development Company of America, are of vast extent, covering over 2,700,000 acres, a great portion of which is timbered with heavy pine forests suitable for lumber of the highest grade. These forests are estimated to contain at least 8,000,000,000 ft. of lumber, valued at $20,000,000.

During the last year the Kansas City, Mexico & Orient Railroad has extended its line 14 kilometers west of Sanchez, the former terminus of the road, and is making one of the deepest cuts in the world through a hill at that place, 600 ft. long by 110 ft. deep at the deepest point. Once this road is through the mountains, direct railroad connection will be established between Chihuahua, Guaymas and the west coast. It will take some time, however, as the most difficult part of the road has yet to be built, and it has been so far a slow task to raise the large capital needed.

While a time of financial stress bears heavily upon many enterprises, it has some good effects also in eliminating a lot of doubtful undertakings, and bargains are offered to the stronger interests which might otherwise hesitate to invest their money. Now that business is picking up, these people can be relied upon to exert their energies toward developing the country, and the general indications for a prosperous future throughout the State are most encouraging.

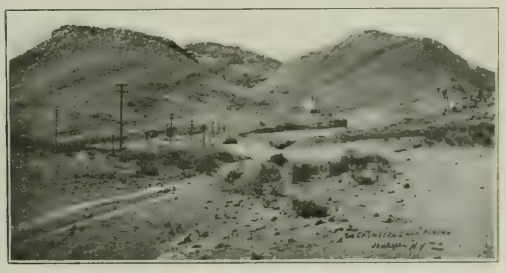
Santa Eulalia District

The Santa Eulalia camp has not seen many changes lately, although the San Toy mine, which was purchased for a large price by Charles M. Schwab, two years ago, has become an important producer under the management of Donald B. Gillies, and is shipping 100 tons a day of 90-oz. silver ore to the Torreon smeltery. The company had not much ore in sight when the mine was bought, but a campaign of vigorous prospecting has determined the original ore channel, and now the mine is turning out to be a very successful property. At the present time the workings are about 400 ft. deep. Another important producer in this camp is the Potosi mine of the Chihuahua Mining Company, which is shipping 600 tons daily, carrying 20 oz. silver and 15 per cent. lead to the El Paso smeltery. This company was also shipping a large amount of zinc ore, but the tariff has forced it to suspend these shipments. At Mina Vieja, in this camp, the Guggenheim Exploration Company is completing an aërial tram line from the mine down to the town.

The Chihuahua smeltery of the American Smelting and Refining Company formerly bought much of the custom ores at Santa Eulalia, but at present it is principally handling the lead ores from its own mines. The plant has been running for some time at its full capacity, however.

The Rio Tinto mine and smeltery at Terrazas has been purchased by Corrigan & McKinney, of Cleveland, Ohio, and the plant is now being successfully operated under the management of R. B. Hutchinson. The smeltery has a capacity of 200 tons of copper ore a day, practically all of which comes from the company's mines. A high-grade matte is made and shipped to Europe. The owners of this property

REFUGIO MILL, PARRAL



PALMILLA MINE, PARRAL

*Mining engineer, 25 Broad street, New York.

formerly sold the Concheño mine to the Greene Gold and Silver Company. After making the first payment upon the purchase price, the company defaulted and the property reverted to Corrigan & McKinney, and is now under contract to T. F. Cole and associates. The old Americana mine has again become prominent as a shipper in the hands of Dale & McDonald. It was thought that this property was worked out at one time and the lower workings were flooded, but the present owners have uncovered another shoot of good ore near the surface that is turning out well, and regular shipments to the smeltery are being made.

Naica Output Increasing

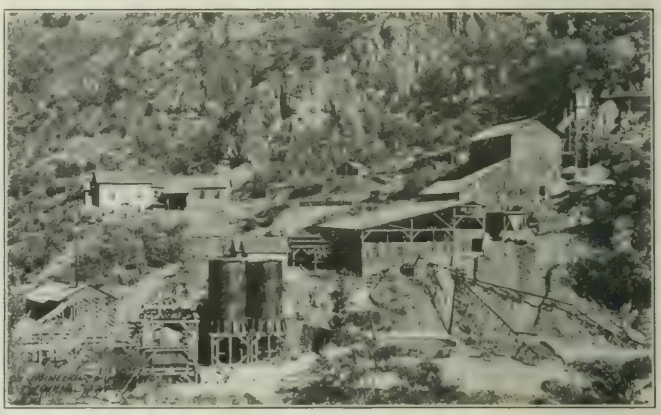
The Naica mine has been carrying on vigorous development during the past year with excellent results. A large amount of good ore has been opened up in the various levels and the directors report there is today 122,780 tons of first-class ore and 17,600 tons of second-class ore in the reserves. The estimates are made only down to the third level, 150 meters below the yards, but the entire floor of the ore chimneys is formed of ore. The quantity of ore shipped to the smelteries during the past six months amounted to 11,700 tons, containing 450 gm. silver, 3.5 gm. gold and 23 per cent. lead a ton. From the organization of the company to the present time, a total of 161,128 tons of ore has been sold to the smelteries, for which $5,499,568 has been received—an average of $33.82 a ton. Of this amount the stockholders have received $2,650,800 in 207 dividends. The company no longer ships its ores to the Torreon smeltery that contract having terminated—but has made more favorable arrangements with the Encinillas smeltery at Santa Rosalia, Chihuahua, where most of the output is treated, the balance going to the Compañia Metalurgica Mexicana at San Luis Potosi. It is probable that the Naica company will soon build its own smeltery on the property. The mines are connected with the main line of the Mexican Central by a branch 30 km. long, owned by the company. The power plant which supplies the mine with compressed air for the drills and hoists is taxed to supply enough power for the drills in use.

A French company has recently acquired 120 pertenencias at Naica and intends to carry on prospecting on a large scale, under the direction of H. G. C. Thorehrn, the manager. At the San Francisco property, adjacent to the Naica Consolidated, J. R. Roslyn expects soon to commence work upon a long tunnel. It is also reported that the Encinillas company, at Santa Rosalia, is planning to increase the capacity of its smeltery soon by adding another 400-ton lead furnace. This company has been doing a very good business the past year under the management of T. S. St. Denier, treating the ores from Santa Eulalia, Naica and Parral.

Parral District

At Parral the heavy flow of water from the lower levels in the mines and the low grade of ore, together with a low price for silver, have curtailed operations. Messrs. McQuatters and Long have been actively engaged in organizing the Alvarado Mining Company to work the Palmilla mine of Pedro Alvarado, and a custom mill is planned to handle a large tonnage.

The Hines Consolidated Company is to be reorganized and operations started. This mine has a large amount of low-grade ore. One of the important properties in the Parral district today is the El Rayo mine, which is making a good showing under the direction of George A. Schroter, consulting engineer. The production in July was over $47,000—from a mill-run of 27 days, treating 3612 tons, from which a net profit of $25,000 was made. The ore averaged over $16 a ton, and an extraction of 90 per cent. was obtained. The mine has, according to reports, ore positively developed to continue this rate of production for several years to come.



RIO PLATA MILL, WESTERN CHIHUAHUA

Other Properties

The Calera mine, controlled by Grant B. Schley, and the other zinc properties about Minaco have all had to shut down owing to the American tariff on zinc ore. The owners have to figure on shipping to Europe, but it will take some time to arrange for such a move, and in the meantime the properties are likely to be idle unless the price of zinc in the United States advances materially. One of the best properties working near this district today is the Promontorio mine at the old Cusiriachic camp, owned by the Cusiriachic Mining Company. This is a large gold-silver property, which was bought last year by Potter Palmer, Jr., and associates, of Chicago. The management has entirely retimbered the mine and completed the installation of the new plant, and is now producing on a much larger scale than heretofore.

The large mines of the western part of the State are widely separated, and many of them are run by water power. Water has been very scarce this season, but in spite of that a good showing has been made. The Batopilas mine is in bonanza again, and is now installing a cyanide plant to replace the lixiviation process. The mine is under the management of Alexander Sheppard, and Walter M. Brodie, of Chihuahua, is the consulting engineer. The Republica mine, in the Jesus Maria district, has had some trouble lately from the heavy flow of water, and is now partially flooded. The company was paying $20,000 a month in dividends from 100-oz. silver ore until this happened. It is hoped that larger pumps will handle the water and the production can be resumed.

On the Septentrion river the Rio Plata mine was very short of water last spring, but the rainy season has now begun and the mill is running well. This has been a large producer so far under the direction of D. W. Shanks, and all the levels are reported to be in good ore today. The mine paid for itself during 2 years prior to last May. It is a tunnel proposition from which the ore is trammed to the new 25 stamp mill and cyanide plant. This cyanide plant has just been installed, and for the first month's run treated 80 tons a day, giving an extraction of 82 per cent. Two water wheels, recently installed, have shown defects and are now being replaced so that there should be no further trouble, and a steady production can be maintained in future. During July they treated 1464 tons of 60 oz. silver ore, recovering 88,000 oz. The recent developments in the mine have proved the continuity of the ore-shoot, which averages from 3½ to 6 ft. wide, and shows assays up to 200 oz. in

silver in the working faces. The greatest trouble encountered was from a lack of water during the spring months, but that will be overcome in future by the auxiliary steam plant installed last year.

At the Dolores mine, the recent developments have opened up large additional reserves of high-grade gold ore, and the property was never in such good condition. This is the first season the water-power equipment has been in operation, but it has been so extremely dry the mine was able to run the mill by this power only part of the time, and it will take some time to determine exactly what will be accomplished. In the mine, the main Dolores shaft has been sunk an additional 100 ft., from the bottom of which a crosscut cuts the vein in 50 ft. Drifting toward the south upon this level has opened up a good body of ore from 5 to 8 ft. wide, assaying $35 to $40 per ton, with ore still in the present breast. To the north low-grade ore was found, but at 150 ft. the oreshoot, developed in the level above, is expected to be encountered. Besides this work in the main mine, considerable prospecting is being done on some of the other veins upon the property with good results.

The conditions are favorable for a resumption of activity in mining in the northern Mexico districts, and the improvement is already marked.

English Investments in Mexico

As early as 1824, English capital was attracted to the mines of Mexico. The firm of John Taylor & Sons, of London, about that time became heavily interested in Pachuca and other English and Scotch companies followed, taking properties in all parts of the country. One company, the United Mexican Mines Association, about the middle of last century, owned and worked mines at Minas Nuevas, Sonora, Jesus Maria, Chihuahua, in Durango, at El Oro, in Temescaltepec and Zacualpan in the State of Mexico, at Guanajuato and in Oaxaca. It took a visiting director two years to see all of the properties of the company. With the sale of the San Cayetano mine at Guanajuato a few years ago to an American company, the United Mines company passed out of Mexican mining. A Scotch company developed Guanacevi, Dgo. in the '40's and built a mint, with machinery so substantial that the authorities have recently been unable to move it away. An English company installed enormous Cornish pumps at Fresnillo, near Zacatecas, bringing them overland from Veracruz at a great cost. Other important English operations were at Zimapan, north of Pachuca. Most of the English companies abandoned their properties between 1850 and 1860, owing to the insecurity of government and the heavy costs of operation and transportation. When the Americans became interested in Mexico, in the '80's, the English had practically retired from the field.

In the past decade the English interest in Mexico has revived and there are now several important English companies in the field and English capital is largely interested in the El Oro mines and other American controlled mines. Recently many English engineers from South Africa and Australia have come to Mexico looking for mining properties. The indications are very strong for an increasing English investment in Mexico, independently, and in conjunction with the Americans.

Consolidated Goldfields of New Zealand

SPECIAL CORRESPONDENCE

The report for the year ending Dec. 31, 1908, states that the gross profit for the year from mining operations on the Wealth of Nations, Humphrey's and Golden Fleece mines, together with dividends on investments amounts to £17,654, out of which a dividend of 1s. per share (5 per cent.) was paid in October. The Wealth of Nations mine is, as regards development, considered as three years ahead of the mill. Additional power has been obtained by regrading the last mile and a quarter of the water race to the reduction works.

The Golden Fleece mine has been worked on tribute, the tributors paying 15 per cent. of the gross gold won up to a standard of 8 dwt. per ton and 20 per cent. over this amount. The Humphrey's Gully alluvial workings have been worked at a loss, but it is expected that the working would be payable if worked by tributors. The Consolidated company holds 160,000 shares out of a total of 275,000 shares in the Progress mines and 94,924 shares out of 250,000 shares in the Blackwater mines. During the year the Progress mines treated a tonnage of 48,500 tons for a profit of £15,824, which is a decrease of £21,665 over the results of 1907. The results of the development work carried out during the period under review were disappointing, the large bulk of the quartz exposed being below the payable limit in value.

The ore received is estimated to be equal to a year's supply for the mill. In order to work up a large accumulation of pyritic slimes, concentrates and chlorination residues and also in order to treat the concentrates made monthly, it has been decided to erect a smelting plant consisting of a reverberatory furnace and arsenic-condensing chambers. An analysis of the working expenditures and revenue on 48,500 tons milled and 33,300 tons cyanided shows that the revenue per ton was 25s. 3d., and the costs (exclusive of capital and development expenditure) 22s. 10d. per ton. The Blackwater mines, which were formed as a company in December, 1906, commenced milling in August, 1908, and now has a battery of 30 stamps. For the four months ending Dec. 31, 1908, the revenue was £17,752, and the expenditure (exclusive of development), £9481. For the seven months ending July 31, 1909, the revenue was £33,457 from 14,440 tons milled, or at the rate of 46s. 4d. per ton. The costs, including development, were £14,453, or 20s. per ton.

During January, both mine and mill were shut down in consequence of labor troubles. At the end of 1908 the tonnage blocked out was estimated to be 2½ years ahead of the mill. The latest returns from the mine, those for August, are the best yet recorded. The 30-stamp mills produced gold to the value of £7283 from 3000 tons of ore, at a cost of £1995 for mining and milling and £420 for development making a total of £2415, or 16s. per ton.

Soldering Platinum

Soldering ordinary platinum vessels is commonly done with platinum itself as the soldering material, or with pure gold, using the oxyhydrogen blow-pipe or its equivalent melting flame. Gold has the disadvantage that it melts at a lower temperature than the platinum, and under temperatures to which crucibles or other vessels may be subjected, it melts and leaves the crack open.

In *Central-Zeitung für Optik und Mechanik* it is recommended to close the crack with a mixture of platinum powder and turpentine oil, then to heat the joint to a white glow, and in this condition to hammer the parts together. Another method, applicable where the crack is on the edge, consists in hanging a narrow strip of platinum sheet over the crack, then placing the article in the fire, heating it white hot, and hammering if necessary.

According to *Metall-Arbeiter* a small hole may be closed by a rivet made of platinum wire, welded after hammering both heads closely. For larger holes a patch is made of platinum sheet, riveted on, and then welded.

Consolidated Mercur Gold Mines Company

The president's report Aug. 23, 1909, for the year ended June 30, 1909, states that during the year 282,260 tons of ore were mined and milled. The gold produced was $761,236 or $2.70 per ton. Loss in tailings, per ton, $0.88, making the total value of the ore $3.58 per ton. Mining costs were $1.53 per ton, and milling $1.09. Assets, $75,039; liabilities $9.16. During the year $5000 was expended on account of slime plant construction.

Dulces Nombres Quicksilver Deposit, Mexico

Orebody Found in Limestone; Differs from Other Quicksilver Deposits in Origin and Occurrence; Production of Over 1,000,000 Pesos Since 1890

BY PERCY ANDRUS BABB*

A dozen or more states of Mexico record activities in the mining of quicksilver. Those best known, however, are Guerrero and San Luis Potosi, due partly to the magnitude of the production and, also, to the publicity of the interesting geological features of the deposits of Huitzuco in Guerrero and of Guadalcazar in San Luis Potosi. Generalizing relative to the quicksilver deposits of the country, Sr. Juan D. Villarello, president of the Sociedad Geologica Mexicana, in a monograph published in 1903 under the title "Genesis de los Yacimientos Mercuriates de Palomas y Huitzuco," remarks upon the general association of cinnabar with pyrites, stibnite, realgar, silica, bitumen, and often tetrahedrite, gold, sulphur and gypsum. He says it is almost always true that in deposits of mercury, bitumen and silica are found in the gangue accompanied by pyrites; in some, as at Huitzuco, the sulphantimonide of mercury with sulphur and gypsum occurs; and in many others, as at Huitzuco and Guadalcazar, in Peru, and at Sulphur Banks, Cal., gases and water issue from the workings charged with carbonic acid and hydrogen sulphide. He might have noted, also, that the quicksilver deposits occur oftener than otherwise in Cretaceous formations, intimately connected with igneous eruptions, although there are exceptions in which deposits are formed altogether in eruptive rock. J. F. Kemp calls attention to the fact that quicksilver ores are quite invariably associated with igneous rock, although the walls are often sedimentary. G. F. Becker has tabulated the minerals accompanying [illegible] from 28 [illegible] localities, showing that silica, either as quartz or in the opaline state, and calcite are the common gangue minerals. Pyrite or marcasite is invariably present and bitumen is very widespread. Various other antimony, arsenic, silver, lead, copper, and zinc minerals, as well as gold, are of somewhat irregular occurrence. He holds that the cinnabar has come up in solution as a double sulphide with the alkaline sulphides, but places emphasis upon the precipitating properties of bitumen. He considers the likely source of the ore to be in deep-seated and widely distributed granitic rocks, and especially in such portions as overlie the foci of volcanic activity.

Dulces Nombres Deposit Unique

The Dulces Nombres deposit of quicksilver lacks almost all of these general characteristics set forth in the preceding paragraph, and is certainly unique as to the genesis of the ore and its mode of occurrence. The district is practically unknown, the only mention I find in the press is a brief reference in The Mineral Industry of 1907 to the Guadalupana mine, immediately south of Dulces Nombres. The deposit is not only of geologic interest, but has been a successful commercial undertaking. It is now operating on a profit basis, and during the year of 1908 marketed 700 flasks of quicksilver, the recovery from 785 tons of ore averaging 3.98 per cent. Hg. During the last two decades something in excess of 10,000 metric tons has been extracted, from which have been won in excess of 14,000 flasks liquidating over a million pesos.

The property is approximately 15 km west of the railroad at Enramada, a station in the state of San Luis Potosi on the Mexico-Laredo line of the National Railways. The Dulces Nombres mountain reaches an altitude of 2300 m. above sea level, and the floor of the valleys is 300 m. lower. No water has yet been encountered in any of the workings—the greatest depth of the workings is 100 m.—nor is it likely that any will enter for another 150 to 200 m. The rock is self-sustaining, requiring no timbering—even the shafts are untimbered with the exception of the collar-set. Competent miners are paid one peso per 8-hour shift; mechanics, carpenters, masons, blacksmiths, etc., one peso per 10-hour shift; and general labor half a peso—8-hour shifts if in the mine, otherwise 10-hour shifts. Simple and light equipment meets all demands, and operating costs are exceedingly low in terms of rock excavated.

The history of the camp is comparatively recent, dating back to 1890, when Dulces Nombres proper was denounced by a Mexican ranchman who discovered rich specimens of cinnabar strewn along either side of the *arroyo* which dissects the property. Until very recently the property lacked intelligent mining; the extraction was always carried right up to the exploration faces, and ore encountered wherever it might be and pursued wherever it led. The experience of the operators has been a series of ups and downs—*bonanzas* productive of big returns alternating with workings barren of ore. The present company has undertaken much needed exploration work, operating the property with more regard to approved mining practices.

DULCES NOMBRES QUICKSILVER MINE, SAN LUIS POTOSI, MEXICO

Interesting Geology of the Deposit

The Dulces Nombres formation belongs

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to the Central Plateau region, an immense table land mostly of Cretaceous sedimentaries, which have been extensively intruded and uplifted during the Tertiary era, forming numerous isolated ranges, termed rather aptly "lost ranges" by Robert Hill. The Dulces Nombres uplift extends 4 km. north and south and 3 wide—hardly a range, but rather one mountain mass eroded into several crests projecting somewhat above the body of the mass and dissected by two main *arroyos*.

The mass of the mountain is composed of stratified limestone of the Comanche series of the Lower Cretaceous formation; the strata varying from 10 cm. to a meter in thickness, and made up of numerous laminations which disclose themselves where weathered or altered by descending waters. Due to bitumen present in the limestone their color is black and dark gray. A general analysis of the limestone is as follows: CaO, 46.35 per cent.; SiO_2, 12.46; Al_2O_3, 1.93; CO_2, 36.42; C, 1.30; total, 98.46 per cent. plus a trace of iron.

The carbon is very combustible, therefore it cannot be graphite; but where there has been intense movement between beds, graphite does occur.

Resting on the Lower Cretaceous and conformable with it are the lower beds of the Middle Cretaceous, but the upper beds of this formation have been entirely eroded. The Middle Cretaceous is characterized by interbandings of chert, beds of approximately the same thickness as those of the Lower Cretaceous, lack of visible laminations, and a gray to light-gray color where weathered.

Several hundred meters to the southeast of the Dulces Nombres, there outcrop sandstones of the Upper Jurassic, calcareous in composition, but the conformability to the younger formation was not ascertained. It is not certain but that their presence here is explained by their having been faulted.

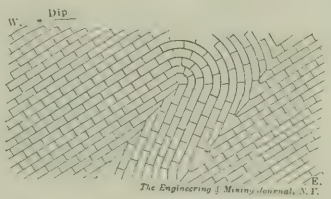
The strata have been tilted about 50 degrees, dipping west, with local variations ranging from vertical to horizontal in places. The mountain has a north-south trend corresponding with the direction of the limestone strata.

No Igneous Rock Associated

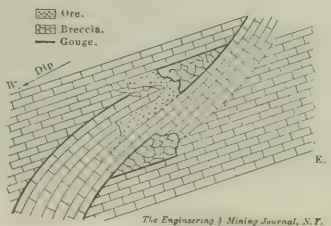
No igneous rocks outcrop on the Dulces Nombres mountain. To the north, east and south, however, on other ranges several kilometers away, igneous rocks outcrop and lava is found; moreover, a few kilometers to the east are several eruptive cones. To the north and the south fissure veins have been found carrying low silver and gold values at the surface. These have never been prospected. Surrounding valleys completely isolate the Dulces Nombres from these other uplifted areas; nevertheless, we are justified in assuming local activity of intrusive rock as the cause of the uplifting and tilting of the limestone now referred to as the Dulces Nombres mountain.

Incidental to the uplifting of the limestone a strong faulting occurred where the tilted strata were broken away and lifted up from the beds now extending to the east, the eastern slope of the Dulces Nombres mountain being the eroded fault plane. Since then there is no evidence of faulting, although there have been many slight local movements involving displacements of a centimeter to 15 cm., and resulting from the adjustment of the tension within the mass of disturbed rock.

The limestone has been subjected to thrusts at right angles to the direction of the strata, i.e., against the dip, bending and folding the beds into small, irregular and distorted areas. On the surface the strata may be seen in places folded into



FOLDING OF CRETACEOUS LIMESTONE



TRAP FORMED BY FOLD

Z's and pleats and the parallelism of the beds unbroken along the strike; but underground the folds are usually found ruptured, the sides coming together as acute angles, having formed gouge and slickensides. As the major part of the local movement occurring underground is in the vicinity of these highly distorted areas, it is not unlikely that they are the effect of the breaking down of the folds.

The ore occurs as widely scattered pockets and stringers of high-grade mineral within the downward opening acute angles of the corresponding folds above described. The upward opening angles are never mineralized. In the joints and slips near the pockets stringers occur, while the pockets make more within the brecciated matter toward the vertex of the angle. A highly distorted and ruptured area is an excellent indication of the nearness of ore, while lack of distortions in the beds will permit the elimination of considerable ground from further prospecting and exploration.

Theory of the Ore Deposition

That the mercury salts have been interrupted in their ascension by these closed angles and folds is evident. The lessening pressure and temperature which must have been common in these localities; the crushed and fissured condition of the rock, offering numerous points for the initiation of precipitation and the diffusion of the solutions or gases; the presence of the natural precipitant in the carbonaceous impurity in the limestone; and the trap formed by a fold or an angle with its impervious capping of gouge; are factors any one of which might alone indicate deposition in these places.

There are absolutely no vein, gangue minerals, or other economic minerals than mercury found. The slips, joints and narrow fissures from the insignificant local adjustments of weight and tension have been cemented by calcite leached from the rock itself; a very small amount of pyrites and gypsum now and then may be noted along the slips or in the gouge, doubtless a re-precipitation of leached constituents from the limestone. No silica, salts of other minerals, sulphur, primary calcium minerals, or evidence of the presence of carbonic acid and hydrogen sulphide accompany the mercury minerals.

Two important negative conclusions and one affirmative are logical determinations from the above: viz., (a) inasmuch as no salts of metals, and particularly silica, accompany the mercury salts, nor has any cementation taken place except from leached matter within the zone of deposition, it follows that the deposit of mercury is not due to any precipitation from uprising solutions; (b) for the same reasons, together with lack of alteration in the limestone and impregnations of mercury outside of the area already described, and want of any metamorphic action, a precipitation from gaseous mineralized solutions is precluded also; and (c) the presence of pure salts of mercury unaccompanied by any foreign material and these mercury salts the one foreign material present in the limestone, certainly at least strongly indicate that the mercury reached the zone of the present workings as a gas, and that gas probably of a pure mercury salt, i.e., in the state of a sublimate.

The carefully studied geology of the Central Plateau not usually complicated as to its elementary features and familiarity with the vast mining operations general throughout this section demonstrate that here the deposits of ores are always accompanied by one or more of the common gangue minerals, always two or more economic minerals, and often particularly in the case of mercury deposits, with appreciable quantities of

complex sulphides or their oxidized products—all intimately related with eruptive rocks in their genesis; therefore, it is very probable that the mercury deposits of Dulces Nombres were originally laid down at some distant locality accompanied by certain usual gangue and also, perhaps, economic minerals; and that some later dynamical action has caused the initiation of the migration of the deposit as a whole, the mercury compounds due to their comparatively low critical temperature having been the first to advance into a higher horizon, while the continuance of this migration to embrace the other minerals was interrupted, or else their deposition has occurred from gaseous solutions from greater depths.

The quicksilver is found usually as the sulphide, cinnabar, but not of uncommon occurrence is native mercury, presumably oxidized from the sulphide.

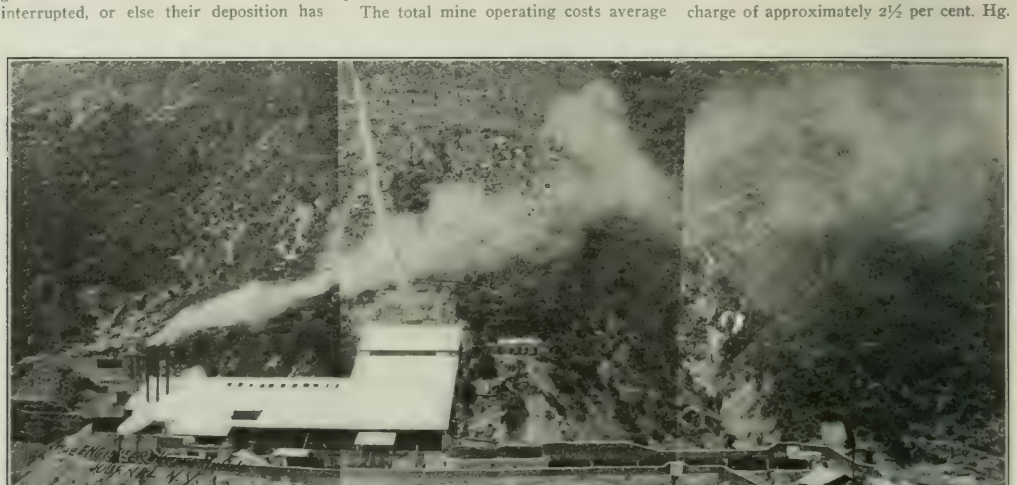
In the vicinity of certain workings known as the *abra* there is a highly fractured vertical zone which has been subjected to an intense oxidization, resulting in the formation of several interesting and rare mercury minerals; a considerable amount of native mercury; calomel or horn quicksilver, occurring in colorless crystals and white earthy masses; the oxy-chloride, terlinguaite, occurring in earthy masses of canary yellow and greenish-yellow colors, crystallizing in the isometric system, and here found for the first time in Mexico, the oxy-chloride, eglestonite, occurring as yellowish-green powder, crystallizing in the monoclinic system, and here found also for the first time in Mexico.

Mining Treatment and Methods Used

The mine workings are concentrated in a contiguous series of several beds of the limestone, extending along the strike some 400 m. and attaining a depth of about 100 m. To the north and south of the present workings there are 1000 m. of promising unexplored ground, and to the east surface indications of distorted and folded rock would seem to justify attention in this direction. Because of the widely separated and small bodies of high-grade ore, averaging as broken in the mine from 3 to 15 per cent. Hg, exploration costs are high.

The total mine operating costs average in the neighborhood of 40 pesos per ton of ore, and smelting 3½ pesos. An expensive amount of exploration work is avoided due to the probable presence of ore being indicated by the highly distorted areas in the rock serving as an excellent guide. The ore is readily distinguished from the limestone, and its extraction is thus facilitated. The rock is rather hard to drill, but on the other hand breaks well.

The company has installed a smeltery of 5 tons capacity per 24 hours. It is constructed of brick, the parts subject to intense heat being of high-grade fire-brick. The ore is fed into the furnace through a hopper, and spread out as a shallow bed from which the hot gases of combustion of wood fuel liberate the metallic contents in volatilized form together with a small quantity of sulphurous gases and these gases then pass from the furnace to a series of external upright iron pipes, set in tubs of water and air-cooled. The mercury condenses in the pipes and is collected in the water traps as exceptionally pure native mercury, due to the entire absence of any deleterious foreign matter in the ores. A 90 per cent. recovery is being made, but with more experience with the practice and minor improvements about to be made, the management expects to make a 92 to 94 per cent. recovery. The only preparation given to the mine-run of ore is to crush the larger pieces so all will pass a 1.-in. ring, and to mix the high-grade with low-grade dump ore of a commercial grade to effect an average tenor in the charge of approximately 2½ per cent. Hg. Placed at the furnace and crushed to 1 in. mesh, ores of ¼ per cent. mercury pay for smelting and marketing.



VIRGINIA-MEXICO MILL; SAND PLANT AT RIGHT, SLIMES PLANT UNDER COVER

Ore Treatment at the Virginia & Mexico Mill, Jalisco, Mexico

By Jesse Scobey*

The ore treated at the Virginia & Mexico mill is assembled from four different mines at a point 1000 ft. above the mill, where it is sorted and lowered by means of a 2-track gravity incline plane, with ½ in. cable, in 2-ton cars, automatically discharging into the mill bins, from which it is drawn over grizzlies to three 10x7-in Blake rock breakers operated in one unit by one 30-h.p. motor. The crushed ore

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is drawn from masonry bins through challenge feeders to six batteries of 30 stamps operated in two units by 30-h.p. motors each. The stamps run at 109 drops per min., crush in solution, passing five tons per stamp through 12-mesh screen every 24 hours. The ore is fed direct to six Wilfley tables, making concentrates, and acting as classifiers, throwing slimes direct to slimes plant, and sands to two Allis-Chalmers tube mills, 42x16 ft., using local silica pebbles from the Santiago river. Each mill is separately driven through clutch pulley by a 20-h.p. motor. The product goes for reconcentration direct to six additional Wilfley tables which again classify into slimes which go to slime plant, fine sands which go to sand plant and coarse sand returned to the tube mills by two 6x54-in. Frenier sand pumps set in tandem.

Treatment of Sands

The sands go to two 30x6-ft. steel sand-collecting tanks fitted with Butters distributors and central overflow, which separate slime, sent to slime plant, from sands returned to the collector by a 6x54-in. Frenier sand pump. The sand collectors discharge by hand to an 18-in. Robins belt conveyer operated, by a 10-h.p. motor, with an automatic tripper discharging sands to six 30x6-ft. steel sand-treatment tanks; these are discharged by sluicing into the Santiago river. The strong solution from sand treatment goes to one 22x8-ft. steel tank, whence through a 7x8-in. Gould pump to clarifying tanks and zinc boxes.

Slime Treatment

The slimes are raised by two 7x8-in. Gould pumps with ball valves to one 20x20-ft. steel settling tank with clear overflow. The three Gould pumps and one Frenier pump are operated in one unit by one 30-h.p. motor. The clear overflow from the settling tank goes to one 22x8-ft. battery-solution tank, supplying feed water as weak solution to stamps and tables.

The settled slimes are drawn through a 6-in. pipe to fourteen 15x22-ft. slime tanks, with air agitation and decanting equipment. The treated slimes flow by gravity to one 22x12-ft. Butters treatment storage tank with mechanical agitator operated together with one 14x12-in. air compressor and one 14x10-in. wet vacuum pump by one 30-h.p. motor.

The Butters filter equipment is semi-gravity operated through a 6-in. Butters pump, directly driven by a 30-h.p. motor. The filter proper is a two-hopper steel tank, with 50 leaves, and an acid box with six leaves. The filter is equipped for both air and water discharge. The wash-water tank is steel, 22x8 ft. The solution-wash tank is 22x12 ft. and also built of steel.

Pregnant solution goes to two 26x10-ft. clarifying tanks, steel with cloth filter bottoms covered with sand, feeding by gravity six 8-compartment steel zinc boxes, 24x22x15 in. Barren solution goes to one 26x10-ft. steel tank and is returned to circulation by a 7x8-in. Gould pump. The precipitate is pressed in an 18x18-in. Johnson, steam dried and smelted in a 2-hole furnace using No. 4 crucibles.

Power Equipment

Power is supplied in alternating current by one 200-h.p. generator directly belted to a 15x20-in. 4-valve Atlas engine, and one 100-h.p. generator directly belted to a 12x18-in. Atlas. The two generators acting in synchronism supply 300 h.p. to the mill. Steam is generated by three 100-h.p. high-pressure tubular boilers

INTERIOR OF VIRGINIA-MEXICO MILL SHOWING RE-CONCENTRATING WILFLEY TABLES; BUTTER'S FILTER PLANT IN DISTANCE

fired by wood. Water is supplied from the Santiago river by a vertical centrifugal pump directly operated by a 15-h.p. motor.

P. R. Whitman is mill superintendent, W. I. Winchester master mechanic, George M. Carle master carpenter and concentrator, P. E. Cox electrical engineer, A. F. Solano mill man and Clifford R. Wilfley is chemist, assistant to Mr. Whitman.

The cyaniding patents held by the McArthur Forrest Company in Mexico were declared invalid last December by the Supreme Court of the Republic in the suit brought by the Department of Fomento.

All ores in Mexico are called *metales*. Hence the expression in English "to have good metal" in a mine.

Scientific Treatises as Evidence in Courts of Law*

By William Jago

The practice as to the admission of books as evidence varies in different countries. Short summary of English practice—In criminal cases very little use is permitted, but there is somewhat more latitude in civil actions. The books themselves are not evidence, but a witness may possibly say, "I know this subject, and from my general knowledge I *say* that a certain portion of a book is a correct statement of fact." Examining counsel may not put a book passage to a witness, but cross-examining counsel is at times allowed to do so. This course was permitted in R. v. Palmer. It is open to the objection that the opinion of an absent person is got in without possibility of testing its value. Cross-examination from books has recently been refused both in criminal and civil cases; examples, arguments against, and in favor of admittance of books as evidence.

American views and practice; résumé of arguments by their authorities for and against submission, that the present English rule might with advantage be sufficiently relaxed to admit of the production of scientific books as evidence in the discretion of the learned judge, certain precautions being taken.

Expressions of opinion from a gathering of chemists and lawyers should be of value, as throwing light on a subject in which both are interested, bearing in mind that the proper object of evidence is to provide the Court with the fullest and most authoritative knowledge possible, and so to assist in the administration of justice.

*Abstract of a paper read at the recent Congress of Applied Chemistry at London.

For successful results in copper-plating zinc sheet, according to *The Metal Industry*, use a warm solution consisting of the following: Cyanide of potassium, 6 oz.; regular copper compound, 2 oz.; bisulphite of soda, 2 oz.; water, 1 gal. Use soft sheet copper for anodes, a current strength of 3½ to 4½ volts. A fairly good deposit should be obtained in one-half hour. Blistering results from either too strong a current or too much cyanide. Carbonate of copper can be used in the place of the red copper compound, but use 3 oz. instead of 2 ounces.

Earthwork on the Southern Pacific grade in Jalisco, Mexico, cost the subcontractors from 12 to 16 centavos per cubic meter. The work was done by Indians carrying the material in baskets from the right of way, making a fill of upward 15 ft. in hight.

A Proposed New System for the Cyanide Treatment of Slimes*

By Ferdinand McCann†

Having lately visited cyanide plants in the Republic while gathering data for the book which I have just published on the subject, I was greatly interested by the almost perfect settlement of slimes performed by the Dorr continuous slime thickener installed at the San Rafael mill in Pachuca, and it occurred to me that by extending the field in which this apparatus is at present employed, an entirely new system of cyanide treatment of slimes might be devised.

The elaboration of this idea has resulted in the following proposal of a system which I will call the dilution, in contradistinction to the decantation system of slime treatment. This system consists in the establishment of a series of slime thickeners, following the agitation tanks, with a dilution of the thickened pulp as it enters each successive thickener.

The apparatus which I recommend for the purpose is the Dorr continuous slime thickener, or any apparatus acting on the same principle, not only on account of its marked superiority over cones and spitzkasten as a settler, but also on account of the fact that the tanks and agitating apparatus used in the present installations of mechanical agitation in flat bottom tanks, could by very slight modifications be used as thickener tanks, so that the cost of the conversion of a decantation plant into a dilution plant would be small.

The advantages which I believe may be obtained by this new treatment over the decantation treatment are: *A*. Lower cost of installation, as fewer tanks are required. *B*. Less time required in the treatment, with a consequent increased capacity for a plant already installed. *C*. Less labor, as the manipulation of the decantation pipes is entirely eliminated. *D*. Smaller amount of precious metal in the solution discharged with the tailings, with consequent increased extraction. *E*. The same bulk of solution to be precipitated.

The advantages which may be obtained by this installation in connection with a plant practising mechanical agitation in flat-bottom tanks, with semi-decantation and filtering, comprise those mentioned under headings *A*, *B*, *C* and *D*, and in addition there would be *F*. Greater capacity and efficiency for the filtering plant. The disadvantage of such a plant would be that *G*. A greater bulk of solution would have to be precipitated. The advantages and disadvantages of such plants using Filtration tanks would be those mentioned under headings *D*, *F* and *G*.

* A paper read at the last meeting of the Instituto Mexicano de Minas y Metalurgia (Mexican Institute of Mining and Metallurgy) Mexico City, Mex.

† Author of "Cyanide Practice," Mexico City, Mex.

Method of Working the Dilution System

In order to explain the working of this system let us assume that we have an ore assaying 500 g. of silver per ton, which has been slimed in the ordinary manner and introduced into an agitation tank in the proportion of 50 tons of dry slimes to 150 tons of solution containing 0.3 per cent. KCy, and that the pulp thus formed is agitated continuously for 48 hours. We can assume, according to results obtained in Pachuca by continuous agitation, that at the end of that time, a washed and dried sample of the slimes will assay 70 g. of silver per ton, so that the 150 tons of solution will contain 21,500 g. of silver dissolved from the ore, or 143 g. per ton of solution.

By passing this pulp through a Dorr thickener we will obtain a thickened pulp containing 55 per cent. of moisture. Therefore we will have: (1) an overflow of 89 tons of clear solution assaying 143 g. of silver per ton, and 0.3 per cent. KCy; and (2) 111 tons of thickened pulp, containing 61 tons of the same solution. By mixing this thick pulp thoroughly with 549 tons of barren solution; i.e., 9 tons of barren solution for every ton of rich solution contained in the thickened pulp; we obtain, as a charge for the second Dorr thickener, a dilute pulp composed of 50 tons of dry slimes, mixed with 610 tons of solution assaying 14.3 g. of silver per ton. From this second Dorr thickener we obtain: (3) an overflow of 549 tons of clear solution assaying 14.3 g. of silver per ton and 0.3 per cent. KCy; and (4) 111 tons of thickened pulp, containing 61 tons of the same solution.

By mixing this thickened pulp with 549 tons of water and passing it through a third Dorr thickener, we have: (5) an overflow of 549 tons of clear weak solution assaying 1.43 g. of silver per ton and 0.03 per cent. KCy; and (6) 111 tons of thickened pulp, which as it contains but 61 tons of solution assaying 1.43 g. of silver and 0.03 per cent. KCy, may be thrown away, as it will not pay to extract the material in solution by further handling.

The preceding statements regarding the cyanide contents in the various solutions do not refer to free cyanide, as of course, a certain amount will have combined with the silver, etc. The only precaution required in this treatment is that, in each dilution, there should be a perfect mixture of the thickened pulp with the diluent, as otherwise the dilution would be imperfect, and the thick pulp, in falling to the bottom of the successive thickener tanks, might carry undiluted solution inclosed within its mass.

This mixing might be performed by a centrifugal pump, receiving both pulp and diluent and throwing them together into a bucket or other small receptacle, which would not only act as a mixing apparatus, but also enable the diluted pulp to overflow without much current into the successive Dorr thickener.

Treatment of the Solutions

The solution (1) should be precipitated, while solution (3) might be partially precipitated, and partially used in the battery, collection—and agitation tanks. But as each 50 tons of ore require 549 tons of precipitated solution for dilution in the second Dorr thickener, we can assume that we would have to precipitate 11 tons of solution per ton of ore treated. This is about the amount of solution precipitated in the decantation plants of the El Oro Mining and Railway Company, and the Dos Estrellas company, before the installation of the filters, so that in this respect there is no difference between the two systems.

The question naturally arises as to what is to be done with the solution (5); as, if fresh water were used in each dilution, the bulk of solution in the mill would soon be too great to handle, and if the solution (5) were used over again, as a diluent in the treatment of the successive charge, it would assay 2.71 g. of silver and 0.057 per cent. KCy; after its third use it would assay 3.82 g. of silver and 0.081 per cent. KCy etc.

This weak solution, after being used once or twice as a diluent, might be used in the battery and collecting tanks, and then its contents could be precipitated before being used again as a diluent, in which way the silver could be kept within reasonable bounds; but the cyanide content would creep up until equal to those of the strongest solution in use in the mill, which, with a 0.3 per cent. solution, would mean that with each ton of tailings discharged there would be a loss of 1.22 tons of solution containing 3.66 kg. of cyanide, thus making the cost of treatment rather high.

However, by using a weak solution of cyanide throughout the mill, say 0.05 to 0.1 per cent. KCy, as is at present done in mills using the decantation process with filter attachment, the loss by this dilution treatment would be within commercial bounds, and would be much less than that sustained under the decantation treatment.

In case this practice were followed, the precipitated barren solution should only be used in dilution of the thick pulp entering into the second Dorr thickener and the direction of pulp entering the second Dorr thickener should be performed by adding solution (5), which overflows from the third thickener, so that the quantity of solution to be precipitated would remain more or less constant, in the quantity of 11 tons of solution per ton of ore treated.

Application of the Process in Connection with a Filter Plant

When the dilution system is installed in connection with a filter plant the third Dorr thickener could be dispensed with,

and the thickened pulp (4) from the second Dorr could be run direct to the filters, where, after filtering, it could be washed with the small quantity or water required to replace that discharged with the tailings, so to keep the bulk of the solution constant, as is at present done in practice.

The advantages of installing this system in connection with a filter plant would be that, on account of the pulp being thick, the cake would be formed on the filter leaves in less time, consequently increasing the capacity of the present filter-plant installation; and also, that the silver content in the solution accompanying the pulp to the filter would be much less than those ordinarily contained, so that the losses which might occur through imperfect washing of the cake would be diminished.

This latter feature is of especial importance in installations where the ore is treated in Pachuca tanks, as in such installations the solutions which are filtered assay from 100 to 300 grams of silver per ton, according to the value of the ore treated, and subsequently it is customary to wash the cake on the filter, first with barren solution, and afterward with water; but even with this double washing the displacement of the rich solution is not perfect, as is evidenced by the fact that the tailings discharged from the filter sometimes carry solution assaying from 8 to 20 grams of silver per ton; so that at present the practice of collecting the wash water in dams, and reprecipitating is giving good results.

By the application of the dilution system, before filtering, the solution which is contained in the pulp delivered to the filter would be of such a low grade that the wash with barren solution in the filter might be unnecessary, as a simple water wash would probably extract all of the values in solution, so that the time occupied in filtering could be reduced one-third, with a resulting increase in the capacity of the present filter installation.

Plant Required

It is customary, in the decantation treatment of slimes, to consider that a tank 30 ft. in diameter and 10 ft. high is necessary for treating 50 tons of ore with 150 tons of solution, as if the pulp is thicker than 1 to 3 there will be little settling and decantation, so that in modern installations for slime treatment by partial decantation and filtering, counting on four days' treatment in the tanks, there are required from 24 to 27 tanks of this size for treating 300 tons of ore per day.

By the dilution system, as there is no decanting in the treatment tank, there would be no reason to prevent charging 100 tons of slimed ore with 140 tons of solution to each tank. Furthermore, as the same extraction is obtained in 48 hours by continuous agitation as in 96 hours by the decanting and settling treatment, the tank capacity for a plant treating 300 tons of ore per day by the dilution system would be as follows: Three thickeners, or agitating tanks used as settlers to dewater the pulp from the batteries; seven agitating tanks, being one extra for the time lost in filling and emptying; three Dorr thickeners for the first dilution; three Dorr thickeners for the second dilution; making a total of 16 tanks, as against 24 to 27 for the same purpose in the partial decantation and filtering plant of the same capacity.

In the older decantation plants, which have no filters, the tank equipment required is much greater than that of the partial decantation and filtering plants above mentioned, as in addition to the agitation plant therein described, there is generally a system of final settling tanks, where the slimes remain for another three or four days, so that there may be required from 20 to 30 more tanks of the same size for that purpose.

These settling tanks would be entirely replaced, in the dilution system, by the installation of three Dorr thickeners, for the third dilution, as the capacity of a 30-ft. Dorr thickener is about 100 tons of ore, contained in 222 tons of thickened slimes, and about 1000 tons of clear solution overflow per day.

Regulating the Quantity of Diluent

It may appear that the regulation of the exact amount of diluent to be supplied to each thickener would be a matter requiring extreme care and attention, but I believe that this would not be the case, as the only result of a slight variation would be that the solutions in the successive thickeners would carry more or less value, which could be regulated by the daily assays. The Dorr thickener works automatically, with very little attention, and would handle sudden changes without any trouble.

An easy way for workmen to judge whether the proper quantity of diluent were being added would be for him to have two cans of different sizes, which he could place under the streams of thickened pulp and diluent passing into the centrifugal pump, to observe whether the cans were filled in the same time, and if not, he could so regulate the valve of the diluent pipe that the time required to fill each can would be the same.

Assuming the specific gravity of the ore to be 2.7, that of the diluent to be 1.03, and the thickened pulp to contain 55 per cent. of moisture, the relative size of the cans required for a dilution of 9 of diluent to 1 of solution contained in the thickened pulp would be in the proportion of 6.87 to 1.

By the ordinary working of the dilution system, as soon as the assays have shown the extraction in any tank to be satisfactory the pulp contained in that tank could be transferred to the first Dorr thickener by means of a centrifugal pump, leaving the tank thus emptied ready for the next charge. But should it be desired, the plant might be arranged for the continuous working of the system. This arrangement, like that of the "Boss" continuous-amalgamation process, might have some advantages, and may be worth investigating. However, it would probably need some special arrangement for transferring the pulp uniformly throughout the agitation tanks.

Conclusion

I wish to state that my interest in the Dorr thickener is purely a scientific one, and I would further state that I do not propose this system as one which has been proved, nor would I advise its installation without having proved it by a preliminary trial on a small scale. I merely offer it as a suggestion to the various metallurgists practicing cyanide treatment, in the hope that the application of the principles herein proposed may be of benefit to them in their work, and that I may be instrumental to a slight extent, in the improvement of the present metallurgical practice.

The Antimony Industry in Mexico

The Mexican antimony industry was developed by M. Elsasser, an American engineer, who for many years controlled the market. Later he became associated with the Cookson interests of London and later sold out to them. A smeltery for the production of star antimony was installed at Wadley on the National Railroad in the northern part of San Luis Potosi about 1900 and practically all of the Mexican ore is now treated there and shipped abroad as metal.

The smeltery is controlled by the Cookson interests, which also have mines or contracts at Charcas, and Catorce in San Luis Potosi, and control the most important antimony deposits in other parts of Mexico. Most of the production is from mines controlled by this interest, as but very low prices are offered for independent ores. Recently several German buyers have appeared in the Mexican field and American interests were attracted there before the Payne tariff increased the rate of duty on antimony ore. There are abundant deposits of antimony in Mexico.

In the laboratories of the General Chemical Company the determination of minute quantities of arsenic in brimstone is performed in the following manner: The brimstone is oxidized by a mixture of three volumes of carbon tetrachloride to two volumes of pure bromine, followed by nitric acid. A little water is added and the nitric acid and carbon tetrachloride removed by evaporation. Arsenic is then determined in residue by Marsh or Gutzeit method.

Electrical Power at Mexican Mines and Mills

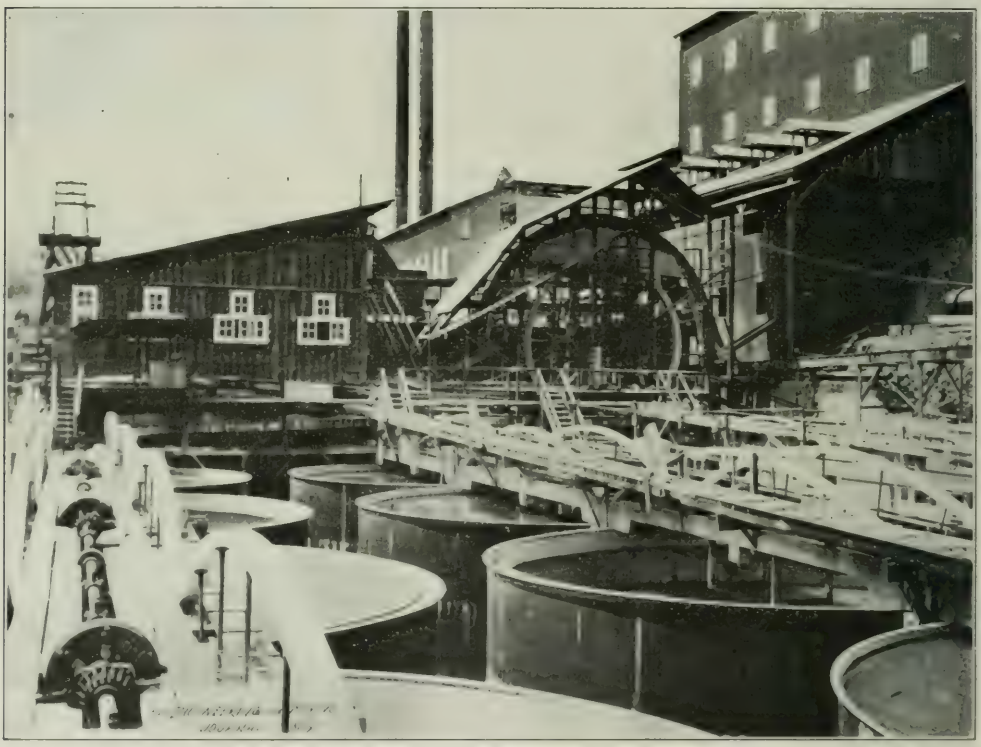
Installation at El Oro 30,000 h.p.; at Guanajuato 21,000 h.p.; Necaxa Power Transmitted 171 Miles to El Oro; Plant with 2950 ft. Head Planned

BY CHARLES V. ALLEN*

The progress in Mexico, resulting in the application of electricity to mining and milling is quite beyond the conception of those unfamiliar with the country's advancement. Not only has Mexico come into prominence through the development of silver cyaniding, but in electrical installations and applications, of which much less mention is made, the country holds no second place with the United States.

Electric power is becoming an essential feature in mining and milling, and its applications and possibilities are often little realized by mining men generally. The setting of steam engines and the lubrication of inefficient steam machinery, with its necessary multiplication of belt transmissions and resulting losses, is now passing with many mines, and in these days the mine manager finds it very necessary to have a knowledge of volts, amperes and watts, and also to know how to install and properly care for electric motors. While an electrician can be employed to attend to all this, at little expense, nevertheless an acquaintance with these matters on the part of the manager is all important.

All industries which have adopted electric drive have advanced rapidly by improving their product and increasing their output, but the mining and milling of coal and metals has experienced thereby an impetus greater than any other industry. One of the principal reasons for this, and there are also many of a local nature depending on the location of the mine, is the fact that practically all of the drives in a steam-power mine and mill are so readily electrically convertible, the only exception being the steam pump. With many other industries the peculiarity of the drives requires special motors and mechanical speed-changing devices which render the conversion much more difficult. An ingenious mine operator in Mexico has adapted a steam compressor to electric drive by fastening a boiler-plate flange around the flywheel to serve as the pulley to be driven by the motor. Steam hoists, so long as they are not of the direct-motion type, and there are few such, are readily changed to electric drive with very little expense; in fact I know of none in Mexico which have been abandoned and new electric hoists purchased unless the original steam hoist was too old to continue in service.



EL ORO CYANIDE MILL DRIVEN BY MOTORS UNDER BOARDWALK

*Consulting engineer, Apartado 2063, Mexico, D. F.

Mexicans Favorable to Electrification

The conditions in Mexico are much the same as in the western part of the United States, where fuel is expensive and water power available. The ordinary industry can be located where cheap power can be had. With mining, however, the conditions are different, as power must be supplied where the mine is. In earlier days water powers were used direct for driving mills where the conditions allowed them to be located within a reasonable haul from the mine. Nature seems to have provided for but few such installations, but with modern methods the possibility of transmitting electric power to great distances permits the mill to be located at the mine, where generally a desirable site for this purpose is available.

Formerly steam was the usual source of power, with wood as fuel, with the result that the wood has had to be hauled greater and greater distances until the cost has rendered further working prohibitive, resulting in the shutting down of many Mexican mines. This has opened an excellent field for electric power. The class of load common with mining customers is particularly desirable to power-transmission companies as it is especially steady, being 24 hours each day, and every day in the year.

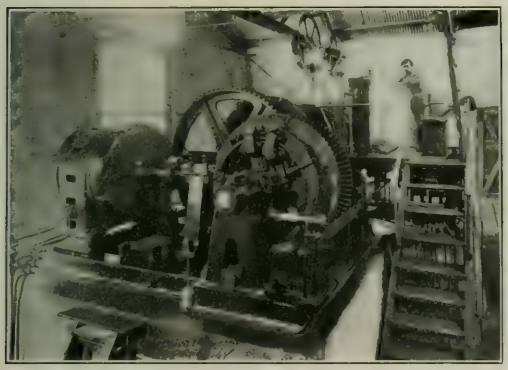
The fact that mining is so important in Mexico's industries, as well as the fact that the cost of fuel in most of the mining camps has become prohibitive, is doubtless responsible for the extensive adoption of electric power. In the mining and extracting of the metals, everything which can reduce the cost must be considered in order to make profitable the low-grade properties, and inasmuch as power is one of the chief sources of expense in Mexico, a country where labor is comparatively cheap, it is fortunate that the ample water powers in this mountainous country can be utilized to their utmost. This is being done, as reference to a few of the installations which have brought about vast changes in the mining industry of this country will show.

Guanajuato Camp Revived

Five or six years ago the Guanajuato mines were, with but one exception, abandoned on account of the inability to operate them due to the high cost of fuel for power purposes. They could no longer be kept unwatered, and the ore economically handled by the crude methods employing horse whims or *malacates*. The Guanajuato Consolidated Mining and Milling Company, however, was operating extensively and with this power customer in view, and for the lighting of Guanajuato, the Guanajuato Light and Power Company constructed a plant, which ultimately amounted to 8000-h.p. capacity, to generate electricity from water power and transmit it a distance of 110 miles to the Guanajuato camp. Today we find that in order to keep up with the large demand for power this company has installed two other power plants for 3000 and 10,000 h.p. respectively, making a total generating capacity of 21,000 h.p. Between $40,000,000 and $50,000,000 has been invested by Americans in the camp in the last five to six years. The mines with low-grade ore have been made to pay well, and the dumps, formerly abandoned, passed through the mills at a profit. In fact the whole community has been wonderfully revived by the reopening of the old workings, which have developed new strikes of very rich ore; probably the most remarkable of these being that of the Pinguico mines, which would have remained uncovered except for the advent of cheap electric power.

El Oro the Largest Consumer

The largest electric-power consuming mining camp in Mexico is El Oro. This camp receives its power from Necaxa, 171 miles away; it is transmitted at 60,000 volts at present, but this is to be raised to 80,000 volts soon. This has been found necessary on account of the demand exceeding any anticipation. In fact the power demands in all the mining camps have exceeded all original expectations. The power consumption in El Oro at present amounts to some 10,000 k.w., with over 30,000 h.p. of electrical machinery installed. This camp differs from Guanajuato in so far as there are a few large consumers instead of a large number of smaller consumers. The cost of power is from one-half to one-third of the former cost by use of steam. As a result the mines have increased the output and so reduced operating expenses that large accumulated piles of tailings, from which all the values have been extracted, so far as economical practice allowed with the former cost of power, are now being reground in tube mills and again treated by cyanide. Over 4500 h.p., requiring 50 electric motors alone, is used by the four large companies for hoisting in this camp. Thirteen electric locomotives are in service; the largest, 30-ton, being used on a 3.8 per cent. grade, is the first in Mexico to replace steam locomotives. Constant-speed motors are employed up to units of 600-h.p. capacity, and hoist motors up to 400 horsepower.



DOUBLE DRUM ELECTRIC HOIST, GUANAJUATO AMALGAMATED GOLD MINES AND THE MALACTE IT DISPLACED

Extensive Use of Electric Power in Pachuca

One of the most prominent camps, and one of the first to adopt electric power and make use of it universally was Pachuca. A large amount of electrically driven mining and milling machinery has been and is being added to mines in this district. This power is supplied by the Cia. Electrica é Irrigadora and the Cia. de Transmisión Electrica de Potencia. Until recently the former company's first installation, which comprised six generating units, and started about 10 years ago, was sufficient to supply the demand, but within the last two years it has added two more plants, with a fourth under construction. All of these plants use water from the

same river and the power is transmitted at 25,000 volts over two separate circuits to Pachuca. The largest principal consumer at present is the Cia. Real del Monte y Pachuca, which consumes about 4000 h.p. The Cia. de Transmisión Electrica de Potencia has also added two other power plants since the original installation.

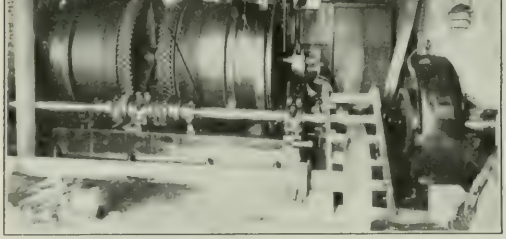
Electrical Power Is Being Generally Introduced

Mention might be made of Oaxaca, Parral, Chihuahua, Durango, Zacatecas, Temascaltepec, Sultepec and many other mining camps, where electric power is used to a greater or less extent.

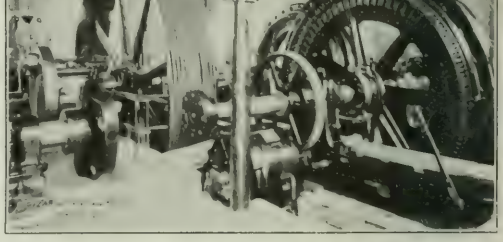
With the greater part of the mining operations of Mexico, situated as they are from 4000 to 7000 ft. above sea level, the rivers running to the east and west coasts create ideal water powers capable of inexpensive development. In many cases there are streams where there are available heads up to 3000 ft.; a power project recently surveyed has 2950 ft. head available.

In many of the camps where expensive fuel prevails, and the haul to market of the ore is also expensive, the ore must run 50 to 60 pesos to the ton, and even more in some places, to pay for shipping. This results in much low grade material going over the dumps after the richer ore has been sorted out. Naturally the remedy for this is a mill or a smeltery on the ground, or a railroad to reduce the cost of transportation. The latter is usually impossible, on account of the inaccessible location of the mines; and, furthermore, would not be of so much help except in the case where smelting ore was being mined. Whatever the class of ore being mined, cheap power at the mine is essential, all the more so if it be a mining ore of low grade.

As a result of the conditions in Mexico, electric power will play a more and more important part in the economical and expeditious [illegible] the development of the country.



STEAM HOIST CHANGED TO ELECTRIC, EL ORO



SYNCHRONOUS MOTORS DRIVING STAMPS AT EL ORO

Classification of Mexican Ore Deposits

A tentative classification of the ore deposits of Mexico is submitted by E. Ordoñez, mining geologist of Mexico city. It is as follows:

(1) Veins in more or less propylitized eruptives (andesites, dacites, porphyrites, etc.). Under this heading belong the greater number of the deposits of the Sierra Madre Occidental and some on the Mesa Central. Excellent illustrations are furnished by Pachuca, Huatla, Angangueo and Parral. Sulphides of silver are the chief ore and the gangue is mainly quartz and calcite. Gold is sometimes the principal metal. The silver is always accompanied by sulphides of other metals, such as lead, copper and zinc.

(2) True veins between walls of clastic rocks which have been metamorphosed by intrusives, and both of which have been faulted by tectonic movements before the introduction of the vein filling. These deposits are frequent in the central part of Mexico, such as Taxco, Zacualpan, Sultepec, Tlalpujahua, Providencia, Guanajuato and Zacatecas. Silver is the principal metal produced, but, as in type No. 1, it is often associated with gold and other metals named.

(3) True veins with quartz gangue, occurring solely in thinly stratified clastics, and without certainly demonstrated connection with intrusive rocks, even if in the immediate vicinity of eruptives. They are frequent in the central part of Mexico, and good illustrations are El Oro, Pozos and Temascaltepec.

(4) Segregated veins in effusive rocks and even at times in intrusives. The best illustrations are furnished by the deposits of tin and a few of iron.

(5) Contact deposits between limestones or clastics and intrusive rocks, such as greenstone monzonites, diorites and different varieties of porphyries. The mineralizers penetrating and among the strata [illegible] gave the localities, as they were [illegible] the [illegible] of long ranges of Cretaceous sediments. At other times the mineral deposits appear in connection with dikes, not only in Mesozoic limestones, but also in the Archean and Paleozoic strata of the southern and the northwestern portions of Mexico. These contact deposits are the chief producers of copper and iron in Mexico. The great copper mines at Cananea belong to this group, as well as most of the orebodies in the Sierra Madre Occidental, and of the interior and northern portions of the Mesa Central. While the larger portions of these deposits yield copper or iron, yet there do not fail those with lead or zinc, or even of gold in association with copper. Good illustrations are furnished by San Carlos in Tamaulipas, Sierra del Carmen, Golondrinas, Mazapil, Encarnacion, Las Vegas, Aurora, Balsas, Cerro de San Pedro, Campo Morado and many more.

(6) Deposits in cavities or caves in limestone and replacements in limestone, with or without connection with intrusive rocks. This group embraces all the important orebodies yielding lead, zinc, antimony and mercury and a few with copper. Illustrations are provided by Nonas, San Juan de Guadalupe, Sierra Mojada, Santa Eulalia, Naica, Amoles, Zimapan and others.

Mexico in 31 years has produced, according to the statistics of the Mexican mint, over $1,000,000,000 of gold. During that period the gold output has increased from $13,300,000 to $62,271,000 for the last fiscal year, 1908-09.

Tungsten is found in several localities in Mexico but the product is very limited, only one mine in Sonora having made any shipments. Deposits are reported from Oaxaca, San Luis Potosi and Guerrero.

The figuring basis in Mexico for gold and silver content is one gram of gold equals 1,550 pesos and one gram of silver at the New York price of 50c an ounce equals [illegible]

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The Mineral Production of Mexico

Owing to the incompleteness of the Mexican statistics of production, we are unable to give any thoroughly satisfactory table. Exports may, however, be taken as indicating the condition of the mining industry. We owe the statistics for 1908, together with a complete revision of Table I (from THE MINERAL INDUSTRY, Vol. XVII), to the courtesy of Don Miguel M. Irigoyen, chief of the Section of Statistics, Secretaria de Hacienda y Credito Publico.

From data in THE MINERAL INDUSTRY, Vol. XVII, we have compiled Table II, which enumerates the principal items of Mexican mineral production, with the exception of coal. In the case of zinc ore the statistics are but partially complete, inasmuch as they represent only the receipts of smelters in the United States, while European smelters have taken considerable quantities during the last two or three years and the real production of zinc ore in Mexico is probably 10 or 15 per cent. more than our table shows.

I. MINERAL EXPORTS OF MEXICO.
(In metric tons or pesos.)

Year.	Antimony. Metal	Antimony. Ore.	Coal.	Copper. Ore.	Copper. Ingot.	Gold. Ore.	Gold. Bullion.	Gold. Specie.	Gold. Precipitate.
1895	....	600	61,686	3,006	20,429	P 103,773	P.4,920,504	P. 175,098	P34 257
1896	....	3,261	75,541	144	20,659	206,874	5,533,789	261,078	206,674
1897	....	5,873	105,298	1,094	16,858	365,226	6,220,765	202,223	206,902
1898	....	5,932	118,553	13,146	10,362	1,037,202	6,493,735	367,704	358,791
1899	....	10,382	113,192	223	25,293	335,849	7,017,286	183,474	382,743
1900	....	2,313	38,676	408	27,970	306,392	7,435,864	192,456	305,868
1901	....	5,103	17,281	5,576	33,818	284,722	8,324,681	210,431	260,547
1902	1,218	1,280	3,406	6,101	63,609	303,979	9,079,371	129,899	118,953
1903	2,304	7,302	1,840	10,912	51,716	264,503	9,693,692	54,636	209,485
1904	1,694	81	125	48,365	57,338	537,290	10,867,272	172,532	255,219
1905	1,978	57	497	92,540	56,634	1,513,344	29,636,117	106,470	535,847
1906	2,418	178	91	73,193	46,767	5,369,173	21,072,014	37,746	517,642
1907	4,615	681	1,532	115,245	51,519	3,033,090	19,653,362	5,023,404	915,055
1908	4,046	36	719	70,900	26,214	2,746,289	30,101,546	42,389	479,903

Year.	Graphite.	Gypsum.	Lead. Ore.	Lead. Base Bullion.	Silver. Ore.	Silver. Bullion.	Silver. Specie.	Silver. Precipitate.	Silver. Slag.
1895	794	1,340	568	50,122	P.10,977,079	P.22,178,294	P.18,300,553	P. 570,124	P72,590
1896	795	2,050	167	48,663	9,971,053	28,565,843	18,737,331	1,533,355	64,121
1897	759	2,095	2	60,029	11,401,176	35,775,125	21,925,347	1,786,827	39,800
1898	1,365	1,650	(b)	60,918	11,048,358	37,137,599	16,588,789	1,920,843	46,488
1899	2,305	1,050	1	67,441	10,766,099	37,585,911	5,580,834	2,006,027	4,810
1900	2,561	1,600	468	79,944	12,495,524	41,468,745	22,679,655	1,961,253	87,886
1901	762	800	(b)	79,097	9,615,939	36,348,374	12,008,158	2,400,967	93,549
1902	1,434	(b)	118	107,366	4,108,088	45,796,576	17,753,526	2,087,263	132,093
1903	1,404	(b)	11	100,532	11,781,048	48,276,797	16,167,673	1,778,188	289,900
1904	970	(b)	1	95,010	11,000,869	45,430,020	7,251,132	1,563,808	202,594
1905	970	27	1	101,196	8,505,834	63,564,789	20,335,297	1,174,322	29,012
1906	3,915	(b)	(b)	73,699	9,619,763	63,057,152	42,390,357	1,029,997	(b)
1907	3,202	(b)	11	76,158	11,396,844	68,187,169	23,848,571	1,268,754	783,116
1908	1,076	(b)	26	127,010	11,230,372	63,298,659	60,405	860,546	(b)

(b) Not reported.

The most striking feature of the statistics of Mexican mineral production is the increase in recent years in the output of the base metals and non-metallic mineral substances. In an article published elsewhere in this issue Doctor Raymond and Mr Ingalls point out that the history of four centuries in America, North and South, emphasizes a great principle, namely, that while mining in new regions is originally inspired by the desire to obtain the precious metals, no permanent mining industry is established, and no substantial development is secured, until the mining of the base metals and of the bulky minerals, especially coal, is begun, "Precious-metal mining is characterized by the ephemeral camp; base-metal mining is distinguished by the growth of permanent towns, often cities, and an enduring population. This has been the history of the United States; it is becoming the history of Mexico."

Up to a quarter of a century ago, Mexico was known chiefly as a producer of silver, besides a comparatively little gold. In recent years it has attained a position among the world's greatest producers of copper and lead, and lately has been achieving eminence as a producer of antimony, zinc ore, and petroleum. It is these bulky substances that furnish traffic for the railways and constitute the basis of a permanent mining industry. Let us take up some of the branches of Mexican mining, subject by subject.

Antimony.—For 15 years or more, Mexico has been a producer of antimony ore. In the earlier years of this industry, all

of the ore was exported. Beginning with 1902 smelting in the Republic was inaugurated, and since then the exportation of antimony ore has dwindled to insignificance, while the output of antimony metal has attained such proportions as to put Mexico in the premier position among the world's producers of this substance.

Copper—Among the copper producers of the world, Mexico now ranks next to the United States, its normal output far exceeding that of Spain and Portugal. In 1908 the Mexican production was materially below the average owing to the suspension of operations at Cananea, pending reconstruction of works, etc., during the early part of the year, but in 1909 the Republic will no doubt regain its former position and will continue to forge ahead in the production of this metal. By the introduction of methods of improved mining and the modernization of its smelting works, the management at Cananea now expects to be able to compete successfully with the other big copper-producing companies of North America. After Cananea, Boleo is the largest producer of copper in Mexico, Aguascalientes next, and then Nacozari, although the latter probably will be rivaled by Teziutlan. There are in Mexico several deposits of copper ore that are believed to be large, such as those at Inguaran, in Michoacan (owned by the Rothschilds of France), which only await the advent of railways to become important producers.

Gold and Silver—The large increase in the production of silver in Mexico in 1908 was due to the increased application of the cyanide process, which has become the greatest feature of interest in Mexican metallurgy. With the further extension of the use of this process, the output of silver in Mexico will doubtless gain materially in spite of a continuance of price at the present level. Along with the increased production of silver there is a larger production of gold, inasmuch as most of the ore that is precipitated, with some of the other metals, is [illegible] gold which is recovered at the same time.

From the earliest application of the cyanide process in North America, it was well known that many kinds of silver ore were amenable to the solution used chiefly for the extraction of gold. It was indeed considered to be one of the great advantages of the cyanide process over the chlorination process that the former could extract the silver content of gold ores, which, of course, could not be done by chlorination. As early as 1895 the cyanide process was applied to the treatment of a straight silver ore in Nevada, the product being a silver precipitate that was melted into bars of the white metal. It remained, however, for metallurgists to make the great and general application of the cyanide process to silver ores in Mexico, and this has now become a branch of metallurgy that Mexico may properly claim for its own.

Lead—The chief lead-producing districts of Mexico are Mapimi, Santa Eulalia and Sierra Mojada. Mapimi, owned by a close corporation, is one of the most profitable enterprises in the Republic. Sierra Mojada, famous as a district, is no longer what it was in its pristine days. On the other hand, Santa Eulalia, which is one of the famous old districts of Mexico, is showing new developments of extraordinary character. Naica, a new district (developed since about 1906) is also figuring as an important producer of lead ore.

Petroleum—Ten years ago it was scarcely dreamed that Mexico would ever be a producer of petroleum, but during the last two or three years it has become famous by some extraordinary "gushers." Production was inaugurated in 1907. In 1908 important developments were made in the industry, and production practically doubled. Explorations, conducted at widely separated places, seem to indicate that a large territory, bordering on the gulf of Mexico, is underlaid by oil. Although the industry is still in its crude stages, the existence of oil in large quantities has been proved, and Mexico may be expected to figure largely as a producer within a few years, furnishing at least enough of this fuel to supply all domestic requirements, even though insufficient to make the Republic an important factor in the export trade. For the most part, the wells now producing furnish a heavy variety of oil with an asphalt base. Although not possessing the refining qualities of the lighter oils, the petroleum has been found to be valuable on account of its by-products.

Zinc Ore—Since about 1904, Mexico has been a producer of zinc ore, and in 1906-08 the mining of this substance attained large proportions, chiefly owing to the requirements of the smelters in the United States, whose supply from home sources was deficient. The recent imposition of a heavy import duty on zinc ore sent into the United States has been a serious setback to the industry in Mexico, which is now practically limited to the European market, where the price for spelter did not average so high as in the United States even before the recent tariff changes. The situation in the zinc industry of the world is at present greatly confused by the radical fiscal chances in the United States, wherefore it is doubtful what will be the result for the zinc industry in Mexico. Plans for zinc smelting in Mexico are being discussed, but so far they do not appear to be attractive or promising.

II. MINERAL AND METAL PRODUCTION OF MEXICO.
(In metric tons or kilograms.)

Year.	Antimony, Met. Tons.	Copper, Met. Tons.	Gold, Kg.	Graphite, Met. Tons.	Lead, Met. Tons.	Petroleum Met. Tons.	Quicksilver, Met. Tons.	Silver, Kg	Zinc Ore, (b) Met. Tons.
1905	1,978	65,449	24,236	970	101,196	.....	190	2,023,418	29,173
1906 ..	2,414	61,615	27,889	3,915	73,699		200	2,130,638	80,632
1907	4,615	57,491	28,108	3,202	76,158	294,000	(a) 200	1,901,934	98,681
1908	4,046	38,190	36,779	1,076	127,010	587,000	(a) 200	2,258,080	65,309

(a) Estimated. (b) Receipts of smelters in the United States.

When the directors of a mining company indulge in the practice of swelling apparent profit by charging various expenditures to capital account they soon find that the latter may become a very elastic and convenient quantity. However, it is necessary to sink shafts and drive drifts to get at the ore and it is proper that they be charged to the ore. If charged to capital account, as we have known it to be done, a drift may disappear in the extraction of the ore and continue to exist only in the capital account of the books. When a shaft is reckoned as an asset it is assumed that it will be still valuable after all the ore has been removed. This is not often the case. If shafts and adits were really assets, how valuable the Comstock would be! With mining companies, even more than with other industrial enterprises, the only safe rule is to charge to capital account only actual additions of productive property.

Details of Practical Mining

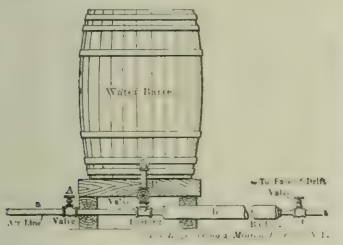
Notes of Interest to the Operators of Small Mines as Well as of Large Mines. The Things That Have to Be Done in Everyday Mining

REPORTS FROM EXPERIENCE

Readers of the JOURNAL are invited to contribute to this department. Articles should be brief, thoroughly practical, and preferably illustrated by drawings or sketches. Our draftsmen will prepare properly any kind of a pencil sketch that is intelligible. Something that is an old story in one district may be quite unknown in another. Articles accepted and published are suitably paid for.

Scheme for Ventilating the Working Face

In order to spray muck piles at the face of ill-ventilated drifts and assist the ventilation in a less wasteful manner than by "blowing out" the drift with air from the drill-supply line the apparatus shown in the accompanying drawing has been adopted at several large mines. A pipe



WATER AND AIR-LINE CONNECTIONS FOR SPRAY

connection is provided from a water-supply barrel to the air line *a*; this air line is enlarged at *b*. To spray the muck shot down the valve *A* is closed and water run into *b* by opening valve *B*. The air is then turned on, after *B* has first been closed again. In this way much less air is consumed than by the ordinary method of blowing out, and the water absorbs the gases contained or held by the muck.

Tail Rope Haulage Operated by Skips

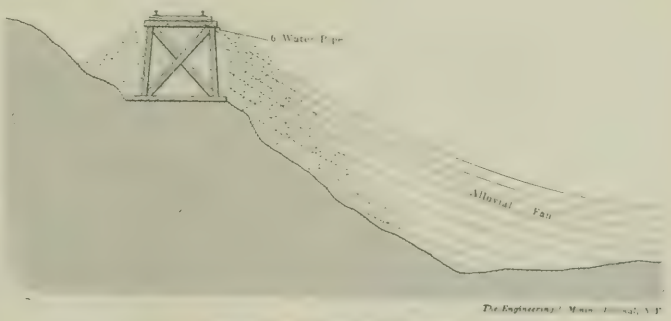
At the Republic mine, Michigan, where an unbalanced ore skip is being used, the descending skip furnishes power for hauling empty ore cars. The tram has a length of 900 ft., and has a sufficient down grade for the loaded cars to run out by gravity. The car is of the double-truck type, side dump, weighs 6500 lb. and carries 3½ tons of ore. A tail rope is attached to the car and is connected with a winding drum on the axle of the sheave. This drum is 8 ft. in diameter, the same as the sheave. A friction clutch is used to operate the drum. There is also a brake on the drum to control the speed of the outgoing cars. Both brake and friction clutch are operated by a wire rope from the station level. An indicator is also used to show the exact position of the car on the track. The car dumps automatically. Of course in this particular case the skip remains at the surface until the car has reached the bin and is ready for its return trip. As the skip descends, the friction clutch is thrown in, and the empty car is drawn back to the shaft ready to receive the ore when it comes up. This scheme works excellently with a shaft that is not working at its full capacity or where the stopping of the skip for a few moments does not interfere with the output. A second drum is now being installed at the same mine. This one will only be 4 ft. in diameter, as the distance for tramming the ore is less.

In a system of counterbalanced skip a similar scheme is used, except that the ascending skip also brings in the empty cars. In this case the loaded car goes out as the skip descends and then returns as the skip comes up. The drum is at the station level and is operated by a rope drive from the sheave. The drum, as before, is provided with friction clutch and brake. This of course adds a little extra strain on the hoisting cable, but it is not enough to affect seriously its working.

Disposal of Waste

In the stripping of the large ore deposits on the Mesabi range, the disposal of the overburden is one of the large problems that has to be solved. In most cases this waste material is hauled from one to two miles in side-dump cars and emptied over the side of a dump, 50 to 100 ft. high. The shifting of the standard-gage track to keep up with the growth of the dump is a matter of considerable expense. In nearly all cases this is accomplished by hand labor. At one or two mines it is done with the wrecking car by simply attaching four chains to 30-ft. sections of track, lifting them bodily and setting them over the required distance. At one mine a track shifter is being tried.

Where there is ample room and no danger of damage suits arising, the latest device is to use water to wash the material from the railroad tracks. The necessary requirements are a high bank upon which to build a 15- or 20-ft. trestle, and a deep gulch in which to deposit the dirt. A substantial trestle is constructed and this is filled up to the ties with dirt from the dump cars. Just beneath the ties and on the outside row of posts is placed a 6-in. water pipe with ½-in. holes in one side, 18 in. apart. These holes all open out from the track. The bottom of the trestle is buried sufficiently deep to hold it in place and there is little danger of its washing out.



DISPOSAL OF WATER BY SLUICING

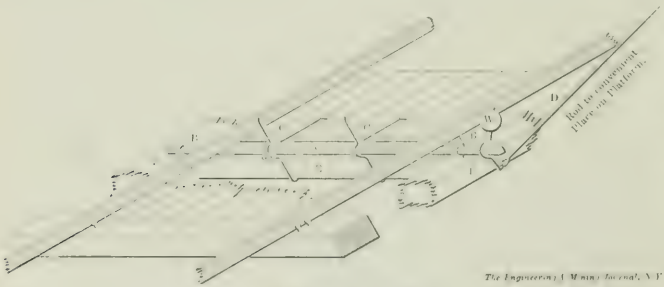
The material is dumped over the side of the trestle from the cars and the water plays upon it, washing it down the slope to the low ground. In this way the angle of repose for the dirt will be 10 or 15 deg. instead of approximately 40 deg. In

the east under consideration the track is about 75 ft. above the side of a small lake. This flat alluvial fan will extend out a long distance and add largely to the capacity of the dump. In this way a solid track can be maintained and it need only be moved once in many months, whereas, in the usual way it is necessary to shift the track almost daily. The shifting operation is expensive and in addition the track is always in bad condition. In the accompanying illustration, the dotted portion represents the waste that could ordinarily be dumped from the trestle, while the inclined lines to the right indicate the amount that may be disposed of by using water from the pipe which parallels the track.

Gate for Use in Incline Shaft

By A. H. Sawyer*

The contrivance shown in the accompanying drawing consists of a 2-in. iron bar *A* working in bearings *B B* fastened to the timbers *F F* which are, in turn, fastened to dividings not shown. Crossbars *C C* are held in place on the bar *A* by set screws. The upper portion of these crossbars engages the skip and the lower the timber *E* when the rod *D* is pulled. When the skip is hoisted, the weight *H* causes the bars *C C* to fall back in place. To prevent dirt from clogging the bars the apparatus is planked over.



PLAN FOR GATE IN SHAFT

Breaking Ground for Steam Shovels

Two systems of blasting the ground to be excavated by steam shovels are used in the Mesabi district, Minnesota. The overburden to be blasted is glacial drift, while the ore is soft hematite. Where the bench to be broken does not exceed 20 or 25 ft. in height, the usual method is to drill holes 15 to 18 ft. from the edge and about 15 ft. apart, extending along the entire bench to be broken. A handle bar is fastened to the drill steel and two men operate the drill by means of this handle. The drill is lifted about 2 ft. and dropped by its own weight. The men walk around in a circle 3 ft. in diameter and in this way turn the drill. When the hole is the required depth (about 20 ft.) one or two sticks of 7/8-in. powder are lowered and discharged to spring the hole. The hole is again opened and 5 to 15 sticks of dynamite are placed in the bottom of the hole and discharged to spring the hole further, so that it will contain 10 to 15 kegs of black powder. When loading the hole with black powder, a stick of dynamite, in which two caps and fuses are inserted, or an electric wire attached, is lowered in the hole and powder is filled around it. After the powder is in place, the hole is firmly tamped with sand. Each hole is discharged separately. During cold winter weather only one hole is discharged at a time, and the loosened material is moved before it has an opportunity to freeze. In the summer often 15 or 20 holes will be fired, one after the other, yielding enough loose material to last the steam shovel several days.

"Gophering"

The other system of loading, called "gophering" is used when the ground is so dry or sandy that the vertical hole cannot be kept open, or when the bench is too high to drill from the top. In this method holes are drilled in from the side. The total depth is 20 to 25 ft. A pointed 1 1/4 in. drill bar is used. After it has been driven a few feet with hammers, the bar is withdrawn, and sticks of 7/8 in. dynamite are placed end to end in the hole and discharged. This loosens the ground and the dirt is then taken out by means of a long handled shovel. In this way a hole 10 or 12 in. in diameter is opened. The hole is inclined at an angle of 15 to 20 deg. The lower end of the hole is sprung with 8 or 10 sticks of 7/8 in. powder and cleaned out. Ten to 15 kegs of black powder are then used. The black powder is fed into the hole by means of a box 3x3x15 in., nailed to a 22-ft. slim pole. The box is pushed in and turned over to empty it. Another method of loading is by means of a V-shaped trough made of 3x4-in. boards. The powder is poured into the upper end, and the trough given a backward and forward motion, and in this way the powder soon finds its way to the bottom of the hole. Two men can usually put in two of these holes per shift. If the ground is loose enough to work with the shovel, it is not necessary to spring the hole before the bottom is reached. However, if it should be a tough clay, it is necessary to spring it. When boulders are encountered, they are broken by discharging dynamite on their face. In case a boulder is too large to break in this way, it is often necessary to start another hole.

*Keweenaw Copper Company, Mandan, Mich.

Bundling Drill Steel

At the Hamilton shaft of the Chapin mine, where a small number of men are at work as contract miners, the steel is delivered at the surface from the shop. As the miners come out for their dinner, each drill gang selects its drills for the next shift. These are all bundled together and tied with a wire. While the men are out at noon, the steel is lowered and sent to a common distributing center near where the men are working. The majority of the work is by contract, and each contractor's tools are numbered. This saves the trouble of sorting the steel underground where the light is usually none too good. It also facilitates the distribution of the steel. The steel is furnished by the company while the powder, fuse and other tools are charged directly to the miner. At the Ludington shaft where most of the work is now being done, one man is employed whose only work is to look after, collect, and deliver the drill steel to the miner.

Swinging a Boom Pole

The scheme used at the Smith shaft of the Cleveland Cliffs Iron Company consists of having two pulleys anchored about 100 ft. each side of the boom. At a convenient place, out of the way of the boom, is a windlass upon which a rope winds. The two ends of the rope are attached to the boom and passed over the pulleys making an endless rope. The windlass between the pulleys is operated by one man. There are six turns of rope on the windlass to give it ample friction. The windlass will operate the boom in either direction.

Personal

Mining and metallurgical engineers are invited to keep THE ENGINEERING AND MINING JOURNAL informed of their movements and appointments.

Walter Douglas, of Bisbee, Ariz., has been visiting New York.

Harper Sproule has established an ore-testing station at Parral, Mexico.

C. W. Wright is returning to Sardinia to resume his professional engagement there.

Paul Danckwardt has been examining some mines in the Galena district in South Dakota.

Edwin E. Chase has returned to Denver, Colo., after three months' absence in Mexico.

Louis A. Wright, of the General Development Company, has been visiting New York.

Dr. E. D. Peters, who has been making a Western trip, returned to his home about Sept. 25.

Geo. L. Fraser has resigned as manager of the Royal Collieries, Ltd., at Lethbridge, Alberta.

Niels O. Bagge recently arrived in New York from Mexico, and shortly afterward sailed for Europe.

George D. Reid of Denver, Colo., is examining properties in the Snake river region of Oregon.

Alvah B. Carpenter has returned to Los Angeles, Cal., from a professional trip to Zacatecas, Mexico.

Joseph A. Haley, of Boston, has started on a trip to visit copper mines in Montana, California and Arizona.

S. F. Shaw, of Los Angeles, Cal., will be in Costa Rica during October and November making examinations.

C. Colcock Jones arrived at Seattle, Sept. 15, from a two months' trip to the Copper river region, of southwest Alaska.

Chas. H. Rundberg, superintendent of the Dominion Copper Company's mines at Phœnix, B. C., has resigned that position.

A. G. Kuehne and G. Richards, of New York, have been examining the Ferris-Haggarty and Elkhorn copper mines in Wyoming.

Dr. Fayette A. Jones, of Albuquerque, N. M., will be a member of a party organized to explore Tiburon island in the Gulf of California.

B. W. Vallat, formerly with the Colorado Fuel and Iron Company, is now connected with the Northwestern Iron Company at Mayville, Wisconsin.

Claude T. Rice, at one time on the staff of the JOURNAL, is editor and publisher of *Mines and Methods*, a new paper just started at Salt Lake City, Utah.

Bruce R. Warden, mining engineer for the Nicola Valley Coal and Coke Company, operating the Middlesboro colliery at Nicola Valley, B. C., has resigned.

E. P. Merrill, manager of the Real del Monte & Pachuca Company, has returned to Pachuca, Mexico, after a trip of several weeks to New York and Europe.

Stephen S. Goodale, a graduate of the Colorado School of Mines, has taken charge of the department of metallurgy and ore dressing in the School of Mines of the University of Pittsburg.

F. H. Banbury, engineer of the Acheson Oildag Company, of Niagara Falls, N. Y., sailed for Europe on Sept. 25. He will first go to Genoa, Italy, later visiting other countries to establish the Oildag process.

C. W. Saxman, formerly general manager of the Yampa Smelting Company and the Tintic Mining and Development Company, has opened an office at 312 Dooly building, Salt Lake City, as consulting mining engineer.

H. T. Dickinson, superintendent of mines for the De Beers Consolidated Mines, Ltd., at Kimberley, South Africa, is on a visit to the United States. His present address is at the Columbia University Club, New York.

Federico Stallforth, president of the Mexico Consolidated Mining and Smelting Company, has returned to the City of Mexico from a visit to the mines in company with J. B. Chavrier, a prominent French mining engineer.

President Taft, on his visit to Butte this week, was taken down to the 1200-ft level of the Leonard mine. He is, so far as we know, the second President of the United States who has ever been underground. He also visited the smelting works.

Ole Hallingby, for a number of years assistant mechanical engineer for the Calumet & Hecla Mining Company, has been made superintendent of the La Salle and Laurium mines, succeeding F. W. Ridley, who was appointed superintendent of the Allouez and Centennial mines some time ago.

G. C. Bateman and H. Lawrence Brown, of Cobalt, Ont., have formed the firm of Bateman & Brown, and are prepared to undertake the management, examination and development of properties in the Cobalt district. Both members have had varied experience in Mexico, the United States and Canada. Mr. Bateman is engineer for the Temiskaming & Hudson Bay Company, and Mr. Brown for the Silver Cross, Belmont and others.

Obituary

Charles Hamilton Paine died in Boston, Aug. 23, aged 56 years. He was in business in Boston from an early age, and for over 20 years was a member of the banking house of Paine, Webber & Co., from which he retired a few years ago. He was interested in a number of mining companies, and was a director in several copper companies.

Hugh Fletcher, of the Geological Survey of Canada, died at Lower Cove, Cumberland county, N. S., Sept. 23, of pneumonia, aged 59 years. Mr. Fletcher, who had been connected with the survey for 37 years, was a noted authority on the mineral resources of Nova Scotia. He had been engaged during the past summer in mapping out the coal areas of Cumberland county. At the time of his seizure he was on a visit to James Baird, manager of the Fundy mine.

Walton Townsend died in New York, Sept. 25. He was one of the pioneers in 1849, making the trip to the Pacific coast by way of Cape Horn. Settling in San Francisco, he played a prominent part in the early history of that city. Later he went to Portland, Ore., where he organized a system of pack trains, running into what is now Idaho. He also founded a bank there, and became interested in mining, and is said to have supplied funds for the development of the Copper Queen mine, in Arizona. Returning to New York, he retained his interest in mining projects until age compelled his retirement.

Societies and Technical Schools

Massachusetts Institute of Technology—W. E. Wickenden has been appointed assistant professor of electrical engineering to assume the duties vacated by Prof. George C. Shaad, who has gone to the University of Kansas to take charge of the electrical department at that place. Mr. Wickenden is now in the electrical engineering staff of the University of Wisconsin and has made a record for himself in teaching and research.

University of Illinois—H. H. Stoek has been appointed professor of mining engineering in the new Mining School at the University of Illinois. Mr. Stoek was graduated from Lehigh University in 1887. He received the advanced degree of E. M. in 1888. In 1885 he was assistant in the Department of Mineralogy, National Museum, Washington; in 1887 he was inspector of dredging on the Thames river, Connecticut; in 1888 he was assistant engineer of the Susquehanna Coal Company, Wilkes-Barre, Pennsylvania; and for three years following 1900 he was instructor in mining, metallurgy and geology at Lehigh University; during this period also he served as an expert in examining iron properties in North Carolina and in inspecting copper and iron mines in Michigan and Minnesota; from 1893 to 1898 he was assistant professor of mining and metallurgy at the Pennsylvania State College; and in 1898 he became editor of *Mines and Minerals*, published at Scranton, Penn. He is the author of many technical papers.

Special Correspondence from Mining Centers

News of the Industry Reported by Special Representatives at Butte, Denver, Salt Lake City, Goldfield, Cobalt and Toronto

REVIEWS OF IMPORTANT EVENTS

San Francisco

Sept. 22—Those interested in mining in Mariposa think that the county is on the eve of a mining revival. A number of mines which have been idle for years are being reopened with good prospects. One which was abandoned some years ago and the machinery removed, has been started again by Los Angeles capital, and is now the largest producer in the county. The veins in the county are generally large ones, it being one of the five Mother Lode counties of the State. The grade of ore on the average is higher than that found in the other Mother Lode counties. More of the gold is saved on the plates at the mill. From a total of over 51,000 tons worked in a recent year the saving on the plates was $6.89 per ton, while in Amador county the saving on plates was $3.04, in Calaveras $2.86, and in Tuolumne, $3.30 per ton; all these are Mother Lode counties. In El Dorado it was $7.40 per ton. The concentrates treated in Mariposa county yielded $88.38 per ton in gold and silver as compared with $67.43 in Amador, $51.84 in Calaveras, $47.78 in El Dorado and $25.68 in Tuolumne county. The total average recovery per ton in gold and silver from both plates and concentrates in Mariposa was $8 per ton, while in Amador it was $4.76 in Calaveras $3.72, El Dorado $8.22, and Tuolumne $4.17 per ton. Amador, Calaveras and Tuolumne counties had a much larger tonnage, while El Dorado was credited with a smaller tonnage. But these averages of Mariposa county are for the treatment of over 51,000 tons of ore from all the quartz mines of the county combined, large and small. The total recovery of gold and silver in that year in Mariposa was $408,711. These averages show the possibilities of quartz mining in Mariposa county to be excellent. There are plenty of known mines still lying idle for want of capital, which seems odd when people are looking for good mines, and those working in the country are making a good record in average values of ore treated. When ore will "plate" alone nearly $7 per ton, without counting concentrates, and there is plenty of it, the ledges producing it ought not to be neglected very long.

There is also increased interest in Inyo county of late, being as it does on the borders of Nevada where many prospectors have been at work in the past few years. In addition to its gold and silver, Inyo county is the largest producer of lead in California, and it has good copper mines as well, not many of which have been developed as yet. The county turns out also about $1,000,000 worth of borax a year. Recent railroad building in the county has made it possible to open districts heretofore inaccessible, so that in the future the base ores may be readily shipped to smelteries. Some few smelting plants are in operation in the county and more are planned. It is true that the copperfields of Greenwater did not turn out as well as at first predicted, but the first predictions were made by interested parties who were too sanguine. The salines of the county are very abundant and have been but in part developed. Soda and borax are being utilized, but there are other salines which will later be utilized. Meantime satisfactory progress is being made with gold, silver and lead properties, and much development work is in progress in different parts of the county.

There is more mining activity in Sierra and Plumas counties than has been the case for years. The discoveries at Alleghany and Forest, particularly in quartz, though to some extent in auriferous gravels also, which occurred within the past two years, attracted numerous prospectors and capitalists to that mountainous section which had been long neglected. Now the Western Pacific only has 75 miles of track to lay to be completed, and as it passes through Plumas county it will give a wonderful impetus to that whole mountain region both as to timber and mineral resources. The whole mineral belt of the two counties is being now pretty thoroughly prospected. Heretofore gravel has been most sought for, but now the search is principally for quartz lodes. The reason quartz mining has not been so popular is that capital was slow to assist the quartz miners, but now there is plenty of money available for anyone who can make a good showing. There is a large copperfield in Plumas county on which development work has been carried on for some years, but there has been no output as there were no means of transportation. With the completion of the railroad in a month or so, the miners will be able to ship the ores to smelteries and get the reward for their work and patience. The grade of the ore boxed is high, and these fields should be remunerative.

Another one of the higher mountain counties which now expects to attract attention is Modoc, in the northeastern part of the State. The Hoag mining district, near Fort Bidwell, has a number of active mines which have been developed during the past few years, but there has been no production because they had no mills to reduce the ore. Grading and building on a millsite is now under way and a custom mill is under construction. The camp is now about four years old and the miners have done a great deal of work without much reward so far. There are no railroad facilities in that section, so ores could not be shipped to outside reduction works. Now that a mill will soon be ready for work there is more confidence in the camp and some properties have been sold and on others leases have been taken. The ores are free-milling and considerable ore has been taken out awaiting a mill, which has now arrived.

Denver

Sept. 24—In the upper Clear Creek district, at Empire, on the Colorado & Southern, the Marshall-Russell tunnel is an enterprise worthy of notice. It is projected for 12,000 feet, and has already been driven 4000 feet, and it is stated that the company owns all the claims along its projected line. In its course, it will intersect a gold-bearing series of veins, and also a silver-bearing belt, both of whose early records of yield from surface workings give great promise for the future production from the tunnel. Among other well-known producers which will be intersected are the Neef, Gold Dirt and Tenth Legion. New York capital is said to be doing the work.

The continued strikes of high-grade ore in the lowest workings of many of the Cripple Creek district big mines has given rise to the name "Deeper Cripple Creek," and much speculation is rife as to the new territory to be made available when the Roosevelt drainage tunnel shall have tapped underground waters far below present workings.

Butte

Sept. 23—At a special meeting of stockholders of the British Butte Mining Company held last week it was decided to create a new class of stock to be known as bearer share warrants. The company was formerly capitalized at $5,000,000 with $1 par shares. Under the new plan the capitalization remains the same but there will now be only 4,500,000 shares of $1 each and there will be in addition 25,000 bearer share warrants of the value of $20 each. Stockholders will be allowed to

exchange at the rate of 20 of their old shares for one of the new bearer share warrants, and will be allowed one such exchange for every 200 shares now held by them. The new share warrants are issued for the purpose of enabling the company's stock to be listed on the Paris Bourse and the warrants will be printed both in English and French. It is understood that the real reason for the change is that there is little or no market for British Butte stock in this country or in England but that a market may be created in France.

New proxies for the annual meeting of stockholders of the Davis-Daly Copper Company, have been received in Butte. The new proxies are made out to F. A. Heinze, H. M. Raborg and W. C. Shaw, the former being directors and the latter assistant secretary of the company. The proxies specify that a majority of the proxy committee shall control and that they may vote on any resolution or proposition that may be submitted to a vote of the stockholders. The annual report of President Heinze has also been forwarded to stockholders. The report states that since the Davis-Daly took over the properties from the old Davis-Daly Estates Company, the shaft at the Colorado has been sunk 327 ft., of which 151 ft. is three compartments and 176 ft. four compartments, while another compartment has been added to the former two-compartment shaft by raising a distance of 1005 ft. Stations have been cut on the 300,- 1200,- 1400,- and 1500-ft. levels, each of an average of 30 ft. long and three compartments wide, except the 1400 station which is 90 ft. in length. A total of 2575 ft. of crosscuts, 1839 ft. of drifts, 634 ft. of raises and 160 ft. of winzes have been run. The new company has paid on account of the debts of the Davis-Daly Estates Company, $524,881; for property and equipment to June 30, $121,-756; and for development and general expenses, $254,926. Development from the Colorado shaft is stated to have disclosed three veins, one of which is 30 ft. wide and will assay at 3½ per cent. copper, 6 oz. silver and 50c. gold. The other two veins are 5 ft. wide. The shaft is stated to be down 60 ft. below the 1500-ft. level. Newman Erb and S. M. Jarvis, who recently resigned from directorships in the company on account of a disagreement with Heinze, have sent out a circular letter soliciting proxies for themselves and urging stockholders to vote for a conservative handling of the company's finances.

Considerable apprehension was felt in Butte over the outcome of the struggle waged between Butte Engineers' Union No. 83 and the Western Federation of Miners. A few days since, by a heavy vote, the engineers decided to withdraw from the Western Federation, alleging that, owing to the stand taken by the latter organization in asking for the repudiation of contracts which the Butte union had entered into with the mine owners, and owing to other questionable tactics, they found it impossible to get along in harmony with the Federation. The Butte Miners' Union, also affiliated with the Western Federation, in reply, came out with an ultimatum that no engineer not in good standing with their union would be permitted to work in or around the mines. A meeting of the seceding engineers was held in Butte last night for the purpose of organizing a new local union, and resulted in a riot. Members of the miners' union attempted to break up the new organization and several shots were fired and one man slightly wounded. In addition to the actual violence which attends the situation the Western Federation of Miners has instituted action in the local district court to enjoin the engineers' union from withdrawing from the national body and particularly to enjoin them from taking away and appropriating about a thousand dollars worth of furniture, stationery and other articles alleged to belong to the Western Federation. The situation is regarded as serious inasmuch as both sides are determined in their stand, and the ultimate outcome may possibly be the shutdown of all the mines in the district.

Later—The threatened strike of miners has been ended by the hoisting engineers returning to the Western Federation from which they had separated.

Salt Lake City

Sept. 17—The Utah Metal Mining Company was launched last week at a meeting of the stockholders of the Bingham Central Mining Company and the Bingham Standard Copper Company. Besides these two companies, the other properties in the consolidation are the Bingham Central Standard Mining Company and the Bingham Metal Company. The new company controls 3300 acres. The first work will be the construction of an 11,000-ft. tunnel which will be an underground highway between the Tooele and Bingham sides of the mountain. The property will be fitted out with electrical equipment. Power will be generated by the company's plant operated by water power. S. H. Treloar is manager.

During August, mining companies operating in Utah mined and marketed 10,500,-000 pounds of copper. In comparison with previous months this shows a falling off of 125,000 pounds. The decrease was probably due to the explosion of the reverberatory furnace at the Yampa smeltery and the changes in the Copperton mill of the Utah Copper Company.

During the week ending Sept. 10, the ore shipments from Tintic amounted to 7590 tons. Two new shippers were added to the list, the Bullock mine and Ridge Valley.

Goldfield

Sept. 27—The Red Top Cross on the 600-ft. level of the Clermont shaft of the Goldfield Consolidated has encountered the hanging wall of the Red Top vein after driving 450 ft. No drifting has been done on the vein and the value of the discovery is still unknown. An unexpected discovery of a large body of high-grade ore has been made on the 600-ft. level of the Mohawk shaft. Free gold is disseminated through the ore.

The Diamondfield Black Butte Mining Company is about to present a reorganization plan to the stockholders. The company owes about $18,000. The proposal is that, after the sale of the property under execution they will organize another company with the same capital as the present corporation, and that the owners of shares in the present company will be given a period of six months within which they may exchange their shares with a payment of 2c. per share and receive an equal number of shares in the new corporation. All shares not exchanged within six months will be lost.

The estimated production for the district for the week ending Sept. 19 was 6790 tons, having an estimated value of $238,175.

The production of Tonopah for the week was 5950 tons having an estimated value of $148,750.

Indianapolis

Sept. 25—The national executive board of the United Mine Workers of America, which consists of twenty-six members, including President Lewis and two other resident officials, convened in this city, Sept. 23, to discuss plans for aiding the 8000 striking coal miners in Nova Scotia. The organization has been furnishing the strikers with funds since they went out last July and will make every effort to sustain them in their fight. The striking miners are demanding increased pay and improved conditions of employment as well as the privilege of membership in any organization they choose. The operators are putting up a fight to compel the Canadian miners to separate from the United Mine Workers of America.

The new flameless explosive used in some of the mines in Pennsylvania will come up for consideration at this meeting of the executive board also.

Toronto

Sept. 24—Dr. Eugene Haanel, director of mines, announces that the first electric smelting plant in Canada, on a commercial scale will shortly be established in con-

connection with the iron and steel industries of the Lake Superior corporation at Sault Ste. Marie, Ont. The company is arranging for the construction of a number of furnaces similar to those successfully operated in Sweden. Another electric smelting enterprise is in contemplation for the treatment of the iron ores of the Ottawa district. A company headed by Louis Simpson of Ottawa, has secured a power site at Chats Falls on the Ottawa river, for generating electric energy and it is proposed to invest about $7,000,000 in an electric smelting plant. The success of these undertakings, Dr. Haanel predicts, will result in an extensive electrical smelting industry in Canada, many localities offering specially favorable opportunities owing to the proximity of large but hitherto unavailable iron orebodies to suitable water powers.

Cobalt

Sept. 24—The much larger amounts which the lots in the Gillies Limit brought in the last sale is due to the find on the Waldman property. When the limit was first thrown open, the public was somewhat suspicious, but the finds on the Waldman and other properties showed that there were very good possibilities. At the present time the Waldman is running the plant of the Provincial mine, and will get air from that source until the new owners take charge. The shaft is now down 50 ft., and there is good ore in the bottom.

Another recent find which has enhanced the value of the Gillies Limit lots and the surrounding properties was made on the Red Jacket, formerly known as the Morrison. The discovery was made on the 125-ft. level, and at one point where the vein was cut, it was 20 in. in width, carrying about 2000 oz. in silver. This find was made in the Keewatin formation. It was only a few months ago that engineers in this section considered that high-grade veins in the Keewatin would only be of very rare occurrence, but the development in the last few months has upset the theories. Since that time the Crown Reserve, Nipissing, O'Brien, Law son, Buffalo, Waldman, Red Jacket and others have opened up veins of high grade ore in the formation. These discoveries have been the means of opening up large areas that were hitherto considered unworthy of being prospected.

Dr. Milton Hersey is making an examination of some of the Gillies Limit lots for a Montreal corporation. Doctor Hersey was much impressed with the results of prospecting that are widening the silver-bearing areas around Cobalt, and he points out that these new finds are indications that thorough prospecting will find silver in many parts that are now considered barren. When the power companies have up and electricity ready for delivery many hitherto prospects will be opened up as they will then be able to commence work without the necessity of installing expensive plants, and the cost will be cut down from 50 to 200 per cent. This power will probably be ready for delivery at the end of the year, although mining men are not placing very much reliance upon the statements of the officials of the power companies, as they have been misled so often.

On Lot 6 of the Gillies Limit, recently purchased by A. J. O'Brien, the continuation of the Red Jacket vein has been discovered on the surface. It has been trenched for some distance and shows silver. This lot was formerly purchased by C. L. Pratt, of Detroit, but was forfeited. Negotiations are under way for the purchase of the Young O'Brien lot with some of the people interested in the Crown Reserve.

A surprise was created the other day when the Nipissing increased the dividend to 7½ per cent. for the quarter. On the capitalization this means a disbursement of $150,000. This has been done without any attempt to increase the shipments appreciably, and will leave the cash reserve, which is usually held at about one million, on the same basis as formerly.

Mexico

Sept. 21—The message of President Diaz to the opening of Congress on Sept. 16 recites in a definite manner the attitude of the government toward recent political movements in Mexico which have been attracting considerable attention abroad. The President says: "During recent months there has been perceptible a political movement preparatory to the election of federal officers which is to take place next year. It is certainly praiseworthy that the Mexican people show each time a greater interest in the exercise of its electoral right, as this is an earnest that in selecting its future officials it will perpetuate those conquests which the republic has made under those beneficent influences of peace. Unfortunately not all the manifestations of electoral propaganda have kept within the peaceful limits of the law, and initiated by agitators, prompted by their own personal interests, certain disorders have occurred, which the police have repressed with true moderation. The government, whose principal duty it is to preserve public order, will not permit that this be disturbed even though to accomplish the object, it may be necessary to employ energetic measures. Nevertheless, it is considered expected that this necessity will not present itself because the citizens will know how to make use of their rights subject to the law."

In another part of the message reference is made to the increased railroad mileage during the past semester, amounting to 536 km. The total railroad mileage of the republic at the present time amounts to 19,321 km. under federal concessions, and 840 km. are under state concessions. During the second semester of the fiscal year the number of mining titles passed was 2072. This compared with the corresponding period of last year shows a falling off of 36 per cent. Comparing the exports and imports of the two fiscal years the message points out that the imports show a falling off of 75,000,000 pesos, while the exports diminished only 11,000,000 pesos. In the past year there was exported 16,000,000 pesos of coin, which affects the real difference between the value of the exports and imports.

The local zinc-mining interests are concerned in the possibility of the effect of the Mexican ore upon the European market, as a large supply of zinc from Australia and other parts of the world, and the throwing on the market of the considerable Mexican output may result in lower prices abroad. This consideration has somewhat unsettled the plans for extensive operations in the shipping of zinc ore to Europe.

The Mexican congress is now in session, and it is expected that shortly the new mining law which passed the house of deputies at the last session will come up before the Senate for final confirmation. The law is now before a joint committee of both houses of Congress, and will probably be enacted substantially in the form in which it was approved by the lower house.

Local geologists are of the opinion that the reported oil found floating in the Gulf of Mexico recently is not due to any seepage from underwater oil formations, but rather to the oil which is floated in immense quantities into the sea from the Dos Docas well which was blown in on July 1, 1907, and which is still uncontrolled. This well is near Tampico.

London

Sept. 15—The 20th annual general meeting of the Institution of Mining Engineers is in session at Newcastle-Upon-Tyne. The meeting extends over three days, and visits will be paid to places of interest in the neighborhood, including the Harton Colliery and the Newbiggin Colliery, where a shaft is being sunk through sand by the drop-shaft method. A description of this work is given in a paper to be read at the meeting by F. M. Bainbridge, Jr., and Walter M. Redfern. Other papers to be presented are on "Fire-damp Caps," and the "Detection of Fire-damp in Mines by Means of Safety Lamps," by E. Bessell Whalley and W. M. Tweddle, on the "Equipment for the Study of Flamecaps and for Miscellaneous Experiments on Safety Lamps," by Professor G. R. Thompson, and on the method employed in stopping an extensive leak under high pressure in the tubing of the East pit, Murton Colliery, in 1907, by W. O. Wood.

Mining News from All Parts of the World

New Enterprises, Installations of New Machinery, Development of Mines and Transfers of Property Reported by Special Correspondents

THE CURRENT HISTORY OF MINING

Alabama

JEFFERSON COUNTY

A definite statement has been given out by George G. Crawford, president of the Tennessee Coal, Iron and Railroad Company, as to some of the future intentions of the corporation in this district. The company has completed the purchase of large tracts of land in the western part of Jefferson county, Ala., adjacent to the Ensley steel plant. A big reservoir with pumping stations, reservoirs, etc., to supply a larger and cheaper supply of water will be provided, by-product coke ovens will be constructed in large number and other improvements made. Plants to consume iron and steel will follow later. The plans include the building of a concrete dam on Village creek, 490 ft. long and 90 ft. high, which will form a reservoir with a capacity to store 2,500,000,000 gal. of water. Pumping engines with a capacity of 25,000,000 gal. per day will force the water through a 42-in. pipe-line 2¼ miles long, to the Ensley distributing reservoir. The company is also opening a new coal mine and will build 1000 coke ovens.

Alaska

Rainy Hollow—Burnem, Kennedy & Conway are sacking copper ore at Juneau for shipment to Tyee.

Chicagoff—The new Chilean mill is *en route* from San Diego. With the 4-stamp mill about 12 tons of ore is being treated daily, and under the new installation 30 tons can be milled.

Mills—The mill at Chicagoff is about completed. The building will accommodate 10 stamps, but only half will be installed this season.

The Reynolds Alaska Development Company—The company at Valdez is said to have $40,000 to pay creditors. If a settlement is made the company will expend a large sum on development work.

Wild Goose—The company is profitably operating three hydraulic elevators on Ophir creek, in the Council district.

Ketchikan—A peculiar condition prevails at present in the copper districts of Alaska, with only Ketchikan shipping ore at present where last year numerous mines were sending great quantities to the Sulzer, Ladysmith and Tacoma smelteries. There are today but two real producing properties, the Mount Andrew and the It. The mines on Prince William sound and other parts of southeastern Alaska are either closed or doing development work.

Porcupine—A recoverery of 270 oz. of gold as the result of a 20-hour run was recently made at the placer at Haines. E. E. Harvey is in charge.

Innoko—Prospectors are rushing into this new district from Fairbanks.

Arizona

COCHISE COUNTY

Boston-Courtland—A double compartment shaft is being sunk on the 300-ft. drill hole on Geronimo claim at Courtland. W. C. Humphries, manager.

Calumet & Arizona—The Irish Mag shaft, 1250 ft. deep, is being equipped with a 250-h.p. hoist and retimbered. Ore is meanwhile being hoisted through the Oliver shaft.

GILA COUNTY

Cordova—The Sullivan shaft between the Miami and Inspiration ground is down 400 feet.

Superior and Globe—Plan of crosscutting at 500-ft. level has been changed and shaft will be sunk deeper. A compressor is being installed.

GRAHAM COUNTY

Arizona Copper Company, Ltd.—Capital of company is now £703,084, including common and preference stock. Total dividends to date £2,731,671. Company office, Edinburgh, Scotland; mine, Clifton.

Shannon—Ore has been found below the lowest level of the mine at Clifton and the prospect of an important extension of the orebody is good.

MOHAVE COUNTY

Bi-Metal—The London Venture Corporation is reported to be negotiating for this mine near Kingman.

California

AMADOR COUNTY

Bunker Hill—The directors have decided to increase the monthly dividends from 3c. to 4c. per share. The orebody is being entered on the 1750-ft. level and drifting on the 1050 level will begin soon.

Kennedy South Extension—The electric power hoist has been started and cleaning out the shaft is going on.

BUTTE COUNTY

Mammoth Channel—The machinery for the new pumping and air-compressing plant at Magalia is being installed.

CALAVERAS COUNTY

Reiner—The pay channel, near Angels, has been reached at 270 ft. The 20-stamp gravel mill is installed and an additional 20 stamps ordered. J. C. Benson, superintendent.

EL DORADO COUNTY

Richmond—The group, near Omo, has been bonded to W. G. French, of Los Gatos, and will be operated. There is a small mill.

Heald—The mine at Nashville, owned by J. C. Heald, is under bond.

FRESNO COUNTY

Judges Mining Company—The company, operating the Richter, near Ockenden, has started up the new cyanide plant.

MARIPOSA COUNTY

Number Five—C. T. La Torbeau, superintendent, is installing an electric hoist and is sinking on the orebody, near Hornitos.

NEVADA COUNTY

New York-Grass Valley—In the mine which has been closed for a year, A. P. Wilson, working by himself, has found the lost ledge about 70 ft. from the shaft on the 900-ft. level.

Native Son—J. H. Bishop has obtained an extension of his bond on the mine at Blue Tent and will continue the tunnel.

Delhi—In addition to the rediscovery of the McMurray shoot in the west vein, there has been found ore on the east vein in the lowest or No. 8 level. Mine, near Columbia Hill, Hamilton Eddie, superintendent.

Eureka—The mine has been sold by Robert Morrow to Messrs. McCreedie, Tilton and McDonald, of Oakland, who are arranging to reopen it. It is near the Idaho-Maryland, Grass Valley.

PLACER COUNTY

Hidden Treasure—At the property, Bullion, H. F. Power, superintendent, a slope has been sunk a mile and a half from the mouth of the tunnel, from the white lead to the blue lead channel, 45 feet.

PLUMAS COUNTY

New York—The mine at Greenville has been closed, pay shoots not having

been found during the bond. The Indian Valley is also closed.

Long Valley—Superintendent Henry Adams reports 38 men at work on Rush Creek and the 10-stamp mill running steadily.

SHASTA COUNTY

Whiskey Creek—The group, a mile from Stella, has been bonded to C. M. Clark, of Buffalo, and W. W. Rees, of Redding. A 5-stamp mill for testing purposes will be erected.

Delta Consolidated—This company has made its first shipment of ore, the 6 miles of narrow-gage railroad being completed.

SIERRA COUNTY

General Sherman—The mine at Alleghany has been bonded to E. J. Morgan, Nevada City, who will transfer the bond to the syndicate operating the Gold Canyon and other mines at Alleghany.

SISKIYOU COUNTY

Golden Wonder—The mine on Cherry creek, near Yreka, James Whitney, superintendent, is ready to resume. A new concentrator has been put in the mill.

Mount Vernon—The mine at Cherry creek, near Yreka, after lying idle some years, is about to resume.

TUOLUMNE COUNTY

Confidence—The mine is being unwatered by Guy Scott, of Soulsbyville, and Charles Fisher, of Oakland.

Gold Spring—New pumping and hoisting machinery has been supplied at Jamestown.

Colorado

BOULDER COUNTY

Primos—McFarlane & Co., Black Hawk, has the contract for a 50-ton plant to treat company and custom tungsten ores at Nederland. E. F. Lake, Cardinal, manager.

Lilly of the West—The mine near Jamestown has been purchased by a Boulder company.

Livingstone—Ore from the Mianza ore shoot runs from $5 to $15 per pound. It is tellurim ore. Mine at Sugar Loaf.

CLEAR CREEK AND GILPIN COUNTIES

Gold Collar—A 100-h.p. boiler is being added at the mine. Alfred Skeels, Central City, manager.

Lamar Burroughs—These mines, in the Central City district, which it is stated have been intersected by the Newhouse tunnel, show big orebodies, and are to be developed by laterals. The Central tunnel is also said to be sending out as much ore to the Newhouse, and a goodly tonnage is also being delivered from the portals of the Lincoln and Rockford tunnels.

Lake Mines—The Mountain Electric company will install a 75-h.p. motor and a Rand air drill compressor has been ordered. Henry Eilmann, Central City, superintendent.

Martin—An eastern company will develop this mine at Apex. Fred Thompson, Central City, manager.

Dump—I. R. Ball, Central City, has bond, and will install machinery.

Mixsell Mill—McFarlane & Co., Black Hawk, has the contract for a 10-stamp mill at Idaho Springs, for Phillip Mixsell.

Colorado Blue Bell—This company, Idaho Springs, is figuring on machine drills.

Gold Quartz—A Nebraska company is interested and is figuring on a mill. Office, Alice, Colorado.

Kennedy—The erection of a concentrating plant of 50 tons is planned. David Kennedy, Georgetown, manager.

Virginia City—The property, near Georgetown, is under negotiations for $75,000.

Big Blue—This group on Saxon mountain is reported sold for $65,000. A compressor and tramway may be installed.

CHAFFEE COUNTY

Last Chance—The company will operate claims in Taylor gulch near Garfield. H. G. Green, Salida, manager.

CUSTER COUNTY

Bull-Domingo—Work has been resumed at Bassick.

Geyser Silver Mining Company—Extensive explorations at Silver Cliff are carried on at 1400 and 1850 levels. A 40-ton mill is being built. O. W. Murphy, manager.

LAKE COUNTY—LEADVILLE

Wolftone—A daily shipment of 350 tons of lead-sulphide ore to local smelter is maintained.

Highland Mary—Work has been resumed and shipments of 50 tons daily are being made. North and south drifting is being carried on.

Robert Emmet—The mine is in shape to ship 30 tons daily of zinc ore to Chicago.

Ontario—The mine at Twin Lakes is shipping three carloads monthly from the lower tunnel.

St. Louis Tunnel—The lessee, the Little Evelyn Company, has discovered a body of siliceous gold ore south of the tunnel in Breece hill and is shipping.

MINERAL COUNTY

Blue Bell—Active work is being carried on by the company in Creede properties.

Creede United—Machinery is being installed to advance the Humphries tunnel work and mill being repaired to take care of anticipated ore. A. E. Humphries is in charge.

North Creede Mining Company—The company has been formed in Denver with $500,000 capital to carry on extensive work at Creede.

SAN JUAN DISTRICT

New Gold King Mines—Improvements on mill are nearly completed and development is under way. V. E. Kerr, Silverton, manager.

TELLER COUNTY—CRIPPLE CREEK

Delmonico—The experimental plant for the treatment of dump ore without crushing has proved a failure.

Pharmacist—The mine will reënter the shipping list taking ore from the S. N. Simmons lease.

Jenny Sample—Work will be resumed under new contracts to local leasers.

Modoc—A crosscut will be driven from 500-ft. level to Ocean View claim. F. H. Frankenberger, manager.

Jerry Johnson—During the year 6840 tons averaging $27.24 a ton were shipped and 2782 tons averaging $4.72 a ton treated at the mill.

United States Reduction and Refining Company—During the first six months of the year the net earnings were sufficient to provide for sinking fund contribution due for that period, pay the accrued interest on the company's bonded indebtedness, and yield a substantial surplus for the preferred stock.

Indiana

CLARK COUNTY

A fine prospect for a coal mine has been discovered in the slate bank of a ravine on the Sweet farm, two miles north of Henryville. Recent high waters have washed pieces of pure hard and soft coal out of the steep banks formed by slate and gravel; the pieces found range in weight up to a pound or more. Preparation is being made to develop the find.

VIGO COUNTY

The regular quarterly meeting of the Indiana Coal Operators' Association was held in Terre Haute, Sept. 16, and the members heard an address by State Mine Inspector Epperson on the enforcement of the mining laws. The operators reported increasing prosperity in the mining industry. The committee appointed to promote the establishment of a safety station in the Indiana field, where fire fighting devices could be kept, reported progress and promised a definite report at the December meeting.

Idaho

BOISE COUNTY

Gold Hill—Consolidation with Iowa has been effected. Active work for resumption is under way at mines and mills at Quartzburg.

Columbia—The 50-ton mill is nearly completed. J. H. Friar, manager.

SHOSHONE COUNTY

Orofino—Plans for the construction of the 100-ton mill at Murray have been received and work of grading the foundation begun.

Bear Top—This mine adjoining Orofino has shipped a car of ore and a car of concentrates. Eight or ten cars are being shipped each month. The capacity of the mill will be increased.

Federal—Efforts to clear up and retimber the portion of No. 6 tunnel which caved in last week are being pushed. This is an exit for all ore from both the Mammoth and Standard mines.

Hercules—Since the destruction by fire of the mill, the mine has been closed. The high-grade ores will be shipped and the other grades will be dumped near the site of the old mill.

Monarch—The construction of a 300-ton ore bin is to be begun. The orebody continues to widen out and the capacity of the mill is being increased from 75 to 200 tons.

Montana Standard—Zinc ore has been shipped from Burke to Joplin for experimental treatment.

Kansas

CHEROKEE COUNTY

Childress & Co.—A five-lot lease on the Lou Dillon tract has been purchased. Construction on a mill is to begin soon.

Herald—Extensive drill work on the lease has disclosed one of the largest runs of zinc in the district. The discoveries show more than 100 ft. of zinc ore above the 300-ft. level.

Lucile—The new mill at Baxter Springs will be in operation in October.

Mission—Foundations are completed for the 400-ton mill south of Baxter Springs. An additional shaft is being sunk.

Lancaster—The property is one of the leading producers at Baxter Springs. Water is secured from a 900-ft. well. Edward Miller, manager.

Michigan

COPPER

Adventure—The vertical shaft to open the three lodes exposed in the drill cores is down 200 ft., and good progress is being made. A hoisting plant capable of taking care of all the exploration is in commission, and the railroad spur is nearing completion. The first lode will be encountered at 950 feet.

Oneca—The first drill hole is down 600 ft., and is nearing lode. No. 2 hole, 4000 ft. to the north of No. 1, is down 120 ft. Both these drills are to expose the Baltic lode.

Ojibway—Drifting from the 800-ft. level between shafts is progressing satisfactorily and is revealing a good showing. Sinking is going forward in both shafts toward the 250-ft. level, at which point it will be temporarily suspended and attention given to opening up ground to maintain rock shipment for a mill run which will be made early the coming year. No. 1 shaft is down 1100 ft., and No. 2, 1200 feet.

New Baltic—The drill on this tract is down 325 ft., and has passed through an amygdaloid foundation carrying small copper. The formation is 750 ft. vertically.

Copper Range—Diamond-drill operations have been discontinued at Sections 7 and 8. A complete cross-section of the tract has been made. Nothing has been given out regarding future developments.

Mass—This company is blocking out stoping ground at the 13th, 15th and 17th levels on the so-called new lode, and when enough has been done to keep one lead of the mill in operation, shipment from this source will begin.

Osceola—The No. 4 Kearsarge shaft is about to enter the producing list. It is down 1000 feet.

IRON

Breitung Hematite—The mine at Naguanee, which has been idle for four years, will be reopened.

Missouri

JOPLIN ZINC-LEAD DISTRICT

Nowata—The mine at Porto Rico produced 226,000 lb. zinc and 13,000 lb. lead in 6 shifts. This is the greatest production of any sheet-ground mine in the district. The mine is on the Luke and Ash ground. Wilbur Squires, Joplin, manager.

Nashville-Tennessee—The company has nearly completed its 150-ton mill, East Hollow, northwest of Joplin. Edward Mallet, manager.

Zincite—The camp is becoming active. Two new mills on the Claycomb land have added to the production.

Thornton—The company has struck lead at 175 ft. on the Murphy-Hancock lease. Claude Thornton, manager.

Old Dominion—On the old I Know lease, at 135 ft., a large face of ore assaying 30 per cent. has been exposed and $2500 worth of ore taken out the first week. Walter Porter, manager.

Montana

BROADWATER COUNTY

Three Forks—The property, 6 miles north of Three Forks, is being developed by Herbert G. Dunbar. The work has been done on the Pennsylvania claim, where a shaft has been sunk 250 ft., which will be continued to the 300-ft. level.

BUTTE DISTRICT

North Butte Extension Development Company—At the annual meeting, Oct. 19, plans to raise money for development will be submitted. The company has paid for the Overman claim.

Davis-Daly—Newman Erb and S. M. Jarvis have secured an order of court resulting in postponing the annual meeting to Oct. 15.

CHOUTEAU COUNTY

Little Rockies—Stockholders have authorized sale for $300,000.

GRANITE COUNTY

Bi-Metallic—The south end of the mill on the property is being remodeled into a chlorination leaching plant for the treatment of tailings from the pan-amalgamation mills.

JEFFERSON COUNTY

Minneapolis-Corbin—The double-compartment shaft is now down 170 ft. At 200 ft. a station and crosscut will be made.

Nevada

CHURCHILL COUNTY

Nevada Hills Mining Company—The caving of the ground in a winze from the 350-ft. level disclosed a rich body of ore. The mine is at Fairview.

Nevada Hills—A strike of lead-silver-gold ore has been made in a faulted vein barren in the upper levels. W. H. Webber, manager.

ESMERALDA COUNTY—GOLDFIELD

Goldfield-Daisy—Spenker & Piper, leasing on the 200-ft. level of Daisy No. 2 shaft, have encountered a body of ore running from $18 to $25 per ton.

Goldfield Consolidated—A cave-in in Consolidated Hampton stope has put the Combination mill out of commission and will decrease earnings about $60,000 monthly until new mill is enlarged.

NYE COUNTY

Johnnie Mining and Milling Company—The company has purchased for $6000 the Battery group of five claims adjoining the Johnnie on the north. The Johnnie is at present working a force of 50 men. The Lane mill will be installed at once.

Pioneer Lease—Under the direction of W. B. Deveraux, at Pioneer, a crosscut from the 210-ft. level has cut the vein. The ore shoot was lost in the levels above and the present discovery is of importance

Montana-Tonopah—Annual report shows debt of $300,000 paid and $45,000 in hand. Charles E. Knox, reëlected president.

STOREY COUNTY

Utah—Work is resumed and tunnel No. 4, abandoned 30 years ago, is to be extended.

Consolidated Virginia—Two crosscuts have been started on 1850 level

Equitable—The mine in Six Mile cañon

is being sampled preparatory to resumption of development to 1200 ft. by the reorganized company.

Lady Bryan—Mill in Six Mile cañon is being remodeled to treat ore from 270-ft. stope.

WHITE PINE COUNTY

Cumberland-Ely—There is no change in the labor-strike situation and no ore has been produced for several months.

Steptoe Mill—The Nevada Consolidated is supplying about 6000 tons daily. No ore is coming from the Cumberland-Ely.

South Dakota

BLACK HILLS DISTRICT

Gold Dollar—The company has bought the Eleventh Hour mill and will move it to Squaw creek.

Golden Reward—Work will be resumed at Hardscrabble property.

American Eagle—A new ore shoot has been opened up. Company planning to start mill at Maitland again.

Utah

BEAVER COUNTY

Red Warrior—The control has passed back to the promoters. Development is planned. W. J. Merritt, Beaver, manager.

Revenue Consolidated—Development is going ahead. Roads have been completed to Newhouse and the compressor started. Crosscut tunnel to connect with the ore in the shaft is under way. A. J. Walter, Beaver, director.

JUAB COUNTY

Centennial-Eureka—Arrangements have been completed for the driving of a tunnel from the road west of Eureka to the 550-ft. level of the Centennial-Eureka. The tunnel will be 3000 ft. long and double tracked throughout and with electric haulage. The tunnel will save the company $15,000 a year in hoisting.

Lower Mammoth—The company will complete retimbering and sinking of the shaft by Dec. 1. With the completion the mine will again be one of the Tintic producers.

SALT LAKE COUNTY

Utah Copper Company—The August output was 5,162,716 lb., and cost slightly over $[illegible]. About 8500 tons daily are being treated at Copperton, and Garfield. "Strip ping" is not made a charge against operating expenses in the above cost estimate.

SUMMIT COUNTY

Lucky Tiger-Combination Hill—A night shift of [illegible] men has been put on at Park City on the Grand level.

Silver King Coalition—The contribution [illegible] Daniels, the Hanauer and the Alliance tunnel of the Silver King will be finished soon.

Washington

KITTITAS COUNTY

Gallagher—The property at Cle Elum has been sold by the receiver to L. A. Johnson. Work will be resumed. G. W. Gallagher, manager.

OKANOGAN COUNTY

Q. S. Mining Company—The annual meeting decided to erect a customs smeltery near the mines. A. M. Dewey, Spokane, manager.

Wisconsin

ZINC-LEAD DISTRICT

Fox—The mine at Benton was bought by Mineral Point Zinc Company for $25,000. The fee to the land, 259 acres, was bought for $32,500. It has two shafts to ore, and is equipped with 75-ton mill.

Wisconsin Zinc Company—The company has taken possession of the property of the LaFayette Land and Mining Company, 1000 acres between Shullsburg and Benton.

Vinegar Hill—A new shaft was started on the Rundell farm at Rewey.

Wyoming

CARBON COUNTY

Leighton-Wyoming—Machinery from the Haskins mine will be moved to property near Dillon. J. T. Leighton, manager.

Walcott—Development is under way and equipment installation completed at Elkhart mine, Saratoga. W. C. Sammons manager.

Ferris-Haggerty—Engineers are examining mine and holdings of old Penn Wyoming company in connection with pending negotiations.

Canada

ONTARIO—COBALT

Trethewey—Another 10 per cent. dividend will be declared in the near future.

Hylands—A new vein, in width up to 28 in., carrying silver, has been discovered.

McKinley-Darragh—During August the mine produced 140,000 oz. silver. At the present the mill is unable to handle the ore in hand.

Bailey—A tunnel will be started to cut the vein from which the Cobalt Central mined.

White Reserve—The property, in the Maple Mountain district, has shut down temporarily. It is in good condition, and a shipment of [illegible] tons was recently made. Internal dissension is probably responsible.

Young Hudson—A 22,000 shipment has been made.

Kerr Lake—The mine is producing 200,000 oz. of silver per month at an estimated cost of about 7½c. per oz. All of this output is from development.

La Rose—This company has declared the quarterly dividend of 3 per cent. with 1 per cent. bonus. The Lawson will soon ship ore steadily, and this will add to the resources of La Rose.

Ore Shipments—Shipments from Cobalt for the week ending Sept. 18 were as follows: Crown Reserve, 63,000 pounds; Drummond, 72,100; Kerr Lake, 160,050; La Rose, 130,000; Nipissing, 252,301; O'Brien, 63,960; Temiskaming, 60,000; Trethewey, 123,000; total, 924,420 pounds.

ONTARIO—GOWGANDA

Prospectors Exploration and Development Company—Ten claims have been staked on Meteor river, a new district, 16 miles southeast of Gowganda. The formation is diabase broken by numerous calcite veins.

Bartlett—Crosscutting at the 100-ft. level has resulted in the discovery of new veins. On shaft No. 2 a vein found in the shaft at 40 ft is now yielding at 70 ft. Several new veins have been recently uncovered on the surface.

ONTARIO—PORT ARTHUR

Glenorchy—The company is prospecting quartz veins and iron formation on Canadian Northern railway at Glenorchy.

ONTARIO

Minnehaha—Active operations have been commenced at Manitou lake, by the Minnehaha Mining and Smelting Company, of Buffalo.

Wright—The shaft is down 30 ft., at which depth the ore encountered shows gold. The mine is at Dryden.

BRITISH COLUMBIA—ROSSLAND

Le Roi—The main shaft will be sunk below the 1650-ft. level and diamond drilling undertaken when pending financial arrangements are concluded.

Westmoreland Copper—An option on this property in Westmoreland county has been given to L. Vogelstein & Co., of New York, and an engineer has been sent to examine the property.

YUKON TERRITORY

Dawson—The largest nugget in the Forty-Mile district was found a few weeks ago by Carlson & Wagoner on No. 7. It weighs 95 ounces.

Gold Seekers Dredge—Arrivals from the Forty Mile district bring word that the dredge, the uppermost on Walker's Fork, has had excellent pay all summer.

Lone Star—The mill started last month, indicating renewed activity.

Klondike—Great prosperity is reported at the quartz properties. 110 quartz claims were located in July, and over 150 applications were made in August. A stampede is reported from the lower Yukon to the mouth of the Kuskokwim river.

Mexico

AGUASCALIENTES

Asientos—The Aguascalientes Metal Company, Albert Doerr, manager, is making heavy shipments.

Los Angeles—Bruno Newman is developing extensively on this and El Doctor.

CHIHUAHUA

Dolores Mines Company—A dividend of 18 per cent. has been declared. The profits for three months to Aug. 31 were $141,358. Total cash resources, $308,819. The mine is in western Chihuahua.

Palmilla Mill—The milling company has approved plans by Bernard MacDonald for a 60-stamp unit of the proposed 200-stamp installation. The mill will be south of Palmilla mine and treat also custom ore. Water for mill will be supplied by hydraulic ram from flow from new Palmilla tunnel.

New Year Mining Company—At Sierra Mojina, west of Gallegos, the company is developing the Sierra Mojina, an old silver-lead-gold mine.

Naica—The Naica, Lepanto and Ramon Corona mines are shipping steadily a large tonnage of silver-lead ore, most of which is treated at the Encinillas smelter at Santa Rosalia.

Las Plomosas—Jose Lago is completing his concentrating plant near the Conchas river, and expects to produce 30 tons daily of high-grade zinc concentrates.

San Carlos—The company is developing some enormous ledges of ores carrying gold, silver, lead, copper, zinc and iron in western Chihuahua, near the Rio Grande.

DURANGO

Ventanas—The 200-ton plant and hydroelectric installation is nearly completed. The mine is now owned by an English company. D. J. Pullinger, manager.

Guadalupe—The mine at Indé is operating regularly. It receives power from the Sestine river for 100-ton mill. A. A. May is manager for the Barings of London, owners.

El Toro—A Chicago company is operating this property and another at San Ramon in the Topia district, near Canales.

Avino—Under new management this English owned mine near Durango is planning to operate, shipping product to smeltery.

Velardeña—The smeltery is buying custom ore. One copper and three lead furnaces are in blast.

Mapimi—A geological survey of the Peñoles company's property is being made.

GUANAJUATO

Nueva Luz—The shaft to cut the Veta Madre at 2000 ft. is now down 1366 ft. Carl Henrich, manager.

San Cayetano—The successful unwatering of mine by the tunnel has been accomplished.

Guanajuato Consolidated—Estimated gross value of 7433 tons of ore for August, 128,000 pesos. Profit, 56,000 pesos; 8300 pesos was spent on development.

GUERRERO

Maine and Nebraska—The smeltery near Balsas is completed. Walter E. Koch, engineer.

La Union—The copper property near the coast is being explored.

La Dicha—The property of the Mitchell Mining Company is still closed awaiting adjustment of the company's affairs.

JALISCO

San Pedro Analco—A cyanide plant will be erected soon. Patio process is now used. Carlos Gil, manager.

Cinco Minas—Road to Tequila has been repaired and much machinery is being taken to mine. Sinking on vein is being pushed. H. E. Crawford, manager.

Mina Grande—This mine, Hostotipaquillo district, has been sold to a French company in which F. J. Fournier is interested. Luis Chevrillon is engineer.

Mololoa—A Toronto company is developing and will erect a plant.

Amparo—The mine at Etzatlan is being extensively developed and good results are obtained in the mill.

Agua Blanca—Pumps and hoist will be installed and mill overhauled. The property, in Autlan district, now belongs to Jalisco-Guanajuato Development Company, Dwight Furness, manager.

HIDALGO

Flojonales—The Robert S. Towne interests have purchased this mine at a town of same name in northern part of State, and will operate. Explorations have been carried on for two years.

MICHOACAN

Santiago—Plans for a 1000-ton mill are being made. The mine yields low-grade gold ore. It is controlled by a Chicago company.

NUEVO LEON

Cruz del Aire—An aërial tramway is under contract. The company at Sabinas Hidalgo is shipping 30 cars monthly.

OAXACA

Fresno-Belvoir—The H. W. Caltin interest has been sold to H. M. Smith and D. B. Meyer, who will exploit the mine at Taviche.

Santa Sofia—This mine, near Santa Catarina, is taking out gold ore of high grade.

Guebeshe—Railroad from Ocotlan to mill is nearly completed.

Treadwell—Drifting has been started at the 400-ft. level. W. N. Brown, manager.

Victoria Tapada—A cyanide mill is being installed at Totolapam. J. W. Brill, manager.

Rio Seco—A mill is being installed on this property in the Nochistlan district.

QUERETARO

Republican Mining and Milling Company—The company is extensively mining antimony at Maguey Verde, near Estorax. The ore is treated at Wadley, San Luis Potosi, and the product shipped to England.

SAN LUIS POTOSI

Benito Juarez—The 300-ton cyanide plant is completed. Mine is at Salinas. J. C. Brennon, manager.

SINALOA

Choix Consolidated—The company is operating in El Fuerte district.

Piramide—The company is developing successfully in San Jose de Gracia district.

SONORA

El Temblor—The mine near El Tigre has been sold to J. J. Steindler, of New York for $50,000.

Calumet & Sonora—Mill of Joplin type, 110 tons daily capacity, is being erected at Cananea to treat mine's lead-zinc and lead-copper ores.

Promontorio—The 10-stamp concentrating plant, near Alamos, installed by the Clark Copper Company is completed.

Greene Cananea—New York office repudiates report of early dividend. Company in August produced 3,784,000 lb. copper; 70,312 oz. silver; 421 oz. gold.

TEPIC

El Dorado—A smelter has been purchased to be installed at Amatlan de Cañas. Capacity, 15 tons.

ZACATECAS

National Smelting—Operations are resumed at Chalchihuites.

Noria—A strike of 8-kilo silver ore has been made at 105 meters in depth. The mine is at Sombrerete.

Africa

WEST AFRICA

Gold production of Ashanti and the Gold Coast is reported at 17,760 oz. in August. For the eight months ended Aug. 31 the output was 120,401 oz. bullion in 1908, and 100,438 oz. in 1909, a decrease of 32,963 oz. The bullion reported this year was equal to $3,268,055, or 158,150 oz. fine gold.

South America

PERU

Inca Mining Company—A 100-stamp mill will be installed at Santo Domingo mine, Carabaya. C. W. Brown, manager.

Montebello—Extensive exploration is being carried on at Carabaya.

Metal, Mineral, Coal and Stock Markets

Current Prices, Market Conditions and Commercial Statistics of the Metals, Minerals and Mining Stocks

QUOTATIONS FROM IMPORTANT CENTERS

Coal Trade Review

New York, Sept. 29—The coal market in the West shows no change from the preceding week. A little more activity in Lake shipments is reported, but not much. Production is increasing slightly, but an effort is being made, apparently, to regulate it by demand.

The Eastern bituminous trade is improving, but prices continue very low, and there is no prospect of an advance as long as the West Virginia competition continues.

The anthracite trade is steady and follows its usual course with little or no variation.

The Anthracite Coal Trust Suit—The taking of testimony in the Government suit against the alleged anthracite coal trust was resumed in Philadelphia, Sept. 27. President Baer, of the Reading company, was the first witness, and he denied the existence of any trust or agreement to maintain prices or regulate production.

Coal Traffic Notes

Coal and coke tonnages originating on Pennsylvania railroad lines east of Pittsburg and Erie, year from Jan. 1 to Sept. 18, short tons:

	1908.	1909.	Changes.
Anthracite	3,620,482	3,414,412	D. 206,070
Bituminous	23,424,136	25,873,455	I. 2,449,319
Coke	4,895,229	7,563,228	I. 2,667,999
Total	31,939,847	36,851,095	I. 4,911,248

The total increase this year to date was 15.4 per cent.

Coal tonnage reported by the Southwestern Interstate Coal Operators' Association for the month of June, short tons:

	1908.	1909.	Changes.
Missouri	142,993	162,921	I. 19,928
Kansas	279,752	430,584	I. 150,832
Arkansas	113,051	142,587	I. 29,536
Oklahoma	128,056	186,124	I. 57,057
Total	663,852	922,215	I. 258,353

The total increase in tonnage this year was 38.9 per cent.

New York

Sept. 29—The market is steady and quiet, business being slow this week. For prepared sizes schedule prices are $4.75 for lump, $5 for egg, stove and chestnut, f.o.b. New York harbor points. For steam sizes quotations are as follows: Pea, $2.15@2.25; buckwheat, $2.35@2.50; No. 2 buckwheat or rice, $1.70@2; barley, $1.15@1.50, all f.o.b. New York harbor.

Bituminous

Conditions are unchanged. Deliveries are improving, but new business is rather held back by the celebration in New York this week. Orders from the Far East and the Sound continue to come in, but New York harbor is slower. Transportation is a little irregular, freight trains being held up by the extra excursion trains which most of the roads are running. Prices are unchanged.

In the coastwise freight market vessels are in good supply, and rates are unchanged. New York harbor quotes on small vessels 50c. around the Cape, with 5 to 15c. higher to special points. Philadelphia quotes on large vessels 60@65c. to Boston, Salem and Portland, 65@70c. to Portsmouth, 70@75c. to Lynn, and 75@80c. to Newburyport.

Birmingham

Sept. 27—The demand for coal is increasing, and more mines are in operation than for two years past. The railroads are beginning to feel a sharp demand for cars, but no shortage is reported yet. All the coke ovens available are being put in operation to meet the demand from the furnaces.

Chicago

Sept. 27—The coal market continues strong for everything except fine sizes from Illinois and Indiana mines. Domestic coals are in steadily increasing demand. Prices hold firm; on western lump they are advancing slowly.

Illinois and Indiana sell, in car lots, at $1.75@2.65 for lump, $1.60@1.75 for run-of mine and $1.20@1.40 for screenings. Smokeless brings $3.55 for lump and $3 for run of mine, with occasional cuts of 10 or 15c. on forced sales to escape demurrage. Hocking is in good demand at $3.05. Gas coals are steady with no change in price. Anthracite shows no important change.

Cleveland

Sept. 27—Lake shipments are improving, but are still light for the season. The local market for steam coal is strong and active; domestic coal is also doing well. Prices are unchanged.

Indianapolis

Sept. 27—While there are a few unsatisfactory conditions in coal mining, there is an evident and gradual increase in the output. Railroad officials report a heavy demand for cars and have instructed their agents and yard masters to look sharply after the car movement.

The 200 men employed in Deering Mine No. 8, near Clinton, who went on a strike because they deemed the cage unsafe, returned to work after remaining out two days. Secretary Penna, of the Operators' Association, insisted that the men return to work, holding that the stopping of work was a violation of the wage contract.

Pittsburg

Sept. 28—Lake shipments have improved but are not extremely heavy. The local demand shows continued improvement, with prices hardening and the prospect of a definite advance in the near future. The regular market remains quotable at $1.10 to large consumers and $1.20 to retail dealers, for mine-run at mine, with slack at 65 cents.

Connellsville Coke—The market continues excited, and prices have advanced sharply. Even odd lots for immediate shipment cannot be picked up at less than about $2.75 for furnace, while the outside range is indicated by one sale made in the past few days, covering several thousand tons per month over the fourth quarter, at $3, so that the market for prompt and near-by has advanced about 25c. in a week while the advance in prompt coke from the low point last May is well in excess of $1.25. Less than a week ago a sale of 15,000 tons a month over the entire year 1910 was made at $2.90, and since then three or four sales have been made at the same price, one over the whole year and the others over the first six months. These transactions followed ineffective bids of a number of furnaces at $2.75 for next year, and the position now is that there are very few sellers at $2.00, the majority holding their coke for $3 or higher, and there seems to be no doubt that some such level will be established, the market scoring a really astonishing advance.

We quote standard furnace coke at $2.75@3 for prompt and fourth quarter delivery, and $2.00@3 for next year, with foundry coke $2.75@3 for this year and $3@3.25 for next year.

The *Courier* reports the production in the region in the week ended Sept. 18 at 426,648 tons, and shipments at 4949 cars to Pittsburg, 7510 cars to points west of Pittsburg and 891 cars to points east of Connellsville, a total of 13,350 cars.

St. Louis

Sept. 27—Coal men are in better humor than for several years. Prices have had an upward trend all week and continue to advance. All southern Illinois operators are at present so crowded with business that they are not taking any orders and guaranteeing shipment under 30 days. The lower-grade mines are benefiting by this condition.

Staunton, Mt. Olive and Springfield district coals are bringing $1.25@1.35 at mine, or $1.72@1.82, St. Louis, for 6-in. lump; 3-in. lump is being offered at 5 or 10c. less. Nut coal is 90c. per ton at mine, or $1.42, St. Louis. These prices are quoted for immediate shipment only and it is intimated that the price will be raised probably as high as $1.50 per ton at mine about Oct. 1. Standard 6-in. lump is $1@1.10 at mine, or $1.52@1.62, St. Louis; 2-in. lump is offered for 10c. a ton less. Screenings and fine coal are away off. Standard screenings have been offered at 15@20c. at mine and are on the market in an abundance at that figure. Steam nut is offered freely at 50c. at mine, or $1 f.o.b., St. Louis. Carterville lump and egg are now strong at $1.50 at mine and $2.17, St. Louis. The demand for washed No. 1 is strong and for No. 2 fair.

Iron Trade Review

New York, Sept. 29—The iron and steel trades have been characterized this week by a continuance of the active buying of material, though there has been rather less excitement than was manifested in the preceding week.

Pig iron has sold actively in the Central West, where bessemer and basic have been the varieties chiefly in demand. In the East foundry iron has been the leader, basic pig being less active. Prices remain firm, with an advancing tendency.

In finished material structural steel is called for by many new contracts, generally of moderate size. Plates and bars are also active, and the demand for rails and other general building material is good everywhere. Mills are generally full, and prompt deliveries are no longer easy to obtain.

The railroads continue to be buyers of bridge and other material, while orders for rails are coming in freely for 1910 delivery. There is also a good demand for light rails for industrial and mining work.

Rates on Steel Products—The carload rates on steel rails from Johnstown, Penn., and Cumberland, Md., to Pacific Coast points have been reduced from $14 to $13.70 per ton; and a rate of $13.10 has been made from Lorain, Ohio, to the same points. Car wheels and axles have been given a rate of 77c. per 100 lb. from the Pittsburg district to Pacific coast points.

Baltimore

Sept. 28—Exports for the week included 1,547,114 lb. structural steel and 629,501 lb. miscellaneous iron and steel to Panama; 3,174,260 lb. steel billets to Liverpool; 740,712 lb. tin scrap to Rotterdam. Imports included 635 tons ferromanganese from Liverpool; 5488 tons cupreous pyrites from Spain; 11,230 tons iron ore from Cuba.

Birmingham

Sept. 27—A good demand, a steady inquiry and an advancing price are conditions that prevail with the Southern pig-iron market. Save with regular customers there is but little iron to be obtained for delivery during the balance of this year. There are five or six furnaces scheduled to go into blast during the month of October. The quotations are now being made at $15 per ton, No. 2 foundry; two or three companies have already announced that figure and have notified agents, the price to be maintained whether for immediate delivery or into the first half of the coming year. The minimum price has settled on $14.50 per ton.

Chicago

Sept. 28—Strength continues in practically every branch of the iron market, with advancing prices. Pig iron sells in good-sized lots; $14.50@15, Birmingham ($18.85@19.35, Chicago) obtains on sales of Southern No. 2. Northern iron holds to $18.50@19, with some sales made at $19.50. Lake Superior charcoal iron is in good demand at $19.50@20. The ordinary sale continues to be 300 to 1000 tons, with an occasional larger sale.

Sales of iron and steel materials continue large. Coke is active at $4.85 for the best Connellsville.

Cleveland

Sept. 28—Sales of small lots still continue. The docks at all the Lake Erie ports are crowded, and there will be trouble about storing ore.

Pig Iron—The market is active and prices are advancing. Heavy sales have have been made of all kinds except basic. Current quotations are: Bessemer, $18.40 @18.90; basic, $18@18.50; No. 2 foundry, $17.75; gray forge, $16.25@16.50, Cleveland delivery.

Finished Material—Several large contracts for shapes and plates are pending. All lines are active. Store trade in bars and structural shapes is heavy, and nails are in demand.

Philadelphia

Sept. 29—Extraordinary quantities of iron ore are arriving at this port from foreign sources of supplies and contracts are being placed for additional large winter deliveries. The Pennsylvania Steel and the Bethlehem Steel companies are increasing their imports and additional unloading facilities are being provided at Port Richmond. Furnace companies are contemplating large ore supplies far in advance. All kinds of pig iron are strong, but the market does not show as much business as the week before. The advancing tendency in all kinds of pig is reflected here, but no advances have been made. Basic will move upward first and will probably be followed by No. 2 X foundry. Gray forge is quiet. No. 2 X foundry is $18.50; gray forge $17.50 and basic $18@18.50 per ton.

Steel Billets—Buyers are calling for deliveries according to contract. Billets have been quoted 50c. higher on recent inquiries.

Bars—Today's reports show still further activity in both common and refined iron, especially for delivery in 30 to 60 days. Stocks of iron in country stores have been almost depleted.

Structural Material—An important demand this week is from railroad companies who have decided upon increasing station and terminal facilities. Local construction demands are taking a good deal of material.

Scrap—Nearly all kinds of scrap iron have moved up a little in price and dealers are on the warpath for heavy melting steel, railroad and yard scrap. The market is very strong and stocks of desirable scrap are light.

Pittsburg

Sept. 28—Developments in iron and steel prices have shifted largely from pig iron to finished products. Effective today the American Sheet and Tin Plate Company has advanced flat sheets $2 a ton to 2.30c. for black and 3.35c. for galvanized, 28 gage, leaving corrugated roofing unchanged at $1.55 per square for painted and $2.80 per square for galvanized, and has advanced tinplate 10c. per box to $3.50 for 100-lb. cokes. One of the independents had made a sharp advance in its prices last month, while last Friday the Youngstown Sheet and Tube Company advanced its prices $2 a ton on black sheets and $1 a ton on galvanized.

Bars, plates and shapes show a much stronger tone, although the absolute minimum of the market cannot be quoted higher than 1.40c. on bars and 1.50c. on plates and shapes. These prices cannot be done for next year's delivery, and we can report sales of good-sized tonnages of steel bars for first quarter at 1.50c and of plates at 1.60c., the market standing at this range, depending on tonnage and delivery, with a clear prospect that minimum prices will soon be 1.50c. on bars and 1.60c. on plates and shapes.

Spang, Chalfant & Co. have just secured

a contract for 30 miles of 16-in. line pipe for a western gas interest, and have also secured the Fort Worth, Tex., contract, covering 100 to 110 miles of pipe of various sizes.

Pig Iron—A sale not hitherto reported was 5000 tons of bessemer from the Bessemer Pig Iron Association to the Republic Iron and Steel Company for fourth-quarter delivery at $17.50, Valley. Since then the Youngstown Sheet and Tube Company has bought 25,000 tons from the association, for delivery over the first half of next year, at $18, Valley furnace. There have been some small lots sold for fourth quarter and first quarter at $18, Valley, and the market is firm at this figure. Basic may be quoted nominally at 25c. advance for this year, at $16.25, Valley. A large local consumer has bought 12,000 tons, paying for foundry $16.50, Valley, for fourth quarter and $17 for first quarter; for forge, about 75c. less. The minimum of the market is quotable on this basis, but furnaces ask 25 to 75c. higher.

Ferromanganese—The market continues strong, and prices are firm at $42.50@43 for prompt, $44 for fourth quarter and $45 for next year, all at Baltimore.

St. Louis

Sept. 27—Alabama pig iron is quoted the same as last week, at $14 per ton, Birmingham, or $17.75 f.o.b., St. Louis. Nearly all of the producers are entirely sold up for the rest of this year. The future market is active and producers are not willing to tie up any business for delivery after the first of the year at present prices. Foundries are now running full time and find a very good demand for finished products.

Metal Markets

New York, Sept. 29—The markets generally show only slight changes from last week; the tendency in most cases is inclined to be strong, on account of increased consumption.

Gold, Silver and Platinum

UNITED STATES GOLD AND SILVER MOVEMENT

Metal.	Exports.	Imports.	Excess.
Gold			
July 1909	$16,661,782	$ 3,369,885	Exp. $13,291,897
" 1908	4,845,272	2,949,179	Exp. 1,896,093
Year 1909	80,496,119	23,405,477	Exp. 57,090,642
" 1908	58,353,098	29,357,075	Exp. 29,006,172
Silver			
July 1909	5,049,366	3,926,117	Exp. 1,123,249
" 1908	4,930,746	3,029,581	" 1,891,165
Year 1909	34,409,032	26,798,145	" 7,610,887
" 1908	30,445,291	24,180,929	" 6,264,362

Exports from the port of New York, week ended Sept. 25: Gold, $10,000; silver, $956; 28c. to London and Paris. Imports: Gold $11,000; silver, $158,978, from Central and South America.

Gold—The price of gold on the open market in London was a little higher, 77s. being now being obtained for bars and 76s. 4½d. per oz. for American coin. A large part of the supplies arriving was taken for Russian account. Exports from New York were $1,400,000 to Canada.

Platinum—Demand is active, especially in the jewelry trade. There has been a further advance of 50c., and dealers are now asking $26 per oz. for refined platinum and $20.75 for hard metal, while $21@22 per oz. is paid for good scrap.

Our St. Petersburg correspondent writes, under date of Sept. 16 that prices are without change. The general conviction is that a further increase is to be expected. The agreement between the Société Anonyme de l'Industrie du Platine and the estate of Prince Demidoff will soon be concluded. The metal is quoted in St. Petersburg at 20,500@21,000 rubles per pood; at Ekaterinburg at 5.25 rubles per zolotnik, both of crude platinum 83 per cent. metal. These are equal to averages of $20.09 and $19.74 per oz., respectively.

Silver—The market continues steady. Supplies are absorbed at current quotations, and fluctuations are confined within narrow limits. China shows some disposition to buy, and this fact assists in steadying the price.

SILVER AND STERLING EXCHANGE

Sept.	23	24	25	27	28	29
New York....	51¼	51⅛	51⅛	51⅛	51⅛	51⅛
London.....	23½	23½	23½	23⅝	23⅝	23½
Sterling Ex..	4.8610	4.8615	4.8610	4.8605	4.8605	4.8605

New York quotations, cents per ounce troy, fine silver; London, pence per ounce sterling silver, 0.925 fine.

Exports of silver from London to the East, Jan. 1 to Sept. 16, as reported by Messrs. Pixley & Abell:

	1908.	1909.	Changes.
India.....	£ 6,557,063	£4,576,200	D. £1,980,863
China.....	516,400	1,555,200	I. 1,038,800
Straits.....	112,385	82,800	D. 29,585
Total.....	£ 7,185,848	£6,214,200	D. £ 971,648

Receipts for the week £10,000 from New Zealand, £4000 from Mexico and £170,000 from New York; total, £184,000. Exports, £1000 to Port Said and £232,000 to India; £233,000 in all.

Copper, Tin, Lead and Zinc

Sept.	Copper. Lake, cts. per lb.	Copper. Electrolytic, cts. per lb.	Copper. London, £ per ton.	Tin. cts. per lb.	Lead. New York, cts. per lb.	Lead. St. Louis, cts. per lb.	Zinc. St. Louis, cts. per lb.
23	14 @14½	13⅝ @14	59⅝	30⅝ @30¾	4.32½ @4.35	4.20 @4.22½	5.65 @5.70
24	14 @14½	13⅝ @14	59⅝	30⅝ @30¾	4.32½ @4.35	4.20 @4.22½	5.70 @5.72½
25	14 @14½	13⅝ @14		30⅝ @30¾	4.32½ @4.35	4.20 @4.22½	5.72½ @5.75
27	14 @14½	13⅝ @14	59⅝	30⅝ @30¾	4.32½ @4.35	4.20 @4.22½	5.75 @5.77½
28	14 @14½	13⅝ @14	59⅝	30⅝ @30¾	4.32½ @4.35	4.20 @4.22½	5.77½ @5.80
29	14 @14½	13⅝ @14	59⅝	30⅝ @30¾	4.32½ @4.35	4.20 @4.22½	5.77½ @5.80

London quotations are per long ton (2240 lb.) standard copper. The New York quotations for electrolytic copper are for cakes, ingots and wirebars, and represent the bulk of the transactions made with consumers, basis, New York, cash. The prices of casting copper and of electrolytic cathodes are usually 0.125c. below that of electrolytic. The quotations for lead represent wholesale transactions in the open market. The quotations on spelter are for ordinary Western brands; special brands command a premium.

Copper—There has been no special feature to the market during the past week. A moderate business is reported both for home trade and export at current prices. While the consumption in this country has probably reached a point not very far from the highwater mark, buyers are not in a hurry to cover their requirements on account of the statistical position. Producers, on the other hand, are not pressing their output for sale, as they consider present prices fairly safe. The close is steady and unchanged at 13@13⅛c. for Lake copper and 12¾@13c. for electrolytic copper in cakes, wirebars or ingots. Casting copper is quoted nominally at 12⅝@12⅞ cents.

There is no truth in the gossip that a copper consolidation is going to be effected, or even is being seriously considered. This idle talk recurs every little while with no more foundation than the brains of newspaper writers, or perhaps the visions of inconsequential promoters.

Copper sheets are 17@18c., base for large lots. Full extras are charged, and higher prices for small quantities. Copper wire is 14½c. base, carload lots at mill. Business continues on a good scale.

The standard market in London fluctuated within narrow limits during the entire week, showing throughout a good undertone. The close is steady at £59 5s. for spot, and £60 2s. 6d. for three months.

Refined and manufactured sorts we quote: English tough, £62 10s.; best selected, £61 10s.@62 10s.; strong sheets, £73 10s.@74 10s. per ton.

Copper in September—During the first week of September copper was rather dull, business not being heavy while the market was considerably disturbed by some large sales of metal from second-hands. A considerable part of these sales, it was reported, were for the account of a speculator who had bought heavily but was obliged to liquidate, being unable to carry his holdings. By Sept. 10, however, this copper appeared to have been pretty well cleaned up and there was less pressure to sell from second hands. On the other hand there was more offered from first hands, especially after the publication of the producers' statistics which showed an increase of 12,000,000 lb. in stocks during August. Electrolytic continued to be offered at somewhat below 13c., although it is certain that consumption has reached a very high level. About the middle of the month a decided revival was manifested in the demand for export, although the European statistics for the first half

of the month showed an increase of something like 2000 tons in the visible supplies. These sales supported the market, although they caused no advance, and domestic consumers, finding that there was little probability of any further yielding, began to come in rather freely. The same condition prevailed during the closing week, prices remaining firm, but not advancing. Business was fairly large but producers showed a willingness to sell at current quotations. Lake copper showed an unusualy wide range.

Tin—An enormous speculation has developed in the London tin market, and under large transactions prices have advanced from day to day. The movement appears to be based on the belief of a bigger consumption, particularly in this country, due to the expansion in the tinplate business. So far, neither dealers nor consumers have taken a full interest in the movement and the market here on this account has been rather irregular and at times below the importation point. The close in London is slightly reactionary at £140 for spot and £141 2s. 6d. for three months, while business here is being done at 30¾@30⅞ cents.

Lead—The market is quiet and unchanged at 4.32½@4.35c. New York, and 4.20@4.22½c. St. Louis.

The London market has shown more strength than for a great many months past, and closes higher at £13 2s. 6d. for Spanish, and £13 5s. for English lead.

Spelter—The demand for this metal from all sources continues on an increasing scale, and can only be satisfied by offering to pay higher prices from day to day. The close is firm at 5.92½@5.95c. New York, and 5.77½@5.80c. St. Louis.

New York quotations for spelter on Sept. 23 were 5.82½@5.85c.; 24, 5.85@5.87½c.; 25, 5.87½@5.90c.; 27, 5.90@5.92½c.; 28 and 29, 5.92½@5.95 cents.

The London market is also somewhat higher at £23 2s. 6d. for good ordinaries and £23 7s. 6d. for specials.

Base price of sheet zinc is 7½c. per lb., f.o.b., LaSalle-Peru, Ill., less 8 per cent. discount.

Other Metals

Antimony—Business is quiet and prices unchanged at 8⅝@8¾c. for Cookson's; 8⅛c. for Hallett's; 8@8¼c. for U. S., and 7⅝@7⅞c. for outside brands.

Aluminum—No change can be reported. No. 1 ingots can be had at 20@23c. per lb. in large lots, with the American maker holding to the higher figure.

Quicksilver—Business is good and prices hold the recent advance. New York quotations are $46 per flask of 75 lb., with jobbers asking 63@65c. per lb. for small lots. San Francisco prices hold at $44@45 for domestic orders and $42@43 for export. The London price is now £8 7s. 6d., with second hands selling at £8 6s. per flask.

Magnesium—The price of pure metal is now $1.50 per lb. for 100-lb. lots f.o.b. New York.

Nickel—Large lots, contract business, 40@45c. per lb. Retail spot, from 50c. for 2000-lb. lots, up to 55c. for 500-lb. lots. The price for electrolytic is 5c. higher.

Cadmium—Current quotations are 75c. per lb. in 100-lb. lots at Cleveland, Ohio. In Germany 450@475 marks per 100 kg., at factory in Silesia.

Zinc and Lead Ore Markets

Joplin, Mo., Sept. 25—The high price of zinc sulphide ore was $52 per ton, the base price of 60 per cent. zinc ranging from $49 down to $45; zinc silicate ore sold on a base of $22@25 per ton of 40 per cent. zinc, the high price being $31. The average price, all grades, was $43.58, a decrease of $1 per ton, owing to increased sales of low-grade sulphide and of silicate ores. No higher price than $56 per ton was reported paid for lead, and the average, all grades, was $55.30. An unexpected slump in output was noted for the previous week, but this week shows it on the increase again.

SHIPMENTS, WEEK ENDED SEPT. 25.

	Zinc, lb.	Lead, lb.	Value.
Webb City-Carterville	3,504,860	896,010	$105,475
Joplin	2,206,050	252,980	59,417
Miami	521,810	347,420	18,162
Galena	645,690	66,450	16,677
Duenweg	696,900	160,190	16,664
Aurora	727,520	31,950	16,545
Carthage	497,890	.....	11,948
Prosperity	315,340	137,180	11,058
Jackson	474,830	.....	10,921
Badger	463,050	.....	10,881
Alba-Neck	429,890	.....	10,317
Spurgeon	496,630	38,240	9,594
Quapaw	221,520	29,380	5,696
Saronoxie	273,040	.....	4,565
Granby	272,900	11,500	4,100
Shoalsburg	242,500	3,760	3,377
Carl Junction	131,050	.....	3,376
Zincite	74,910	.....	1,873
Cave Springs	62,590	.....	1,502
Stott City	57,780	.....	1,444
Peoria	60,130	.....	842
Totals	12,377,480	1,975,060	$324,334
Nine months	439,707,080	66,705,860	$10,394,924
Zinc value, the week, $269,712;		9 mos.,	$8,576,445
Lead value, the week, 54,622;		9 mos.,	1,818,479

MONTHLY AVERAGE PRICES.

Month.	Zinc Ore. Base Price. 1908.	1909.	Zinc Ore. All Ores. 1908.	1909.	Lead Ore. All Ores. 1908.	1909.
January	$37.60	$41.25	$35.56	$38.46	$46.88	$52.17
February	36.63	46.94	34.92	34.37	49.72	50.56
March	36.19	37.40	34.19	34.71	49.96	50.82
April	35.40	38.63	33.08	37.01	52.47	55.63
May	34.19	40.06	33.39	37.42	56.05	56.59
June	33.06	44.15	32.07	40.35	50.18	57.52
July	34.55	43.06	31.67	41.11	59.90	53.74
August	36.53	48.25	33.42	44.54	60.34	57.60
September	37.63	.....	34.44	.....	54.59	.....
October	35.95	.....	33.28	.....	52.63	.....
November	39.19	.....	35.02	.....	54.53	.....
December	42.75	.....	39.63	.....	49.68	.....
Year	$36.63	.....	$34.31	.....	$53.90	.....

NOTE—Under zinc ore the first two columns give base prices for 60 per cent zinc ore; the second two the average for all ores sold. Lead ore prices are the average for all ores sold.

Platteville, Wis., Sept. 25—The base price paid this week for zinc ore, 60 per cent., was $48 per ton. The base price paid for lead ore, 80 per cent., was $55@57 per ton.

SHIPMENTS, WEEK ENDED SEPT. 25.

Camps.	Zinc ore, lb.	Lead ore, lb.	Sulphur ore, lb.
Harker	429,780	.....	.....
Hazel Green	354,200	.....	.....
Highland	361,160	.....	.....
Cuba City	346,130	157,150	66,410
Linden	303,800	.....	.....
Shullsburg	280,000	.....	.....
Platteville	243,400	.....	249,000
Galena	203,000	.....	.....
Benton	211,400	.....	55,400
Livingston	140,000	.....	.....
Rewey	58,200	.....	.....
Total	2,960,070	157,150	370,810
Year to Sept. 25	100,420,010	6,168,250	9,271,915

In addition to the above there was shipped to the American Zinc Ore Separating Company, 498,300 lb. and to the Joplin Separator Works, 160,000 lb. zinc concentrates.

Chemicals

New York, Sept. 29—The general market is dull for the present, but there is little change in prices.

Copper Sulphate—Business is light but prices are unchanged at $4.10 per 100 lb. for carload lots and $4.35 per 100 lb. for smaller orders.

Arsenic—The market is dull, the buying reported last week having entirely subsided. Quotations for white arsenic are 2.70@2.75c. per lb. for spot, and 2.87½c. for futures.

Nitrate of Soda—The market is very quiet; quotations are 2.10c. per lb. for both spot and futures.

Mining Stocks

New York, Sept. 29—The Stock Exchange has been somewhat erratic during the past week, showing no definite tendency but rather an inclination to react on slight causes. It has been almost wholly a professional market, the public being generally absorbed by the celebrations which were going on during the week. The exception to the lower tendency was found in the steel stocks which displayed remarkable strength throughout the week, and which may be said to have saved the market from a general break.

Sales of 310 shares of Homestake, of South Dakota, were reported during the week at $93@93.75 per share.

The Curb market was rather dull for the most part and was even more affected by the celebrations than the Exchange. Copper stocks were irregular and in some cases lower, the most notable instance being Cumberland Ely, which lost considerably, although no special cause can be given. Cobalt stocks were generally steady but by no means active. The Nevada gold stocks were in much the same condition with comparatively little trading.

Boston, Sept. 28—Copper shares are neglected, although the tone of these specialties remains good. At times the absence of buying spurs the trading element to take a turn on the short side, but it is short-lived, and prices quickly recover. Saturday last, when the New York Exchange suspended to celebrate the Hudson-Fulton festivities, Boston remained open, which is the second instance of this kind in its history. The experiment was worth adopting and if it had not been for the fact that western wires were out of commission, due to the previous night's storm, the results would have been perfectly satisfactory.

The strike in the Butte mining camp had little or no effect on mining shares. North Butte has now a steady market and the price is up almost $4 to $62.37½. There is a disposition to buy this stock without advancing the price. The Amster stocks have been in the fore. Arizona Commercial is up almost $4 for the week to $48.25. A block of the stock was purchased privately just before the death of of Director C. H. Paine, so that the latter's demise had no effect on the price.

Atlantic's $2 assessment caused weakness in the stock and the price fell to $8.50. Amalgamated, which took a sudden drop to $82, more than recovered the decline. This stock is more scarce in brokers' offices than ever.

Curb stocks are generally selling at slightly lower levels. Cumberland-Ely has gone off over $1 to below $6, with no accompanying explanation.

STOCK QUOTATIONS

NEW YORK Sept. 29		BOSTON Sept. 29	
Name of Comp.	Clg	Name of Comp.	Clg.
Alaska Mine	‡.11	Adventure	6¾
Amalgamated	83½	Allouez	58⅛
Anaconda	49¾	Am. Zinc	32⅜
Balaklala	‡2$\frac{1}{16}$	Arcadian	5
British Col. Cop.	7	Arizona Com.	48
Buffalo Mines	3⅛	Atlantic	8½
Butte Coalition	25¾	Boston Con.	15⅛
Colonial Silver	‡$\frac{1}{16}$	Calumet & Ariz.	104
Cum. Ely Mining	6¾	Calumet & Hecla	675
Davis-Daly	5⅞	Centennial	40½
Dominion Cop.	7	Copper Range	80½
Douglas Copper	1$\frac{1}{16}$	Daly-West	8
El Rayo	2⅞	East Butte	11⅞
Florence	2¼	Franklin	17¾
Foster Cobalt	‡.32	Greene-Can.	9
Furnace Creek	‡.05	Hancock	10
Giroux	9	Isle Royal	24
Gold Hill	⅛	Keweenaw	2½
Goldfield Con.	6$\frac{13}{16}$	La Salle	15½
Granby	100	Mass	7½
Greene Gold	‡⅛	Michigan	10½
Greene G. & S.	‡9	Mohawk	62
Guanajuato	2⅛	Nevada	24½
Guggen. Exp.	215	North Butte	61⅞
Hanapah	‡15	Ojibway	8½
Kerr Lake	9⅛	Old Colony	65
McKinley Dar.	.93	Old Dominion	54
Miami Copper	16⅛	Osceola	151
Micmac	[illegible]	Parrot	31¾
Mines Co. of Am.	⅛	Quincy	90
Montezu. of C. R	16	Rhode Island	‡4¾
Mont. Sho. C.	2	Shannon	16⅞
Nev. Utah M. & S.	1¼	Superior	58
Newhouse M. & S.	7⅛	Superior & Bost.	15¾
Nipissing Mines	12¼	Superior & Pitt	15⅜
Old Hundred	⅛	Tamarack	70
Silver Queen	19	Trinity	12
Stewart	⅞	U. S. Smg. & Ref.	57⅞
Tennessee Cop'r	36¼	U. S. Sm. & Re. pd	53⅛
Tri Bullion	¼	Utah Con.	44⅛
United Copper	10⅛	Victoria	3¾
Utah Apex	4⅛	Winona	7¾
Utah Copper	49⅛	Wolverine	152
Yukon Gold	5$\frac{1}{16}$	Wyandotte	2⅛

‡Last quotation. ‡Last quotation.

N. Y. INDUSTRIAL	
Am. Agri. Chem.	46½
Am. Smelt. & Ref.	99½
Am. Sm. & Ref., pf.	112¾
Colo. Fuel & Iron.	46½
Federal M. & S., pf.	‡91½
National Lead	90½
National Lead, pf.	111
Pittsburg Coal	20⅞
Republic I. & S.	48⅞
Republic I. & S., pf.	108
Sloss-Sheffield	90⅜
Standard Oil	‡685
U. S. Steel	89⅛
U. S. Steel, pf.	129⅜
Va. Car. Chem.	47⅛

BOSTON CURB	Low.
Ahmeek	225
Chemung	16
Chino	8⅛
Gila	8¾
Indiana	6⅜
Mason Valley	2
Ray Central	2¼
Ray Con.	19¾
San Antonio	8
Yuma	1$\frac{5}{16}$

Furnished by Hornblower & Weeks, N. Y.

ST. LOUIS Sept. 25		
N. of Com.	High.	Low.
Adams	.40	.30
Am. Nettie	.09	.07
Center Cr'k	1.75	1.60
Cent. C. & C.	86 00	84 00
C. C. & C. pf.	85 00	83.00
Cent. Oil	120 00	100 00
Columbia	9.00	7.00
Con. Coal	18 00	17 00
Doe Run	115.00	100 00
Gra. Bimet.	.30	.25
St. Joe.	12.50	11.00

LONDON Sept. 29			
Name of Com.	Clg.		
Dolores	£1	5s	0d
Stratton'sInd.	0	3	3
Camp Bird	1	9	6
Esperanza	3	1	0
Tomboy	0	19	0
El Oro	1	6	6
Oroville	0	14	0

Cabled through Wm. P. Bonbright & Co., N. Y.

NEVADA STOCKS. Sept. 29.

Furnished by Weir Bros. & Co., New York.

Name of Comp.	Bid.	Name of Comp.	Bid.
COMSTOCK STOCKS		Silver Pick	.12
Belcher	.90	St. Ives	.05
Best & Belcher	.56	Triangle	.01
Caledonia	.35	BULLFROG STOCKS	
Chollar	.25	Gibraltar	02
Comstock	‡ 28	Homestake King	‡ 01
Con. Cal. & Va.	‡1.25	Mont. Shoshone C.	1.87½
Crown Point	.89	Tramp Cons	.04
Exchequer	.31	MISCELLANEOUS	
Gould & Curry	.21	Cumberland Ely	6.50
Hale & Norcross	.60	Giroux	9.25
Mexican	1 27	Greenwa'r Copper	04
Ophir	1.15	Nevada Con	24.37½
Overman	.70	Nevada Hills	.70
Potosi	59	Navada Smelting	.87½
Savage	.53	Nevada Wonder	.70
Sierra Nevada	.46	Nevada-Utah	1.56
Union	.66	Penn-Wyoming	...
Utah	05	Pittsburgh S. Pk.	.65
Yellow Jacket	1 40	Ray Central	2.25
TONOPAH STOCKS		Ray Con	19.75
Belmont	.73	Round Mt. Sphinx	05
Extension	.57		
Golden Anchor	...		
Jim Butler	.12		
MacNamara	.29		
Midway	.18		
Montana	97		
North Star	.02		
Tono'h Mine of N	7 00		
West End Con	27		
GOLDFI'D STOCKS			
Adams	.01		
Atlanta	.12		
Blue Bell	.02½		
Booth	11		
C.O.D. Con	08		
Columbia Mt.	08		
Comb. Frac.	82		
Cracker Jack	02		
Dia'dfield B. B. C.	01		
Florence	2 75		
Goldfield Belmont	04		
Goldfield Daisy	11		
Great Bend	04		
Jumbo Extension	15		
Kendall	02		
Lone Star	02		
May Queen	04		
Oro	.04		
Red Hill	.05		
Sandstorm	.06		

COLO. SPRINGS Sept. 24	
Name of Comp.	Clg.
Acacia	.07⅝
C. C. Con	.03¼
Doctor	.09⅞
Elkton	.75
El Paso	.63½
Findlay	.12
Gold Dollar	.13¼
Gold Sovereign	.04¾
Isabella	18¾
Jack Pot	‡ 08½
Jennie Sample	08
Jerry Johnson	.06¼
Lexington	‡.01¾
Mary McKinney	48
Old Gold	.04½
Pharmacist	‡ 03½
Portland	83¾
U. G. M.	08
Vindicator	74
Work	‡ 07

Assessments

Company	Delinq.		Sale		Amt.
Alta Gladstone, Utah	Sept	15	Oct	20	$0.00
Andes, Nev.	Sept.	14	Oct	5	0 10
Arcadian, Mich.	Sept	1	Sept	31	0 50
Bonanza Mt. Copper, Ida.	Sept	7	Oct	7	0 001
Brunswick Con. Va., Nev.	Oct.	1	Oct	22	0.02
Bullion, Nev.	Oct.	7	Oct	25	0.05
Challenge Con., Nev.	Sept.	28	Oct	18	0 10
Con. Imperial, Nev.	Sept	15	Oct	7	0.01
Copper Mt. M. & D., Ida.	Sept	7	Oct	4	0 003
East Buffalo, Ida.	Sept	10	Oct	10	0 0005
Hale & Norcross, Nev.	Sept	21	Oct	11	0 10
Hancock Con., Mich.	Oct	10			1 00
Julia Con., Nev.	Oct	14	Nov	8	0 03
Mexican, Nev.	Sept	10	Oct	4	0 10
San Antonio Copper, Mex.	Dec.	1			1 00
Shelton G. & S. Mining, Utah	Sept	28	Oct	30	0.05
Sierra Nevada, Nev.	Oct	12	Nov	8	0 10
Silver King Con., Utah	Oct	4	Oct	23	0 10
So. Columbus Con., Utah	Sept	20	Oct	20	0 0005
Wilbert Min. Co., Ida.	Sept	13	Oct	5	0 05
Winona Mich.	Sept	14			1.00

Monthly Average Prices of Metals

SILVER

Month.	New York.		London.	
	1908.	1909.	1908.	1909.
January	55.678	51.750	25.738	23.834
February	56.000	51.472	25.855	23.706
March	55.365	50.468	25.570	23.227
April	55.505	51.428	25.133	23.708
May	52.795	52.905	24.377	24.343
June	53.663	52.538	24.760	24.166
July	53.115	51.043	24.514	23.519
August	51.683	51.125	23.858	23.588
September	51.720	......	23.877	......
October	51.431	......	23.725	......
November	49.647	......	22.933	......
December	48.766	......	22.493	......
Total	52.864	......	24.402	......

New York, cents per fine ounce; London, pence per standard ounce.

COPPER

	NEW YORK.				LONDON.	
	Electrolytic		Lake			
	1908.	1909.	1908.	1909.	1908.	1909.
January	13.726	13.893	13.901	14.280	[illegible]	57.688
February	12.905	12.949	[illegible]	13.295	58.786	61.198
March	12.704	12.387	12.875	12.826	58.761	56.231
April	12.743	12.56¼	12.928	12.93¾	58.331	57.363
May	12.598	12.893	12.788	[illegible]	57.387	59.338
June	12 675	13.214	12.877	13.548	57.842	59.627
July	12.702	12.880	12.933	13.363	57.989	58.556
August	13 462	13.007	13.639	13.296	60.500	59.393
September	13 388	......	13.600	......	[illegible]	......
October	13.354	......	13.646	......	60.139	......
November	14.130	......	14.386	......	63.417	......
December	14.111	......	14.411	......	62.943	.....
Year	13.208	......	13.424	......	59.902	.....

New York, cents per pound. Electrolytic is for cakes, ingots or wirebars. London, pounds sterling, per long ton, standard copper.

TIN AT NEW YORK

Month.	1908.	1909.	Month.	1908.	1909.
January	27.380	28.060	July	29.207	29.125
February	28.978	28.290	August	29.942	29.966
March	30.577	28.727	September	28.815	......
April	31.702	29 445	October	29.444	......
May	30.015	29.225	November	30.348	......
June	28.024	29 322	December	29.154	......
			Av. year	29.465	......

Prices are in cents per pound.

LEAD

Month.	New York		St. Louis	London.	
	1908	1909.	1909	1908.	1909.
January	3.691	4.175	4 025	14.469	13.113
February	3.725	4 018	3 868	14.250	13.313
March	3.838	3.986	3 835	13 975	13 438
April	3.993	4 168	4 051	13 469	13 297
May	4.253	4.287	4 214	12 938	13 236
June	4.466	4.350	4 291	12 600	13 031
July	4.744	4 321	4.188	13 000	12 563
August	4.580	4 363	4.227	13.375	12.475
September	4.515	......	......	13.125	......
October	4.351	......	......	13 375	.....
November	4.330	......	......	[illegible]	......
December	4.213	......	......	13 156	......
Year	4.200	......	......	13.439	.....

New York and St. Louis, cents per pound. London, pounds sterling per long ton.

SPELTER

Month	New York		St. Louis		London	
	1908	1909	1908	1909	1908	1909.
January	4.513	5 141	4 363	4 991	20 563	21 438
February	4 788	4 889	4 638	4.739	20 875	21 563
March	4 665	4 757	4 527	4 607	21 075	21 438
April	4 645	4 965	4 495	4 815	21 344	21 531
May	4 608	5 124	4 458	4.974	19 906	21.975
June	4 543	5 402	4 393	5 252	19 000	22 000
July	4 485	5 402	4 338	5 252	19 031	21 969
August	4 702	5 729	4 556	5 579	19 350	22 126
September	4 769	......	4 619	.....	19 563	......
October	4 801	......	4 661	......	19 750	......
November	5 059	......	4 909	......	20 875	......
December	5 137	.....	4.987	......	20 625	......
Year	4.726	.....	4.578	......	20.163	......

New York and St. Louis, cents per pound. London, pounds sterling per long ton.

CHEMICALS, MINERALS, RARE EARTHS, ETC.—CURRENT WHOLESALE PRICES.

ABRASIVES—
Carbons, good drill quality, carat $50.00@75.00
Carborundum, f.o.b. Niagara Falls, powd. lb. .08
Grains " .10@.17
Corundum " .07@.10
Crushed Steel, f.o.b. Pittsburg " .05¾@.06
Emery, in kegs; Turkish flour " .01¾@.02
Grains " .03½@.04
Naxos flour " .01¾@.02
Grains " .03½@.04
Chester flour " .01¾@.02
Grains " .03½@.04
Peekskill flour, f.o.b. Easton, Pa " .01½@.01¾
Grains, in kegs " .02¾@.03
Garnet, per quality sh. ton. 25.00@35.00
Pumice Stone, Am. Powd., 100 lb. 1.60@2.00
Italian, powdered per lb. .01¼@.01½
Lump, per quality " .05@.30
Rottenstone, ground " .02@.04
Lump, per quality " .05@.30
Rogue, per quality " .05@.30
Steel Emery, f.o.b. Pittsburg " .07½@.07¾

ACIDS—
Acetic 28% lb. .02½
Boric " .07
Hydrofluoric, 30% " .02¾@.03¼
" 48% " .06
" 52% " .06½
" 60% " .10
Hydrochloric acid, 20°, per lb. 1.25@1.50
Nitric acid, 38° per lb. .04½@.04½
Sulphuric acid, 50°, bulk per ton. $12 up
60°, 100 lb. in carboys. .85@1.12½
60°, bulk, ton 16.00@18.00
66°, 100 lb. in carboys. 1.00@1.10
66°, bulk, ton 18.00
Oxalic per lb. .07¾@.08¾

ALCOHOL—Grain 95% gal. 2.64½
Denatured " .43@.45
Refined wood, 95@97% " .50@.55

ALUM—Lump 100 lb. $1.75
Ground " 1.85
Chrome Alum " .03¾@.05

ALUMINUM—Sulphate, com'l. lb. 1.50@1.75

AMMONIA—24 deg. lb. .04½@.05½
" 26 deg. lb. .04¾@.05¾

AMMONIUM—
Bromide lb. .28
Carbonate " .07¾@.09½
Muriate grain " .05¾@.06¾
Lump " .09½@.09¾
Sulphate, 100 lb. 2.62½@2.67
Sulpho-cyanide com. .30
" " chem. pure .40

ANTIMONY—needle, lump " .04@.04½

ARSENIC—white " .02¾@.03
Red, Outside brands " .06@.07
Saxony " .07½@.08

ASPHALTUM—
Barbadoes per ton. 50.00@80.00
West Indies " 20.00@60.00
Egyptian lb. .11@.16
Gilsonite, Utah ordinary per ton. 32.00@40.00
Trinidad " 20.00@25.00
California " 25.00@30.00

BARIUM—
Carb. Lump, 80@90% lg. ton. 30.00@35.00
Precipitated 96@98% " 36.00@40.00
Powdered, 80@90% lb. .02@.02½
Chloride com'l ton. 36.00@39.00
Nitrate powdered, in casks lb. .05@.06½
Blanc Fixe, dry, bbl. per lb. .02¾@.04

BARYTES—
Am. Ground sh. ton. 12.00@17.00
Floated " 17.00@20.00
Foreign floated " 20.00@22.00

BLEACHING POWDER—35% 100 lb. 1.25@1.50

BLUE VITRIOL—(copper sulphate), carload, per 100 lb. 3¾@4.35

BONE ASH lb. .02¾@.04

BORAX, sacks " .04½@.05

CALCIUM—Acetate, gray, 100 lb. 1.75@1.80
Carbide, ton lots f.o.b. Niagara Falls, N. Y., for Jersey City, N. J. sh. ton. 65.00
Chloride, f.o.b. N. Y. " 11.00@14.10

CEMENT—
Portland, Am. 500 lb bbl. 1.50@1.60
Foreign " 2.25@2.90
"Rosendale," 300 lb " .85
(in sacks) " .65
Slag cement " .75@1.25

CHROME ORE—
New Caledonia 50% ex. ship N. Y. per lg. ton. 14.00@16.00
Bricks, f.o.b. Pittsburg, per M. 175.00

CLAY, CHINA—Am. common ex-dock, N. Y. ton, 7.00@10.00
Foreign " 10.00@17.50

COBALT—Oxide lb. 1.10@1.75

COPPERAS—Bulk 100 lb. $0.55
In bbls " .65@.75
In bags " .60@.70

CRYOLITE (carload) lb. .06@.07

FELDSPAR—Ground sh. ton. 12.50@14.00

FIRE BRICK—
American per M. 30.00@40.00
Imported " 30.00@45.00
St. Louis " 16.00
Extra " 20.00@23.00
Special extra " 30.00@35.00

FIRE CLAY—F.o.b. St. Louis.
St. Louis, extra quality, per ton. 5.00
" ordinary " 2.50

FLUORSPAR—
Domestic f.o.b. shipping port:
Lump lg. ton. 8.00@10.00
Ground " 12.00@14.00
Foreign crude ex. dock 8.00@10.00

FULLER'S EARTH—Lump, 100 lb. .80@.85
Powdered " .80@.85

GRAPHITE—Ceylon.
Flying dust, finest to best lb. .02½@.04
Dust " .02½@.05
Chip " .04@.08
Lump " .05½@.12
Large lump " .08½@.10½

GYPSUM—
Fertilizer sh. ton. 5.00
Ground " 4.00@7.00

INFUSORIAL EARTH—
Ground Am. Best lb. .01¾@.02½
German " .02½@.02¾

LEAD—Acetate (sugar of) brown, lb. .07¾@.08
Nitrate, com'l " .07¼@.08½

MAGNESITE—Greece.
Crude (95%) lg. ton. 7.50@8.50
Calcined, powdered sh. ton. 26.00@37.00
Bricks, domes, per qual. f.o.b. Pittsburg M. 160@200

MAGNESIUM—
Chloride, com'l 100 lb. .90@1.25
Sulphate (Epsom salt) 100 lb. .90@1.00

MANGANESE—
Foreign, crude, powdered:
70@75% binoxide lb. .01@.01½
75@85% binoxide " .01½@.01¾
85@90% binoxide " .01½@.04
90@95% binoxide " .06½
Ore, 80%-85% sh. ton. 16.00@32.50

MARBLE—Flour sh. ton. 8.50@9.00

MINERAL WOOL—
Slag, ordinary sh. ton. 19.00
Selected " 25.00
Rock, ordinary " 32.00

MONAZITE SAND—
Guar. 97%, with 5% Thorium oxide, normal lb. .08 and up

NICKEL—
Oxide, crude, lb. (77%) for fine metal contained .47
Sulphate, single lb. .09@.11
Sulphate, double " .06½@.08

NITRATE OF SODA—
100 lb. 95% 2.10
95% for 1910 2.10
96% is 2½@7½c. higher per 100 lb.

OZOKERITE—best lb. .14@.17

PAINTS AND COLORS—
Litharge, Am. powdered lb. .05½@.06½
English glassmakers' " .08¾@.09½
Lithopone " .03½@.07
Metallic, brown sh. ton. 16.50@22.00
Red " 14.00@18.00
Ocher, Am. common " 8.50@9.00
Best " 16.00
Dutch, washed lb. .02¾@.03
French, washed " .01½@.02
Paris green, pure, bulk " .17½@.20½
Red lead, American " .06@.06½
Foreign " .08¾@.09½
Turpentine, spirits bbl., per gal. .58@.60
White lead, Am., dry lb. .05¾@.05¾
American, in oil " .06½@.07
Foreign, in oil " .09½@.09¾
Zinc white, Am. extra dry " .05½@.05¾
French, proc's, red seal, dry " .06¾@.07½
French, process, green seal, dry " .07½@.10½

PHOSPHATES—Acid .55@60c. per unit
*Fla., hard rock 77% 6.50@9.00
land pebble 68% 3.75@4.00
†Tenn., 78@80% 5.00@5.50
75% 4.75@5.00
68@72% 4.25@4.50
‡So. Car. land rock 60% 3.50@4.00
*F.o.b. Florida or Georgia ports. †F.o.b Mt Pleasant. ‡On vessel Ashley River, S. C.

POTASSIUM—
Bicarbonate crystal lb. $.07½
Powdered or granulated " .08
Bichromate, Am. " .07¾@.08
Scotch " .10¾
Bromide " .20
Carbonate (80@85%) " .03¾@.04
Caustic, ordinary " .05¾@.06
Elect. (90% KOH) " .06
Chloride (muriate), 100 lb. 1.90
Chlorate, powdered " .09½@.09¾
Crystals " .09@.09½
Cyanide (98@99%) " 18c.
Carloads (30,000 lb.) " 18¾c.
5-ton lots " 20@.22½
Less than 5 tons
Kainite, long ton, bulk, 8.50; bags, 9.50
Permanganate lb. .09½@.10½
Prussiate, yellow " .13@.13½
Red " .30@.33
Sulphate (basis 90%) 100 lb. 2.18@2.21

PYRITE—
Domestic, non-arsenical, furnace size, f.o.b. mines per unit. 11@11½c.
Domestic, non-arsenical, fines, per unit, f.o.b. mines 10@10½c.
Imported, non-arsenical, furnace size, ex-ship, per unit .12@.12½
Imported, arsenical, furnace size, ex-ship, per unit .11½@.12
Imported fines, arsenical, ex-ship, per unit .09
Imported fines, non-arsenical, ex-ship, per unit 10½@11c.
Pyrite prices are per unit of sulphur. A deduction of 25c. per ton is made when ore for furnace is delivered in large lumps.

SALT—N. Y. com. fine 280 lb. bbl. .72@1.13
N. Y. agricultural sh. ton. 3.80@4.50

SALTPETER—Crude 100 lb. 4.00@4.50
Refined, crystals " 5.50@6.00

SILICA—
Ground quartz, ord'ry lg. ton. 10.00@15.00
Silex, ground " 13.00@15.00
Silex, floated " 35.00@40.00
Lump quartz " 5.00@5.50
Glass sand " 2.75

SILVER—Nitrate, crystals oz. .33¾@.36¾

SODIUM—Acetate lb. .04½@.05
"Alkali," per 100 lb., 58/48 .80@.87½
Bicarb. soda, per 100 lb 1.00@1.30c.
Soda, caustic, per 100 lb., 78/60 1.75@1.90
Soda, caustic, powdered .02½@.03
Salt cake, per 100 lb., bulk .40 up
Salt cake, bbl .65@.85
Soda, monohydrate, per lb 1.40@1.75
Bichromate lb. .05½@.06½
Bromide " .20
Chlorate, com'l " .08½@.09½
Cyanide ("100% KCN") Carloads (30,000 lb.) " 18c.
5-ton lots " 18¾c.
Less than 5 tons " 19c.
Hyposulphite, Am " 1.30@1.50
Phosphate 100 lb. 2.20@2.50
Prussiate " .08½@.09
Sal soda, f.o.b. N. Y. " .65@.75
Foreign, f.o.b. N. Y. " .80@1.00
Silicate, com'l " .65@1.00
Sulphate, com'l (Glauber's salt) 100 lb. .60@.80
Sulphate, com'l, calcined " .65@.85

STRONTIUM—Nitrate lb. .07½@.08

SULPHUR—Louisiana (prime) to New York lg. ton. 22.00 up
To Boston, Philadelphia or Baltimore " 22.50 up
Roll 100 lb. 1.85@2.15
Flour " 2.00@2.40
Flowers, sublimed " 2.20@2.60
Sicilian, extra qual., unmixed seconds, crude brimstone to New York lg. ton. $22.00
Other ports " 22.50

TERRA ALBA—Fr. & Eng. 100 lb. .80@1.00

TALC—Domestic sh. ton. 15.00@20.00
French " 18.00@25.00
Italian, best " 30.00@40.00

TIN—Bi-chloride, 50% lb. .09½
Crystals " .21½@.22
Oxide, lb " .32½@.35

URANIUM—Oxide " 3.50@4.25

ZINC—Chloride sol., com. 20° " .02¾
Chloride, granular " .04½
Dust " .06¾
Sulphate " .02¾@.02½

NOTE—These quotations are for ordinary wholesale lots in New York unless otherwise specified, and are generally subject to the usual trade discounts. In the cases of some of the important minerals, such as phosphate rock, pyrites and sulphur, in which there are well established markets, the quotations fully represent the latter. But in the cases of some of the minor mineral products, the quotations represent what dealers ask of consumers and not what producers can realize in selling their output as matters of private contract.

THE MINING INDEX

The editors of this paper read all the important publications of the world that relate to mining and the treatment of minerals. This index is published as a reference for all interested and to make it impossible for readers of the ENGINEERING AND MINING JOURNAL to miss any important article published anywhere.

We will undertake to furnish a copy of any article (if in print) in the original language, for the price quoted. Where no price is quoted the cost is unknown. These papers are not kept in stock, but must be ordered from the publisher; hence there will be some delay for foreign papers.

No accounts can be opened for these small amounts, but remittance must be sent with order. For the convenience of those making small but frequent remittances, coupons are furnished at the following prices: 20 cents each, six for $1.00, thirty-three for $5.00 and one hundred for $15.00. This arrangement will be especially appreciated by foreign readers and men in distant mining camps. Where remittances are made in even dollars we will return the excess over an order in coupons upon request.

ALUMINUM.

10490—CASTING—Some Notes on Making Aluminum Castings in Green Sand Molds. (Brass Wld., August, 1909; 3¾ pp., illustrated.) 20c.

AMMONIUM SULPHATE.

10491—PRODUCTION of Ammonium Sulphate in 1908. C. G. Atwater. (Am. Fertilizer, Aug., 1909; 3 pp.) 20c.

ARSENIC.

10492—ANALYSIS—Qualitativer Nachweis und Quantitative Schätzung geringer Mengen Arsen. R. Bensemann. (Zeit f. angew. Chem., Sept. 10, 1909; 1¾ pp.) 40c.

ASPHALTUM.

10493—ANALYSIS—Beiträge zur Analyse der Asphalt-Kalksteine und Stampfasphaltmehle. Dr. Prettner. (Chem.-Zeit., Aug. 31, 1909; 1½ pp.) 20c.

BISMUTH.

10494—OCCURRENCE AND USES of Bismuth (Bi). E. B. Wilson. (Mines and Minerals, Sept., 1909; 2½ pp.) 20c.

CEMENT.

10495—PHILIPPINE RAW CEMENT MATERIALS. Alvin J. Cox. (Philippine Journ. of Sci., May, 1909; 19 pp.)

CLAY.

10496—FIRE CLAY—Quality in Fire Clay for Gas Benches. (Progressive Age, Sept. 1, 1909; 5 pp., illustrated.) Describes the mining of fire clay and its manufacture into bricks and tiles. 40c.

COAL AND COKE.

10497—ALABAMA—Lahausage Mine, Alabama. A. W. Evans. (Mines and Minerals, Sept., 1909; 2 pp., illustrated.) Gives the location and geology of this property, analysis of the coal, method of mining and description of the plant. 20c.

10498—CHILE—The Coalfields and Collieries of Chile. A. Russell. (Min. Journ., August 21, 1909; 1½ pp.) 40c.

10499—COAL DUST and its Allayment. John Foster. (Journ. Brit. Soc. Min. Students, Aug., 1909; 14 pp., illustrated.)

10500—COAL DUST—French Coaldust Experiments. M. J. Taffanel. (Coll. Guard., August 13, 1909; 3 pp., illustrated.) Continuation of article previously indexed. 40c.

10501—COAL DUST—The Most Approved Methods of Dealing with Coal Dust, so as to Prevent the Occurrence of Explosions. John Mason. (Journ. Brit. Soc. of Min Students, Aug., 1909; 4½ pp.)

10502—COAL DUST—Versuche mit Kohlenstaub im Versuchsstollen des Rossitzer Steinkohlenrevieres. (Czaplinski and Helinsky. (Oest. Zeit. f. B. u. H., Aug. 28 and Sept. 4, 1909; 11½ pp., illustrated.) 60c.

10503—COAL DUST EXPERIMENTS at the Experimental Gallery of the Rossitz Coal Field. (Czaplinski and J. Helinsky. (Iron and Coal Tr. Rev., Sept. 10, 1909; 1½ pp., illustrated.) Translation of article in *Oest. Zeit. f. B. u. H.* 40c.

10504—COKE—The Action of Organic Sulphur in Coal During the Coking Process. A. L. Metcalfe. (Can. Min. Journ., Sept. 1, 1909; 1½ pp.) 20c.

10505—COKE—The Porometry of the Beehive Coke Oven. J. R. Campbell. (Chem. Engr., Aug., 1909; 2 pp.) 40c.

10506—COKE OVENS—Mackay-Seymour Coke Ovens. (Iron and Coal Tr. Rev., Sept. 10, 1909; 2 pp., illustrated.) Describes plant erected at the Emley Moor and Park Hill Colliery. 40c.

10507—CONVEYING APPARATUS—Ash-, Coal- and Coke-Handling Equipment for Gas Plants. J. R. Shays. (Power, Aug. 31, 1909; 2½ pp., illustrated.) Describes installations made by the Robins Conveying Belt Company. 20c.

10508—ELECTRICAL POWER GENERATION and Distribution at the Collieries of the Lochgelly Iron and Coal Company, Limited, Fife. John Paul. (Trans. Min. Inst. Scotland, Vol. XXXI, Part 6, 1909; 19 pp., illustrated.)

10509—ELECTRICITY RULES in New South Wales Mines. (Iron and Coal Tr. Rev., Sept. 3, 1909; 2½ pp.) Report by A. A. Atkinson, Chief Inspector of Coal Mines for New South Wales, giving the special rules which have been established at most of the large collieries in New South Wales. 40c.

10510—ENGLISH COALFIELDS—Geology of Lower Coal Measures of Derbyshire and Nottinghamshire. R. D. Vernon. (Coll. Guard., August 27, 1909; 1½ pp., illustrated.) 40c.

10511—EUROPEAN COAL MINES. Brief Notes on. F. W. Parsons. (Eng. and Min. Journ., Sept. 11, 1909; 2½ pp., illustrated.) 20c.

10512—EXHAUST STEAM—The Utilization of Exhaust Steam in Collieries. C. B. Chartres. (Iron and Coal Tr. Rev., August 20, 1909; 2 pp., illustrated.) Abstract from Proc. South Wales Inst. of Engineers. 40c.

10513—EXPLOSION—Official Report on the West Stanley Disaster. (Iron and Coal Tr. Rev., August 16, 1909; 3 pp., illustrated.) 40c.

10514—EXPLOSION—Wehrum Mine Explosion. (Mines and Minerals, Sept., 1909; 2¾ pp.) Account of the explosion at Lackawanna No. 1 mine at Wehrum, Indiana County, Penn. 20c.

10515—EXPLOSIONS—Mine Explosions as Related to Earthquakes. W. A. Spalding. (Eng. and Min. Journ., Sept. 18, 1909; 2 pp.) 20c.

10516—EXPLOSIONS—Seismic Disturbances and Coal Mine Explosions. A. H. Stow. (Eng. and Min. Journ., Sept. 4, 1909; 2 pp.) A discussion of the possible effect of seismic disturbances on the accumulation of gas in coal and its extension into the Workings. 20c.

10517—EXPLOSIONS—The Phenomena Preceding Gas Explosions. F. Laur. (Eng. and Min. Journ., Sept. 11, 1909; 2¾ pp.) Translation from Bull. Société de l'Ind. Minerale, June, 1909. 20c.

10518—FLUSHING PROBLEM in the Anthracite Region. (Eng. and Min. Journ., Sept. 18, 1909; 1 p.) 20c.

10519—HALLAGE—Self-acting Top for Gravity Plane. H. Mck. Conner. (Mines and Minerals, Sept. 1909; 1 p., illustrated.) A device used at one of the mines of the New River Collieries Co., Flinlow, W. Va., by which cars may be delivered and received on tracks of different grades. 20c.

10520—LOW GRADE FUEL—Firing Cheap Grades of Coal Economically. William Kavanagh. (Ele. Wld., Sept. 2, 1909; 1 p., illustrated.) 20c.

10521—LOW GRADE FUELS—Characteristics of Bituminous Coals and Low Grade Fuels. C. M. Ripley. (Power, Sept. 7, 1909; 1½ pp., illustrated.) 20c.

10522—MACHINE MINING—Neue Elektrische Maschine zum Kohlengewinnen. (Bergbau, July 22, 1909; ½ p.)

10523—MACHINE MINING—The Stearvenson Electric Driven Coal-Cutter. (Coll. Guard., August 27, 1909; 1 p., illustrated.) 40c.

10524—PEAT—Production of Peat in 1908. Chas. A. Davis. (Advance Chapter from Mineral Resources of the U. S., Calendar Year 1908; 10 pp.)

10525—PENNSYLVANIA—Coal Mining Method of Great Lakes Coal Company at Kaylor, Armstrong Co., Penn. E. K. Judd. (Eng. and Min. Journ., Sept. 4, 1909; ⅔ p., illustrated.) 20c.

10526—PHILIPPINE COALS—Calorimetry, and the Determination of the Calorific Value of Philippine and Other Coals from the Results of Proximate Analysis. Alvin J. Cox. (Philippine Journ. of Sci., May, 1909; 31 pp., illustrated.)

10527—RESCUE STATION at Frameries, The. (Coll. Guard., Sept. 10, 1909; 2½ pp., illustrated.) Translation of article by S. Stassart and J. Bolle in *Ann. des Mines de Belgique*. 40c.

10528—SAFETY LAMPS—Early History of the Tests of Safety Lamps. William Clifford. (Black Diamond, Sept. 10, 1909; 2 pp., illustrated.) 20c.

10529—SAMPLING AND ANALYZING of Coal. (Am. Mach., Sept. 2, 1909; 3⅓ pp., illustrated.) Deals with the method of the U. S. Geological Survey. 20c.

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10531—TURBINES—Exhaust-Steam Turbines at Lancashire Collieries. G. H. J. Hoeghwinkel. (Trans. Manchester Geol. and Min. Soc., Vol. XXXI, Parts 5 and 6, 1909; 12½ pp.)

10532—WASHINGTON—Coal Resources of Washington. R. P. Tarr. (Mines and Minerals, Sept., 1909; 3 pp., illustrated.) Continuation of article previously indexed. 20c.

10533—WEST VIRGINIA—The Kanawha Region, W. Va. H. H. Stock. (Mines and Minerals, Sept., 1909; 4 pp., illustrated.) Continuation of article previously indexed. 20c.

COPPER.

10534—ANALYTICAL METHOD—Comments on Volhard's Volumetric Method for Copper. H. Theodor. (Chem. Engr., August, 1909; 2 pp.) Translation from *Chem. Zeitung*. 40c.

10535—ARIZONA—The Miami Copper Mine, Arizona. R. L. Herrick. (Mines and Minerals, Sept., 1909; 4½ pp., illustrated.)

10536—BISMUTH IN COPPER—The Influence of Bismuth on Wire-Bar Copper. H. N. Lawrie. (Trans. A. I. M. E., Sept., 1909; 10 pp., illustrated.)

10537—GERMANY—Die Kupfererzlager bei Lauterberg am Harz. Fleck. (Glückauf, July 24, 1909; 7 pp., illustrated.) 40c.

10538—NEWFOUNDLAND—Western Copper Company's Mines, Newfoundland. H. V. Smythe. (Can. Min. Journ., Sept. 1, 1909; ¾ p.) 20c.

10539—PERU—The Copper Deposits of Huaiacyec, Peru. Enrique I. Dueñas. (Min. Journ., Sept. 11, 1909; ½ p.) 20c.

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The Black Range District of Western Australia

A New Field Which Has Developed Quite Rapidly and Promises to Become Second in Importance Only to Kalgoorlie

BY J. BOWIE WILSON*

The township of Sandstone, which is the center of the Black Range district of the East Murchison goldfield, has sprung into existence during the last two years. The discovery and development of the rich mines in its vicinity has converted what but a short time ago was the camp of a few prospectors into a flourishing mining township with about 2000 inhabitants. A hospital, managed by a resident surgeon, has been built on the outskirts of the town, and is supported by subscriptions from the miners supplemented by a government endowment. The climate is healthy, although during the summer months the thermometer often registers 100 deg. during the day, but being far inland and at an elevation of about 1400 ft. above sea level, the air is dry and the heat not distressing.

The chief difficulty is the want of water. Though the annual rainfall is fairly good, it all falls at one time and, the country being flat, soon sinks into the ground. There are no rivers or creeks worthy of the name in the district, and all water has to be obtained by sinking wells. These give a good supply, but the water contains a large quantity of mineral and, though usable, cannot be said to be good.

Long Wagon Haul to the Mines

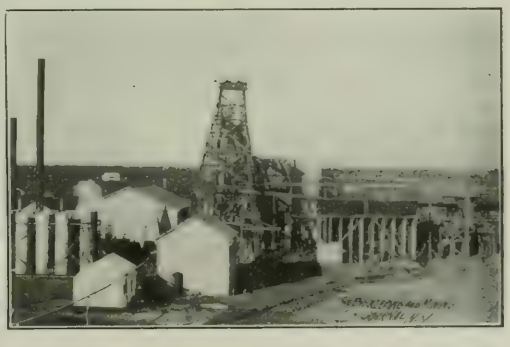
Sandstone is best reached from Perth, the capital of western Australia, by traveling north, a distance of 306 miles, to Geraldton, a coast town, and thence almost due east to Mt. Magnet, 216 miles by rail. A railway is under construction from Mt. Magnet to Sandstone, but at present it is necessary to make this part of the journey by coach. Coaches run three times a week. Leaving Mt. Magnet at 2 o'clock in the afternoon, they travel until about 11 o'clock that night when a stop is made at what is called an "accommodation house" (differing from a hotel in that it has no license to sell liquors) until 5 o'clock in the morning. Sandstone is eventually reached about 5 o'clock in the evening, when the traveler alights stiff, sore and covered with dust after his coach ride of 105 miles. The scenery passed through is most monotonous, the road being practically level for the whole distance, and the country covered only by mulga, a species of scrub which grows to no size, and salt bush.

Camels, Donkeys and Horses Used for Freighting

All the machinery and stores required by the mines and the supplies for the township have to be taken over this road by teams. About 50 teams are on the road, composed of donkey, camel and horse teams. The donkeys are generally driven in a team of 17 made up of two in the shafts and the rest harnessed three abreast. They make a very pretty team, and can haul about 700 lb. per donkey. The camels are harnessed to the wagons in much the same manner as horses, with collars around their necks, and straps around their humps to keep the collars and traces in position. These animals were first imported for use as pack animals, but it is claimed that they can do better work as draft animals, and also that white men can handle them better than the Afghans, who were brought over to drive them. They are driven in teams of six or eight, and make an ugly looking team, but are able to draw about 1400 lb. per camel.

The horse teams draw about 2100 lb. per horse. The horse teams are the quickest, but have the disadvantage that they must carry feed for the horses, while the camels and donkeys are turned loose at the end of the day's journey to feed on the salt bush and herbage. The cost of freighting is from £5 to £6 per ton from Mt. Magnet to Sandstone with practically no back load.

SANDSTONE DEVELOPMENT COMPANY'S NO. 1 SHAFT



OROYA BLACK RANGE COMPANY'S HEADFRAME AND PLANT

Geology

The district being still in its infancy, not much is known about its geology. The surrounding country consists of a slightly undulating plain covered with a fairly dense growth of mulga, the monotony being relieved by the occurrence of what are locally called "breakaways." These consists of beds that have the appearance of being composed of sandstones and conglomerates, lying horizontally along the tops of some of the ridges. They are evidently the remnants of an earlier cementation of the surface of the country, which

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have resisted the subsequent denudations and now remain as flat-topped cappings to the highest ridges. They have weathered into peculiar shapes, but generally present clifflike faces.

The surface of the county is covered, to varying depths, by a layer of what is locally called "cement." This, apparently, has been formed by the decomposed country rock being bound or cemented together into a fairly solid mass by salts of iron, silica, magnesia and lime. This is doubtless caused by the evaporation, during the dry, hot spells, of mineral-bearing solutions drawn to the surface zone by capillary action.

The most prominent characteristic of this portion of western Australia is the enormous amount of silicification that has occurred during some former period of its geological history. Quartz in the form of segregations and blows appears in every direction, and one frequently drives for hours through stony flats where it would be no exaggeration to state that it would be impossible to lie down without resting upon a lump of white quartz. This universal occurrence of quartz, lying upon the surface of the cement, makes it exceptionally difficult to prospect the country, as even when a gold-bearing stone is found, there being practically no fall to the country, it becomes a Chinese puzzle to determine in which direction to sink through the overlying cement to prospect the settled country for the reef from which the gold-bearing quartz was shed.

Main Series of Fissures Runs North and South

At Sandstone there are clearly two main series of fissures or lode formations. One series strikes roughly north and south and dips to the west at an angle of about 35 deg. from horizontal. These reefs have every appearance of being what are usually called true fissure lodes and contain a filling of quartz which carries gold in a coarse form. It is this series of reefs that the three principal mines of the district, the Black Range Gold Mining Company, the Oroya-Black Range Company and the Sandstone Development Gold Mining Company, are working. The first named company is mining a reef locally known as "Hacks" and the last two upon the "Sandstone" line of reef, the Development company holding outcrop leases to the north and black claims to the west of the Oroya-Black Range Company.

This series of reef formation, as exposed in the workings of these three mines, has apparently been subjected to at least two periods of earth movement. A fissure was first formed along which quartz was deposited, and at some later date the fissure was reopened, suffering displacement and some movement, when a fresh precipitation of quartz took place. This theory is formed both from the characteristics of the reef and the disposition of the filling.

The reefs have a habit of splitting at frequent intervals, thus forming hangingwall and footwall reefs divided by much jointed and apparently moved country rock. Where the two reefs have combined to form one there are two classes of quartz easily distinguishable. One, locally called "beefy," is a banded quartz which generally carries the most gold, and the other a white vitreous quartz which generally appears to be unpayable. I am inclined to think that the banded quartz is the older of the two.

In the 470-ft. level of the Development company's workings a crosscut clearly shows a dike (not yet properly classified) striking and dipping parallel to the reef and having quartz on both sides of it, although where cut by the crosscut the larger body of stone was lying on top of the dike. I believe that this dike, or a similar one, has been exposed a long way to the south in the workings of the Oroya-Black Range company.

The East and West Series

One or two favorable prospects have been opened up on a series of reefs striking east and west. Although good gold has been found in places, these properties have not as yet developed into anything of importance. This formation differs from the ones running north and south in that instead of dipping at a flat angle they are practically vertical, and instead of having clearly defined walls they merge into the enclosing rock. They must be classified, I think, as impregnations along a line of weakness and are similar in appearance to many reefs in western Australia which were described by A. Gibb Maitland, government geologist, as ".... the ore bands of chalcedonic quartz and jasperoid rocks which are of such frequent occurrence in the colony and which contain payable gold in such widely separated localities as Black Flag, Mt. Magnet and Horseshoe." At Sandstone these reefs have not yet received sufficient attention or development to demonstrate this value.

Although Sandstone and the Black Range district generally has only been actively developed during the last 4 years, it is now looked upon as one of the most promising of the mining centers outside of Kalgoorlie. Its growth and importance are best shown by the official returns of fine gold won each year. Previous to Dec., 1903, the output was 1084 oz.; in 1904, 11,186 oz.; 1905, 16,693 oz.; 1906, 35,420 oz.; 1907, 57,947 oz.; 1908, 72,632 oz.

Two mines, the Black Range Gold Mining Company and the Oroya-Black Range Gold Mining Company, have supplied practically the whole of this output, the Sandstone Development Company being still more engaged with development than with production. The mining and treatment costs published by these companies show that they are doing good and efficient work especially when the rate of wages ruling in the district is taken into account.

The arbitration court's award determining the rate of wages to be paid in the Sandstone district from June 1, 1907, to May 31, 1910, was as follows, the figures being for a shift of 8 hours: Hand miners in shafts, 15s.; rises, 14s.; other work, 13s. 4d.; machine men in shafts, 15s. 4d.; rises, 14s. 10d.; other work, 14s. 2d.; mullochers and truckers, 12s.; men working in cyanide vats, 13s. 10d.; surface laborers, 11s. 8d.; timbermen, 15s.; drill and tool sharpeners, 14s. 4d.; engine drivers, winding, 15s. 8d.; engine drivers, stationary, 15s. Wet ground, ⅓ per shift extra. Overtime, first 4 hours time and one quarter, afterward time and one-half.

BLOCK RANGE COMPANY'S SHAFT, MILL HOUSE AND BATTERY

The Black Range Gold Mining Company

This is a Victorian company with its registered office in Melbourne, and was the first to be formed to work properties at what is now Sandstone. It started in a small way in December, 1903, and succeeded in paying its first dividend in January, 1905. Since that date the dividends have been regular. It was reconstructed in 1906 and now consists of 60,000 shares of £1 each, of which 7500 shares remain unissued. It is working a north and south line of reef, dipping to the west at an angle of 35 deg. The mine is worked by a main vertical shaft to the 300 ft. level, connected to the various levels by cross-

cuts, but below this level the mine has been opened up to the 450-ft. (vertical distance) level by a winze sunk on the dip of the reef from the main drive on the 300-ft. level. This necessitates a double handling of all stone won below the 300-ft. level, a costly operation. The directors appreciate this and have under consideration the sinking of a new shaft.

From the collar of the vertical shaft the ore is trucked to the battery bins, which feed a 20-head mill. The sands are cyanided in galvanized-iron tanks, the tailings being carted away in tip drays. The slimes are still being stacked. The plant is an ordinary one, and calls for no special mention.

Since December, 1903, a total tonnage of 55,027 tons has been treated for a recovery of 61,870 oz. of fine gold by the battery, and 37,511 tons have been cyanided for a return of 17,146 oz., or a total production of 79,016 oz. of fine gold. Dividends amounting to £97,812 have been paid. These figures are up to the end of December, 1908.

The costs published by the company for the work done during the half-year ending December, 1908, are as follows: Mining, 11s. 5.4d. per ton; crushing, 3s. 8.2d.; hauling and pumping, 4s. 2.8d.; general expenses, 2s. 3.3d.; plant expenditure, 2s. 3.7d.; development, 9s. 8.8d.; total, 33s. 3.7d.; development, 9s. 8.8d.; total, 33s. 8.2d.

The cost of driving averages about £4 per ft., being given as £3 7s. per ft. on the 300-ft. level, and £4 5s. on the 450-ft. level. It is natural to expect the cost of driving to increase as the workings deepen, but in this case I think a large proportion of the increase shown must be attributed to the double handling of the stone already mentioned. Rising costs about £1 12s. per ft. The great difference between the cost of driving and rising is largely due to the fact that the rises are often put up under the reef while the drives are driven in the reef itself.

The Oroya-Black Range Company

This is an English company, an offshoot of the Oroya-Brown Hill Company, and was formed in 1906 to purchase from the Oroya Brown Hill Company a number of gold-mining leases on the outcrop of the Sandstone line of reef. The Oroya-Brown Hill Company had secured options on these leases, and, after having expended some time and money in proving the value of the property, formed the present company to work the leases.

The company, under the management of Bewick, Mireing & Co., has developed its mine well, and has erected a compact and well designed plant. The main shaft is an underlay one, and the ore is hauled in self-dumping skips which feed direct to the rock breaker. The broken ore is distributed along the battery bins by a grasshopper conveyer. The ore is crushed in a 20-head battery, using 1275-lb. stamps, and, after passing over copper plates, is elevated by a tailings pump to the sand separators. The coarse sands are returned to Forwood-Down regrinding pans, and, after being ground, return to the sand separators. The overflow from the separators is laundered to the cyanide plant.

Cyanide Practice of Oroya-Black Range Company

The cyanide plant consists of two traveling collecting vats, fitted with Butters distributers, carried on a superstructure over the treatment vats into which the collected sand is dropped. This arrangement, though pretty in theory, must have greatly increased the cost of the plant, especially in a locality like Sandstone, where all the building material required has to be brought a long way by rail and 105 miles by team, none of the local timber being suitable for building purposes. I fail to see that the advantages gained are sufficient to warrant this increased expenditure.

The treated sands are discharged through the bottom of the vats into trucks which are hauled by a friction hoist to the top of the dump. This is necessary on account of the flatness of the country. The slimes overflowing from the collecting vats, after being partially thickened in a set of spitz kasten, made of sheet iron, are treated in a vacuum slime plant. The thickened slime is first dewatered by the vacuum plant and the cakes, being mixed with cyanide to the required thickness, are after agitation again treated by the vacuum plant.

DONKEY TEAM

CAMEL TEAM

During the year ending Aug. 31, 1908, the battery ran 93 per cent. of the whole time with an average duty of 7.22 tons (2000 lb.) per 24 hours. The costs were as follows: Mining, 15s. 10.3d.; treatment, 8s. 2.6d.; realization of bullion, 9.2d.; amount charged to development, 5s. 6.1d.; total, 30s. 4.2d.

The ore treated is free milling, and the gold, being largely coarse, is readily amalgamated. For the year ending Aug. 31, 1908, 29,192 oz. of fine gold were recovered, equal to 50s. 4d. per ton milled, of which amount 36s. 7.8d. per ton (72.7 per cent.) was recovered by amalgamation. The total extraction obtained is given at 96.6 per cent., the residues published for August being sand residues, 1.56s. per ton, and slime residues, 1.01s. per ton. Until the end of 1908, the company had paid £25,000 in dividends, and a dividend has been declared payable in June, 1909, amounting to £15,000, making a total of £40,000 in dividends.

The Sandstone Development Gold Mining Company

This company was formed in Sydney in 1906 to develop some block leases taken up west of the Oroya-Black Range Company's leases and also some outcrop leases to the north. Steady development work has been carried on, and up to the present the work done has been practically all of this nature. The work done having proved that the ore continued to be of a paying grade at depth, the directors are now erecting a 10-head mill to treat the ore from this mine. Up to Jan. 31, 1909, this company had crushed at the Government battery 3123 tons (2000 lb.), containing gold worth £17,800, or an average value of 114s. per ton. This stone was won chiefly from development work, and was crushed partly to provide funds and partly to give bulk samples of the stone exposed to check the sampling. When this company commences crushing with its own plant it is expected that the results will be as satisfactory as those of its neighbors.

Mining properties in Mexico are frequently apportioned in *barras*, or twenty-fourths.

Sources, Treatment and Prevention of Malaria

Introduced into the System by Infected Mosquitos. Quinine a Specific in Treatment and Should Be Taken As a Prophylactic

BY DR. F. A. CHESTER* AND C. C. SEMPLE†

Plasmodium malariæ are protozoans, not bacteria. They are introduced into the system by infected mosquitos of the genus Anopheles. Inhabiting the red blood corpuscles, they first appear as amoebulæ, growing to fill the interior of the cell, living upon the red coloring matter. Upon reaching maturity they undergo segmentation each segment taking the appearance of a pigment spot surrounded by protoplasm. The corpuscle then breaks, liberating the spores, pigment and toxins into the blood serum. Each spore then enters a new corpuscle in which it goes through the same sporulating cycle as the parent. The effects of the sporulating process and liberation of toxins into the blood are manifested in the symptoms of malaria, known under the various names of chills and fever, ague, intermittent, remittent, pernicious, breakbone, black-water, malarial fevers and dengue.

Classification of Types of Malaria

The malarial parasites were investigated by Laveran about 30 years ago and within the last 10 years much has been added to the physician's knowledge of the malady. The time of rupture of the corpuscles is marked by the malarial paroxysm or chill and fever stage. The paroxysms show a marked periodicity in their recurrence, varying both in character and intensity. A classification of the types of malaria has been made upon the basis of frequency of recurrence: quotidian malaria, in which the fever attacks every day; tertian malaria, in which the fever comes every other day; quartan malaria, in which the return is every fourth day; aestivo-autumnal malaria, the usual tropical variety; pernicious fever, in which the fever persists; and bilious fever accompanied by severe headache and over secretion of bile. Specific organisms for tertian, quartan and aestivo-autumnal fevers are recognized, each of which has been uniformly found occurring with its definite type of infection. The parasites of tertian and quartan fever exist in the blood of infected cases in larger numbers, practically in the same stage of development and all sequent at about the same time. Hence the regularity of their recurrence when unaffected by quinine administration. Seven-day intervals frequently occur between paroxysms where quinine has been given in tertian and quartan fever. The irregularity of the fever in the aestivo-autumnal form is accounted for by the frequent presence in the blood of groups of organisms, in various stages of their cycle of development. This is the most serious form of malarial infection and the prevalent one in the tropics. When the maturing groups of parasites closely follow each other we have the pernicious type of aestivo-autumnal fever developed.

Diagnosis Difficult

The diagnosis of malaria should be left to competent physicians whenever possible because the first stages of yellow fever very closely resemble the malignant types of malaria and the treatments differ diametrically. Microscopic examination of the blood to identify the malarial parasite is the surest method of diagnosis but even this may fail to reveal the presence of the organism, unless the sample be taken at the time of paroxysm or if quinine has been previously administered. The parasites become lodged in the spleen and during intervals between attacks may disappear from peripheral circulation. Where medical attendance is not available, the prevalence of the malady in the district may be more or less relied upon, but if unknown in the locality, it is possible that the complaint is not malaria and medical assistance should be obtained even at the cost of having to leave the field until a cure is established. This point should be particularly observed in the tropics where outbreaks of yellow fever are possible.

Symptoms—Fever Not Always Noticeable at Once.

Unless checked, the sporulating process may continue indefinitely. It does not necessarily follow that a person inoculated through mosquitos should develop the symptoms of malaria at once. If one is in good health the first attacks may not be manifested in any way that the victim is aware of, a strong constitution can withstand the attacks for a while, but as the blood becomes anemic and filled with toxin the effects become noticeable. At first the victim feels unnaturally drowsy, disinclined to work or exert himself in any manner, often with more or less severe headache although headache is frequently entirely absent. Slight aching of the joints and soreness of the muscles with facial neuralgia are often attendant. There may be intervals of fever preceded by a chill or merely a flushed feeling over the entire body. In early attacks the chills are often entirely lacking. The more violent symptoms felt when the malady has secured a firm hold are at first a sensation of heaviness about the limbs, headache or none, with aching of the joints and soreness of the muscles. Then rapidly develops a sense of numbness, the finger nails turn blue, the skin is dry and feels parched, the patient feels cold though his temperature may be above normal. Chills which may be very violent then follow with chattering of the teeth, appearance of goose-flesh over the body and violent muscular contractions. The chill is rapidly followed by fever with or without excessive perspiration. The change from chill to fever stage is often marked by a period of severe and exhausting vomiting; bile, mucous or nothing whatever may be thrown off the stomach. The fever when attended by perspiration usually brings the patient a sense of relief. When the fever breaks the patient will ordinarily fall asleep for a few hours, awakening with a sense of weakness alone remaining as a memento of the attack.

After repeated attacks the spleen usually becomes enlarged and may be felt to the left side just below the floating ribs. Diarrhœa or dysentery often accompany malaria and yield to malarial treatment. An over secretion of bile is usual, and the kidneys and bladder may be affected. Hemoglobinuria or coloration of the urine by hematin, derived from destroyed red blood cells excreted by the kidneys is not at all uncommon and is not an alarming development. Hematuria or hemorrhage of the urethra, bladder or kidneys marks the "black water" fever and though a grave symptom is not necessarily indicative of a fatal termination of the attack. It is frequently the case that instead of the usual chills, severe facial neuralgia accompanied by headache mark the paroxysms and in neuralgias where marked periodicity is observed as well as many tropical forms of dysentery the origin is malarial and they yield to vigorous antimalarial treatment.

Pernicious Type

If neglected the recurrence of malarial attacks become more frequent and intense

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and the symptoms characterizing the pernicious type may develop. While under the surveillance of skilled medical practitioners the majority of cases of pernicious fever result in recovery, the mortality is high as compared with the other forms and the development of this type calls for immediate and vigorous treatment The symptoms are persistence of the fever with exceptional high temperatures; a comatose or semi-comatose condition may prevail, accompanied by twitching of the muscles of the legs and arms, the breathing becomes loud and stertorous, the tongue dry, no diaphoresis is induced by antipyretics and a rigidity of the muscles of the jaws and face resembling tetanus is observed. Death may ensue in from 24 to 48 hours after the beginning of the attack. The comatose type never runs a long course, 48 hours being the exceptional length; either death or relief usually comes within the first 30 hours.

Treatment of Ordinary Malaria

In the treatment of malaria quinine is a specific. Two modes of employing it have been suggested: First, the remedy is withheld until after the administration of emetics and purgatives, or in remittent fever, until, by diaphoretics and baths, a distinct remission is produced; second, to give immediately 10 to 20 grains or even more twice or three times daily. In remittent fever, the antipyretic effect of large doses is relied upon to bring down the temperature.

In our own experience we have found the following treatment most efficacious: Immediately upon feeling the chill coming on the victom should go to bed, be covered with as many heavy blankets as may be comfortable to him and hot water bottles be placed at the feet, pit of stomach and back of the neck. Massage over the entire body with some stimulating liniment often gives comfort. Antipyretics as acetanilid, antifebrin or phenacetine may be given at once in a dose of 10 grains. If after giving the acetanilid and having followed the dose by quinine and a sufficient time having elapsed for the quinine to exert its influence, the temperature still remains high, repeating the dosage of acetanilid at two or three hour intervals until three doses have been taken, will often bring the temperature to normal. A safe form of using acetanilid is the compressed tablet put up by Parke, Davis & Co. according to the following formula: Acetanilid, 3½ grains; sodium bicarbonate, 9-10 grain; sodium bromide, 1-10 grain; caffeine citrated, ½ grain. The tablets are best pulverized before use and two constitute the average dose. Antipyretics tend to shorten the time of chill which is the most exhausting stage of the attack, hasten the stage and intensity of perspiration and reduce the temperature. Their effect is generally noticeable twenty minutes after administering. Indiscriminate use of them in repeated doses is however, unsafe, without a physician's direction.

Should severe vomiting occur it is best to aid the stomach in removing the obnoxious material by administering emetics and following their use by a stomachic sedative. To this end 30 grains of powdered ipecac may be given, followed by copious drafts of tepid water, then about 20 minutes later or as soon as the stomach is empty relieve the retching and quiet the stomach by giving five grains of cerium oxalate and five grains of sodium bicarbonate in powder form or in gelatin capsule. Ice or cloths wrung out in cold water held in the hand and mouth tend to relieve vomiting.

Use of Quinine

As soon as perspiration has been induced treatment with quinine should be begun. Quinine has no effect if not given four hours previous to the sporulation of the parasites. It should be given as soon as possible after the attack to insure there being quinine in the circulation before another batch of organisms hatch out. Quinine is an absolute specific for malaria and the parasites cannot live when it is present in the blood. As soon as the fever breaks, from 10 to 20 grains of quinine are given, followed by a drink of hot lemonade. A wine glass of neat whisky stimulates circulation and tends to get the quinine into the blood more quickly but ordinarily the use of alcoholic stimulants is not at all necessary and it is better for the patient not to use whisky at all. The dose of quinine is repeated three times daily, sufficient being given at a time to induce slight cinchonism. The administration of quinine in quantity in excess of that needed to induce moderate dizziness is not attended by more effectual results in the ordinary forms of malaria.

Calomel Necessary in Large Doses.

As soon as the stomach can stand it, calomel should be given. In tropical malaria the small doses of calomel as used in the north have very little beneficial effect. Ten grains of calomel mixed with an equal weight of sodium bicarbonate is the average dose. To avoid the griping pains attending the use of calomel the dose may be divided in four parts, giving one-quarter at half-hour intervals. Compressed tablets, each containing 2½ grains of calomel and sodium bicarbonate is a convenient form in which to administer the drug. Five hours after exhibiting the last dose of calomel an ounce of citrate or sulphate of magnesia dissolved in water should be given, and this followed within two hours by a large dose of quinine, 15 to 20 grains. If the quinine is not administered directly after the effects of the calomel are noticed, much of its beneficial action is lost. Quinine is then given two or three times daily to the amount of 30 or 40 grains per day until the third septenary period has passed without a recurrence of the attack. The night after taking the calomel three to four ¼-grain granules of podophyllin should be given. The patient should remain in bed for at least 10 days after the last paroxysm; little can be effected in the way of cure if the patient insists upon getting up and dragging himself about. Rest in bed is essential to prompt and thorough cure.

The treatment with quinine should be faithfully continued until three weeks have elapsed without recurrence of the fever. Arsenic may be given with favorable effect where quinine fails or when the patient is anemic. The effect of the arsenic is to stimulate the formation of fresh blood corpuscles and it probably acts upon the spleen; its action on the system is not very well understood, but its value in the treatment of remittent fever and chronic malaria has long been recognized. It should be given in ascending doses commencing with five drops of Fowler's solution to be augmented by one drop per dose per day, to be taken after each meal until puffiness of the eyes betrays the arsenical impression, after which its use may be discontinued. The dosage should not be increased beyond 15 drops three times per day. Fowler's solution is a most convenient form in which to take arsenic as the dosage can then be increased at will. Arsenious trioxide compressed tablets may also be used: Two 1-60 grain tablets to be taken after each meal. In anemia the use of iron is indicated and may be administered as Blaud's pills, 2½ grains each of iron carbonate and sodium bicarbonate; two pills to be taken after each meal. The iron supplies the necessary iron constituents for blood formation. In chronic malaria and especially when accompanied by kidney and bladder complications we have found the use of methylene blue most efficacious. It is given in one-grain doses three times per day.

In summing up, the treatment for malaria consists in taking from 10 to 15 grains of quinine at 10 a.m. and 4 p.m. following the dose with a drink of hot lemonade and if bladder and kidney complications are present, one grain of methylene blue after each meal. Arsenic is taken three times per day, preferably after meals, but not while methylene blue is being used. The Blaud's pills are to be taken thrice daily at the same time as taking the arsenic.

The use of quinine hypodermatically is not advised, as painful ulcers almost always follow such mode of administration. In pernicious fever the hypodermatic use of quinine in large doses, 10

to 15 grains, is indicated. The dose should be repeated at four-hour intervals and intense cinchonism established. Either the bi-sulphate or quinine and urea hydrochloride are used hypodermatically.

Forms in Which Quinine May Be Taken.

There is a choice in the various salts of quinine that may be used. Ordinarily the sulphate is prescribed. The active principle is the base cinchonidine and, other things being equal, that salt containing the greater percentage of base will for like weights be most efficacious. Taking the active base in quinine sulphate as 100, the relative values of the more common salts are as follows: Quinine sulphate, 100; quinine bi-sulphate, 79.6; quinine hydrochloride crystals, 110.0; ditto dried, 122.0; quinine, acid hydrochloride, 100.7. However, the solubility of the salts is to be considered above the quantity of active base. The sulphate dissolves in 720 parts water; the bi-sulphate in 8.5 parts; the hydrochloride in 18 parts and the acid hydrochlorides in less than its own weight. The sulphate is probably the most extensively used, but on account of its relative insolubility the use of any of the other three salts is very much to be preferred. The various salts may be used indiscriminately.

Much depends upon the form the quinine is in when taken. The stomach, weakened by the attacks of fever and disordered state of the intestinal tract, allow the more insoluble salts to pass through the system without being completely absorbed. Hard pills, sugar-coated or gelatin-covered, and compressed tablets are apt to pass through intact. Compressed tablets are convenient for carrying but should be pulverized before taking. By wrapping the powder in cigarette paper the dose may be taken without tasting. Quinine tannate is almost tasteless, but too insoluble for advantageous use. If tablets are to be used the bi-sulphate or hydrochloride are to be preferred. Quinine and urea acid hydrochloride are convenient forms of taking quinine. The combination comes in compressed tablets of five grains and are so soluble that they may be taken without pulverizing and to prevent being tasted should be wrapped in rice cigarette paper. These tablets also have the advantage in their being suitable for hypodermatic use when required.

A convenient manner of taking quinine is in solution. To dissolve 10 grains of the hydrochloride in a small compound heroic mixture which an experienced will equal five grains of quinine. The bitterness tends to mask the taste of the quinine and taking the remedy in solution insures its being rapidly and thoroughly assimilated. The taking of hot beverages after quinine is to be recommended as it helps away the bitter taste following the use of quinine and tends to aid the absorption. (We have noted that the continued use of quinine generally results in abnormally low temperature.) The diet is not important and one may be governed by his appetite.

If the above outlined treatment is followed from the beginning of an attack one never need fear the development of pernicious symptoms and any fever that is continuous under it for more than four or five days is not malarial. In enlargement of the spleen painting with tincture of iodine is beneficial, while arsenic is prescribed internally at the same time.

Prevention of Malaria.

The frequency and intensity of malarial attacks have a close relation to the rainfall and other meteoric conditions. The attacks are more frequent and severe in wet weather than in dry; and changes from one prevalence to the other are always marked by increases of the number of cases. There is a very widespread belief that blacks are less subject to malarial infection than whites and that natives are more or less immune to attacks. This is not in accordance with our observations. We find that natives living in the district, and having lived therein all their lives, are just as subject to attacks as others and that negroes not only are just as liable to attacks but usually develop the most aggravating cases. White men, according to our experience suffer the least both in regard to frequency and intensity of the attacks. This is probably in part due to the greater care that white men will take to prevent infection. The close relation of malarial outbreaks to rainfall is attributable to two causes, first, the area of breeding ground for the mosquitos is largely increased, and second, exposure all day to rain and wet makes the system less competent to resist attacks. It is also generally believed that repeated infections gradually permit the tolerance of the poison or partial immunity but according to our experience where quinine is not used prophylactically there is no such immunity. The use of three grains of quinine daily as a preventive, is practiced by the Army Medical Corps in their work among laborers on the Isthmus.

Views of Other Authorities.

Regarding the prevention of malaria the following is a synopsis of a paper read by Dr. H. R. Carter, "Director of Hospitals" at a meeting of the Isthmian Medical Society.

A. Prevention of breeding of mosquitos (Anopheles).

1. Destruction of breeding places by filling or draining marshes, cutting brushwood, clearing the banks.

2. Destruction of larvæ. (a) Crude oil on the surface of water. This is a difficult measure to carry out thoroughly as wind blows oil to one side and clears certain areas; also it is difficult to get oil in the midst of reeds, rushes, etc. (b) Planting fish; mosquito larvæ are closely associated with algæ, which protects them or furnishes food.

B. Prevention of mosquitos becoming infected:

1. By screening the sick.

2. By thoroughly treating the sick with quinine.

These measures are ineffectual because it is impossible to screen natives. Apparently healthy children and even adults, harbor the parasites, and quinine does not kill the sexual forms of the parasites which infect the mosquito.

C. Prevention of infected mosquitos getting at well persons.

1. By having houses at a sufficient distance from breeding grounds. With foliage to protect them from the heat of the sun (which quickly kills them), anopheles travel very far; some think that with the wind they may go ½ to 1 mile at one flight. Houses should not be nearer than 1 mile to the breeding places and when possible should be placed on hill tops.

2. By keeping the foliage for several hundred yards around habitations cut.

3. By screening houses thoroughly and using mosquito bars, and staying indoors at night. Mosquito bars are rather ineffectual compared with wire screening of galleries, which is probably the most important of all measures. A screened vestibule should admit one to the gallery.

D. Prevention of infection if infected mosquitos succeed in biting.

This brings up the question of prophylactic quinine, a subject upon which various observers differ. I have no doubt that 6 to 10 grains of quinine taken regularly every night will prevent a large number of infections. One quickly gets accustomed to these doses and does not feel any effect, nor do I think any bad effect occurs. I have not faith in smaller doses, and I have seen a number of infections occur in persons who had taken 10 grains daily for weeks.

Doctor Carter said that there were a number of measures, any one of which, if thoroughly carried out, would be protective, but as it is practically impossible to reach perfection along any one line, use has to be made of many measures, each supplementing another.

Quoting from a pamphlet on "Yellow Fever and the Mosquito," a reprint of an article by L. H. White, M. D., Surgeon U. S. Public Health and Marine

Hospital Service, New Orleans (that appeared in the Dec. 26, 1908, issue of the *Journ. of the Amer. Med. Assoc.*):

"Stegomyia callopsus and the culex pungens are both practically domestic animals—the stegomyia or yellow fever mosquito prefers clean water for breeding grounds, but the culex pungens, malarial mosquito . . . . breeds in identical situations, and, in addition, also breeds indiscriminately in any kind of water which may be available. . . . . The anopheles prefer swampy breeding places and will choose stagnant scum-covered water under the shade of trees and shrubbery if given a chance to do so. From this point they migrate, after hatching, to some clump of dank grass or shrubbery near a house and from this point of vantage enter the house after nightfall in search of blood. They do not fly very high, and this fact gave ground for the old idea that houses built high were safer in malarial countries because noxious miasms kept close to the earth. It has been said that the second stories of the old days were practically exempt from malaria and the third entirely so. Personal experience has shown that anopheles are vastly more numerous on the ground floor than above."

In our own experience we have found that clearing the shrubbery for 200 yards about habitations has materially reduced the frequency of attacks and though we have no experience with multi-storied houses, the hill tops are always points over which strong winds prevail against which the mosquitos will ordinarily be unable to fly, or else they prefer strata of comparatively quiet air. In the prophylactic use of quinine we have found doses of 10 grains given every day at 10 a.m. and again at 4 p.m. to secure absolute immunity. The quinine may be restricted to use say the first four days in the week, omitting the dose the balance of the time. We do not find that the constant use of 20 to 30 grains of quinine three or four days in the week is attended by any bad effect. Instead of inducing nervousness our experience leads us to believe that it has the opposite effect. It is very difficult to get natives and even many intelligent white men to use quinine constantly. They seem to think the constant use of a drug must necessarily be attended with some evil effect and that habitual use of the remedy lessens its curative properties at times of malarial outbreaks. Unlike some drugs the constant use of quinine does not call for correspondingly increased dosage when it has been used prophylactically. We have also observed that the outbreaks come as epidemics or malarial storms; either there is little sickness in camp or else there are many cases. These "waves" of attack differ from one another in some specific feature; prevalence of headache characterize some; pain in the back, others; or abnormally low temperature following fever.

As a further preventive against malaria we suggest the planting of eucalyptus globulus. In South Africa and Italy, the planting of these trees, which grow rapidly, has been attended with complete disappearance of the malady. It is also a well known fact that advancing civilization drives malaria before it.

Steel Corporation Production

The American Iron and Steel Association has prepared a table giving the production in 1908 of iron ore, coke, pig iron, steel ingots and castings, finished rolled iron and steel, wire nails, and tin plates and terne plates by the United States Steel Corporation, as compared with the production of all other interests; also the same comparison as to shipments of iron ore from the Lake Superior region. This table, slightly condensed, is as follows:

	Steel Corporation.		Others.	
	Tons.	Per Ct.	Tons.	Per Ct.
Shipments of Lake ore.....	14,579,613	56 0	11,435,374	44.0
Total prod. of iron ore.....	16,662,715	46.3	19,320,621	53.7
Coke made.....	8,169,931	31.3	17,863,587	68.7
Spiegel & ferro	115,344	75.8	36,674	24.2
Pig iron.....	6,849,064	43.2	8,964,036	56.8
Bessemer steel ingots.....	4,055,275	66.2	2,061,840	33.8
Open-hearth ingots.....	3,783,438	48.2	4,053,291	51.8
Total steel ingots.....	7,838,713	56.1	6,114,771	43.9
Bessemer rails..	795,713	58.7	558,523	41.3
Open-hearth r'ls	260,580	45.9	306,724	54.1
Total steel r'ls	1,056,293	55.0	865,247	45.0
Other rolled products.....	4,515,841	45.6	5,391,418	54.4
Tin and terne plates.....	386,718	72.0	150,369	28.0
Wire nails, kegs	6,529,718	61.2	4,133,254	38.8

The total of finished rolled products, including rails was 11,828,789, of which the Steel Corporation produced 5,572,124 tons, or 47.1 per cent., and other makers 6,256,665 tons, or 52.9 per cent. The table shows that the Steel Corporation produced in 1908 considerably less than one-half of the total production of pig iron and finished rolled iron and steel and over one-half of the total production of steel ingots and castings. All its figures include the production of the Tennessee Coal, Iron and Railroad Company in 1908. With the exception of rolled forging blooms and rolled forging billets, all unfinished and intermediate rolled products, such as billets, blooms, slabs, sheet bars, tinplate bars, muck bars, etc., are not included in the table. Nor do the figures include hammered car, locomotive, or other axles, anchors, shafting, hammered or pressed armor plate, and other hammered or forged products. For the first time in a table of this character open hearth steel rails and tinplates are separately enumerated.

The Steel Corporation's development, large as it has been, has hardly kept pace with the outside production. Thus to compare 1908 with 1902, the corporation's first year, we find that its proportion of the total pig-iron production has fallen from 44.7 to 43.5 per cent.; of steel ingots from 65.7 to 56.1; of finished steel from 50.8 to 47.1. The only increase was in its proportion of the total iron-ore production, which increased from 45.1 per cent. in 1902 to 46.3 last year.

Iron Ore in Spain

Consular Agent A. E. Carleton, of the port of Almeria, furnishes the following information concerning the red hematite ore of the Spanish province of Almeria: The iron-ore resources of Almeria have long been known in the commercial world, but not until the production of the mines in the north of Spain began to fail, has any special attention been paid to the development of this region. Although its mineral possibilities are not yet fully appreciated, there appears to be a general opinion among mining experts, based on examinations and showings that red hematite ore of excellent quality is to be found in abundance and a great future is predicted for the industry.

The great drawback to the development of the mineral resources of Almeria is the lack of railways; the only line in the province, which passes through only one district, not being able to give transport to all the minerals extracted. There is a network of cables connecting the mines with the foregoing railway, and likewise narrow-gage roads belonging to private companies. There are also several cables which run direct to the sea.

The province of Almeria ranks fourth in the production of iron ore in Spain, the following statement showing the relative output in the several districts for 1907 in metric tons: Bilbao, 4,736,190; Santander, 1,437,707; Murcia, 1,033,022; Almeria, 844,676.

According to the U. S. Geological Survey, turquoise and turquoise matrix to the amount of 20,500 lb., with an estimated value of $147,950, was produced in Arizona, New Mexico, Nevada, and California in 1908. The 1907 value was $23,840. An odd stone recently cut in Los Angeles from a deposit on Ithaca peak, in Mohave county, Ariz., showed a blue letter Y of turquoise in a gray matrix, this cutting being made possible through the presence of a split turquoise vein. The stone was sent to a student in Yale University.

The stock exchange in Mexico City is called the *Bolsa* and is conducted somewhat on the plan of the "Curb" market of New York.

North Lake Concrete Shaft and Foundation for Steel Head Frame

The accompanying illustrations show a concrete shaft, together with the head-frame foundation at the North Lake mine of the Cleveland Cliffs Iron Company, Ishpeming, Mich. The shaft itself is 20 ft. in diameter at the top and 17 ft. at the bottom, there being three 6-in. offsets in the sides of the shaft, which is 98 ft. deep. The shaft wall at the bottom is 3 ft. 6 in. thick, and 2 ft. thick at the top. The shaft was sunk, by the Foundation Company of New York, through quicksand to solid rock, from which point it will be continued to a depth of 500 or 600 ft. The shaft has five compartments, viz.: *a*, ladderway; *b*, for pipes; *c*, cage for men and timber, 6 ft. x 10 ft. 10 in.; *d*, skip-way, 4 ft. 3 in. x 5 ft. 5 in. The frame-work for shaft construction will be steel with wood guides, giving inside dimension of shaft, 14 ft. 10 in. x 10 ft. 10 in.

Tunnel

The tunnel shown in the illustrations is also built of concrete. The end at the right is to be used as a timber tunnel through which all the timber will pass from the yard to the shaft. The inside dimensions are 7x7 ft., with a 30-in. gage track laid in the concrete floor. This portion of the tunnel is 30 ft. long. The walls are 14 in. thick. The left end is 90 ft. long and is to be used as the entrance from the machine shop, engine room and dry house. All the drill steel, machinery and other supplies, except timber, will be sent to the mine through this entrance. An auxiliary tunnel will connect this main one with the dry house, so that it will not be necessary for any of the men to go out of doors when coming from work until they have put on dry clothes.

This structure is built on the edge of a swamp and beneath the tunnel portion is a cemented rock foundation 4 to 6 ft. deep, extending entirely across the tunnel and 1 ft. 6 in. on each side. The entire tunnel will be covered with dirt to a depth of 4 ft. This tunnel construction gives an entrance to the mine that does not in any way interfere with the loading of cars from the bins, or with surface works that are to be constructed above the shaft. The roof of the tunnel is reinforced with old steel cable, 7½ tons being used. All the joints between the sections of the forms are reinforced with 1-in. square iron bars about 3 ft. long. The remainder of the wall is not reinforced.

The "white copper" reported from Mulatos mine in western Chihuahua by the "Padre" is now known to be an alloy of tin and copper ores, which abound in some parts of the mine.

NORTH LAKE SHAFT NO. 1, ISHPEMING, MICH.

The Auriferous Antimony Ore of West Gore, Nova Scotia

By D. F. Haley*

The auriferous antimony deposit of West Gore, Hants county, Nova Scotia, occurs in a fissure vein in slates of lower Cambrian age. These slates are known as the gold-bearing series of Nova Scotia since practically all the gold which the province has produced has been won from the saddle reefs of this series.

Geological Conditions at West Gore

The slates at West Gore have been upturned to form a local anticline the axis of which strikes about east and west. The strike of the slates is not quite parallel to the anticlinal axis, being about N. 70 deg. E. with a dip of 45 deg. to the southeast. In the slates are many beds of quartzite locally called whin. The fissures, of which there are three, cut across both the slate and whin but the ore is found only in the slates. The fissures are parallel and strike N. 55 deg W., dipping to the southwest at an angle of 75 deg. Ore has been found in each fissure but has been extensively developed in only the middle one.

Vein Filling Material

The vein filling is crushed slate, quartz and some calcite and carries as associated minerals stibnite, native antimony, pyrite, mispickle, kermesite (Sb_2S_2O) and a soft, reddish mineral occurring in the gouge which is probably metastibnite (Sb_2S_3). The hanging-wall of the deposit is smooth and well defined but there is no regular footwall. A gouge of varying thickness composed of finely crushed slate with thin seams of stibnite and the red sulphite is generally found between the ore and the crushed vein filling. The ore is ordinarily found on the hanging-wall side and occurs frozen to the hanging in lenses of varying length and thickness. The thickness of the lenses ranges from 6 to 24 in. of high-grade ore in the center, thinning out in all directions. These lenses are about 50 to 60 ft. in diameter and are arranged in the fissure in a certain definite shoot which pitches about 45 deg. to the east in the vein. When a lens has petered out, a few feet of drifting or raising will usually bring in another until the limit of the ore zone is reached. Outside of this zone of enrichrichment only small amounts of ore are found. The oreshoot is about 250 ft. long with the lenses arranged irregularly therein but persistent in depth. E. H. Faribault of the Canadian Geological Survey is of the opinion that the intersection of a certain bed of slates with the fissure was favorable for deposition and this is probably the cause of the arrangement of the lenses, for the enriched zone has the same pitch in the vein as the dip of the inclosing slates. There are no igneous or intrusive rocks in the vicinity nor are there any signs of thermal-spring action, the ore probably being formed from circulating waters deriving their metallic contents from below. The deposition along a certain bed of slates is probably due to the fact that this bed contained more organic matter or was more open, allowing other solutions to permeate it more easily than the rest of the strata.

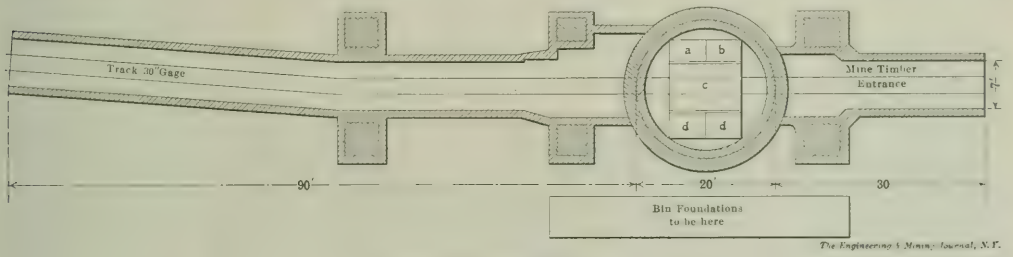
It is interesting to note that deposition is still going on, for in a crosscut the face of which is about 100 ft. from the vein a small stream of water was encountered in the breast. The face of the drift is now partially covered by a thin skin of sulphide of antimony. The smell of hydrogen sulphide is very marked in this drift. The red sulphide previously noted as occurring in the gouge is soft and clayey and is also still forming. It may be that this latter phenomenon is due to water from the upper levels taking antimony into solution which is redeposited in lower levels (such action has been noted by Weed and others).

The native ore occurs throughout the ore zone as small stringers and in bunches of varying size; it is most abundant where quartz predominates as the vein filling. It often occurs as wirelike stringers in the stibnite ore. It has a silver-gray color. Iron pyrite and mispickle occur as small crystals shot through the slaty filling. The pyrite carries considerable gold, the slaty filling of the ore zone carrying about 0.15 oz. Gold also occurs in the free state in the slate, the stibnite and in the quartz. The lenses of stibnite are quite pure, carrying from 45 to 55 per cent. antimony and from 1 to 3 oz. gold per ton; the stibnite seems to be made up of a number of grains of ore cemented together by finely crushed slate. This intermixed slate is not always visible to the eye, but can be seen by a glass. This explains why the ore which looks to be pure only averages about 45 per cent. antimony. Sometimes the stibnite is found in thin radiating crystals in cracks in the quartz. Its color is steel gray but it weathers rapidly to a blue. Where the ore occurs in the form of lenses there is rarely any quartz filling in the vein at that point, but in some places the fissure is 7 ft. wide filled from wall to wall with white quartz through which run small veins of stibnite and bunches of native ore.

Development of the Property

The main shaft is 500 ft. deep and is sunk on the vein, levels being driven every 100 ft. and carried east and west to the ends of the ore zone. From the 500 level a winze was sunk about 260 ft. east of the shaft and was carried down in the vein to a depth of 370 ft., levels being driven at 600, 700 and 800 ft. from the collar of the shaft. These levels were still in ore.

Overhand stoping is practised and no timber is used but that in the levels and chutes. The levels are timbered with spruce sets with 5-ft. centers. All chutes are carried through the stopes with 3-in. plank. Chute planks are framed on the surface so that when put together no nails are required, the filling holding them in place. Alternate chutes are made with ladderways. In starting a stope large stulls are first placed over the drift timbers normal to and hitched into the walls. The footwall end of the stull just touches the cap of the drift set. Poles are laid on these stulls. The gouge and slaty filling are then broken down from the ore to the hanging for a hight of 7 ft. and the length of the stope. This first slice of waste is dropped into cars on the level and hoisted or dropped into the level below for filling. As the ore is frozen solid to the hanging-wall it makes a good



OUTLINE OF CONCRETE TUNNEL

*Mining engineer, West Gore, Hants county, N. S.

back to shoot to and is not disturbed until the waste is all removed. Planks are then laid down and pop holes put into the ore which, after being broken down, is shoveled into the chutes which have been started by this time. Chutes are placed at 25-ft. centers. The waste from the next 7-ft. slice is then allowed to fill on the poles, the chutes are carried through it as the filling rises, planks are laid and the ore shot down and shoveled into the chutes. By this method of mining no timber is required in the stope, the stope is always filled to within easy reach of the back and the men afforded a safe and sure footing on which to work.

On breaking through to the level above the drift-set, sills are caught up by placing a stull normal to the wall and just under it. From the footwall end a short piece of plank is wedged between stull and sill. These stulls are not hitched into the wall but are held in place by wedges. By this method the drift set is held firmly in place until filling has been completed.

In large stopes where a chute must carry a large amount of rock the chutes are lined with 1-in. maple boards. All ladders are made of 2x4 spruce with ½-in. round iron rungs. When a stope is worked out the ladders are removed and all chutes but the end ones filled with rock. Iron doors made of ½-in. iron, sliding in grooves (made by spiking 12-lb. T-rail to the chutes) and operated by a hard-wood lever 8 ft. long, are used on all chutes and are very satisfactory, being much quicker than rack and pinion or the usual board arrangements. These doors can be removed and used over and over again as the stopes are worked out.

Before the erection of the mill the ore was dumped on a floor and washed by a hose. Two men picked out the largest pieces of No. 1 ore and threw them into the cobbing house. The mixed ore and slate remaining on the floor was shoveled into a car and thrown on the dump.

All waste was dumped from a higher level and shot into a chute from which it was drawn into a car and taken to the waste dump.

The Crusher Plant

The ore is now run to the mill, hoisted to a 60 ton bin from which it is drawn by a circular ore-bin gate. After sliding over a grizzly set to 1½ in. the oversize falls onto a table 3 ft. long 30 in. wide, where it is washed, the good ore is picked out and dropped into the shipping bin. The remainder is worked forward with a short hand-fed hoe into a 10x16 Farrel jaw crusher set to 1½ in., the crushed product from which joins the throughs from the grizzly and goes to crusher bin 60 ton bin. From this bin an automatic plunger feeder distributes the ore to a 18-in. belt elevator 12 ft. center to center of head and tail sheaves. This belt is a 7-ply rubber belt with a ⅛-in. reinforced cover with 14x7x7-in. malleable-iron buckets spaced 18 in. apart. Between the buckets and the belt small rubber valves of medium hard rubber are used. These are 1½ in. diameter and ¼ in. thick with a ¼-in. hole in the center to slip over the elevator bolt. The object of these washers is to eliminate the excessive wear which ordinarily takes place between the belt and cup from sands lodging there. With the above arrangement the sands that drop behind the buckets, as they turn over the head pulley, can run in the channels formed between the valves and several months are added to the life of the elevator belt.

This elevator delivers to a 12-ft. trunnion screen 36 in. in diameter. The first 8 ft. of this screen is covered with plate ½ in. thick punched with ⅜-in. round holes. The last 4 ft. has ⅝-in. round holes. Oversize from this screen goes to a belt conveyer 30 ft. long. From this belt No. 1 ore and waste are sorted out. The belt is 18 in. wide and travels at 35 ft. per min. Ore left on the belt goes to a gravity screen with 1¼-in. openings. The throughs of this go to rolls, the oversize to an 8x10 Dodge crusher set to crush to ⅝ in. This material with the crushed product from the rolls goes to the 16-in. elevator before mentioned and to the same screen.

Concentrating Plant

The throughs of the ⅝-in. end of the screen go to a jig making concentrates and tailings, the tailings going to 15x20 Bacon rolls set to ⅜ in., and the crushed product to elevator and same screen. Throughs from ⅜-in. end of screen go to a 3x8-ft. trommel with ⅛-in. round punched holes, oversize to jigs making concentrates and tailings. Tailings are recrushed in a Huntington mill. Throughs of this trommel go to octagonal trommel 3x8 ft. covered by 12-mesh 19-wire screen of woven-wire cloth; oversize passes to jigs, throughs to spitzkasten. Spigot product of the first compartment of spitzkasten goes to classifier; the hutch goes to five jigs and is about 30 mesh in size. Overflow from classifier and other spigots of spitzkasten go to a King revolving screen with 100-mesh cloth. Oversize material passes to three Willey tables, undersize to settling tank and after settling to a 6 ft. Frue vanner. Middlings from Willeys together with hutch material from the five jigs is treated on a separate table.

All but the rough jigs are three compartment machines with screens 24 in. wide by 30 in. long. Roughers are two compartment with same size screens.

Features of Milling Operation

The picking table and belt recover 50 per cent. of the antimony in a coarse form carrying about 40 per cent. Sb and 1 oz. gold. Coarse jigs account for 30 per cent. of the antimony recovered in a product carrying 50 per cent. Sb and 1½ to 2 oz. gold. The fine jigs and tables recover the remaining 20 per cent., making a product carrying 40 per cent. Sb and 3 oz. gold. The smaller the size of concentrate the higher the gold value, but the arsenic contents also increase with the fineness; 80 per cent. of the ore recovered by the process carries less than ½ per cent. of arsenic. The presence of the gold in the fine concentrate is due to the fact that the mispickle of the slates and ore is very fine and not liberated until the ore has been crushed to about 20 mesh, but when liberated it is easily caught owing to its high specific gravity. It appears as a silver-white streak above the blue stibnite. This streak assays 15 to 25 per cent. As, 15 to 20 per cent. Sb and 9 to 11 oz. Au. Arrangements are being made to separate this material from the antimony product and handle it for its gold and arsenic contents.

Most of the native antimony is caught on the jigs, for a small piece of native ore attached to a relatively large piece of quartz would, owing to its high specific gravity, settle out with the stibnite. Some of the native ore is also found in the silver-gray high-gold streak on the tables.

The mill has a capacity of 100 tons per 24 hours and has treated successfully a 4 per cent. ore from the dump, making a saving of 80 per cent. of the antimony and gold. The milling plant has not been operating long enough to get exact figures of cost, but under normal conditions we figure the cost will not exceed $2 per ton of ore treated, including all charges. Fuel is hard wood and there is an assured supply for many years available. It costs $2.50 per cord at the mine. All ore is barreled for shipment. Barrels cost 30c. each when purchased from factory, but local merchants furnish a considerable supply of sugar barrels at 10c. each. Factory barrels hold 500 lb. mine ore or 700 lb. concentrates. Sugar barrels hold 800 to 1000 lb. concentrate.

A recipe for a non-shrinking alloy, to be used in duplicating patterns, is given as follows by *The Metal Industry*: Tin, 50 lb.; zinc, 50 lb. This gives a tough, hard metal that runs well if a good grade of zinc is used. The addition of 2 lb. of bismuth will render it even more fluid and enable it to be poured at a lower temperature. By using heavy sprues and pouring cold the shrinkage, which is slight, may be largely overcome.

In the remote districts of Mexico rebellious and high-grade gold and silver ores are being treated by cyanide at a large cost to avoid the greater cost of transport to railroad of the crude ores.

Equipment and Ore Handling at Cornwall Mine

Ore Mined by Steam Shovels; Crushed in Pit; Handled in 50-ton Cars. Loading Pocket Holds 2500 Tons; Storage Capacity 30,000 Tons

BY QUINCY BENT*

Owing to the increasing depth of the workings at the Cornwall mine, Lebanon county, Penn., the steep track grades and in order to cheapen the mining of ore, it seemed wise to consider a new system of operation and to build such a plant as would best meet the required conditions.

It was decided to build a double skip incline on the footwall side of the mine, at the bottom of which should be located a pit pocket capable of taking the largest lumps that a 70-ton steam shovel would handle, and to crush at that point with a large jaw crusher in order to make the handling of the lumps less destructive to the bins, feeders and skips.

At the top of the incline was located the roll crusher and screening plant, from which the crushed ore is to be taken in a transfer car across a steel viaduct to the loading pockets which are located between the tracks of the two railroad companies. The steel viaduct and loading pockets, in course of construction, are shown in the accompanying illustration. It is intended to work the mine in 30-ft benches with steam shovels dumping into 50-ton mine cars; these cars to be self cleaning and side dumping, with mechanically operated gates, and being shifted with steam locomotives to the dumping place over the pit pocket. Special provisions are made for handling large lumps of ore and getting these to the 60x42-in. crusher with the minimum difficulty, a Mason roller 9 ft. in diameter being used to feed the crusher. Small bins are placed between the various steps in the operation to provide leeway and insure as far as possible continuous operation.

After passing the crusher, set at 16 in., the crushed material rejoins the stream, which has been roughly separated by means of a space back of the feed roller, in a 100-ton double-roller pocket which feeds either skip car.

The whole structure of the pit pocket, 70 ft. high, is entirely self-contained and can be slid down the footwall as the depth of the mine increases.

The crusher was designed by E. C. Bacon and built by the Farrel Foundry and Machine Company, the important parts being steel castings of generous dimensions. A 150-h.p. motor drives the crusher.

Hoisting Arrangement

The skips travel at a maximum speed of 600 ft. per minute on a 45-deg. incline with a load of 10 tons. The hoist is operated by a 500-h.p. direct-current motor, the starting, accelerating, slowing down and stopping being accomplished by automatic electric control. The skip will be arranged for hoisting water in flood times. As long as the mine footwall continues at 45 deg., the skips will be run balanced; but when the slope changes to 30 deg., as will be the case in several years, another 500-h.p. motor will be added to the hoist and the operation continued unbalanced.

The hoist was built by the Lidgerwood Manufacturing Company, being equipped with double drums of 108 in. diameter and 52 in. face grooved for 1½ in. wire rope. Two post brakes are provided to hold in both directions. The brakes have wheels 54 in. in diameter with 12 in. face and are operated by compressed air.

Crusher Facilities

The skips dump on a [illegible] 50 ft. above the ground level, into a 175-ton bin which has at its outlet a Mason square-discharge roll feeder and another step-

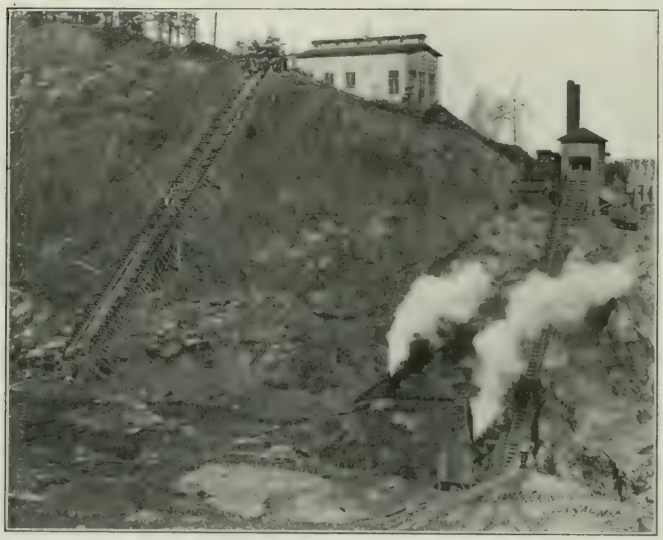
VIEW OF SURFACE WORKS SHOWING STEEL VIADUCT AND YARDAGE FACILITIES

*Maryland Steel Company, Sparrow's Point, Md. Former manager, Pennsylvania Steel Company.

bar screen, all to pass 4-in. lumps. The oversize is crushed in two sets of 48x 48-in. corrugated rolls, with corrugated segmental faceplates. The first roll is set to 10 in., the second to 4 in., both being driven by a 250-h.p. motor. These rolls were built by the Morris County Machine and Iron Company, and are substantial and well designed.

The crushed product joins the under 4 in. size separated by the bar screen and squirrel cage mentioned above, and passes to two 15x5-ft. Allis-Chalmers revolving screens having 1¼ in. perforated plates. These two sizes, under and over 1¼ in., are stored in separate transfer pockets to be taken by the motor transfer car, over the steel viaduct, to the loading pockets where they are stored ready for railroad shipment.

440-volt, three-phase alternators. These engines will operate on coke-oven gas which is to be piped from the ovens of the Lackawanna Iron and Steel Company and the Pennsylvania Steel Company, through an oxide sulphur purifier, a recording meter, and into a 250,000-cu.ft. gas holder from which it will be drawn as needed by the engines. The 440-volt current is passed through step-up transformers to a transmission voltage of 11,000 volts and is wired along the Cornwall and Cornwall & Lebanon Railroad tracks to the mines, entering the substation on the hill side where it is stepped down to 440 volts for use in the alternating-current motors. For use in direct-current work there is provided a 500-kw. rotary converter which will supply 500-volt direct current.



OPEN PIT, INCLINES AND POWER HOUSE

Loading Pocket

The loading pocket is a concrete structure having a capacity of about 2500 tons of crushed ore; the shipping track passes under and through the bin arches, the cars being loaded by means of Mason rollers, not over two minutes being required for the loading of one car and several cars being loaded at once. Extending back from the bin is an elevated trestle 40 ft. high from which can be stored 30,000 to 35,000 tons of crushed ore; this can be reclaimed by a steam shovel or a grab-bucket crane operated from a railroad track.

Power Generation

The power for the operation of this plant will be generated at Lebanon by three gas engines direct connected to 750-kw. Westinghouse

Features of the New Arrangements

The features of the new arrangements at the Cornwall mine which will make for more economic working are: (1) No ore is to be taken out of the mines with locomotives, thereby avoiding grade trackage and excessive repair costs. (2) The steam shovels can work to greater capacity, as no stops have to be made to break lumps. This also reduces powder costs. (3) Delays on account of shifting should be minimized, as all cars are 50-tons capacity and the operation is planned to be continuous. (4) The ore will be thoroughly mixed after passing the various machines and bins, including the storage bins. (5) The ore will be broken, ready for roasting. (6) The ore will be sized so that it can be mixed in the proper proportion for most efficient roasting. (7) Railroad cars will not be delayed in loading, and trips to the mines increased to one per car per day. (8) Railroad cars will not be damaged by mine handling. (9) The number of men required and possibly the time of operation will be lessened.

The present method of mining cannot be continued for more than 1,000,000 to 1,500,000 tons at any event owing to the excessive grades necessary, etc. By this scheme excess power can be sold to various consumers at a profit, as its cost at the switchboard should not exceed 5 to 6 mills per kw. hour.

The engineering work, in general plan and spirit, was layed out by A. J. Mason, of Hoover & Mason; the electrical apparatus furnished by the Westinghouse Electric and Manufacturing Company; the details, designing and construction, being accomplished by the company's engineers on the ground. The whole plant is expected to be in operation during the early fall.

Chrome Ore in Canada

By Phillips Thompson

According to a report just published by the Mines Department of Canada,[1] the production of chrome-iron ore appears likely to become an important Canadian industry judging by its rapid progress during the last few years. The statistical table published in this report shows that the output of chromite has increased from 1000 tons, valued at $20,000, in 1894, to 7225 tons, of the value of $82,008, in 1908. Up to 1902 production was unsteady, and the deposits were only superficially tested and operated. Their peculiar occurrence added so materially to the difficulties in mining and the cost of preparing the output for the market that there was no reasonable margin of profit. Different conditions now prevail; the deposits have, in many cases, been followed toward depth; more practical mining methods have been adopted, and concentration processes greatly improved.

Chrome-iron ore, or chromite, resembles in appearance magnetite, and in the beginning of the industry magnetite was frequently taken for chromite. The study of the deposits is closely connected with that of serpentine rocks, with which they are associated. Economically the most important serpentine belt in Canada is that extending from southern Vermont to Gaspé, in Quebec Province, the mineral constituents of which include chromite and asbestos. This great serpentine belt may be divided into three areas: (1) The area covering part of the townships of Bolton, Orford, Brompton, Melbourne

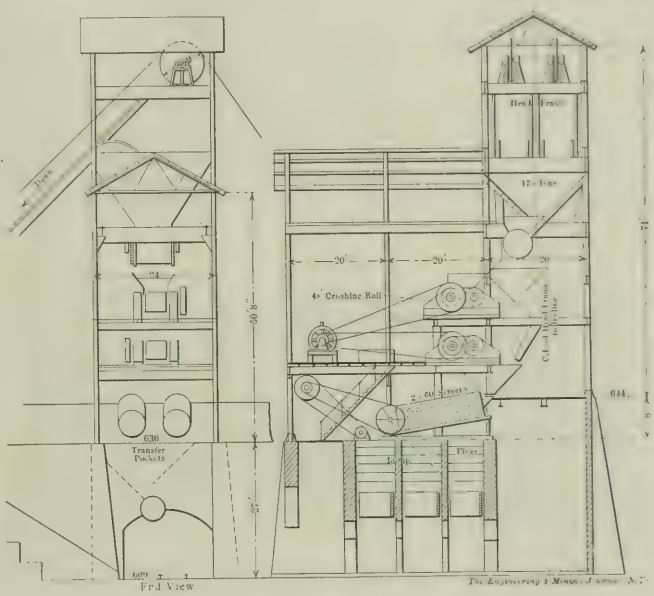
[1] "Report on the Chrome Iron Ore Deposits in the Eastern Townships, Province of Quebec." By Fritz Cirkel. Canadian Department of Mines, Mines branch. Pp. 141; illustrated, 10x6½ in.; paper. Ottawa, 1909; Government printing bureau.

and Danville which may be termed the southwestern area. (2) The Thetford-Black Lake area covering part of the townships of Ham, Wolfeston, Coleraine, Thetford and Broughton. (3) The area covering part of the Gaspé peninsula. In the first area chromite exists at several points in Bolton, Brompton and Melbourne townships. Attempts at mining have been made, but in nearly every case the mineral was found in too small a quantity for commercial exploitation. As prospecting in this region is difficult owing to the heavy forest growth, its true value as regards chrome-iron ore can only be surmised. Similar conditions prevail in the Gaspé peninsula, where small pockets of chromite have been found in the serpentines of Mount Albert. All the productive mines of chrome ore are in the Thetford-Black Lake area, more especially in the township of Coleraine. The serpentines in this area form disconnected masses, generally of small extent in the great series of slates, schists and diorites designated as the Cambrian formation. Occasionally they assume such proportions as to form mountain ridges, as may be noticed in Black Lake, where the mines are situated on the great serpentine ridge, which attains a hight of 900 ft. Most of the serpentine in the chrome-iron-ore region contains a very small percentage of chromite disseminated through the mass in a fine state of diversion. The chromite does not occur in veins, but is found, as a rule, in irregular masses and pockets, having no definite form and no tendency to adhere to dimensions. These masses may have dimensions of from a few feet up to 50 or 75 ft. Cracks and faults can be found throughout and calculations as to the continuance of a deposit toward depth are entirely out of place. The mining of chromite will consequently always be attended with much uncertainty on account of the pockety nature of the deposit.

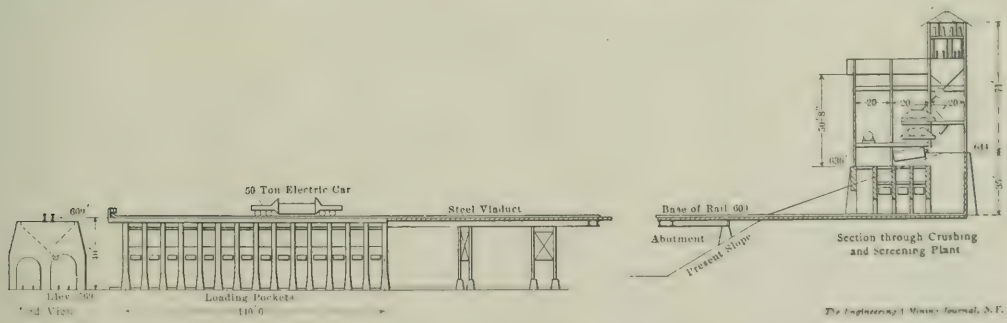
The serpentine is often cut by intrusive granite dikes, which are frequently in or close to chromite-iron deposits, and seem to have exerted a favorable influence on the deposition of the mineral. Sometimes these dikes cut off the work entirely, but in the majority of cases good ground is found by driving through the dike mass.

Owing to the irregularities of the chromite deposits there is considerable variation in the quality of the ore and rock mined. While one mine may deliver a high percentage of crude another may not produce any crude at all, but a milling material rich in chromite. In the one case the crude forms perhaps from 20 to as high as 40 per cent. of the total rock mined, while the bulk of the poorer rock goes to the mill. In cases where the crude deposits are not large and the disseminated ore predominates, from 5 to 10 per cent. of crude only may be obtained. The lowest percentage of milling rock of the total rock mined is 20 per cent and the highest 65 per cent. On an average the chromite in the low-grade milling rock, as at present extracted may be taken as from 40 to 60 per cent. Rock containing less than 10 per cent. chromic oxide is usually allowed to go to waste.

The report gives elaborate details of the plant employed for the concentration of the ore and its preparation for market, and the present condition of the producing mines. Three companies are in the field, the Black Lake Chrome and Asbestos Company at Black Lake, the Canadian Chrome Company near Thetford, and the American Chrome Company operating in the neighborhood of Black Lake. There are in operation 75 stamps with a total approximate capacity of 150 tons of milling rock per day. About 150 men are employed during the summer season.



SECTION THROUGH CRUSHING AND SCREENING PLANT



ELEVATION OF TRANSFER AND LOADING SYSTEMS

A New Martin Furnace with Double Hearth*

The chief aims of modern steel works are output, economy and quality, and the attainment of the first two does not necessarily mean that the third will be satisfactory. The Thomas and Bessemer processes leave much to be desired in this respect, and the Martin furnace is coming to the front on this account. Talbot-Martin furnaces have been built to 250 tons capacity and larger ones will shortly follow. The economy of the Martin process is obtained by annexing the steel plant to the blast furnace, receiving the pig iron in a molten condition, and by the simultaneous smelting of ore.

When this process in stationary Martin furnaces is considered with the same one in tilting furnaces (Talbot process), it is seen that in the single-hearth stationary Martin furnace the rate of charging is limited on account of the excess of slag-forming materials, which are hard to remove from the stationary type, and which render the final refining difficult. If the highest rate of charging is sought in spite of the larger content of slag-forming materials, the loss of iron in the slag will be heavy. In the tilting furnace the heavier charge may be used, but a separate process is required for the final refining. With either process quality or quantity must suffer.

It was evident that a heavier charge could be used if the resultant slags, rich in iron, could be removed to permit the final refining and again worked over without loss of their iron and heat. This led to the invention of the Martin furnace with double hearth, and a tilting device whereby the slag could be poured from one hearth to the other. The furnace and process are protected by letters patent.

The furnace consists, as shown by the accompanying sketches, of a double hearth so constructed as to permit, by its mounting on rollers, a tilting motion which allows the contents of one hearth to run wholly, or in part, into the other. As opposed to the common form of tilting furnace, the tilting serves here not to discharge the furnace, but to carry on different operations simultaneously in the one furnace.

For iron smelting the furnace can be made with moving top, as the Mischer or Talbot type. This construction is shown in Fig. 4. The possible angle of incline here is slight as the walls of the hearths are not high enough to allow a greater tilt. Larger furnaces may be built with a parting in the roller-ways, as in Fig. 2, requiring a lighter supporting structure. There are no difficulties of construction to be overcome, only well known forms being required. The roller-ways do not rest directly upon the arches of the heat chambers, but upon the side walls outside the arches and upon a support in the center.

The amount of tilt given the hearths governs the amount of metal or slag to be run from one hearth to the other, this amount depending (see Fig. 3) upon the angle of tilt a, gradient of hearth b, length of hearth l and depth of bath t. To increase the amount of material flowing from one hearth to the other for a given value of a, the angle b must be decreased and the ratio $l:t$ increased. In the accompanying table, $b = 30$ deg. As the usual proportions of hearths seldom give $l:t$ less than 7, it is seen that a small value of a will allow considerable material to pass over.

In order to retain the charges when in a tilted position the outer walls of the hearths are raised, as shown. It is to be remembered that metal flowing over with the slag is not lost. Removing the slag from the bath of metal is, as in electric furnaces, easily accomplished.

Another method of construction is shown in Fig. 1, in which the top and arches are stationary and the hearth alone movable. This construction is useful in metallurgical operations requiring low temperature.

Method of Operating

The method of operation in the combined pig iron and ore process, which first suggested the furnace, is as follows: A charge is left only sufficiently long in hearth A to reduce the iron from the slag, this being already decarbonized. In order to free the charge from the iron-bearing slag and to pave the way for the final refining, the furnace is tilted so the slag flows from hearth A to hearth B. After the slag has been poured into B, molten pig is charged, the contact of the pig and slag sets up an energetic refining action and the iron is taken from the slag. Meanwhile the charge on hearth A is finished and tapped. The hearth is repaired as usual and the tap hole left open.

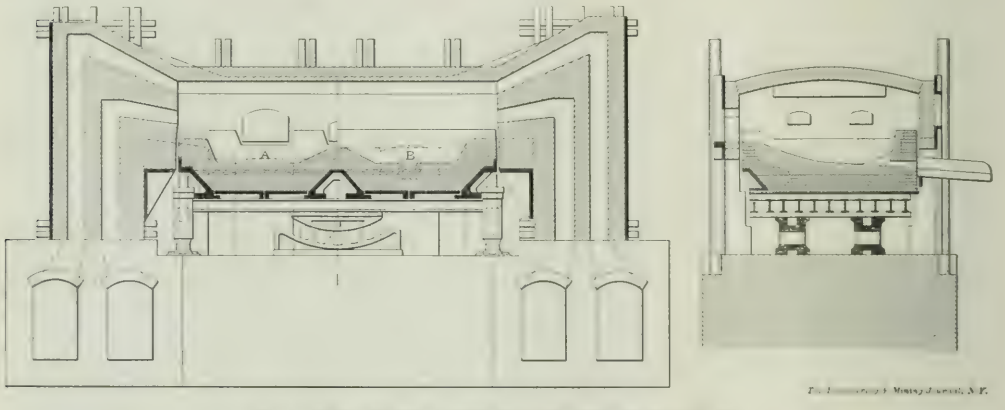


FIG. 1. DOUBLE-HEARTH MARTIN FURNACE WITH STATIONARY TOP

TABLE OF OVERFLOW FOR DIFFERENT VALUES OF $l:t$.

Angle of Tilting Deg.	$l:t = 7$. Per Cent.	$l:t = 8$ Per Cent.	$l:t = 9$ Per Cent.	$l:t = 10$ Per Cent.
0	0	0	0	0
2½	16.5	18.0	19.0	20.0
5	32.5	37.0	41.0	45.0
7½	51.5	57.0	62.5	66.4
10	67.0	71.0	75.3	78.0
12½	77.0	80.1	82.6	84.5
15	83.6	85.6	87.7	89.0

As the operation is a continuous one, the slags, which have not been discharged, have become heavier. These slags must be poured when sufficiently low in iron. This is done after the charge has been tapped from A and the pig added to B. By a slight tilting of the furnace, the slag

*Abstract of an article by Carl Brisker in Stahl und Eisen, July 28, 1909.

runs from *B* to *A* and out through the still open tap hole. Or it may be discharged over the side walls of hearth *B* and the hearth *A* used at the same time for charging fresh material. In hearth *B* the heat generated by the decarbonization of the iron is made use of by the addition of iron ore. Ore is scattered over the charge as long as the temperature holds. As all of the iron cannot be reduced from the ore, a certain amount of ore is slagged. The desired slag, heavy with iron, is thus obtained. It will be later poured off into hearth *A* where the operation is steadily going on, molten pig added, and the process continued as before.

An advantage claimed over the Talbot double-hearth furnace is that in the Talbot furnace the slags must be withdrawn and taken to another furnace to save their iron content. As against the ordinary Martin process, the whole operation is complete in the one furnace. Phosphorus is completely extracted.

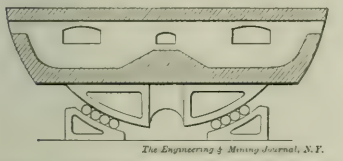


FIG. 2. HEAVY CONSTRUCTION WITH TWO ROLL WAYS

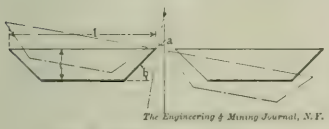


FIG. 3. DIAGRAM OF HEARTHS

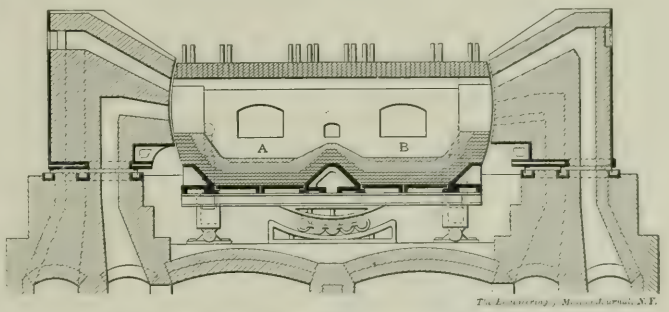


FIG. 4. DOUBLE-HEARTH MARTIN FURNACE WITH MOVING TOP

The Tungsten Ores of Canada

SPECIAL CORRESPONDENCE

A careful report on the occurrence of tungsten ores in Canada[1] has just been issued by the Mines Branch at Ottawa. The introductory part gives a general description of tungsten and its various uses, and the principal ores in which it is found, including wolframite, hübnerite, scheelite and tungstite, all of which occur in different Canadian localities, mainly in Nova Scotia and British Columbia. General chemical tests for the discovery of the presence of tungsten are given, with the indications which may guide the prospector in his work. Regions characterized by the occurrence of ores of tin or gold quartz veins occasionally bear tungsten minerals as well. While tin ores are of rare occurrence in Canada, in several of them tungsten is also found, as in Lunenburg county, N. S.; in the vicinity of Victoria mines, in the Sudbury district, and in some of the Yukon creeks, where cassiterite and scheelite are found in the heavy sand and gravel. It will accordingly be profitable to examine quartz veins in gold quartz districts. As a rule veins rich in gold are poor in tungsten, while near gold quartz mines, the veins may be valuable for tungsten but practically free from gold. An assay of concentrates from a stamp mill may reveal the presence of ores of tungsten. The dark color, easy cleavage and high density of hübnerite and wolframite, when found in quartz veins, are very characteristic. In placer mining the presence of scheelite is readily detected by the occurrence of rounded grains or pebbles almost white and so heavy as to concentrate with the gold. Though seldom thus found in quantities of economic importance, they may be a valuable indication of scheelite-bearing veins in the neighborhood.

Where intrusive granite comes in contact with slates and schists, quartz or pegmatite veins frequently intersect both the intrusive and the slate-schist series. It is generally agreed that the contraction of the granite mass occasioned fissures, which in the slate-schist series appear to have become quartz veins, at times carrying gold or tungsten. Where the slate or schist overlying the granite is not thick, these veins may occur at considerable distance from known outcrops of granite, while the latter may exist at no great distance below. Geological evidence suggests that tungsten deposits found in proximity to granite masses are derived from those constituents of the igneous mass which were expelled toward the close of the formative period, and found their way into pegmatite masses; irregular tin-wolfram-quartz veins carrying occasionally gold or tungsten or both. So far Canada has not become a producer.

The concluding portion of the work deals with the known occurrences of tungsten, the list having been considerably extended by the chemical examination of concentrates undertaken in connection with the investigation. In most instances the quantity of ore available is insignificant, and in others the grade is low, but these discoveries may be important as indicating the occurrence of larger or richer deposits in the vicinity. During the summer of 1908 scheelite deposits of a promising character were discovered at the Moose River gold mines in Halifax county, N. S., as one of the indirect results of the investigation. The attention of prospectors having been directed to tungsten a scheelite-bearing vein was discovered near the Waverly gold mine, Halifax county, about 40 miles distant from the Moose River deposits, and as it is in line with the strike of rocks the intervening region is regarded as an encouraging field for prospecting. Exploration pits had been put down on the Moose River scheelite claims to a depth of 25 ft. and a small quantity of ore produced, incidentally to development work. At New Ross, Lunenburg county, N. S., tungsten minerals occur in association with tin ore and several claims have been taken up, but are not being operated. Scheelite has for many years been known to occur in connection with silver in Marlow township, Beauce county, Quebec, but the mine never got past the prospecting stage. The discovery 50 years ago of wolframite in a boulder at Lake Couchiching, Ont., is believed to indicate the location of the parent deposit somewhere near the headwaters of the Ottawa. The tungsten ores of the Kootenay district in British Columbia occur in association with gold in quartz veins and are usually confined to well defined gold-quartz deposits. So far the tungsten has not been separated or turned to any commercial purpose, but it is hoped that the saving of tungsten ores may be found profitable in the case of some properties too low in gold to be worked as gold mines. Scheelite has been discovered in large quantities in the Cariboo district of British Columbia, masses of pure scheelite sometimes 50 lb. in weight, having been taken out, and the shipment of concentrates may be feasible.

[1] "Report on the Tungsten Ores of Canada." By T. L. Walker. Canadian department of Mines, Mines Branch. Pp. 56, illustrated; 9½x6½ in.; paper. Ottawa, 1909; C. H. Parmelee, King's printer.

The Carboniferous Deposits of Northern Coahuila

Geology of an Important Coalfield of the Cretaceous System. Abundant Fossils but Their Bad Condition Renders Identification Difficult

BY J. G. AGUILERA*

The first who made mention of the carboniferous deposits of Coahuila, their importance and quality, was Kuchler,[2] who considered the formation of these deposits as belonging to a coal system, and classified the limestone of the sierra as Blue Mountain limestone. He gives also a geographical description of the region, and mentions the existence and extent of the sheet of basalt, which is found there.

W. H. Adams[3] classifies as Triassic the coal in the vicinity of Cedral, northwest of Las Esperanzas, and at the foot of the Santa Rosa mountain, while he considers the coal of Eagle Pass to be Permian.

Persifor Frazer[3] also refers to vast coalfields discovered by Dr. H. B. Butcher, 66 miles northeast of Monclova and 20 miles north of Progreso, near the Sabinas river. He declares that the limestones of the mountains of this region are carboniferous and he ascribes to them an approximate total thickness of 6000 feet.

R. T. Hill[4] attributes to the last period of the Upper Cretaceous the great carboniferous formation of Sabinas which, he declares, is connected with the coal seams of the Rocky Mountain region, already worked in New Mexico, Colorado, Wyoming and Utah. In the geological map which he joins to his report he distinguishes: Coal measures (Laramie?), Lomita shales (Colorado) and Mountain limestone (Comanche), as subdivisions of the Cretaceous and Terrace conglomerate (Neocene) and volcanic lava (Post-tertiary).

R. T. Hill and T. W. Vaughan[5] give a table of all the formations of the plateau of the Rio Grande, in which they establish that the Edwards limestone subdivisions of the Fredericksburg division is equivalent to the Santa Rosa division of Hill.

The Lomita Shale schists, although lithologically resembling the strata of Fox Hills and Laramie, correspond to the Weberville and Eagle Pass subdivision of the Montana division; they are found in the mines of Eagle Pass, San Felipe and Sabinas, which lie to the north of Santa Rosa and to the south of the Sabinas river. The limestone conglomerate corresponds to the Uvalde formation (Pliocene).

C. A. White,[6] in treating of the northern region of Mexico, says: "Exposures of equivalent strata (Eagle Pass beds) occur in and near the valley of the Sabinas river, in the central part of the state of Coahuila, as well as at a few localities between the Sabinas river and the Rio Grande in the same state. * * * The Laramie, which is such an important formation in the two interior regions, is also an important one in the north Mexican region, especially in the states of Chihuahua, Coahuila and Nuevo Leon. Its presence in the first named state has already been mentioned, and it is also well developed in the Sabinas valley, in Coahuila, where it is an important coal-bearing formation."

T. W. Vaughan[7] asserts that the coals of Sabinas belong to the Fox Hills. He groups in four areas the carboniferous fields of the valley of the Rio Grande; in the third, he places the interior part of the plain of the Rio Grande, from the Santa Rosa mountains to beyond Eagle Pass. He mentions the coal mines of San Felipe, Fuente, Sabinas and Porfirio Diaz.

Physiography

The carboniferous district of Las Esperanzas forms a part of the coal-bearing region in the northern part of the state of Coahuila and small parts of northwestern Nuevo Leon and Tamaulipas. From an industrial viewpoint these sections form a single region in respect to the importance of the carboniferous basins encountered, especially in the state of Coahuila, although the coal of each of the states mentioned belongs to a different geologic age. The principal carboniferous fields that have been explored in this region, aside from Las Esperanzas, are: Fuente, Hondo, Mezquite, Agujita, San Juan, Sabinas, and El Menor.

This coal-bearing region belongs in part to the vast desert region of northern Mexico, and lies in the zone which borders on the Gulf coastal region. If we consider it geographically, it forms the southeastern extension of the most eastern ridges of the Rocky mountains, and of a portion of the plateau district which these ridges inclose. In general, it constitutes an immense plain, gently sloping toward the northeast and forming a bottom from which rise high mountains. These form part of the eastern Sierra Madre of Mexico and have an average strike north, 20-25 deg. west.

They divide the region into plains of different sizes, the surface of which here and there presents hills and little mesas of small altitude, while the upper part shows the remains of an ancient plain which latterly was cut up by erosion. The region that we have hitherto been considering forms the northeastern beginning, or the northeastern angle, of the great high plain which improperly has been called the Mesa Central Mexicana.

The relief of the lower parts is, then, comparatively monotonous, while that of the mountains is greatly diversified. One there encounters escarped and ragged ridges, presenting capricious outlines, narrow valleys passages and defiles characteristic of recent mountains. The region is cut by numerous streams of water, differing in class and importance, and all of which belong to the hydrographic basin of the Sabinas and Alamo rivers. By their confluence these two rivers form the Salado river, which is a tributary to the Rio Grande.

The land in the vicinity of Las Esperanzas, the scene of the Mexican Coal and Coke Company's operations, belongs to the lower portion of the region, and in the western part presents only slight undulations and small hills, the elevation increasing toward the sierra of Santa Rosa. Considered from a topographic viewpoint, the land of Las Esperanzas lies in the zone that forms a passage from the base of the sierra to the lower plain. Here as in many other places of the region the plain is subdivided by secondary elements of relief into various small topographic depressions, many of

*Director of the Mexican Geological Institute, Mexico, D. F.

NOTE.—The term "carboniferous" is employed in this article with its literal meaning of ground containing coal, whatever its geological age; for the Carboniferous system, the designation "Permo-Carbonic system" is used in accordance with the recommendation of the International Geological Congress.

NOTE.—Translated from a paper presented in French before the International Geological Congress.

[2] Manuel Kuchler, "Valles de Sabinas y Salinas." Exploration and description of the valleys of Sabinas and Salinas, etc. 16 pp.; illustrated. Imprenta Imperial, Mexico, 1860.

[3] "Coals in Mexico, Santa Rosa District." *Trans.* A. I. M. E. Vol. X, pp. 270-273, 1882.

[4] "Coal in Silesa and Iron Mines in the States of Nuevo Leon and Coahuila, Mex." *Trans.* A. I. M. E. Vol. XII, pp. 537-569, 1883-84.

[5] "Report upon the Geology and Mineralogy of the Santa Rosa Mineral Zone with Map." San Antonio, Tex., 1891.

[6] "Geology of the Edwards Plateau and Rio Grande Coalfields of Texas." *Twelfth Annual Report*, U. S. Geol. Surv., Part II, p. 242.

[7] "Correlation Papers—Cretaceous." *Bull.* No. 82, U. S. Geol. Surv., p. 138, Washington, 1891.

[8] "Reconnaissance in the Rio Grande Coal fields of Texas." *Bull.* No. 164, U. S. Geol. Surv., Washington, 1900.

which are bounded by anticlinal folds, very open and of slight elevation. These topographic depressions correspond to the synclinal folds, as at Las Esperanzas.

Geology

In all the carboniferous region of northern Coahuila, are found in great abundance two sorts of sedimentary rocks; there is also a volcanic rock occurring in extremely limited proportions. The sedimentary rocks are layers of marly sandstone, in color, light green, yellow and red; also, grayish limestones inclosing argillaceous schists, which are gray and black in the upper part and a more or less clear blue in the lower part of the formation. The sandstones are generally of fine grain; in certain places the schists are mixed with a little sand. There is a stratum, varying in thickness between 5 and 30 m., which is a conglomerate of large limestone pebbles.

SEDIMENTARY FORMATIONS OF THE COAL-BEARING REGION OF COAHUILA.

Group.	System.	Series.	Stage.	Sub-stage.	Division.	Plain.	Sierra of Santa Rosa.	
Cenozoic.	Tertiary.	Pliocene.			Uvalde Reynosa.	Calcareous conglomerate Yellowish limestone.		
		Eocene.				Bench of oysters in the schists.	Destroyed by erosion.	
						Variegated schists.	Destroyed by erosion.	
Mesozoic	Cretaceous.	Neo-cretaceous.	Laramie.		Las Esperanzas.	Light greenish sandstones with silicified impressions of plants and stems.	Destroyed by erosion.	Danian.
			Montana.	Fox Hills and Fort Pierre. Eagle Pass.		Schists with workable strata of coal.	Only visible in slight thickness in some places at the foot of the sierra. Coal-bearing schists of small thickness.	Aturian.
						Fossiliferous, yellowish calcareous sandstones, with thin beds of schist and limestone, also fossiliferous.	Calcareous schist of *Exogyra costata* on the summit of the sierra. Fossiliferous schists of Múzquiz (Montana and Colorado).	
					Barroterán.	Bluish schists without fossils		Emscherian (?).
			Colorado.	Niobrara Benton.	Peyotes.	Calcareous schists with *Inoceramus labiatus*, *Ptychodus Whipley*.		Lower Turonian.
		Meso-cretaceous.	Edwards limestone.			Santa Rosa.	Ashy-gray compact limestone.	Cenomanian.

As volcanic rock there is only the basalt which forms a covering over the limestone conglomerate. This basalt comes from eruptions in the sierra of Santa Rosa de Múzquiz. The liquid sheet flowed over an area of several hundred square kilometers, from its starting point to Sabinas and San Felipe.

This stream of basaltic lava served as a protective covering for all the ground over which it spread. Erosion first took place upon the land surrounding this stream, wearing it down to a low level, and then attacked the basaltic rock, with the result that the lava stream was first converted into a plateau, and by the erosion of later times, has been subdivided into a great number of small plateaus.

In the village of Sabinas, and in the vicinity of Agujita, the Neo-cretaceous series is represented by the Fox Hills sub-stage of the Montana; and further, in the vicinity of Hondo, by the Laramie sub-stage of the stage of the same name. All are covered with conglomerates of limestone pebbles which come from the limestone of the Meso-cretaceous series. This limestone reaches a thickness of 30 m.; at the base is a compact Pliocene limestone, which does not subdivide into regular layers; it is in turn covered by the flow of basalt, which is 2 m. thick, and reaches from the sierra of Santa Rosa to the right bank of the Sabinas river, and continues a distance of 45 km. to Hondo. In width it extends over a surface varying from 800 to 5000 m. if we connect the numerous mesas which today are separated by erosion, but which once, as we have seen, constituted a vast platform at the beginning of the Pleistocene.

The Laramie is characterized by two strata of schists and soft sandstone in well-defined beds, with different fossiliferous horizons, some of which, on the northeastern and southeastern boundaries of the carboniferous region contain the molluscan characteristic of Laramie, while the others inclose petrified tree trunks and impressions of plants corresponding to the upper part of the Fox Hills or to the lower part of the Laramie. This stage is found west of Lampazos, on the northeastern boundary of the Cretaceous coal-bearing region.

Montana Stage

The Montana stage, in its Fox Hills sub-stage, may be divided into three zones of an approximate thickness of 600 m.: The upper zone is composed of yellowish sandstone, marly and calcareous, with beds of gray and black schists, more or less carboniferous; the sandstones contain petrified tree trunks and impressions of Equisetum plants of indeterminable species. Over the sandstone, in the most elevated horizon of the zone, is found a stratum of Ostrea Cortex Conrad in the schists under the limestone conglomerate; in certain of the upper beds, the schists also bear impressions of indeterminable plants.

The middle zone is composed of gray sandstones with layers of coal intercalated. It is in this zone that borings of the Agujita have been executed, and where have been opened the mines of San Felipe and the new ones of Mezquite, near Sabinas, on the lands of the old hacienda de Soledad.

The lower zone is composed of bluish, argillaceous schists of considerable thickness. This zone is well represented south of the Sabinas river at Las Esperanzas; but it apparently does not exist at Agujita, Sabinas, Hondo nor Fuente.

At Las Esperanzas, the sedimentary rocks form two series of different petrographic character. The lower series is composed of bluish-gray, argillaceous schists. The upper series comprises calcareous and marly schists, with beds of yellowish limestones and calcareous sandstones, the latter also being yellowish and fossiliferous like the limestone. There are also calcareous sandstones of light-green tint, with intercalations of argillaceous schists. The sandstones contain impressions of plants and silicified trunks or stems, and are covered with sandstones and schists containing Ostreas. In certain places in the vicinity of Las Esperanzas, a cream-colored compact limestone comes above the sandstone with fossil plants, in discordant stratification; it is a limestone destitute of fossils. In 1.0 other part of the region with which we are concerned has this species of limestone been found. Upon the calcareous conglomerate, which covers the light-green sandstones, is spread a flow of basalt, about 5 m. thick in this basin

In the sierra of Santa Rosa, the succession of sedimentary rocks is the same, with the exception of the lower bluish schists, which there are replaced by compact limestones of a grayish blue, upon which are the argillaceous and calcareous schists with Exogyra costata, in the foot hills are found the sandstones of Las Esperanzas. The coal which is mined at Las Esperanzas is found between the first and second divisions of the upper series.

Abundant Fossils

Fossils are abundant, but unfortunately the greater part of them are in very bad condition, so that some cannot be identified with certainty and others not at all. The fossils are almost always destitute of the shell, or partly so, and they are broken. Among the bivalves, the Arcopagia Texana Roemer is always found without the shell.

We meet these same sedimentary strata, but much richer in fossils, in the little mesas situated between the village of Santa Rosa de Múzquiz and the sierra of that name, of which the sedimentaries constitute the sides. The fauna is one of gasteropods characterized by Alaria sp. (?), and also by the presence of Ostreas of the group Ostrea glabra Meek (?). All the mollusks are destitute of their envelopes, and it is only after a detailed study of the ground that one will be able to obtain specimens permitting the establishment of complete identification; up to the present time, none has been discovered except individual specimens mutilated and without shell; among the latter Böse and I have found an example of the Nautilus, cfr. elegans Dekay, and some specimens of Ostrea Arizpensis Böse, which hitherto had not been encountered except in the upper Senonian of Ramos Arizpe, in the horizon of Sphenodiscus lenticularis (Owen). The discovery of this new locality is very recent and the study of its fauna that we are going to make will permit us to arrive at the precise determination of its age and of the subdivision into horizons which appears possible by reason of the variety of fauna that we have met in another place in the vicinity of Múzquiz.

Among the fossils of the Fox Hills sub-stage, forms are found which belong to the lower Fort Pierre sub-stage, and it is not possible to accurately separate these sub-divisions, as is the case in the western part of the United States. On the other hand, at Las Esperanzas there is not represented the upper stratum of Ostrea Cortex of the upper horizon Eagle Pass division of the Fox Hills, and the Fort Pierre is not there developed, under the fossiliferous strata occur shales of great thickness, but without fossils. In consequence, we are unable to establish the equivalents of the American subdivisions and find ourselves obliged to establish provisionally the following subdivisions: Neo-cretaceous series for all the sedimentary deposits of the vast Cretaceous coal-bearing region of Coahuila, distinguishing in this series: The Barroterán division for the lower schists; the Las Esperanzas division for the fossiliferous strata of Las Esperanzas, Múzquiz and other places on the foothills of the mountain; the Sabinas division for the light-green sandstones of Sabinas village, ending in schists with a stratum of Ostrea Cortex; the Aroyo Tulillo division for the strata of Ostrea glabra Meek with Melanias, etc.; the Peyotes division, with strata of Inoceramus labiatus Schlotheim, etc. For the sake of convenience, the sedimentary formations of the carboniferous region of Coahuila are summarized in the accompanying table.

Tectonics

The majority of the mountains of this region are formed with a single anticlinal fold. They generally run in the direction north 20-25 deg. west, and some deviate to north 60 deg. west. In certain of them, the summit coincides with the anticlinal axis, and in others the axis of the anticlinal cuts the summit of the mountain at an angle of 40 or 50 deg., and in this case the strata forming the anticlinal are obliquely cut in the ravines, and depressions eaten by erosion. At some distance away, they resemble a succession of wrinkles on the side or slope of the mountain. The sierra of Santa Rosa presents an example of the first case and La Mitra mountain, near Monterey, an example of the second. All these mountains are monogenetic and are composed, in general, of a central body constituting the mountain, properly so called, and a series of hills and elevations on each of the sides that form the summit of the slopes separated from the central body by narrow and deep passages.

The sierra of Santa Rosa is a mountain, formed essentially by an anticlinal fold, composed, in the most elevated part of the mountain, of compact limestone, varying in color from clear gray to dark bluish gray and arranged in large benches. It belongs to the Meso-cretaceous series that Hill has named for this case the Santa Rosa division, and which, according to him, is equivalent to the Edwards Limestone division of the Texas Cretaceous. This limestone is covered with sandy and argillaceous deposits in thin layers of little strength, belonging to the Neo-cretaceous series and presenting intercalations of stronger limestone and sandstone strata. These have been cut down by erosion on the crest of the mountain, and today form its foothills. Their sediments, uniform in inclination and almost equal on the two foothills are separated from the body of the mountain by gorges and depressions, which end by forming little longitudinal valleys. At the foot, these sediments are less inclined and are joined to the plain, as already mentioned, by small anticlinal folds. On the sides of the central body of Santa Rosa mountain are seen some faults, almost parallel to the general direction of the mountain, running north 20 deg. west, with 25 deg. dip toward the southwest. The sizes of the faults are small and they have permitted movements which produced the present form of the mountain.

The plain is one of erosion, more properly speaking a plateau of erosion, which has developed into a tectonic plain, separated from the low grounds by a chain of mountains. It is partly covered by alluvial deposits.

The Coal Deposits

The formation of the deposits of coal is directly related to the orogenic movements which, folding the Middle Cretaceous and more ancient strata, brought about the formation of the Rocky mountains and their extension, the eastern Sierra Madre of Mexico, and also caused the formation of inland seas and lagoons, all along the zone of low land on the coast of the Gulf of Mexico. The depth of these seas and lagoons varied with the different movements which further and further accentuated the relief of the Rocky Mountains.

According to the conditions which there prevailed, they formed accumulations of lacustrine deposits with deposits of coal, or marine deposits devoid of coal. With the different conditions reigning alternately in the same general depression, there were produced sea-coast or deep-sea deposits, and deposits in inland lakes which intermittently communicated with the sea, and today, the deposits alternate in vertical series. The later orogenic movements have affected the coal-bearing formations which have undergone compression, slightly folding them in their entire bodies. This folding is particularly noticeable in the foothill of the sierra of Santa Rosa. It is fractured and shows faults in various places.

In consequence of these movements, the soil of this vast plain presents slight undulations which have subdivided it into several topographical basins of different dimensions. The sides are very open anticlinal folds hardly rising to an altitude of 50 m., which hight the majority of them do not reach. On the sides of these superficial basins the strata form a pronounced angle with the horizon, as is the case on the declivity of the sierra of Santa Rosa, where they have an inclination attaining 75 deg. But in the low parts, as well as in the hills and plateaus distant from the high mountains the slope ranges between two and five degrees.

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The British Mines Commission

SPECIAL CORRESPONDENCE.

A voluminous report by the commissioners appointed in 1906 to inquire into certain questions relating to the health and safety of miners and the administration of the mines acts has recently been published. This is No. 2; the first report, which was issued in 1907, was mainly confined to discussing the subject of the use of breathing appliances.

The second report covers a much wider field and discusses generally the subject of accidents in mines and the means for their prevention as well as the health of miners. The report is divided into 22 parts, the titles of which show the scope of the inquiry. They are as follows: Part 1. Introduction. 2 Short sketches of mining legislation. 3. Inspection of coal mines. 4. Supervision and management. 5. Ventilation 6. Accidents in coal mines—general observations. 7. Coal-dust explosions. 8. Shot firing. 9. Safety lamps. 10. Falls of roof and side. 11. Underground haulage accidents. 12. Shaft accidents. 13. Miscellaneous accidents. 14. Investigation of accidents. 15. The organization of ambulance and rescue work. 16. Special rules. 17. Ankylostomiasis. 18. Washing and drying accommodation. 19. Examinations for managers' and under-managers' certificates. 20. Preparation of plans. 21. Summary of main conclusions.

Attached to the report are nine appendices, chiefly statistical, but including also court decisions on the responsibility of owners and agents, and some notes on French methods.

The report has been compiled after a long inquiry, during which 134 witnesses were examined, of whom 57 were representatives of the workmen, 8 representatives of the National Association of Colliery Managers and 35 representatives of the owners.

Final opinions on all the matters referred to the commission are not expressed; the subject of watering or other means for dealing with coal dust, for instance, being left open pending further experimental work.

The main conclusions arrived at are summarized in the concluding part of the report and are classified under 88 headings. One of the more important recommendations relates to mine inspection, the commissioners being of opinion that the time has arrived for increasing the staff of government inspectors. An important innovation recommended is the appointment of a new type of assistants to the inspectors, with lower educational qualifications than the present inspectors. These men must have had thorough practical experience in work underground, should be over 30 years of age, and should pass a suitable competitive examination. On this point the commissioners were not of one mind, three of the commissioners being of opinion that it would be a mistake to add to the inspectors men of lower education, and that this action would be detrimental to the safe working of mines.

With regard to the examination of mines on behalf of workmen the commissioners as a body do not recommend the adoption of the system, employed in France, of inspection by "miners' delegates," paid by government, but some of the commissioners took an opposite view and considered the system an admirable one. It may be pointed out that, according to English law miners are entitled to employ two of their number to examine the mine at least once a month; but it appears that this provision is seldom taken advantage of, one of the chief reasons given being that it was difficult to find men to do the hard work for the pay given. One of the witnesses called thought that such inspections were unnecessary, and that the men in the pit were themselves always competent to make inspections; and that it was more to their interest to see that things were safe than to any outsider. On the subject of inspection by firemen the commissioners recommended that the position should only be open to those who had had five years' practical experience in a mine and had obtained a certificate as to his ability to make accurate tests for firedamp. From the evidence given it appeared that many firemen had been appointed who were quite unfitted for this duty, important because such men had to a great extent in their hands the lives of the men under their charge during the whole working shift.

The report contains several recommendations in connection with securing improved ventilation and for minimizing the risk of accidents underground. The subject of coal dust is to be dealt with in a later report but recommendations are made for the prevention of its accumulation in the mines. The commissioners wanted to carry out some experiments of their own and asked the government for a sum of money which, however, was refused. Consequently they had to fall back on such information as they could obtain from private persons who are conducting experimental work.

One noticeable conclusion made in the report is that hoisting engineers should not be required to obtain a certificate of competency, but that they should be submitted to a periodical medical examination. Three of the commissioners considered that they should hold a certificate of competency and should not be employed more than eight hours. The commissioners as a body thought that the hours should be fixed according to the work done.

The commissioners were agreed that there was room for improvement in the matter of ambulance and rescue work but thought that the organization should at present be left to voluntary efforts. A point on which they differed was the provision of bath houses. Those in favor of compulsory bathhouses were also in favor of compulsury washing, a regulation which there might be some difficulty in enforcing.

It must be evident to anyone who reads the report that the commissioners have been at great pains to sift all questions relating to the health and safety of coal miners; and while no radical change in the present mining law is advocated there are a number of minor points brought out, which will probably lead to some useful and beneficial amendments.

Of the mining work performed on the Alaska Treadwell properties during the year ended May 31, 1909, 9538 ft. was development; from stoping 830,551 tons ore and 1670 tons waste were obtained.

The Dust Problem in Coal Mines

By Joseph Virgin*

The dust problem still being a live question, I will here record my own experience and deductions in the use of sodium chloride and calcium chloride as collectors and retainers of moisture. Seeing that moisture in some form must be applied to the dust to render it harmless, I thought it advisable to experiment for myself, especially as a number of mining men object to the saturation of the air with moisture, for physical reasons. Other managers object to moisture in mine air because the water causes the bottom to heave and the tracks to get out of alinement. A final argument is that the moisture causes falls of roof.

Anything that will retain moisture and keep the dust in coal mines damp, is worth the consideration of coal-mine operators. Believing that calcium chloride would act satisfactorily, I determined to experiment. On Feb. 8, 1909, we placed 3 barrels (one-half ton) of common salt on about 500 ft. of heading, the latter being 8 ft. wide; we distributed the salt like sowing seed broadcast. The dust on the tracks was about 3 in. deep, and on the débris ⅛ in. All was covered with the salt.

We purposely left the dust on the tracks. In 24 hours the fine coal was moist, and in two days the dust was quite damp and would stick to the hand like wet gunpowder. The dust remained damp for more than a month. On April 8, 1909, this heading was cleaned up.

About this time, through the kindness of Mr. Clifton, manager of the Pomeroy Salt Association, Pomeroy, O., we received a ton of calcium chloride. This substance was delivered in 3 drums of about 7 cwt. each, and was heavy to handle. The chloride, which was in a solid lump, was pulverized to about the size of nut and slack mixed, and one-half ton was spread over the heading as was done with the common salt. The chloride began to collect water at once, and the next morning, 12 hours later, the water stood in small pools around the larger pieces; before the shift was over the dust was well mixed, and the road in places was a little muddy.

The warmer weather coming on, we have had no dust to clean up since, but have cleaned away about 100 tons of débris which fell from the roof and sides and from cars. The roadway, however, is still damp, which is due in part to the temperature and the saturation of the summer air.

Cost of Applying

The common salt was put on in one-half day by one man, the cost, therefore, was $1 for labor and $2 for one-half ton of salt, or a total expenditure of $3. Calcium chloride cost $7 a ton; it also cost $6 to pulverize and $1 to apply. The total cost in this case, therefore, was $7.

From these experiments it was concluded that sodium chloride was 50 per cent. as efficient as calcium chloride; the cost of sodium chloride was about 43 per cent. of that of calcium chloride.

This higher cost of calcium is largely on account of the necessity of pulverizing. Manufacturers of calcium chloride say you can crush by machinery; however, if we consider that a mine of 500 tons daily capacity would only use about 5 tons each winter, it is evident that it would hardly pay to erect a crusher. In a plant of, say, 5 mines with a total daily output of 3000 tons, there would not be necessity for the use of more than 50 tons in a season. This is also too small a requirement to make the erection of a crusher advisable.

The manufacturers also say that the salt should be liquefied and then pumped on with a spray pump from a water box. This cancels the factor of taking out the moisture in the mine atmosphere and is costly.

Conclusions

I therefore deduce these facts: 1. The salt (calcium chloride) will collect moisture faster than the salt (sodium chloride). 2. That calcium chloride retains moisture longer. 3. That in spite of these facts, common salt is cheaper. 4. The extra cost is caused by calcium chloride being in a solid. 5. A 700-lb. drum is unwieldy and difficult to handle in a mine. 6. Both salts should be sown on dry, not sprayed. 7. Common salt comes in small barrels and can be put on for $2 per ton. 8. Calcium chloride should be put up in 200-lb. packages that it may be easier handled. 9. Watering carts are a nuisance and a hindrance to the transportation of the coal in the day time and a costly method at night, without supervision. 10. Calcium chloride manufacturers should powder the salt so that it may be sown on any time. I believe a careful observance of these suggestions will make calcium chloride an ideal damper for coal dust, causing it to be efficient, clean, sanitary and cheap.

*Mine superintendent, Plymouth Coal Company, Plymouth, W. Va.

President Lewis Opposes Use of Black Powder

Thomas L. Lewis, president of the Mine Workers' National Organization, returned to his office in Indianapolis yesterday and issued a statement concerning the stand which he took at the recent controversy which involved 8000 miners of Pennsylvania. Mr. Lewis alleged that the officers of the Mine Workers in western Pennsylvania opposed the discontinuance of the use of black powder simply to satisfy a malice which they bear toward his administration. Mr. Lewis said he opposed those who favored the continued use of black powder and was instrumental in bringing about an investigation to determine whether its elimination will reduce the earning powers of the miners. "The mining department of the State of Pennsylvania has ordered the discontinuance of the use of black powder," said he, "and any blame for an explosion from this cause cannot be placed against the State. If an accident does occur it can justly be placed against those who insisted that it was not dangerous."

Concerning the trouble in the western Pennsylvania district and his services in bringing about a settlement, Mr. Lewis said: "For years there has been considerable agitation for the enactment of laws to provide greater safety appliances to protect the lives and health of the mineworkers. In recent years hundreds of lives have been sacrificed because of explosions in coal mines.

"Scientific experts employed by the Government have finally proved that dust, as well as gas, is responsible for the loss of life in coal mines. It has also been proved by investigation that the use of black powder or any other explosive causing a flame is more dangerous in gas-and-dust accumulating mines than powder that produces practically no flame." Mr. Lewis said that the introduction and use of the new explosives have been a source of more or less friction in western Pennsylvania for several months and that he has endeavored to have an intelligent and thorough investigation in regard to the merits of the new explosives; the effect in protecting life and also on the earning power of the miners. The claim is made that the new explosive shatters the coal more than black powder does, and as they are paid on a screened-coal basis, it reduces their wages.

"The district officers of the mine workers in refusing to be a party to a joint investigation by the miners' and operators' representatives, and claiming that there is no such thing as a dust explosion, practically set up their judgment against the most expert and scientific mining men of the world."

Mr. Lewis said he would not be a party directly or indirectly, to opposing anything that means added protection to the lives of our people. He said he wanted an intelligent investigation of the whole subject in order that he may definitely determine whether the new explosives reduced the wages of the miners. He said there was no doubt in his mind but that the new explosives add to the safety of the men in those mines generating gas and accumulating dust. He said work in the mines had resumed pending an investigation of the question at issue by the of-

ganization; in the meantime black powder is being used.

Notes on Copper Smelting in the West

By Edward Dyer Peters*

In looking over the great copper-smelting works of Montana it is interesting to note the complete change that has occurred in the relative position of blast and reverberatory smelting furnaces. It is only a few years since we valued the reverberatory especially as a producer of a high-grade matte, knowing that, even though its sulphide charge might not be so well roasted as would be desired, yet the generally neutral atmosphere of the hearth and the consequent free hand for the beneficent reactions between sulphide and oxide, might be depended upon to remove some 20 or 25 per cent. of the sulphur still present, and thus aid the imperfect roast. The blast furnace, on the contrary, was looked upon merely as an apparatus for fusing. Its high coke charge gathered in both the fixed and the volatile oxygen pretty thoroughly, and any attempt to use even a small proportion of poorly roasted ore was followed promptly by a heavy flow of low-grade matte and a silicious slag, needing the prompt adding of limestone or iron oxides.

The Blast Furnace as an Oxidizer

These conditions have been changing rapidly for some time, and are particularly striking to a person like myself, who has not visited the district for some years. The situation at present is absolutely reversed; the neutral reverberatory is now regarded merely as a melter-down of roasted ore; and the 25 per cent. of sulphur that it removes from the charge during the fusing operation sinks into insignificance in comparison to the results obtained from its rival. The blast furnace is now beginning to take its true position as an oxidizing apparatus of extraordinary efficiency; and at Anaconda Great Falls, and Salt Lake City is run so as to remove 78 to 82 per cent. of the sulphur in the charge, and to produce a matte containing usually about 45 per cent. of copper. When one reflects that the ore charged into these furnaces consists only of raw sulphides; that less than 9 per cent. (calculated on weight of charge) of a very indifferent coke is used; and that two tons of air is blown into the furnace for each ton of ore smelted, it is plain that we are approaching the conditions of the pyrite furnace. It is curious to note the eagerness of the blast-furnace superintendent for raw sulphides with which to increase the calorific power of his charge. He is as eager now to secure them as we used to be the reverse, knowing they are to him both flux and fuel, and that, as their percentage increases, the coke bill diminishes correspondingly.

In this connection I may mention an interesting circumstance related to me by the metallurgist who had been conducting a series of experiments in this partial pyrite smelting at one of the great plants. He assured me that so long as his percentage of coke and percentage of sulphur on the charge added up to 18, it seemed to make little difference in the running of the furnace, whether he had 11 per cent. coke and 7 per cent. sulphur, or whether the figures were reversed, viz., 7 per cent. coke and 11 per cent. sulphur. He did not, of course, suppose that a pound of sulphur, with its accompanying iron, yielded as much heat as a pound of coke, but attributed the curious result in part to the increased fusibility of the slag that resulted from the extra iron belonging to the sulphur.

The Mathewson Blast Furnace

It is always interesting to see the largest specimen in the world of its kind, and Mathewson's 87-ft. blast furnace (with foundations already laid for a 40-ft extension) would well repay a long journey, were mere size its only distinctive feature. As a matter of fact, it has many claims to our consideration. For instance, it smelts an average of 2500—sometimes exceeding 3000—tons per day of charge. As its width is 56 in., it is averaging 6.15, and occasionally 8 tons per square foot of hearth area. It is singularly flexible, and permits of change of jackets, or of much more extensive repairs without shutting down the remainder of the furnace.

This feature was peculiarly emphasized a few months ago, when two English metallurgists, who were being shown over the plant by the superintendent, were evidently uncertain whether to accept seriously his statements that the furnace was not stopped when a water jacket was changed. Noting their somewhat ambiguous expression, the superintendent remarked that he was fortunate that day in being able to show them an exceptional instance of the kind, as some extensive repairs were being made at one end of the furnace, and it would be possible to descend to the bottom of the shaft. With some hesitation they accepted his invitation, and soon stood on the hearth of one part of the furnace, separated from the active portion by an irregular mass of partially chilled charge—hot, but not unbearable.

Furnace Refining at the Washoe Works

A peculiarly interesting feature in the furnace refining of copper was shown me at the Washoe smeltery. The electrolytic refining of the copper from this great plant is done on the Atlantic seaboard, but the converter copper is submitted to a partial refining at Anaconda, in order to produce a better anode plate for shipment. There are two refining furnaces in constant use, each casting about 300,000 lb. of anodes per 24 hours. As soon as one of these furnaces is emptied of its refined charge, it is used as a reservoir for the converter copper, which is poured into it direct from the ladles into which the converters are emptied. In about eight hours the furnace will have received its regular charge of 300,000 lb. of copper; the converter copper is then diverted to the other casting furnace, and the stage of refining begins. Although at Anaconda the refining operation is carried out only far enough to produce good malleable anodes (about 99.3 per cent. copper) yet the general sequence of events, as well as the behavior of the copper under treatment, is practically the same as in the more complete refining process, except that certain stages are shortened.

In the ordinary practice for making merchantable copper, the molten bath is skimmed clean and then subjected to powerful oxidation. Air is forced through it until several per cent. of the copper has been changed into cuprous oxide—this condition being accepted as a guarantee of a pretty thorough oxidation of the sulphur, iron and other foreign substances that are still present. The refiner takes a small test ladle of copper from the furnace every few minutes, and the completion of the oxidizing process (for this partial refining) is shown by the fact that the test button cools with a considerable depression in the middle of the surface, and with the formation of a triangular fissure at the bottom of this concavity. Oxidation having reached its maximum, the process of reduction now begins. By the operation of poling, the gases dissolved in the melted copper are driven out, and the newly formed oxide is reduced back to metallic copper.

An Anomalous Practice of Oxidizing and Reducing

At the Washoe works, it was noticed one day by the authorities that the furnacemen were poling the copper through one furnace door while they were blowing air into the bath through another. On remonstrating with the foreman for this anomalous practice of oxidizing and reducing at the same time, the superintendent was informed that an hour or more could be saved on each charge by using poles and air simultaneously, and that, without its aid, it would be hard to keep the furnace duty up to what was expected of it.

Investigation proving the proof of this claim, it has become the established practice at this smeltery. During my visit the superintendent was kind enough to have a test run made for me, under extreme conditions: namely, by oxidizing only

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long enough to remove most of the black specks (cuprous sulphide) from the test button, leaving the latter with an almost flat surface. Then, stopping the air altogether and beginning the poling, which operation in this case naturally divided itself into two stages: (a) stage of oxidation (?)—until test button showed deep depression with crack at bottom; (b) stage of reduction, in which the poling was continued until the crack and depression disappeared, the surface of the button became level, and the metal attained the required malleability.

All these phenomena occurred in their proper sequence and with great distinctiveness, furnishing what was to me a novel and interesting exhibition. I secured a series of nine test buttons representing the various stages of operation, and hope to derive some light from their examination.

The Smoke Question

The smoke question at Anaconda seems to be pretty thoroughly settled by the last decision of the court. The judge, after listening to expert testimony of the usual contradictory nature, examined personally a great deal of the property that was said to be suffering from the smelter fumes. This common sense procedure appears to have had a disastrous effect upon the complainants' case, and two trips that I took to ranches and stock farms within three to five miles of the smelter stack impressed me strongly with the justice of the late decision.

The succulent green leaves of root crops are peculiarly sensitive to sulphur fumes and especially to the action of sulphates and arsenates; and while I failed to find any evidence of damage in the hay, grain, or clover crops, I certainly expected to see the yellowish patches, shriveled edges, and similar evidence of damaged leaves with which we are so familiar in the root crops. On looking over many rows of rutabagas and mangolds, I failed to find a single spot of the nature to which I have just alluded, and to all of these ranches are in the Deer Lodge valley, and in the direct path of the smelter fumes. I feel that the Anaconda people have apparently accomplished two important results, namely, the approximately complete settling of the arsenical sulphates and arsenates, and the reduction of the sulphur oxides at so great a height that they never reach the ground in a sufficiently concentrated condition to do harm to either animal or vegetable life.

The report of the Cripple Creek & Tonopah [illegible] Company, Portland, according to the *Mining Journal*, Aug. 21, 1909, shows that "[illegible] has been accomplished, during the half year just completed at a [illegible] cost per ton."

Chronology of Mining for September, 1909

Sept. 5—Union Copper mine, Copperopolis, Cal., sold to Calaveras Copper Company by Ames estate, Boston.

Sept. 5—Hercules mill, Burke, Idaho, burned. Loss, $100,000. No insurance.

Sept. 8—Iron Mountain mine, Indian Springs, Cal., sold to United States Smelting, Refining and Mining Company.

Sept. 9—Announcement of closing of option on Butte-Ely property, Ely, Nevada, to Cole-Ryan interests.

Sept. 17—Old Dominion Copper Mining and Smelting Company awarded $2,029,000 in suit against A. S. Bigelow. Rehearing asked.

Sept. 24—Florence, Colo., smeltery sold at sheriff's sale.

Sept. 25—Announcement of purchase of Santa Gertrudis mine, Pachuca, by Camp Bird, Ltd., of London.

Sept. 27—Strike at Butte arising from internal dissension in the union settled and mines all resumed work.

Sept. 27—American Mining Congress convened at Goldfield, Nevada.

Sept. 28—Boston & Colorado Smelting Company announces liquidation and the dismantling of the Argo smeltery at Denver.

Sept. 29—Tintic smeltery, Utah, closed.

Development of Nitrate Deposits in California

Special Correspondence

W. J. Dingee and associates, of San Francisco, are about to exploit the niter deposits in Lone Willow district in the desert region of San Bernardino county, 15 miles southeast of Johannesburg, Kern county. Some 16,000 acres of land have been taken up on which more or less niter is found. It is planned to put up refining works to prepare the niter for the market. Nearly all the niter beds so far discovered in California are in the northern portion of San Bernardino county and extend into the southern part of Inyo county. They are found along the old shore lines, or old beaches, which mark the boundary of Death Valley. The beds and clays of the deposits which contain the nitrates have been worn by erosion into knobs, buttes and ridges having a soft rounded surface so they are easily identified.

There is a very large acreage covered by these deposits in the regions referred to and their existence has long been known. The depth is from 6 in. to 3 or 4 ft. Attempts have been made to interest capital in these nitrates so that they might be utilized but some doubt always seems to [illegible] the [illegible] of nitrates present. Therefore, there has, as yet, been no output of niter from California. The nitrate fields of California have been fully described by Gilbert E. Bailey in Bulletin No. 24, of the State Mining Bureau.

California Dividends

The California Oil and Stock Exchange of San Francisco, as reported in the *Chronicle*, Sept. 27, 1909, has posted the following list of dividends declared payable for September, 1909:

Company	Dividend per Share	Total
Alma	$0.03	$11,000
Amalgamated	1.00	50,000
Brookshire	0.02	10,000
Columbia	0.00½	1,896
Caribou	0.25	20,175
Claremont	0.02	9,000
Esperanza	0.02	3,200
Euclid	0.01	3,500
Home	0.02	2,000
Illinois Crude	0.01	2,000
Kern	0.20	20,000
Lucile	0.10	2,670
Linda Vista	0.01	3,838
Monte Cristo	0.03	15,000
Palmet	0.02	36,040
Peerless	0.06	6,000
Record	0.05	5,000
Rice Ranch	0.01	3,000
Royalty	0.02	400
Saint Dough	0.05	9,975
S. W. A. B.	0.01	3,770
Sterling	0.25	62,500
Sexton	0.15	15,000
Thirty-three	0.30	30,000
Wabash	0.01	3,000

Will Recover Coal Lost in Mississippi River

The Monongahela River Consolidated Coal and Coke Company lost from $600,000 to $700,000 as the result of a storm in the lower Mississippi valley. The loss in coal is estimated at more than 8,000,000 bushels. The company's manager, Mr. Theiss, stated that most of the coal will be recovered by dragging, and water diggers, barges and boats are being rushed to the scene. Almost the entire supply of winter coal for New Orleans was lost. The company carries an insurance fund of its own and this money will be available to apply toward the expenses that will be incurred in the recovery of the coal.

"A business communication in Arabic reached a Manchester firm," says *The Marine Review*, "and when translated by a Syrian interpreter proved to contain a request for the price for 'two water sheep' of certain given dimensions. The translator was confident of his version, but admitted that he did not know what water sheep could be. For the moment even the principals of the firm to whom the communication was addressed were puzzled, until it struck someone that this was the nearest synonym in the vocabulary of a [illegible] for 'hydraulic rams.'"

September Dividends

In the accompanying table are shown the amount per share and total amount of the dividends paid during September, 1909, by a number of mining and industrial companies in the United States, Canada and South and Central America.

U. S. Mining Companies.	Location.	Amt. per Share.	Amt. Paid.
Bunker Hill & Sullivan, s.l.	Ida.	$0.15	$45,000
Calumet & Arizona, c	Ariz.	1.00	200,000
Calumet & Hecla, c	Mich.	8.00	800,000
Colorado, l.g.s.	Utah	0.08	80,000
Doctor Jack Pot, g	Colo.	0.00½	15,000
Doe Run, l	Mo.	1.50	98,623
Federal M. & S., pf	Idaho	1.75	210,000
Golden Star Mines, g	Ariz.	0.05	20,000
Great Northern iron ore properties.	U. S.	1.00	1,495,720
Homestake, g.	S.Dak.	0.50	109,200
North Butte, c	Mont.	1.00	400,000
Old Dominion, c	Ariz.	0.50	146,622
Old Dominion C. M. & S.	Ariz.	1.00	162,000
Iron Blosson, s.l.	Utah	0.08	79,200
Iron Silver	Colo.	0.10	50,000
North Star, g	Cal.	0.40	100,000
Quincy, c	Mich.	1.00	110,000
Phelps, Dodge & Co., c	U. S.	0.02½	1,123,365
Round Mt. Mining, s.g	Nev.	0.04	32,126
Sioux Con., s.l.g.	Utah	0.07	52,247
St. Joseph Lead.	Mo.	0.15	150,000
Utah Copper	Utah	0.50	366,837
Yukon Gold, g	Alas.	0.10	350,000

U. S. Industrials.	Location.	Amt. per Share.	Amt. Paid.
Am. Smelters, pf. A.	U. S.	$1.50	$255,000
Am. Smelters, pf. B.	U. S.	1.25	375,000
Crucible Steel, pf.	Penn.	1.50	366,547
Gen. Chem., com	U. S.	1.00	74,103
Inter'l Nickel, com	N. Y.	1.50	123,339
National Lead, pf.	N. Y.	1.75	260,820
Standard Oil	U. S.	6.00	5,820,000
U. S. Steel Corp., com.	U. S.	0.75	3,812,268

Foreign Mining Companies.	Location.	Amt. per Share.	Amt. Paid.
Esperanza	Mex.	$0.37	$110,565
Kerr Lake	Ont.	0.30	180,000
Lucky Tiger Com., g	Mex.	0.60	39,000
N. Y. & Hond. Ros	C. A.	0.10	15,000
Peregrina M. & M., pf.	Mex.	3.50	35,000

American Mining Congress

The American Mining Congress in session in Nevada from Sept. 27 to Oct. 2, elected, through the directors, Dr. E. R. Buckley, of Missouri, president, to succeed J. H. Richards. Other officers were chosen as follows: John Dern, Utah, first vice-president; George E. W. Dorsey, Nebraska, second vice-president; Samuel A. Thayer, Pennsylvania, third vice-president; J. F. Calbreath, Jr., Colorado, secretary. The naming of the next meeting place was left to the new board.

The session was convened at Goldfield, and later visited Tonopah. Elaborate preparations for the congress were made by the Nevada committees, notably a fine mineral and ore display.

The program included many notable technical and practical papers. A resolution on the silver question brought out lively discussion. The forestry policy of the Government and the conservative idea was vigorously treated by the delegates. A report on the Alaskan mining laws was received with interest. Industrial accidents and insurance were subjects of consideration. The perennial mining-bureau question was up and the need of Government recognition of the industry was strongly urged. The session was well attended and successful in every way.

Mineral Production of California in 1908

The yield and value of the mineral substances of California for 1908, as per returns received at the California State Mining bureau from the producers, are shown in the accompanying table. For convenience the minerals other than precious metals are tabulated together.. The precious metals will be reported separately. An increase of $10,503,048 in the production of substances other than precious metals is noted.

CALIFORNIA PRODUCTION FOR 1908.

Mineral.	Unit		Value.
Asbestos	Ton	70	$ 6,100
Asphalt	Ton	105,443	1,082,376
Bituminous rock	Ton	30,718	109,818
Borax	Ton	22,200	117,000
Cement	Bbl.	1,629,615	2,359,692
Chrome	Ton	550	6,195
Clay (brick)	M.	332,872	2,506,495
Clay (pottery)	Ton	208,042	325,147
Coal	Ton	18,496	55,503
Copper	Lb.	40,868,772	5,350,777
Fullers' earth	Ton	50	1,000
Gems			208,950
Granite	Cu.Ft.	483,374	512,923
Gypsum	Ton	34,600	155,400
Infusorial earth	Ton	2,950	32,012
Lead	Lb.	1,124,483	46,663
Lime	Bbl.	396,386	379,243
Limestone	Ton	273,890	297,264
Macadam	Ton	2,939,901	2,446,768
Magnesite	Ton	10,382	80,822
Manganese	Ton	321	5,785
Marble	Cu.Ft.	18,653	47,665
Mineral paint	Ton	335	2,250
Mineral water	Gal.	2,789,715	560,507
Natural gas	M.Cu.Ft.	842,883	474,584
Paving blocks	M.	7,660	334,780
Petroleum	Bbl.	48,306,910	26,566,181
Pyrites	Ton	107,081	610,335
Quartz crystals	Lb.	4,000	10,000
Quicksilver	Flask	18,039	763,520
Rubble	Ton	1,059,044	795,006
Salt	Ton	121,764	281,469
Sand (glass)	Ton	9,255	22,045
Sandstone	Cu.Ft.	93,301	55,151
Slate	Squares	6,000	50,000
Soda	Ton	9,600	14,400
Soapstone	Ton	3	18
Tungsten			37,750
Zinc			3,544
Total			$46,715,168

The larger items constituting the total increase for 1908, relate to petroleum, gold, macadam, bituminous rock and pottery clays. There was a large increase in the quantity of copper that was produced in 1908, as compared with the output of 1907, but owing to the low price for copper the value did not increase in 1908. The total value of the nonmetallic substances was $1,531,108. These substances include borax, coal, mineral waters, salt, infusorial earth, gypsum, magnesite, manganese, mineral paint, fullers' earth, soda, tourmaline, chrysoprase and other gems. The total value of the hydrocarbons and gases was $28,232,059, an increase of $10,203,022. The hydrocarbons and gases include asphalt, bituminous rock, natural gas and petroleum. The petroleum price is the average f.o.b. at wells or stations in each county. The number of barrels of oil produced was 48,306,910, valued at $26,566,181, as against 40,311,171, valued at $16,783,943 in 1907. The large production noted places California at the head of oil-producing States, with Oklahoma second. The increase in asphalt production is large for the year. The total value of structural materials in 1908 was $10,132,179, a decrease from 1907. The value of the outputs of the principal minerals of the State are for 1908, in the following order: Petroleum, gold, copper, clays and their products, macadam, cement, asphalt.

The British Oil Trade

The London *Economist* of Sept. 25 says: "Some three months ago the working agreement between the three large petroleum companies—the Anglo-American, the Home Light, and the British Petroleum—came to an end, and the price of petroleum (lamp oil) was dropped ½d per gal. in our markets. This was erroneously supposed to be in the nature of an attack on the Scotch paraffin oil companies, but the cause of disagreement was the result of the effort of the Anglo-American to capture the retail trade by offering special bonuses to all the dealers who would engage to take all their requirements from this company for a term of years. This process did not work out, but when the time came for the Scotch companies to make their contracts for burning oil for the new season, which begins in September, they had to fix the price at ½d per gal. less than last year. On the reduced basis the usual contracts have been made, and, we understand, for a larger quantity than last year. The Scotch wholesale dealers have refused, we understand, to have anything to do with the contract system proposed by the American company, which involved the disclosure of names and addresses of their buyers to the sellers, and, in fact, handed over the whole details of the retail business to the representatives of the Standard Oil Company. The American company has, on the other hand, found it advisable not to push the sale of petroleum in Scotland, as it began to do last year, by road tank wagons, because whatever paraffin oil was in this way displaced in Scotland was simply put up in competition against it elsewhere. Thus, as a matter of fact, the Scotch market is being now left both by American and Russian sellers to the Scotch makers, but the price of petroleum has been kept down by the incidence of the competition of the Galician petroleum, which the Standard company has tried to corner on the Continent. It is presumed that some agreement has now been come to, as it is stated that the price of petroleum is about to be raised ½d per gal. again."

Colliery Notes

Mine dust and well-ground cinder ashes are good material for use in mixing and preparing masonry and brickwork mortars.

At some of the mines in Russia where operations are far distant from railroads, the average contract price for hauling coal as let to natives is $3.72 per ton per 100 miles.

A unique discovery of vanadium in appreciable quantity is said to have been made recently in one of the coal deposits near Rockwood, Penn. Details of the new discovery are being closely guarded.

Roman cement makes a better paste for pipe-jointing and outside pointing than portland cement; not because it sets harder, but because it is more adhesive, and, therefore, less is wasted in the work.

Finely ground cement goes farther and sets better than coarsely ground, and is far superior for making hydraulic concrete. The weight per cubic foot of cement should always be specified in asking for bids, otherwise the quotations may be misleading.

Referring to hydraulic mortars in general, no more should be mixed than is required for immediate use, as its primary strength cannot be recovered on mixing a second time. Although it will harden, it is short, and disintegrates sooner than when mixed once only.

For ascertaining the setting time of cement, a "needle" has been designed. This device weighs 2½ lb., and the point has a flat end exactly 1/16 in. square. The cement is considered to be set when the needle fails to make an impression on applying its point gently to the surface.

While cement concrete is denser, and able to resist higher compressive strains, it is not more impervious than lime concrete, although the cost is much less. Lime in the proportion of 4 to 1 makes a good fat concrete, and, if carefully mixed, it is impervious to any reasonable head of water.

It is a fact that in a coal mine, if the surface of the coal is wet, the force of an explosion will be retarded temporarily. However, the temperature of an explosion is so high that in spite of the high specific heat of water, if the oxygen supply is continued, the moisture clinging to the surface of the coal will be quickly vaporized, and the coal will begin immediately to volatilize.

When the air current in a mine is kept in a continuous state of saturation by means of air sprays, through which the water is discharged in the form of invisible mist, the common practice in Europe is to have the sprays about 300 ft. apart, the quantity discharged from each spray should be regulated so that the air-current at that point is just saturated; any quantity of moisture greater than what is required to saturate the current increases the danger due to the presence of water.

At the coal mines in Western Siberia the working hours are from 6 a.m. to 5 p.m. The earnings of the men employed at the coal-face vary from 54c. per day for Kirgheese to 80c. per day for Russians. The average output per person employed at the coal-face is about one ton per shift. Skilled labor on the surface is paid 70c. per day, while nonskilled labor is paid from 25 to 50c. per day.

The small amount of nitrogen that is present in coal is extremely useful as a by-product. During the process of coking, the nitrogen combines with hydrogen to form ammonia, NH_3. The ammonia is given off from the coal as a gas and is converted into a solid form as sulphate of ammonia, by passing through sulphuric acid. This product is then used for ammonia salts and for artificial manure.

Properly slaked lime will keep for centuries, and improve with age, especially if kept covered with water. The Romans had a good municipal rule bearing upon this subject. They made it compulsory on every builder that no lime should be used in any building unless it had been slaked at least three years. Observance by the Romans of such rules, therefore, accounts for their excellent walls, which were fit to receive and retain any color of paint placed upon them. There are particles in all limes which require longer to slack than others.

Where steam saturation of the intake air is the plan used to moisten dust in a coal mine, it should be remembered that if the temperature in a saturated current exceeds 90 deg. F., the result will be dangerous to life; for safe working, the temperature in a saturated current should not exceed 75 deg. F. The quantity of moisture carried by saturated currents of 100,000 cu.ft. per min., at 75 deg. F., is about 13½ gal. of water. In saturating the intake current of air, the steam should be discharged into the air through several pipes situated at different hights in the shaft.

The output of the beehive oven may be estimated at approximately 10 tons per oven per week, or a yield that is about 15 to 20 per cent. less than is obtained in the retort oven. Because the coke produced in a beehive oven has a more silvery luster than the coke where extraction of by-products has been carried out, it has been commonly believed that the beehive coke is far superior. There is, however, less ground for this belief than is generally acknowledged. Retort oven coke is not generally inferior in quality to the beehive product, while as regards mechanical strength, the former is superior to the other.

In the many so-called dust explosions, there is no doubt but that the solid coal itself has played an important part in the final explosion. All experiments so far have proved that small particles of coal, under favorable circumstances, may cause a disastrous explosion; however, the results of such experiments do not prove that while a small particle of coal is explosive, another piece of coal a size larger is not explosive. It is, therefore, necessary to believe that one of the most important points to consider in an underground explosion is the area of the free surface of coal and its disposition to yield up its volatile constituents in the vicinity of the explosion. There is no doubt but that in many dust explosions when sufficient oxygen was present, the temperature of the explosion was sufficiently high to volatilize the solid coal and regenerate the explosion.

Although the closed, or retort, type of coke oven is becoming more and more common in Germany, the open or beehive oven is still used in many places. German engineers, basing their statements on long experience, assert that the proper size for a beehive oven is 11 ft. diameter by 7 ft. high; the sides and roof sloping inward gradually to meet as the oven is built up. It is further stated that the floor should have a fall of 12 in. from back to front to facilitate the withdrawing of the charge and to permit free drainage of the water used in cooling it. The oven door should be about 4x3 ft.; if the door is larger, there is opportunity for air leakage, while if the door is built smaller it becomes a difficult matter to withdraw the charge. German engineers also prefer to use the same fireclay for setting and for plastering outside, as the oven bricks were made of; the reason for this practice being that the expansion and contraction will be thus equalized.

A unique air receiver has been built at an eastern colliery. The receiver consists of a disused underground gallery, 400 ft. long and 9 ft. high by 6 ft. wide, with a capacity of 22,000 cu.ft. The tunnel was driven through solid rock which contained no seams or cracks. A 10-ft. concrete bulkhead was built at either end. A 6-in. pipe was led into one of these walls, and a manhole provided. Air was pumped in until the pressure reached 100 lb. per sq.in. The two compressors which charged this reservoir have a combined capacity of 7500 cu.ft. of air per min., and can pump the receiver up to full pressure in 23 min. The advantage of having such a large receiver is that it exerts an averaging influence on the demand for air from the compressors. A group of drills can be started or stopped without greatly influencing the air pressure, and the compressors work at a more even load than would otherwise be the case; also the regulating devices do not act so frequently, which results in less wear on the machines.

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A Chance to Get Rich Quick?

In the constellation of the porphyry coppers, where the unit of idea is about ten millions and a paltry million tons of ore is of no particular account, it is alleged that through some telescopes a new star of the first magnitude has been discerned. It may be marveled that the existence of an orebody of upward of 30,000,000 tons should have been heretofore overlooked, but even so through centuries of science was missed the presence of a new element in the very air we breathe.

In the days agone—four years or so—when the Ely boom was swelling and promoters were waxing fat, the speculatively inclined were wont to scan the map and putting their metaphorical finger upon the property of the Ely Central, lying lusciously between the Ruth and Eureka "estates" (this term is becoming fashionable in promoting literature) of the Nevada Consolidated, reasoned that their orebodies probably extended into it, if not right through it, and *there* obviously was the great chance to be in on the development of a new mine. It was overlooked that this property so attractive geographically was not so seductive geologically, its surface being not the ore-bearing monzonite of the district but rather an overflow of rhyolite; and that Bradley and Requa, who conducted their early operations with great skill and the aid of expert geological advice, acquired the best of the monzonite area and evidently did not deem it worth while to connect their Ruth and Eureka groups. The intervening property being later acquired by the Ely Central Copper Company, some drilling and desultory prospecting was done without finding any ore of consequence and then operations were suspended. But enough of history.

Ely Central has lately been talked of stentoriously by some persons interested and has filled the columns of some public prints. In one week the stock rose from 87c. to $1 1/16. We have been assured that one-half of the effort exerted by the bull pools in some other stocks would easily have put E. C. to $2. "It is not, however, the purpose of these inside interests in Ely Central to manipulate or stimulate the market. They are content with the recent market course of the stock as they prefer that the distribution of it to the public shall be accomplished at a figure which does not discount the probable future value of the mine." The reason for this liberal policy is that "it is much fairer dealing with the public." However, it is considered probable that E. C. will go to $5 within a few months. So here ought to be a chance to get rick quick, if hopes are realized.

The hopes have been supported by a report by Col. W. A. Farish, which has been characterized as "deliriously favorable." Col. Farish measures the distance between the Ruth and Eureka (of the Nevada Consolidated) as 1800 ft. Although there has been no development upon the E. C. between those properties, he says, there is but little risk (in his opinion) in assuming that the ore deposit goes right through. The width of this deposit being 1200 ft. and its thickness 200 ft., as shown by the Nevada Consolidated, the probable reserves of the Ely Central are a simple matter of arithmetic. Anyone can figure them out to be about 33,000,000 tons—or 33,230,769 to be precise. Clearly this is the most rapid development of ore that is on record.

Inasmuch as the above-mentioned ore has not yet been actually seen it is perhaps premature to talk about the grade, cost of mining, extraction in milling, etc. Probably those factors will be about the same as for Nevada Consolidated, so what's the use of wasting thought about them. Anyway, it is expected that copper can be produced at 6 to 8c. per lb. and some may be as cheap as 5 cents.

Assuming that the monzonite goes under the rhyolite of the Ely Central without confusion by faults, dikes, or other geological perversities, and assuming the monzonite to be cupriferous, we should really like to know if the secondary enrichment with chalcocite, which conferred so much value upon the Ruth and Eureka monzonites, occurred in the intervening property before the rhyolite flowed over it, or after; but doubtless we shall have to wait for time to tell this. In the meanwhile we are of the opinion that Ely Central as a speculation is a little too strong for women, children and clergymen.

The Gayley Dry-air Blast

The Gayley dry-air blast process continues to make substantial progress, although circumstances have not been especially favorable to the introduction of improvements. There are now seven air-drying plants in use in the United States,

having a total capacity for handling 400,000 cu.ft. of air per minute, while negotiations are pending for the installation of other plants having a capacity of 1,000,000 cu.ft. per minute. Abroad a plant able to dry 700,000 cu.ft. per minute has been for some time in operation in South Wales; while in Germany, where the process was bitterly attacked and its usefulness questioned by several prominent writers, a plant of considerable size is being installed by a large iron company.

The South Wales plant above referred to is at the blast furnaces of Guest, Keen & Nettlefolds, Ltd., at Cardiff, and some details of the results obtained from it have recently been published in the London *Iron and Coal Trades Review*. These were not obtained in any experimental runs, but in actual practical working over a series of weeks. They are of much interest as showing the operation of the process under local and climatic conditions entirely different from those for which it was originally designed and used. In the following table, compiled from careful observations extending over many weeks, the respective columns show: (1) the results obtained with natural air, (2) the results obtained with dry air, the furnace being driven for increase in output, and, (3) the results when attention was directed to economy in fuel consumption:

	1	2	3
Weekly production tons of pig iron	2,001	2,550	2,286
Coke used per ton of iron lb.	2,278	1,972	1,857
Per cent of increase in output		26.4	14.1
Per cent of decrease in coke used		13.4	18.4

These results seem to be entirely satisfactory, both as regards the increased production of iron and the saving in coke. It is interesting further to note that, notwithstanding the different conditions of climate and weather, they differ little from those obtained by Mr. Gaeley in his trial at Lorenzi furnace in Pittsburg, as stated by him in his original paper for the American Institute. The following table compares the figures obtained in operation at the two places:

	Gaeley No. 1	Gaeley No. 2	Gaeley No. 3	Lorenzi
[illegible]	[illegible]	[illegible]	[illegible]	[illegible]
[illegible]	[illegible]	[illegible]	[illegible]	[illegible]
[illegible]		[illegible]		[illegible]
[illegible]		[illegible]		[illegible]
[illegible]		[illegible]		[illegible]

[illegible]

rate of decrease in fuel consumption, but a greater proportion of increase in output.

These figures give a basis of computation from which it is possible to calculate whether the saving effected will compensate for the first cost of the drying plant. It is certain that it is very much greater than the cost of operating that plant. The saving in fuel has been abundantly proved, while the increased output is so large that in a great steel plant there can be a substantial decrease in the capital invested in blast furnaces, which is a most important item. Without going into details of calculation, we think that the figures given above will be sufficient to show that the savings effected are more than sufficient to pay interest and depreciation charges on the drying plant, besides all working costs. In support of this we have the testimony of Mr. Cook, in his careful paper on the process as used at Warwick furnace. The results at Warwick, a merchant furnace running on foundry iron, also included a greater uniformity in quality of the product.

The dry blast process has now been tried under differing conditions of climate and temperature with unvarying success. It has evidently come to stay, and there is little doubt that its use will increase more and more rapidly as its advantages are appreciated.

The Broken Hill Proprietary Mine

The latest report of the Broken Hill Proprietary Company shows rather a decadent condition at this mine, one of the great silver-lead mines of the world. In the half-year ended with May, which is covered by the report, the production was only 7,011 tons of lead and 148,100 oz. of silver, the corresponding half-year having been 47,84[illegible] tons of lead and 2,02[illegible],148 oz. of silver. In large part this great decrease was due to the strike of the miners, to which reference has heretofore been made in our columns. The strike was caused by the Court of Conciliation and Arbitration of Commonwealth of Australia, in the Court of Appeal in the Supreme Court of New South Wales, that the company has kept its greatest and of the same. Lead for the reason that operations did not pay under the conditions of wages and at the prevailing prices of metals. This decrease [illegible] to the fact that the mine is, apparently, past its most productive days, and no new ore reserves have been developed. The difference in the extent of the workings is shown by the statement that before the strike 4427 men were employed, while in May there were only 1804 on the payrolls. The smelting and other operations have been curtailed to a corresponding degree. These are extensive normally, for the Proprietary company is a great industrial concern, turning out, besides lead and silver, large quantities of zinc concentrates, sulphuric acid and other by-products, mining its own coal and making the coke for its smelting works.

An interesting table appended to the report gives the prices of lead and silver over a series of 25 years. During that period the highest price obtained for lead was £21 per ton in 1907, the lowest, £9 in 1894. The highest in the last half-year was £13 15s., and the lowest £13. Silver ranged from 50d. per oz. in 1885 to 24 13/16d. in 1902, this year going nearly as low, to 22d., while the highest point reached was 24⅝d. early in the half-year.

The JOURNAL is by no means a medical paper, or anything but a paper that deals with engineering and mining. Nevertheless we have thought it useful to present in this issue the excellent article on "Tropical Malaria" by Dr. Chester and Mr. Semple. This disease is unfortunately one that is suffered by many engineers who go to the tropics, and references to it have been common in the technical contributions of Mr. Garrison, Mr. Sharpless, Mr. Hutchins and many other engineers. We think, therefore, that the present contribution will be useful to many of our readers who are called to the tropics. Mr. Semple, one of the authors of this paper, is a mining engineer but has made a special study of malaria, and has been in communication with the medical staff on the Isthmus of Panama and with medical men in Italy, South Africa and China, who have given some suggestions as to the prevention and treatment of this complaint, which is so prevalent in the tropical lowlands. Dr. Chester was for a long time on the staff of the medical department of the Nicaragua Canal Company at Greytown where he had ample opportunity to study many forms of malarial fevers, besides what he has seen and experienced in the Hawaiian Islands and other tropical districts.

The American Institute of Mining Engineers

SPECIAL CORRESPONDENCE.

The 97th meeting of the Institute was held in Spokane, Wash., Sept. 27-29. It was preceded and followed by an extended trip, a special train being provided which carried members from points in the East and the Central West. In all 95 members and guests joined in this excursion, many of the guests being ladies.

The special train arrived at Butte, Mont., Sept. 24, the day being spent in visiting mines and mills, with a reception at the Silver Bow Club in the evening. Leaving at night the train reached Anaconda Sept. 25, and that day was spent in the same way as at Butte.

Leaving Anaconda at 6 p.m., Sept. 25, the train proceeded by the Missoula cut-off to the Cœur d'Alene district, the trip over the summit being made by daylight. Upon arrival at the Morning mine, a Federal Mining and Smelting Company property, near the town of Mullan, a stop was made there to inspect the mine and mill, after which the train proceeded to Wallace, arriving about noon, Sept. 26. In the afternoon side trips were made up Cañon creek with visits to the Hecla and Hercules mines.

Monday morning, Sept. 27, the train dropped down to Wardner, where the party inspected the Bunker Hill & Sullivan mine and mills. In the afternoon the journey was resumed to Harrison, where the party left the train and proceeded by steamer to Cœur d'Alene, at which point they again took the train for Spokane, stopping at Post Falls to view the new power plant of the Washington Water Power Company.

THE MEETING

The train arrived at Spokane Sept. 27. The first session of the meeting was held Sept. 28 in the assembly hall of the Masonic Temple. E. J. Roberts, chairman of the local committee, opened the meeting and introduced J. C. Ralston, city engineer, representing the mayor. Mr. Ralston made an address, cordially welcoming the visitors, and appropriate response was made by Dr. R. W. Raymond.

Dr. D. W. Brunton's paper on "Progress in Mining and Metallurgy" was then read, and called out an extended discussion, the speakers being William Kent, Charles Catlett, Dr. W. O. Snelling, E. S. Hutchinson, Charles Goodale, Ernest Levy, W. L. Saunders and William Kiddie.

At the second session, on the evening of Sept. 28, D. W. Brunton's paper on "Ore Sampling" was read, and was discussed at length by William Kiddie. The paper by F. Bache on "Dust Explosions" was read in abstract by Doctor Raymond and briefly discussed.

The third session, on the morning of Sept. 29, was a joint meeting with the Western branch of the Canadian Mining Institute. McD. Porter's paper on the "Hydraulic Elevator" was first read and discussed by William Kent and Doctor Raymond.

A number of the members of the Canadian Institute were present, and two papers were presented: "Notes on the Coal Resources of Southeast British Columbia and Alberta," by E. Jacobs, Victoria, B. C., and "The Galt Coalfields of Alberta," by W. D. L. Hardie, Lethbridge, Alberta. After the reading and discussion of these papers the meeting adjourned.

The rest of the day was spent in visiting points of interest about Spokane. On the following morning, Sept. 30, the train left that city.

The meeting was followed by an extended excursion, the stopping points being as follows: Seattle, Wash., Oct. 1-3 inclusive; Tacoma, Wash., Oct. 4; Portland, Ore., Oct. 5; Salt Lake City, Utah, Oct. 7-9, including visits to the Tintic mining district, Bingham and the Garfield smelting works; Glenwood Springs, Colo., Oct. 10; Pueblo, Colo., Oct. 11. At each place visited the members and guests were taken in charge by a local committee. The chairman of this committee at Seattle was Chester F. Lee; at Salt Lake City, Duncan McVichie; at Pueblo, J. B. McKennan.

The papers presented at this meeting, most of which were read by title only, were as follows:

1. "Dust Explosions in Coal Mines." By F. Bache, Fort Worth, Ark.
2. "The Formation and Enrichment of Ore-bearing Veins." By George J. Bancroft, Denver, Colo.
3. "Modern Practice of Ore Sampling." By D. W. Brunton, Denver, Colo.
4. "Need of Instrumental Surveying in Practical Geology." By Benjamin Smith Lyman, Philadelphia, Penn.
5. "Modern Progress in Mining and Metallurgy in the Western United States." By D. W. Brunton, Denver, Colo.
6. "The Assay and Valuation of Gold Bullion." By Frederic P. Dewey, Washington, D. C.
7. "The Cyanidation of Silver Ores in Mexico." By Albert F. J. Bordeaux, Thonon les Bains, France.
8. "The Fushun Colliery, South Manchuria." By Warden A. Moller, Tientsin, China.
9. "Protective Value of Humidity in Dusty or Gaseous Coal Mines." By James Ashworth, Congleton, England.
10. "A Study of the Ventilating System of the Comstock Mines." By George J. Young, Reno, Nev.
11. "Professional Ethics." By Victor G. Hills, Denver, Colo.
12. "An Adjustable Pyrometer Stand." By L. W. Balmey, Palo Alto, Cal.
13. "The Rubb Hydraulic Elevator." By J. McD. Porter, Spokane, Wash.
14. "Notes on Construction of a Glass Mine Model." By Edmund D. North, Tonopah, Nev.
15. Postscript to paper, "The Behavior of Calcium Sulphate at Elevated Temperatures With Some Fluxes." By H. O. Hofman and W. Mostowitsch, Boston, Mass.
16. "Cyaniding Slime." By Mark R. Lamb, Milwaukee, Wis.
17. "Influence of Ingot Size on the Degree of Segregation in Steel Ingots." By Henry M. Howe, New York.
18. "The Filing of Assay Samples for Use in Technical Laboratories." By Louis D. Huntoon, New Haven, Conn.
19. "Dredging for Gold in French Guiana." By Albert F. J. Bordaux, Thonon les Bains, France.
20. "Mining Industry of Nicaragua." By T. Lane Carter, Bluefields, Nicaragua, Central America.
21. "Barite Industry of the United States." By A. A. Steel, Fayetteville, Ark.
22. "Federal Coal Mines in the Philippines." By Oscar H. Reinholt, Pasadena, Cal.
23. Discussion of the paper of Charles R. Keyes, "Genesis of the Lake Valley Silver Deposits." By William M. Courtis, Detroit, Mich.
24. Discussion of the paper of Henry M. Howe, "Piping and Segregation of Steel Ingots." By P. H. Dudley, New York, N. Y.
25. Discussion of the paper of Charles R. Keyes, "Ozark Lead and Zinc Deposits: Their Genesis, Localization, and Migration." By E. R. Buckley, Flat River, Mo.
26. Discussion of the paper of D. I. Hewett, "Vanadium in Peru," by James F. Kemp, New York.
27. Discussion of the paper of Hofman and Hayward, "Pan Amalgamation: an Instructive Laboratory Experiment." By E. A. H. Tays, San Blas, Sinaloa, Mexico.
28. "The Influence of Bismuth on Wirebar Copper." By H. N. Lawrie, Portland, Ore.
29. "A Study of the Critical Condition in Appalachian Coal Mines Affecting Explosions in Which Coal Dust Is Factor." By N. H. Marmakee, Williamson, W. Va.
30. "Influence of Top Lag on the Design of the Pipe in Steel Ingots." By H. M. Howe, New York.
31. "The Combustion Temperature of Carbon and Its Relation to Blast Furnace Phenomena." By Charles P. Linville, State College, Penn.
32. "The Conservation of Our Coal Supplies." By Edward W. Parker, Washington, D. C.
33. "The Limit of Fuel Economy in the Blast Furnace." By N. M. Longden, Marcelona, Mich.
34. "Barite Deposits in the United States." By Charles R. Keyes, Des Moines, Iowa.
35. "Conditions and Costs of Mining at the Butte Copper Mines Club." By William Fischer, New York.

Views, Suggestions and Experiences of Readers

Comments on Questions Arising in Technical Practice and Debatable Points Suggested by Articles in the Journal

CORRESPONDENCE AND DISCUSSION

Peroxidation of Iron in Blast Furnaces

I have read over with considerable interest the article by Antenor Rizo-Patron, entitled "Peroxidation of Iron in Blast Furnaces," published in the JOURNAL, Aug. 21, 1909, p. 367. With special reference to his experiences in this respect in copper smelting in Peru, I would like to call attention to the fact that such phenomena are probably a more frequent occurrence than is generally considered. I have had occasion to notice in a good many instances that this condition of affairs is brought about when the furnace is suffering for heat. Now, this may be by reason of too little coke, or it may be that the furnace is running slowly and too much air is passing through the charge, thereby robbing the furnace of heat.

In large copper blast furnaces this trouble is not so noticeable in the furnace as it is in the settler, when this foreign material, or magma, will collect in the fore hearths, and by reason of its interlocation in the specific-gravity column between the customary slags and matte, it will float on top of the matte and underneath the slag and keep on accumulating there as long as it is being formed, and until steps have been taken to change the condition of affairs or the settler is out of business. This condition of affairs may also be brought about from other causes as well.

I had occasion to shut down a furnace at one time when the settler was in very bad shape from this condition, and I have on hand several hundred pounds of this material; and I would be pleased to furnish samples of it to any reliable chemist who might be interested to the extent of making a chemical analysis and writing a paper thereon. A preliminary analytical report on some similar material was: Cu, 4.84; SiO_2, 19.4; Al_2O_3, 10; Fe, 44.8; CaO, 4; S, 5.6; Cr_2O_3, 0.7; ZnO, 0.8; Ag, 1.6; Au, 0.01; MnO, 1; MgO, tr. Except Cu, S, Cr_2O_3, Au and Ag, analyses of above material were made on fusions with Na_2CO_3, and the silica residue which contained insoluble black specks was refused with Na_2CO_3 and Na_2O_2 but the black portion was not all eliminated even then. I suppose it was some form of carbon. All the determinations of iron agreed. When analysis is calculated with iron as FeO it gives over 100 per cent. Hence as there is evidently some ferric oxide there must also be metallic iron. The sample was strongly magnetic. The Cr_2O_3 determination was made in view of the possibility that an accumulation of this acid might have occurred, as has been noted in other places; but the troubles here are purely and simply in the infusible higher oxides of iron or possibly silicates thereof.

The slag that was flowing out of the settler at the time this material was accumulating had the following analysis: SiO_2, 40.5; Al_2O_3, 8.8; FeO, 35.7; CaO, 10.3; S, 0.6; ZnO, 1.6; MgO, 0.41; MnO, 0.47.

CHAS. F. SHELBY,
Superintendent Reduction Division, Cananea Consolidated Copper Company.
Cananea, Son., Mex., Sept. 18, 1909.

Gypsum on Cape Breton Island, Nova Scotia

In the JOURNAL of Sept. 18 there appears an article by John Tyssowski on gypsum on Cape Breton Island, Nova Scotia. After describing various properties in these countries, he just touches on Newfoundland with these words: "At St. Georges Bay, Newfoundland, there is also said to be a deposit of good quality, but this is quite inaccessible, so will probably not enter into the development of the industry for some time."

There is a large deposit of gypsum in St. Georges bay, which outcrops about 500 ft. from the shore, and is quite accessible, and another large deposit of superior quality at Codroy harbor, near St. Georges, which outcrops on the shore for about ¾ mile, showing in cliffs 30 to 50 ft. high, and this is within ¼ mile from a good harbor where ships of any tonnage could be loaded.

OTTO EMERSON.
St. John's, Newfoundland, Sept. 23, 1909.

Cornishmen and Englishmen

When does a man cease to be termed a citizen of the country in which he happens to be born and reared and be known as pertaining to a particular county of that country? How would a person hailing from say St. Louis feel if he happened to be at an international gathering and it was reported that among those present were Germans, French, English, Americans and Missourians? Isn't a Missourian an American? It is equally as ludicrous to distinguish between the Missourians or Kentuckians and Americans as between the Cornish and English.

The foregoing arises from the statement in the JOURNAL of Aug. 14, 1909, which says "among whom are Americans, English, Welsh, Cornish and Swedes." As if Cornwall was a separate nation and the Cornish a separate race from the English! I will admit we once were a nation unto ourselves but that was away back in the tenth century, for Cornwall was finally conquered by the Saxons under Egbert and Athelstan, the latter in the year 926 proclaiming himself as "ruler of all the kings in this island including Huwal King of the Cornish, Constantine, King of the Scots" and so on. Notwithstanding all this took place more than a thousand years ago I have met many persons on this side of the ocean who still look upon Cornwall as being detached from England.

T. SKEWES SAUNDERS.
Aug. 24, 1909. Aire Libre, Mexico.

[Our correspondent is, of course, technically correct in his remarks. A Cornishman is certainly an Englishman. If it were aimed to include the Welsh, however, it would be necessary to say "British." Nevertheless, the Cornish have certain estimable characteristics—among other things they are recognized the world over as expert miners—and we fancy that this was the reason why Mr. Fleming, the contributor of the article in question, referred especially to them, just as reference is frequently made to Yankees as a variety of Americans, usually in a complimentary way.—EDITOR.]

Rope Strains in Hoisting

Referring to the article "Rope Strains in Hoisting," by C. W. Beers in the JOURNAL of Aug. 21, 1909, the formula given for "total rope strain" is:

$$\left(L + \frac{\sin.\ \phi\ L.F}{8000}\right)\left(\sin\ \phi + \frac{\cos.\ \phi}{57.2}\right) + \frac{\cos\ \phi}{10}\left(L + \frac{\sin.\ \phi\ L.F}{8000}\right)\left(\sin\ \phi + \frac{\cos.\ \phi}{57.2}\right) = \left[\left(L + \frac{\sin\ \phi\ L.F}{8000}\right)\right]\left(1 + \frac{\cos\ \phi}{10}\right)\left(\sin\ \phi + \frac{\cos\ \phi}{57.2}\right)$$

Yet Mr. Beers has only considered the stress due to the load.

Surely the stress due to winding on drums of varying diameter should be considered if a formula is to be labeled "total rope strain."

Mr. Sederholm, former chief engineer for Fraser & Chalmers, and Mr. Hewitt, of the Trenton Iron Company, have given

formulas for the stresses due to winding or bending.

It would be instructive if Mr. Beers or others would discuss the stress, due to winding and show what part it plays in the selection of a wire rope.

GUY C. STOLTZ.

Mineville, N. Y., Aug. 29, 1909.

Determination of Alunite

Though much belated, I wish to commend the publication of Mr. Gage's excellent article in the JOURNAL of June 5, 1909. I do not understand the objections Gordon Surr has found in this article. Qualitative field tests, which at the same time give an approximate quantitative result, are invaluable not only to the prospector, but also to many established mines. Too few such tests are published and I have repeatedly urged that they be compiled in book form. They would constitute one of the small volumes of a prospector's library, the publication of which would fill a serious want.

Most mines have only an assay outfit to deal with their particular ores; many smaller mines have assayers without much knowledge of analysis, or with just enough knowledge to do the routine assaying of the mine. If a rock has to be determined it is sent to a petrologist, or a perplexing mineral may be sent to an analyst, and time and money are lost. The knowledge of simple tests cannot be overrated by the practical miner. Anybody who wishes to understand Mr. Gage's article will interpret it in the way that it was intended; that alunite, found among geological and mineralogical surroundings similar to those of Goldfield, might be an indication of the proximity of gold and is worth investigating. No one who has the least idea of prospecting would expect a mine below every gossan or "peach," but every prospector who understands his business would scrutinize them thoroughly.

The knowledge of "indicators" for gold and other metals is so far behind, because every discovered indicator has been made the subject of ridicule, if it could not be proved in the same way as we determine that $2 \times 2 = 4$. We all now admit the ore associations and surface and other indications for tin, because they have been proved geologically and chemically, but many practically proven facts indicating the presence or proximity of gold or silver are called superstitions or, at best, coincidences, simply because science has not advanced far enough yet to account for them.

I remember several years ago the JOURNAL published an article on placer mining in Colombia, by Mr. Sharpless, who complained that the old Indians had marked out the richest spots hundreds of years since, and that he could not understand what "divining rod" they had used. As a matter of fact they simply used the surface indications which nature gave them. Recently I read an article about the ancient silver-lead mines in Burma. The rich leads have been worked by the Chinese for hundreds of years, while the cropping of the other poor lodes had not even been touched. Surface indications must have guided them. The JOURNAL published, on Aug. 7, 1909, some notes about the Morning Star mine in California, which after having been condemned by two experts was taken up by a miner of practical experience and paid 212 dividends. Science has grown out of practical facts and a science that denies them ceases to justify its name.

C. B.

Rama, Nicaragua, Sept. 8, 1909.

Iron in Brazil

The Rio Janeiro correspondent of the London *Economist* writes to that paper as follows: "The President of Brazil recently sent a message to Congress asking for authority to promote and assist the exploitation of the country's iron-ore deposits and the erection of smelting furnaces, by granting such facilities as would guarantee interest on the capital that might be invested in the metallurgical industry. Iron ore is very abundant in this country, especially in the State of Minas Geraes, where it is said that one range of hills alone contains sufficient to supply the world's demand for 160 years taking as a basis the present rate of consumption. The ore is of exceedingly good quality, and when smelted is said to yield a very high percentage of iron. It is found on the surface in a more or less pure state, thus facilitating its extraction at a relatively cheap cost.

"Several attempts to found and develop this industry have been made both by the government and private enterprise, but so far without satisfactory results, entirely on account of the absence of reasonable transport facilities. If special arrangements are made for bringing the ore to shipping points at reduced freights and further facilities afforded in the way of modern and adequate shipping machinery at a moderate tariff, the exportation of iron ore may be started with a very fair chance of success. The success of the smelting furnaces, however, is more problematical. In the first place, the erection and working of such important plants demand a large amount of capital and skilled labor, which would have to be imported, thus greatly enhancing the cost of production.

"The second point to be considered is the limited demand that such furnaces would be called upon to supply. The amount of iron and steel consumed in this country is quite insignificant when compared with the output that such an industry should give to pay its way, and there is little possibility of an export trade with other South American Republics. The cost of production would be above the European or North American level, and lower freights hence would certainly not make good the difference. A third difficulty is the fuel question. Coal is plentiful in Rio Grande do Sul, but it is of very poor quality, and only suitable for ordinary common purposes, and consequently useless for an industry requiring the very best coal. Further, the expense of starting coal mines in that state and shipping the coal to Minas Geraes by way of Santos or Rio de Janeiro would be too high."

American Zinc, Lead and Smelting

The annual report of the American Zinc, Lead and Smelting Company for the year ended June 30, 1909, shows the net profits of the company for that period to have been $3 per share on the company's 80,000 shares. The total net earnings from sales of zinc and lead ores after deducting cost of mining, manufacture, marketing and for promotion of the Huff processes were $360,380. From this were deducted $58,583 for general and administrative expenses and $57,351, interest on bonds and notes, leaving the net earnings at $244,445.

The net profits were appropriated, $47,264 on the mines in Missouri, $28,833 on the Kansas smelteries and $6330 for a concentrating plant in Wisconsin, the remaining $162,016 going into the special reserve fund. The total assets of the company at the date of the publication of the report were $3,452,516 against $3,166,134 and $2,847,903 at the same time in 1908 and 1907, respectively.

According to President H. S. Kimball, in the annual report, no additions were made to the property accounts during the year and all improvements were charged off out of the profits. The additions made to the mines in Missouri consist of the purchase and equipment of the new Vogey mill and developments especially of the December tract. In connection with the smelteries, about 1500 acres of new gas lands were added to the company holdings.

During the year the company also acquired a 60 per cent interest in the stock of the Wisconsin Zinc Company.

The American Zinc Company held for a duty on smelt-bearing ores brought into the United States in the recent tariff fight and expects to benefit from the tariff imposed.

Grahamite, a valuable hydrocarbon, is found near Tampico, Mexico. Small shipments have been made. Gilsonite also is found in the same locality.

Details of Practical Mining

Notes of Interest to the Operators of Small Mines as Well as of Large Mines. The Things That Have to Be Done in Everyday Mining

REPORTS FROM EXPERIENCE

Readers of the JOURNAL are invited to contribute to this department. Articles should be brief, thoroughly practical, and preferably illustrated by drawings or sketches. Our draftsmen will prepare properly any kind of a pencil sketch that is intelligible. Something that is an old story in one district may be quite unknown in another. Articles accepted and published are suitably paid for.

Concrete Powder House

The accompanying illustration shows the type of powder house used by a large Eastern mining company. The building is about 6x12 ft., built entirely of concrete. The door and door frame are wood, but covered with sheet iron. The floor is cemented. It is used for the storage of only a few boxes of powder for immediate use at the mine. There are a number of these buildings, and each shipment of powder is distributed among them. This avoids the storage of large quantities

CONCRETE POWDER HOUSE

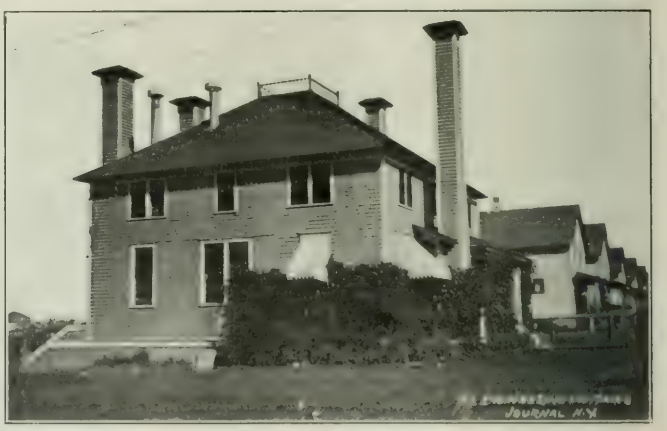
of one place. However, we do not think that the design of these magazines is one that is to be recommended.

Extinguishing a Gaswell Fire*

At a depth of 3702 ft. the Roma Mineral Oil Company, Limited, Queensland, struck a flow of gas amounting to [illegible] cubic ft. per day. The gas was [illegible] by being blown toward the boiler [illegible] and burned several days before it could be extinguished. A large sheet iron [illegible] was built and by means of rope and derrick swung over the well and weighted down. This shut off the supply of gas for a time and the fire ceased. After an extra length of casing was put down, the flow of gas was cut off, and drilling operations resumed.

Chemical Laboratory Sites

In too many cases little thought is given regarding the location of the chemical laboratory. Often it is in some dusty dark, out-of-the-way place, and under such conditions it is impossible to do good work, to say nothing of the comfort of the chemist. The acompanying illustration shows the new laboratory of the Oliver Mining Company, Chisholm, Minn.



NEW CHEMICAL LABORATORY OF THE OLIVER MINING COMPANY

The special features of this building are that it is light, has plenty of room, is surrounded by a beautiful lawn, and is free from the dust arising from the handling of a large tonnage of ore. It is also free from the vibration of heavy machinery.

Bumpers for Runaway Cars

When it is necessary to handle loaded railroad cars on a steep grade in the vicinity of the shaft headframe, there is danger of a car breaking loose and running away. In case one of these cars should strike a shaft house, the building would be wrecked. An excellent plan in a case of this kind is to have a derailing switch about 100 ft. from the shaft, and then between this and the buildings as an additional precaution a bumper may be built. The one in mind is used by the Cleveland-Cliffs Iron Company. It is about 7 ft. square, 6 ft. high, built of heavy stone laid in cement. This is about 20 feet from the shaft. Three of these are in use to protect a steel headframe in the Marquette district.

Plugging a Diamond Drill Hole

A diamond-drill hole had penetrated the hanging wall and passed into the orebody. The hanging-wall dipped approximately 45 deg. and there was still a thin edge of ore to be extracted below the drill hole. The drill hole was 250 ft. deep and at a depth of 70 ft. passed through a water-bearing formation. In mining the ore the drill hole was encountered and a flow of water under a head of 180 ft. made it impossible to work in the bottom of the slope. The hole could not be plugged in the ordinary way from the bottom and the superintendent in charge conceived the idea of dropping a wire cable down the 2-in. hole to the main workings. The cable was attached to a windlass at the surface and a wooden plug fastened to the lower end of the rope. The plug was wrapped with small cotton rope to form a packing and thus

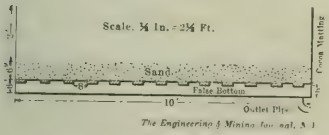
* Annual Report of the Under Secretary for Mines, 1908.

make a tight joint between the rock and the plug. By means of the windlass the cable and plug were drawn up sufficiently tight to keep the water out of the drift for about two hours when the pressure of the accumulated water was such as to force the water through the hanging-wall. The plug was then let down and the pump run for two hours to draw off the water. When the slope was empty the plug was again put in place and the men could work another two hours.

Sand Filters

By W. F. Boericke*

Sand filters are useful around a cyanide plant for clarifying solutions from included sediment and entail only a trifling cost for installation and maintenance. They may be constructed of any convenient size, depending on the amount of solution it is desired to filter. An ordinary box is used with a false bottom of slats, about 8 in. apart; the true bottom is 6 in. below this, as shown in the accompanying drawing. This true bottom should incline slightly toward the outlet pipe. The false bottom should be covered with a layer of



CONSTRUCTION OF SAND FILTER

coarse cocoa matting, securely tacked down. About 6 in. of sand (40 mesh is fine enough) is spread evenly on top, and the filter is ready for use.

The solution runs quickly through the filter, and comes out perfectly clear. In case the sand gets clogged with sediment, and the solution filters slowly, the surface of the sand should be raked over. It should be changed entirely from time to time, but the cocoa matting need not be disturbed. A vacuum pump may be attached to the outlet pipe to hasten filtering.

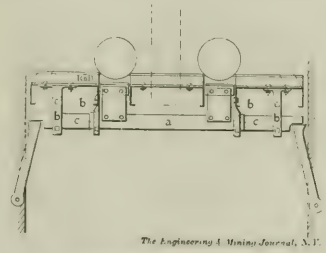
A Safety Device for Cages at the Chapin Mine

Many accidents in mine shafts are due to carelessness on the part of the gate tenders in failing to close the bars to keep the mine car in its place. Moreover, it is possible for this bar to be knocked out of place by a projecting timber or otherwise, resulting in the car rolling off the cage and catching in the shaft timbers.

*Mining engineer, Cobalt, Ontario.

The accompanying sketch shows a device that has been used many years at the Chapin mine, Iron Mountain, Mich., where it has been a success.

It consists of a drop track directly under the wheels. This track can be thrown into position only by setting the cage on both chairs. The instant the cage is lifted from the chairs the track drops down 2½ in. so that it is impossible for a car

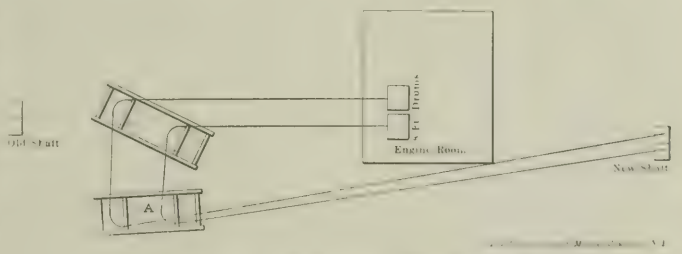


SAFETY DEVICE FOR CAGES

to roll off, even should the bars not be in place. The iron bar *a* used to support the drop track is 2x4 in. and the length of the cage. The drop section of the rail is 10 in. long. The bar is supported in a slot *b* that allows of 2½ in. play and is secured by an angle-iron lug *c* so that it cannot slip endwise. It is operated entirely by the contact of the cage with the chairs at the desired landing.

Arrangement of Sheaves at the Tobin Mine

The accompanying diagram shows the arrangement of sheave wheels that had to be adopted at the Tobin mine, Crystal



ARRANGEMENT OF HOISTING PLANT AT THE TOBIN MINE

Falls, Mich., in order to use the hoisting engine without turning it around. The old shaft was in ground that will eventually be mined and the new shaft was sunk 1000 ft. deep in the footwall and back of the engine room. The drums are 8 ft. in diameter, 8 ft. long and operated by a Nordberg engine. The sheave wheels which are anchored in front of the engine room are 8 ft. in diameter and held in place by 12-in. framed timbers weighted down with rock. While these additional wheels add to the friction losses, no trouble has been experienced with this plan. Three-ton skips are hoisted from the bottom of the shaft in 30 seconds. The wheels at *A* are inclined, to conform with the slope of the rope to the top of the shaft house.

Emergency Chairs on Gallows Frame

There are numberless safety devices for winding plants which are supposed to catch and hold the cage or skip in the event of breakage of the cable. All seem to be good, and on paper or at tests will work perfectly. The weak point of all of them is, however, the fact that they depend upon springs for their action when the cable strain is released.

In mine usage joints and bearings rust and the springs deteriorate, so that when the accident finally happens the mechanism may refuse to work. Further, cables are usually broken by winding the cage into the sheave, and a force strong enough to break the cable is generally also sufficient to bend the rods and jam the moving parts of the safety clutch.

Assurance should be made doubly sure by placing a set of chairs in the gallows frame so that when the cage is pulled to the sheave the chairs will be about 6 in. below the floor of the lowest deck (a separate set for each deck would be preferable). Chairs so placed are high enough above the collar to be out of the way of ordinary work. They are always held in the shaft by weights or springs and, being above ground, there is no excuse for their not always being in first-class condition. Then when an accident occurs, if the dogs of the clutch fail to work, the cage cannot fall down the shaft.

Having the tool "nipper" collect the miners' lunch buckets and send them up to the change house not only saves the men trouble but often removes the temptation of high-grading.

New Publications

REPORT ON THE IRON ORE DEPOSITS OF NOVA SCOTIA, PART I. By J. E. Woodman. Pp. 226, illustrated 6¾x 9½ in., paper. Ottawa, 1909: Government Printing Bureau.

LES FABRIQUES DE PETROLE DE ROUMAINE PAR RAPPORT A LA LOI DE LA CONTINGENCE DE 1908. Par l'ing C. Hallaceanu. Pp. 102, illustrated, 9½x 12½ in., paper. Bucarest, 1909: *Revue du Petrole.*

STEAM POWER PLANT PIPING SYSTEMS: THEIR DESIGN, INSTALLATION AND MAINTENANCE. By William L. Morris. Pp. 490, illustrated, 6½x9¼ in., cloth, $5. New York, 1909: McGraw-Hill Book Company.

COMMISSION D'ENQUETE SUR LA DUREE DU TRAVAIL DANS LES MINES DE HOUILLE: STATISTIQUE DES ACCIDENTS MINIERS. Par L. Delruelle et A. Delmer. Pp. 501, illustrated, 8x11 in., paper. Bruxelles, 1909: E. Daem.

REPORT OF THE MINISTER OF MINES, 1908. By Richard McBride. REPORT OF BUREAU OF MINES. By William Fleet Robertson. Pp. 269, illustrated, 7½ x10 in., cloth. Victoria, B. C., 1909: Printed by Richard Wolfenden.

SUMMARY REPORT OF THE MINES BRANCH OF THE DEPARTMENT OF MINES FOR THE NINE MONTHS ENDING DECEMBER 31, 1908. Sessional paper No. 26a. Pp. 96, 6½x10 in., paper. Ottawa, 1909: Printed by C. H. Parmelee.

A SKETCH OF THE GEOGRAPHY AND GEOLOGY OF THE HIMALAYA MOUNTAINS AND TIBET. Part IV: THE GEOLOGY OF THE HIMALAYA. By S. G. Burrard and H. H. Hayden. Pp. 207-308, illustrated, 9x12 in., paper. 2 rupees. Calcutta, 1908: Office of the Trigonometrical Surveys.

A GEOLOGICAL RECONNAISSANCE IN NORTHERN IDAHO AND NORTHWESTERN MONTANA. U. S. Geological Survey, Bulletin 384. By F. C. Calkins. NOTES ON THE ECONOMIC GEOLOGY. By D. F. MacDonald. Pp. 112, illustrated, 6x9 in., paper. Washington, 1909: Government Printing Office.

GEOLOGICAL REPORT UPON THE GOLD AND COPPER DEPOSITS OF THE PHILLIPS RIVER GOLDFIELD. By Harry P. Woodward. DESCRIPTION OF THE CRYSTALLINE ROCKS OF THE DISTRICT. By L. S. Simpson and L. Glenert. Pp. 109, illustrated, 5x8½, in., paper. Perth, 1909: Fred Wm. Simpson, Government Printer.

BENEFICIO DE MINERAL DE PLATA Y ORO POR CIANURACION. By Ferdinand McCann. Pp. 351, illustrated, 6½x9 in., cloth, $5. Mexico City, 1909: Published by the author.

Mr. McCann has produced in Spanish as excellent practical and scientific treatise on cyanidation that is worthy to rank with the standard books in English on the subject, both in matter and presentation. It is necessarily in part a compilation, but back of it is the author's extended experience, particularly in the Mexican field, and a wide and intelligent study of the actual methods and results in the leading camps. The main text of the book, devoted to the theory and practice of cyanidation, is clear, concise and complete, and also sufficiently scientific to put the book above the class of manuals for beginners of which there are already too many. The chapters given to the practice and results in the leading Mexican mines —El Oro, Dos Estrellas, Mines of Mexico, Esperanza, Guanajuato Consolidated, Real del Monte y Pachuca, Coscotitlan, Hacienda San Francisco at Pachuca and San Rafael—are of timely interest and of great value, although from the progressive nature of the subject are somewhat transitory for a book. Other chapters deal with special problems of cyanidation and present useful tables. The book is well illustrated. The wide application of cyanidation in Spanish-American countries makes the publication of this book in Spanish particularly appropriate. It will serve the increasing number of Spanish-speaking engineers who are rapidly realizing the urgent need of knowledge of the subject and also will be of interest to the English-speaking metallurgists who can read it and who will find in it a practical lexicon for the technical phrases of the business.

ORE DRESSING. Vols. III and IV. By Robert H. Richards. Pp. 1199 to 2052, illustrated. 6½x9½ in., cloth, $5 per volume. New York, 1909: McGraw-Hill Book Company.

Richards' "Ore Dressing" is one of the classics of our mining and metallurgical literature. It appeared as a two-volume book in 1903. Since that time advances in the art of concentrating ores have been exceedingly rapid and in some instances well nigh revolutionary. "Investigations have been made for the purpose of explaining the principles of ore separation," says Professor Richards in his preface to Vol. III, "new concentrating devices have been invented and installed in the mills, and the mills themselves have been greatly improved. For these reasons the time seems to have come to bring the subject up to date. When this present work was started in October, 1906, it was thought that something in the nature of a small supplement or appendix would suffice and on this basis the collection of material was undertaken. It soon became apparent that the new work would rank in size with Vols. I and II, and hence naturally receive the title of Vols. III and IV. The idea of revising and rewriting Vols. I and II seemed to be prohibited by reason of the fact that the machines and the mills are so completely changed on almost every page that no method of revision appeared adequate to the task."

The above remarks amply express the scope of the two new volumes. In brief, they bring the subject as nearly up to date as the limitations of printing and proofreading permit. In doing this Professor Richards has made a painstaking examination of the recent literature and has visited most of the new mills of the United States, at the same time continuing his experimental work in the laboratory of the Massachusetts Institute of Technology. No reader of the book, however casual, can fail to be impressed by the hugeness of the task of its distinguished author and his indefatigable industry in performing it. Richards' "Ore Dressing" is the encyclopedia of its subject.

REPORT ON THE INVESTIGATION OF AN ELECTRIC SHAFT FURNACE, DOMNARFVET, SWEDEN. By Eugene Haane. Canadian Department of Mines, Mines Branch, Pp. 38; 10x6½ in.; paper; illustrated. Ottawa, Canada; O. H. Parmelee, King's Printer, 1909.

This report embodies the latest results of the series of experiments in electric smelting which, begun under Dr. Haanel's direction at Sault Ste. Marie, Ont., in the winter of 1905-6, were continued in Sweden with the improvements in the plant suggested by experience, and brought to a satisfactory conclusion in December, 1908. The first part gives a full description with diagrams, of the Domnarfvet furnace, amplifying the details of its design and operation previously published at some length, and sets forth the results of the trial runs witnessed by Dr. Haanel. An important feature is the comparison of the cost of the production of pig iron in the charcoal blast furnace with that produced in the electric shaft furnace by Professor Von Odelstierna of Stockholm, under conditions as they exist in Sweden, using ore containing about 60 per cent. of metallic iron and charcoal containing 85 per cent. carbon. A charcoal blast furnace in Sweden produces about 8000 to 10,000 short tons of pig iron per year, a quantity which the professor believes can be produced in a properly constructed electric shaft furnace. On this basis the advantage would be $1.54 per ton in favor of the electric furnace, the figures being $10.10 per ton for the charcoal blast furnace and $8.56 for the electric process. The saving is all in the charcoal used, the quantity being 0.95 ton in the blast furnace and 0.27 ton in the other. The inventors of the electric shaft furnace have patented an electric steel furnace possessing some novel features and an abstract of the Swedish patent specifications, showing these improvements in detail, is given. The report also includes a description of the modern process for the manufacture of electrodes for electric furnaces, and the latest methods of charcoal manufacture.

Personal

Mining and metallurgical engineers are invited to keep THE ENGINEERING AND MINING JOURNAL informed of their movements and appointments.

W. G. Page was recently in Winnemucca, Nev., examining some mines.

S. J. Taylor, of Milano, has been appointed State mine inspector of Texas.

J. B. Empson, metallurgist, of Mexico City, has just recovered from typhoid fever.

Wm. L. Spry, of Kenora, Ont., has been appointed recorder for the Kenora mining division.

Whitman Symmes is superintendent and engineer of the Ward Shaft Association at Virginia, Nevada.

Alfred H. Brooks, of the U. S. Geological Survey, has been visiting the Fairbanks district in Alaska.

James MacNaughton, general manager of the Calumet & Hecla company is in the East on a short visit.

Emil Lundquist, of Salt Lake City, Utah, is acting manager of the Newhouse Mines and Smelters Company.

Charles Miller, of Los Angeles, Cal., is in Goldfield, Nev., superintending changes in the Goldfield-Silver Peak mill.

F. Karl Lamb has gone to Edwardsburg, Idaho, for the Eagle Mining Company which is constructing a mill and cyanide plant.

H. A. Kennedy is construction engineer for the Yoquive Development Company for the erection of the new plant in Chihuahua.

E. C. Musgrave, who recently returned to British Columbia from Mexico, has been examining mines in the Portland canal district.

George B. Farish, recently in the City of Mexico, is now in New York. His address is at the Columbia University Club, 18 Gramercy park.

W. L. Loveland, for 19 years with the Allis-Chalmers Company, has been appointed general manager of the Mine and Smelter Supply Company.

Wm. H. Goetz, recently of the Bagdad Mining Company, of Idaho, has become connected with the Yellow Aster Mining Company, of Randsburg, California.

Thomas F. Cole has been elected president of the Giroux Consolidated Mines Company, in place of Joseph L. Giroux, who has resigned on account of ill health.

James Johnston, metallurgical engineer for Charles Butters & Co., Ltd., was recently in Milwaukee, Wis., on his way from Copala, Mexico, to New York and London.

T. B. Drummond, formerly manager of the Newhouse Mines and Smelters Company, has been appointed general manager of the Inspiration Copper Company at Globe, Arizona.

Charles Duncan, lately connected with the Bethlehem Steel Company, has been appointed superintendent of the Lake Superior Corporation's steel-rail mill at Sault Ste. Marie, Ontario.

C. H. Plumb, mining engineer, has bought the office equipment and practice of the Michel-Cooke Engineering Company at Joplin, Mo., and will largely extend his business as consulting engineer.

A. W. Hudson, formerly metallurgist at the Cobar smelting plant, has been made manager of the smelting and electrolytic plant of the Great Cobar Mining Company, Ltd., at Lithgow, New South Wales.

Ira W. McConnell, supervising engineer in the reclamation service, has resigned to go into private practice. He is a graduate of Cornell University, and has been in the Geological Survey over six years.

Dr. Milton L. Hersey, of Montreal, is in Cobalt, Ont., arranging for the development of three mining properties in the Gillies Limit, recently purchased by himself and Ascher Pierce from the Ontario government.

J. H. Lanyon has resigned his position as superintendent of the Calumet & Montana Mining Company in Beaverhead county, Mont., and has been appointed superintendent of the Idaho Mining and Development Company.

A. E. Hodgkins, who has been in charge of the purchasing and accounting department of Witherbee, Sherman & Co., Inc., at Mineville, N. Y., has been appointed general manager of the Cheever Iron Ore Company, at Port Henry, New York.

W. O. Walker has been appointed associate professor and George F. Guttman assistant professor of chemistry at Queens University, Kingston, Ont. Mr. Guttman is a son of Dr. Oscar Guttman, the celebrated English authority on explosives.

Paul C. Kuegle has resigned his position as chief inspector of the Youngstown Sheet and Tube Company, Youngstown, O. He sailed from New York Oct. 9 for Sakchi, India, and will be employed as chief inspector of construction for the Tata Iron and Steel Company.

Dr. Charles B. Dudley, for many years head of the testing department of the Pennsylvania Railroad, was elected president of the International Association for Testing Materials at the convention recently held at Copenhagen, Denmark. The next convention of the association, in 1912, will be held in the United States.

Obituary

Augustus H. Phelps died at Denver, Colo., Sept. 29, aged 62 years. He had been engaged in mining in Colorado for nearly 30 years, and owned large interests in the San Juan district, and also in Idaho.

Patrick Hurley died at Park City, Utah, Sept. 21, aged 35 years. He was for a number of years employed by the Silver King company, and for several years past was superintendent of the Kearns-Keith mine.

John M. Grice was killed by an explosion of dynamite in the Perequina mine, Guanajuato, Mexico, Sept. 15. He was 28 years old. He was born in Kansas and graduated from the Massachusetts Institute of Technology. He was well known in Mexico, and for some time past had been employed as a mining engineer by the Esperanza Mining Company.

Samuel Queen Brown, president of the Tide Water Pipe Company, the Tide Water Oil Company, and the Associated Producers' Company, died in New York, Oct. 5. Born in Pleasantville, Penn., in 1834, Mr. Brown received his education at Alleghany College. For 15 years he was commissioner of the Second Geological Survey of Pennsylvania. For many years he has been well known in the oil trade.

Rasmus Hansen died at Silverton, Colo., Sept. 28, aged 62 years. He was born in Denmark, but came to this country when a young man and settled in Colorado. After working in mines in Gilpin county for several years he went to San Juan county in 1870 and had resided there ever since. He owned and developed several good mines, the best known being the Sunnyside Extension, from which he realized a large amount.

Kenneth Robertson, aged 64, died at Portland, Ore., Sept. 26. Until a few years ago he was prominently known as an expert blast furnaceman and mineralogist wherever pig iron was made in this country, and was identified with the Sloss interests in Birmingham, Ala., for years, also with the Duluth Furnace Company, in Minnesota, and the Pardee interests in New Jersey. He was born in Madison county, Ala., and served in the Confederate army. After the war he entered the School of Mines of Columbia University, New York, and graduated with honors, later following this training by opening one of the first chemical laboratories in Pittsburg, with his brother Richard. He leaves a widow, two daughters and two sons.

Societies and Technical Schools

Venezuela Mining Congress—A correspondent writes from Caracas that an international mining congress in Venezuela is being organized, with prospects of success.

Appalachian Engineering Association—The next meeting will be held in Washington early in November. The sessions will last two days and several valuable papers have been promised, and will be submitted for discussion.

Special Correspondence from Mining Centers

News of the Industry Reported by Special Representatives at Butte, Denver, Salt Lake City, Goldfield, Cobalt and Toronto

REVIEWS OF IMPORTANT EVENTS

San Francisco

Sept. 30—At Marigold on the Yuba river, seven miles above Marysville, there are now four gold dredges at work and at Hammonton, three miles above Marigold, there are fourteen. This makes 18 gold dredges now working in what is known as the Marysville field of Yuba county, which is four more than were at work there in the year 1908. The new machines are all of the largest size and most improved type and are doing an immense amount of work. The ground worked in this field runs very evenly. In course of time it is evident that there will be more dredgers in the Marysville than in the Oroville field. On the Yuba, the area of available dredging ground is quite large. It is deeper than at Marysville and is easily dug. For years those lands along the Yuba river were considered absolutely worthless and in some parts nobody would pay the taxes on them. Some persons who bought such lands at tax sales years ago for nominal prices have made fortunes out of sales since the ground was found to be available for gold dredging purposes. Some parcels bought for 25c. an acre have since been sold at $2000 per acre. The committee from the Anti-Dredge Convention which visited this Yuba field, found that all the dredges operating were land locked and that the material was all being impounded and not allowed to pass into the streams.

R. L. Van Wormer and associates have installed a suction dredge lately a few miles east of Marysville, on the Yuba on the Stevenson estate ground. This is a sort of combined reclamation and mining scheme. The plant consists of a five-inch centrifugal pump run by a 30 h.p. electric motor. The material is raised 76 ft. and spread out over the land in order to raise it higher for purposes of cultivation. The material raised with the water is passed first through a series of sluice boxes to save the fine gold and is then carried on to the land. The gold found is exceedingly fine.

Denver

Oct. 2—In the remarkable Carbon Lake mine, owned by the San Antonio company, in the Red Mountain district between Ouray and Silverton, a strike has been made of stromeyerite, a kind of ore that in the Yankee Girl and Gunton mines made that district celebrated in '84 to '86 one carload of the ore from the Yankee Girl yielding $80,000, with silver $1.00 per ounce. A great boom existed for some years, collapsing in '93, with the fall in silver, and the failure to find any more of the marvellously rich ore. These two mines alone are credited with a production of upward of six millions. The ordinary ore of the Carbon Lake is enargite or arsenical copper ore, but the copper-silver-glance ore is found below the enargite, and is associated with bornite. The discovery again of ore of the same phenomenally rich character as that found between '83 and '93 is going to stimulate mining to a very great degree in Red Mountain.

The Mono-Baltic Mining and Smelting Company, owning adjacent properties, is going to erect at once a 200-ton smeltery for its ores. The president of the company writes from Boston contradicting the report that a consolidation of the San Antonio company, here also contemplated. M. T. Chestnut, manager of the San Antonio company, here also contradicts the consolidation rumors.

The Guadalupe mine, an early producer of rich copper ore, carrying silver, also near Ironton, Ouray county, is to the fore with a rich strike by leasers.

In the Cripple Creek district, the Worcester ventilating system is said to be proving very successful in enabling several of the deep mines, which have been idle on account of the foul gas encountered, to be again actively worked. Five to six feet of ore, running 1½ oz. of gold to the ton, is reported as having struck in the 8th level of the Rexall mine, under Victor. The Granite, also in Victor, is shipping from three to five carloads of high grade gold ore daily. The new machinery erected on the Gold Sovereign mine, to take the place of that burned some time ago, has been completed, and mining and production on a large scale will be at once begun. The mine is operated by a leasing company, of which the manager is Mr. Clements. The stockholders in the Gold Dollar Consolidated company will receive on Oct. 10, a dividend at the rate of [illegible] a share, the amount being $[illegible], a total of $37,500 paid during this year. It is reported now that the rich veins of Bull Hill, which cross the gulch into or under Big Bull Hill and which, in the latter have never shown pay value from the surface, are producing rich ores in the underground workings of a Bull Hill mine which have been extended [illegible] under Big Bull. It has always been believed by Cripple Creek miners that this would ultimately be the case, but not until now has it been reported as accomplished. The claim under which it is found was purchased some time ago by the Golden Cycle company, which is now bringing the ore to the surface. Lessees on the Hiawatha, Little May and Prince Albert, on Beacon hill, are all very busy with new discoveries of rich ore, and mining the old ones, and a good tonnage of high-grade gold ore is going out. The Victor mine, under lease, has shipped from 500 to 600 tons during the past month, of a value of from $10 to $35 in gold per ton.

One of the greatest engineering feats of the West was finished on the 23d, when President Taft touched the electric button at the mouth to the Gunnison tunnel, lifting the headgates at the entrance, six miles distant, and the immense flow of water was available for irrigation. This tunnel was built by the Government under the reclamation act, and cost between three and four millions of dollars; is 30,582 ft. long, and has a capacity of 1300 cu.ft. of water per second. It will irrigate 200,000 acres, and supply power for the Uncompahgre valley.

Goldfield

October 2—At the serious cave-in on the 25th, the 9 cyanide tanks of the old Combination mill were engulfed and the mill placed entirely out of commission for all time. Unfortunately 3 men lost their lives. The intention of the management already announced to dismantle the old mill is forestalled by the accident. The mine was not injured except that the output will be temporarily curtailed. The top of the stope under the mill was 200 ft. from the surface, and was well timbered with square sets of Oregon pine. It is believed the seepage and vibration of the mill contributed to the mishap.

The estimated production of the Goldfield district for the week ending Sept. 25 is 6520 tons, gross value $250,707.

The case of R. P. Dunlap, receiver of the Round Mountain Banking Corporation, vs. F. E. Browns, trustee of the Round Mountain Hydraulic Mining Company, occupied the attention of the district court at Tonopah last week. The case involves the title of the pipe line and the life of Round Mountain. So soon as a clear title to this five-mile line is rested permanently new life will appear at Round Mountain and four or five mills will again begin the reduction of ore already

mined and awaiting a market. The Round Mountain Mining Company is the only property not affected by the pipe-line litigation as it has its own water supply and pipe line.

An important project for the development of power on the Colorado near Las Vegas is under way. The project is headed by Count C. E. Apponyi, an Austrian army officer who made a trip down the river in 1871. He has the backing of important European interests according to report. The first installation plan is for 30,000 h.p., which it is proposed to deliver to the Arizona-Nevada mining camps.

Butte

Sept. 30—The mines of Butte were closed down for four days beginning Friday of last week and ending Monday as a result of the differences between the Miners Union and the Engineers Union in Butte. During this period the only mine in the district which continued to work was the Butte & Boston Company's Silver Bow, where the hoisting engineers remained loyal to the Western Federation. The withdrawal of the engineers from the Western Federation of Miners a week ago resulted in the Butte Miners Union deciding that none of its members should work at mines where the seceding engineers were employed and on Friday morning of last week this order was put into effect with the result that all of the mines in camp with the exception of the Silver Bow were closed down. The trouble seemed serious for several days and it was thought that there might be an indefinite cessation of work but on Monday the seceding engineers decided to return to the Western Federation of Miners and that same day the local miners' union ordered its members to resume work. It is estimated that the miners of the camp lost $150,000 in wages and the producing companies $112,000 in lessened production, making more than a quarter of a million dollars loss caused by the labor trouble. During the whole of the trouble the Amalgamated officials refused to take an active part and the final settlement was wholly due to the efforts of the labor leaders themselves.

Interests headed by President J. J. Hill of the Great Northern Railway have come to an agreement with President J. Herbert Anderson of the Idaho Smelting and Refining Company whereby the Hill interests have agreed to furnish sufficient capital to treble the capacity of the Ponderay smeltery and keep it in operation, provided President Anderson can secure enough contracts to keep the smeltery running the year round. Anderson has just returned from a trip east where it is supposed he was trying to get contracts and it is reported that he will soon make a trip to Montana for the same purpose.

The annual meeting of stockholders of the North Butte Extension Development Company will be held at Portland, Me., Oct. 19. In anticipation of this meeting Dudley A. Tyng & Co. have sent out a circular letter asking for proxies. The letter states that the present management has been pursuing a policy which does not benefit the stockholders, in that it has used certain funds of the company for payments upon options instead of using it for further development work. Tyng & Co. offer to make a loan to the company sufficient to go ahead with development work, provided an efficient board of directors is elected at the coming meeting.

The annual meeting of stockholders of the Davis-Daly company, may not be held until some time later than was originally intended, since a temporary restraining order preventing the holding of the meeting, has been granted by the Maine courts, on the application of Newman Erb and S. M. Jarvis. The ground upon which the restraining order was issued was that there had been no sufficient notification to stockholders of the time and place of the meeting. The restraining order is returnable on Oct. 12 at which time a hearing will be had and the matter of the sufficiency of notice will be passed upon. Mr. Erb has made public his grounds for his objection to Mr. Heinze's continuing in control of the company, and in a recent statement has charged that Heinze has placed the company's funds on deposit in banks where he had a personal indebtedness and has also kept men on the company's pay roll who had not been in Butte for months but who were working in other parts of the country. Each side confidently claims a majority of the votes at the coming meeting but as yet no definite information can be had as to the relative strength of the contending parties.

Salt Lake City

Oct. 2—D. C. Jackling, manager of the Utah Copper Company, denies the reports that the difficulty has been experienced in the steam-shovel operations on account of the men refusing to work under the higher walls, and also denies that the company cannot mine the upper end of the Mackintosh tunnel by steam shovels and that it will use the caving system in mining in this part of the property. He says, "These reports are entirely unwarranted."

In case of the Silver King Consolidated Company against the Silver King Coalition, the United States circuit court has rendered a decision which establishes the responsibility of the Coalition company for the acts of its predecessors, the Silver King Company. The Consolidated company is seeking to recover damages for alleged trespass.

Progress has been made during the last month on the new Tooele plant of the International Smelting and Refining Company. Work has been started on the roaster building and the blacksmith and machine shops are nearly completed. The steel is in place on the power house and the masons have started on the walls. A subcontract has been let for the building of the smokestack and work has begun on the concrete foundation. The material for the building of the high line tramway to Bingham is on the ground and it is being transported to the top of the range.

The Highland Boy smelter, ten miles southwest of Salt Lake City, has been razed and the structural steel and building material taken to the International smelter at Tooele. This plant has been idle for two years when it was closed by the United States court in the smelter-smoke decision. The town of Highland, supported by it, is deserted.

The annual meeting of the New York Bonanza Mining company was held during the week. The affairs of the company and the condition of the mine at Park City were found satisfactory. It was decided to sink a deeper shaft to better handle the mine's production. W. W. Armstrong and F. W. Sherman, superintendent of the Daly-West mills, were elected to the board of directors.

Cobalt

Oct. 3.—There is a big building boom in Cobalt, and several large concrete and brick buildings are being put up, and a great number of frame buildings. In that portion of the town which was destroyed by fire 150 new buildings are being erected, this, notwithstanding the excessive ground rent which is charged by the Nipissing Mining Company. On the principal street these ground rents amount to about $1 to $1.25 per foot of frontage per month.

A few days ago the crosscut from the MacDonald vein at the La Rose cut under the No. 10 vein, which had formerly been worked from a tunnel. The vein was cut 70 ft. below the tunnel level and shows about 3 inches of very high grade ore. During the past fiscal year of the company this vein has produced 200,000 oz. of silver from above the tunnel and also a large amount of high grade ore has been blocked out.

A vein of very high grade ore has been struck in the winze sunk from the lower level of the No. 3 shaft at the Kerr Lake mine. A short time ago a crosscut was started from the bottom of the winze to cut the Jacobs vein at this level. The vein is about 12 in. wide and carries very high silver. So far these workings are the deepest in the camp, and as far as can be ascertained, the ore continues to carry as high grade as on the surface.

During the past week several more of the lots in the Gillies Limit have started work. Dr. Milton Hersey was here a short time ago examining the Pierce lots, and he has purchased a half interest in

these. It is also understood that the Young O'Brien lot has been sold to a Montreal syndicate for $250,000. This claim was purchased in the first place in [illegible] and Stevens not up to [illegible] [illegible] has been accomplished [illegible] the Waldman [illegible] on it for a considerable distance. The shaft on the Waldman vein is now down 60 ft., and the ore in the bottom still continues good.

At the recent annual meeting of the Temiskaming & Hudson Bay Mining Company at New Liskeard the number of the directors was reduced from 11 to 7. It was also decided to erect a concentrator, but it is not likely that work will be commenced on this before next spring. It was also formally announced that the Coleman Township properties had been made over to the Hudson Bay Mines. The financial statement for the year ending Aug. 31 showed that the dividends paid totaled 2400 per cent., amounting to a disbursement of $186,264. During the year a total of 954,000 oz. silver was produced.

The Cobalt Central Company passed the dividend for this quarter, and it is stated as a reason that the funds will be used in the construction of additions to the concentrator. This will necessitate an expenditure of about $30,000, and this could not have been met had the dividend been declared. It is stated that the capacity of the mill will be increased from 80 to 120 tons per day. Up to date this company has paid 4 per cent. on an issued capital of $4,761,500.

The second cyanide plant in the camp, which is at the O'Brien mine, has started operations. This mill is equipped with 30 stamps, 10 of which are to be used for concentrating, and 20 to crush the ore for the cyanide plant. The Moore process will be used for treating the slimes. The other cyanide plant is in operation at the Buffalo, and is treating only the slimes. About 90 per cent. extraction is being made, and the present capacity of the plant is 17 tons per day. This will shortly be increased. The plant at the Buffalo was designed and installed by Groch & Groch, Cobalt. These engineers believe that in future nearly all the mills will be equipped with cyanide plants for treating the slimes. They consider, however, that the concentrating that is being done will produce stuff of such low value as to preclude the possibility of working them on a commercial basis.

Another incident in the Peterson Lake litigation occurred lately, when David M. Steindler, of New York, issued a writ against A. E. McLaren, of Stratford. These gentlemen are the heads of the two factions in this Cobalt dispute. Mr. Steindler asks for a declaration that Mr. McLaren is not lawfully the president of the Peterson Lake, and is wrongfully assuming to act as such, and that the plaintiff, Steindler, has been the lawful president since Dec. 1909. Mr. Steindler also asks for an injunction restraining Mr. McLaren from acting or assuming any part in the duties of the president of the Peterson Lake Company.

Toronto

Oct. 2.—A statement issued by the Ontario Bureau of Mines shows that the total mining and metallurgical output of the province for the first six months of 1909 was $10,649,923 as against $8,082,204 for the corresponding period of 1908. The shipments of ore and concentrates from Cobalt during the half year amounted to 15,360 tons, as against 9209 tons for the first half of 1908—the increase in the quantity of silver content being about 45 per cent. Nickel increased 26 per cent. in quantity and pig iron about 44 per cent. The detailed statement is as follows:

	Quantity.	Value.
Arsenic, tons	1,517	$28,320
Gold, oz.	741	14,011
Silver, oz.	11,234,382	5,379,980
Cobalt, tons	263	16,117
Copper, tons	3,741	529,775
Nickel, tons	6,027	1,234,620
Iron ore, tons	87,738	217,341
Pig iron, tons	211,583	3,197,759
Zinc ore, tons	200	2,000

The annual report of Commissioner Alexander Henderson, of Yukon Territory, gives the total gold production of the territory for the last fiscal year ending March 31 as 217,350 oz. valued at $3,260,263, an increase of $440,000 in value over the preceding year. The amount of royalty collected on gold was $81,507. The report says that the completion of the water system by the Yukon Gold Company will enable it to begin operations on a large scale. It will operate seven dredges and three hydraulic elevators. Experiments with quartz have led to the belief that the time is not far distant when the numerous quartz propositions will add materially to the wealth of the territory.

Mexico

Oct. 1.—The Santa Gertrudis Company has officially ratified the proposition of the Camp Bird, Ltd., and it is believed that the deal will certainly be concluded. Apparently the negotiations between the Camp Bird company and the La Blanca are at an end. It is reported that the Exploration Company of London, represented by R. M. Raymond, is now figuring on the La Blanca. This company is affiliated with the El Oro company. The outcome of the Santa Gertrudis deal has given greater confidence in Mexican propositions and in silver than anything that has happened for a long time.

The English interests back of the concession for a railroad from Toluca in the State of Mexico to the Pacific coast are evidently planning to proceed with the construction. The line will cross the Rio Balsas and reach the Pacific coast at Orilla at the mouth of the river. It will open up a rich agricultural country and furnish an outlet for several important mining camps. At the Pacific terminus of the road are the large iron deposits known as Las Truchas.

The Southern Pacific extension from Guadalajara has now been completed to Magdalena, 25 km. from Tequila. This temporary terminus will serve as a station for the Hostotipaquillo district. Considerable machinery is now awaiting shipment over the new link.

The steamship companies plying between Vera Cruz and Tampico, the Gulf Ports, make a very low rate for zinc ore to Europe. The rate at present is 13s. 6d. to Antwerp and 21s. to Swansea. This rate is for ore in sacks in lots less than 100 tons. The boats make frequent sailings, and the facility for shipment from the Gulf ports is very good. Likewise favorable rates are offered on the Pacific Coast ports by the Kosmos line and other lines for ores for Europe, either around the Horn or over Tehuantepec road to the gulf, and thence to Europe.

Considerable interest is expressed in the purchase of the Pan-American railroad by David E. Thompson, now American ambassador to Mexico. Mr. Thompson, who is an experienced railroad man from Nebraska, has resigned as American minister, to become effective Dec. 30. He has been in negotiation for this line for some time, and now announces that the deal is practically closed and that extensive improvements will be made in connection with the line. The road runs from a point on the Tehuantepec railroad in southern Mexico, along the Pacific coast to the boundary of Guatemala. It has been recently constructed, and is not very well equipped, but has had an extensive business from the outset. There are important copper deposits in the vicinity of this line, which are now being investigated by English engineers. It is expected that the line will connect with some of the projected Central American lines, and furnish a direct outlet and a through railroad route in connection with established lines from Central America as far south as Panama to United States points.

London

Oct. 1.—The prospectus has been issued of the Brazilian Golden Hill, Ltd., formed to acquire from the Brazilian Goldfields, Ltd., rights over 300 acres on a portion of the estate of the Brazilian Goldfields in the state of Rio Grande do Sul, South Brazil. The property has been reported on by E. A. Mannheim and Andre P. Griffiths, mining engineers, who state that it contains several gold-bearing lodes upon which encouraging prospecting work has been carried on. The capital of the new company is £1,115,000, of which £59,093 represents the vendor interest. The subscription of the issue, which has been underwritten, will provide a working capital of £30,000.

Mining News from All Parts of the World

New Enterprises, Installations of New Machinery, Development of Mines and Transfers of Property Reported by Special Correspondents

THE CURRENT HISTORY OF MINING

Alaska

Cordova—The California-Alaska company, whose property is in the Kotsina district, has a 16-ft. vein which has been traced 1800 ft. B. F. Clark, superintendent.

Yukon Gold—The great ditch was completed Sept. 21, reaching Gold hill. The water is conveyed 70 miles, the cost was $10,000,000. This is one of the greatest engineering undertakings in the history of the north.

Fairbanks—Late reports of the stampede to the Iditarod country from Innoko confirm the earlier statements. Fifteen hundred men are now in the district.

Seward—A strike has been made on the Eagle river, a tributary to Knik Arm. The ore is similar to that of the Moose pass region.

Penn-Alaska—Machinery has been purchased. Jesse Blakley, manager.

Cahoon—The company is working pay gravel. A new black-sand device is installed.

Arizona

Cochise County

Great Western—The power plant owned jointly with the Copper Queen at Courtland is completed. It will supply electricity and air to the four shafts of these companies.

Calumet and Arizona—The April Fool shaft at Courtland is down 500 ft., and drifts started. Ore shipments from the Germania are being made.

Tombstone Consolidated—The two pumps and the compressor to recover control of the water at 1000-ft. level have been shipped. The pumps are the Prescott Duplex, capacity 1200 gal. per min. under 1000-ft. head, duplicate of those now at 1000-ft. level. The compressor is a cross-compound condensing Nordberg, capacity 4000 cu.ft. per min. of free air to 100 lb per sq.in. When this equipment is installed at 800 ft. the control of the water to 1000-ft. level will be easily maintained.

Gila County

Arizona Commercial—The new smeltery at Globe is now in operation. It has a daily capacity of 500 tons. The mine is taking out ore from the 600-ft. level.

Cactus—The company is carrying on extensive development at Globe. The Hamilton shaft is in ore 100 ft. from 275 ft. The Pinto shaft is being sunk to 500 ft. Levels and crosscuts are being driven to block out the ore. C. W. Prichett, manager.

Hercules—Two drills are now at work on this property adjoining the Ray Consolidated at Globe.

Ray Consolidated—At the New York meeting the old directors were reëlected excepting the addition of Charles Hayden and W. Hinckle Smith to succeed the two English directors.

Gila Copper—The directorate has been reëlected except A. Chester Beatty succeeded Mr. Wiseman.

Miami—Underground work is devoted to blocking out ore. General Manager Lewis A. Wright estimates of deposit as far as developed at 13,000,000 tons. It will be about a year before the concentrator is completed.

Superior & Boston—The preliminary work for the new McGaw shaft is completed and equipment installed. It will be sunk between the Old Dominion fault on the north and the great Eastern fault on the south, and will cut great eastern fault at 1000 ft. and be the working shaft for the property.

Maricopa County

Vulture—Three levels have been opened below the old workings to a total depth of 600 ft. The east incline shaft is being retimbered. About $100,000 has been expended in development. A 100-stamp mill is planned, a 20-stamp unit of which will be erected at once. A special cyanide process will be used to treat the ore which is gold. W. Spencer Hutchinson is engineer

Pima County

Imperial—September output is estimated at 750,000 lb. copper.

Santa Cruz County

August—The property recently purchased by William Kemp is shipping a car a day to Globe.

California

Butte County

Magalia Ridge—Los Angeles men have become interested in this property on the Cape Horn channel, Magalia ridge, and operations on a large scale will be started. An air compressor and machine drills have been installed. Manager, E. D. Casterline.

Hurleton—Around this place there is a revival in mining. The creeks around Evansville and Natchez were rich in placer gold.

Calaveras County

Lightner—The closing down of this productive mine owing to the bad condition of the shaft is a blow to Angels. A new shaft will be sunk.

El Dorado County

Boulder Extension—In the east extension of the Boulder mine, Rescue, Belmont Blair and Edward Kipp have found a rich vein of ore, richer than that in the original mine. Machinery will be put on

Alliance—The company has transferred its business from San Jose to Modesto The gravel mine near Placerville has been prospected by drills. A tunnel is being driven to drain the channel

Humboldt County

Salmon Summit—Work is in progress and a portable stamp mill is being installed by Frank Smith and associates of Arcata.

Madera County

Fresno Flats—There is excitement about gold veins in this section but thus far there has been no production

Modoc County

Hoag District—The new mill being set up for custom work is a Lane with a capacity of 50 tons daily.

Nevada County

Fairview—Work is progressing on the 20-stamp mill, C. M. Wilson, manager A full force is underground.

Amador Consolidated—As soon as the road is finished to Forest Springs, four miles from Grass Valley, work is to begin A stamp mill has been purchased.

Pittsburg—At this property, Nevada City, Mark B. Kerr, manager, three shifts of men have been set at work regularly and the mill has been started up on ore from the 700- and 800-ft. levels.

Eagle Bird—Machinery at this mine at Washington, injured in the recent fire will be put in order again, including the hoist and air compressor.

Gold Mound—The mine at Deadman's Flat has been placed under bond to E. I. Field, of Telluride, Colo., who will soon begin work. Electric power will be used and the plant will be enlarged.

Yellow Metal—Alexander McMillan, owner of the mine at Bowman's dam, is

selecting a mill site for the 10-stamp mill to be erected.

SHASTA COUNTY

Mad Ox—The mine, Whiskeytown, is being reopened by H. L. Burkey, of Nevada. Extensive developments are planned.

Mammoth Copper Company—This company at Kennet has resumed the operation of briquetting the flue dust. The 20,000 ton capacity bins for sulphide ore will shortly be finished.

SIERRA COUNTY

Scales Diggings—The rebuilding of the Brandy City head dam has done much to bring this section again into prominence and many men are at work thereabouts.

SISKIYOU COUNTY

Mono—The mine at Punch Creek Humbug district has 25 men at work under J. T. P. Porter. The company has a 4-stamp mill and cyanide plant.

Colorado

Colorado Fuel and Iron Company—The annual report for fiscal year shows gross earnings $20,344,030 against last year $22,099,880. Net earnings rose to $2,901,011 from $2,553,367 due to decrease in operating expenses.

CHAFFEE COUNTY

Grant Eclipse Consolidated Mines Company—The company has been formed to unite the Little Giant and Eclipse properties, Monarch district, near Salida.

DOLORES COUNTY

United Rico—The wet concentration mill is in shape for tests of the lead-zinc ore. The company is developing extensively.

EAGLE COUNTY

East Lake Mining and Milling Company—The tunnel in Mt. of the Holy Cross district is in 2200 ft., and has cut a 4-ft. gold vein. The objective point is the Washington vein 200 ft. in advance. The present depth at breast 1800 ft. The tunnel is at timber line.

FREMONT COUNTY

Rocky Mountain Smeltery—The property at Florence is sold under mortgage to the Iowa Fiduciary Company for $80,517.

GUNNISON COUNTY

Royal Oak—An important strike of lead ore has been made on this property at Bowerman owned by the Tin Cup company. Other mines on the district are developing actively, and there is a movement for railroad connection.

LAKE COUNTY—LEADVILLE

Chrysolite—Work is again resumed to open the orebody, from the bottom of the level.

Lone Tunnel—Several carloads had been shipped from the low-grade orebody recently opened in the tunnel.

Ibex—Four shafts are working and about 7000 tons a month being shipped.

OURAY COUNTY

Thistledown—An important strike was made on this property.

San Antonio—High-grade mineral ore has been discovered on this property by the prospectors.

TELLER COUNTY—CRIPPLE CREEK

Cripple Creek—The September output was 63,150 tons of the gross value of $1,297,440. The average value of the ores marketed was $20.50. The Gold Issue mill on Carbonate hill is represented for the first time in the output. The tonnage was distributed as follows:

Plant.	Tons.	Av. Val.	Gross Val
Golden Cycle.	25,200	$20.00	$ 509,040
U. S. R. & R.	12,500	22.00	275,000
Portland	10,000	20.00	200,000
Smelter	4,200	65.00	273,000
Stratton Independ. est.	5,000	4.50	22,500
Isabella	3,000	2.00	6,000
Wild Horse	1,150	4.00	4,600
Gaylord	1,100	3.00	3,300
Gold Issue	1,000	4.00	4,000
Totals	63,150	....	$1,297,440

Free Coinage—The main shaft at Pinto mine will be sunk from 740 ft. to 800 feet.

Raven and Beacon Hill—The Worcester ventilation is being installed at 500 ft., where the characteristic foul gases prevented further work.

Gold Sovereign—New plant has been accepted and work by Clements Leasing Company will be started at once.

El Paso—An aërial train is being built from ore house up to the railroad spur.

Cresson—A daily output of 100 tons is maintained and the reserves increased.

Vindicator Consolidated—Five ore-bearing veins have been opened up at 1300-ft. level of No. 1 shaft. Work to cut them at 1400 ft. is under way.

Ida May—An oreshoot has been opened at shallow depth in a basalt dike and shipments are being made.

Idaho

BONNER COUNTY

Swastika Mining and Development Company—The company has purchased the silver-lead mines near Lakeview on the Coeur d'Alene divide. A 3000-ft. tunnel will be driven to cut the veins at 2000 ft. J. W. Ferguson, manager.

SHOSHONE COUNTY

Bunker Hill & Sullivan—Dividend No. 145, of $45,000, has been paid. The total dividends since Jan. 1, 1909, is $525,000, and total to date, $11,109,000.

Indiana

BLACKFORD COUNTY

There is renewed activity in oil drilling in the field, and during the past week seven new wells were completed with an aggregate production of 316 bbl. per day. Only two dry wells were found.

PIKE COUNTY

In southwestern Indiana, in the Oakland City oilfield, two 300 lb. gushers were brought in Oct. 1. These two wells are to the south edge of the field, and indicate its southern extension, with prospects of the productive area continuing across the Ohio river.

VANDERBURG COUNTY

By the explosion of an alleged illegal shot in the Moore-Gibson coal shaft Oct. 1, several miners were seriously injured. James Clemens, who fired the shot, was immediately arrested by Deputy Mine Inspector Same but was only fined $1 and costs.

Kansas

CHEROKEE COUNTY

DeGraff Bros.—On the 160-acre fee at Badger, a run of zinc ore has been found at 110 ft. Drill prospect work has been in progress three years on this and an adjoining tract and $30,000 has been spent.

Emma Gordon—Charles Theurer has taken a lease on the tailings south of Baxter Springs and is remilling the waste. A complete mill was erected. The Old Chief tailing pile is also being reworked and this is the first work of the kind. Owing to the ore carried away by oil in the formation, the remilling will be profitable.

Baxter Springs District—Practically every mining plant in this district is now either in operation or ready to be started.

Kentucky

JOHNSON COUNTY

Consolidation Coal Company—Work is progressing well on the development of the large tract of coal land owned by this company near Paintsville. The company will expend about $3,000,000 for its initial mining plant, including town, two power plants of 600 kw. capacity, standard gage railroad, steel bridge over Big Sandy river 400 ft. long, with concrete piers and other facilities. The new town will be called Van Lear, and 400 dwellings are already under construction. The company will erect its own water works. Jonathan Jenkins, formerly of Frostburg, Md., has charge of the mines and their development.

Michigan

COPPER

Hancock—The winze on No. 3 lode is down below the 16th level and from that point a drift has been started on the formation. This winze is sinking from the 13th level, the bottom of No. 1 shaft

in a good grade of copper ground the drifts from 13th, 14th and 15th levels are being extended in the same round. The No. 2 shaft, vertical to the lodes is near the 2000 ft. at which point it is estimated the lodes will be cut.

Keweenaw—Work has been discontinued on the Medora shaft and attention will be centered on the Kearsarge lode on which two shafts have been started.

Indiana—The drill in the eastern portion has reached the ledge.

Lake—The crosscut from the 5th level is in 100 ft. without exposing the lode, and it is now apparent that it is steeper than the formation.

Victoria—Drill work has stopped; all attention is given to the main workings with the result that a much better showing is being made and the company is about meeting expenses.

Iron

Newport—Recently during two shifts of ten hours 4005 tons was raised from the "D" shaft at Ironwood, a distance of 2200 ft. This is claimed to be a hoisting record.

Northwestern Ore Dock—The new dock to replace the collapsed No. 5 dock, at Escanaba, will have 400 pockets and will be 2400 ft. long. This will make it the largest dock on the lakes.

Wayne County

Detroit Salt Company—The first shipment of salt has been made from the shaft at Oakwood. This shaft is 16x6 ft. and 935 ft. deep.

Minnesota

Iron—Mesabi

Perkins—The mine shipped its first ore Sept. 4, and is shipping daily 2500 tons, and expects to ship 100,000 tons before the close of navigation. The stripping and loading of ore is done under contract by MacArthur Brothers Company, Chicago.

Hudson—This new mine in section 4, 58-15,, is being opened by Pickands-Mather & Co. It will be an open-pit mine and a stripping contract has been let to the MacArthur Company for the removal of 650,000 yards of overburden. Two steam shovels are in operation. No ore will be mined this year.

Hector—The property formerly owned by George H. St. Clair, is being unwatered by the Inter-State Iron Company, which has a lease. It will require about a month to unwater the mine, when it will be worked to its full capacity.

Monica—The mine is shipping a small amount of ore daily and expects to ship 10,000 tons this season. It is a new mine and considerable amount of development work must be done before a large shipment is expected.

Missouri

Zinc-lead District

Ground & Irwin—The 80-acre tract at Porto Rico has been sold for $80,000.

Quick Seven Mining Company—The company, at Neck City, has been incorporated for $105,000 to operate a new lease.

Granby—P. H. Crossman has made a very rich strike of silicate west of Granby.

Spring City—F. H. Todd of Webb City has secured a 34-acre tract at Spring City. The drilling shows the same run of ore that has been developed at the same level all over the camp.

Galena-Kansas—The Waterhouse mill on the Maggie Taylor land is nearly completed. This mill has a capacity of 200 tons a shift.

Montana

Broadwater County

Horn—The shaft is down 70 ft. and shipping will soon begin. Charles D. Horton, Redersburg, is in charge.

Keating—The company is to make improvements which will cost $125,000. The Blacker shaft will be sunk an additional 300 ft. and a new hoist be installed which will double the present capacity.

Deer Lodge

Montana Mine Exploration Company—The company has acquired a gold property on Lost creek. The shaft is only 45 ft. deep, and $10,000 of ore has been taken out.

Fergus County

Barnes-King—A cave on the 400-ft. level last week necessitated a temporary suspension.

Gallatin County

Gallatin Valley Electric Railway—The road from Bozeman to Salesville has been completed. This is the first electric railway of any length in the State.

Lewis & Clark

Missouri River Power Company—About 600 men are employed in rebuilding the Hauser lake and Wolf creek dams. The flume at Hauser lake to carry the river around the dam is ⅓ mile long, 50 ft. wide and from 10 to 23 ft. in hight. Its capacity is 80,000 gallons per second.

Nevada

Esmeralda County

Oriole Mining Company—The company has bought a mill for its free-gold mine at Mina. Work on foundations has begun.

Nye County

Tonopah—The quarterly dividend of 25c. next to dividend of 10c. just declared brings the total dividend disbursements up to $5,200,000.

Storey County

Ward—It will take 6 to 8 months to get the shaft in proper condition for work. There has been raised $500,000 through assessments for the work of the Ward shaft, which is now at a depth of 3000 ft. This will drain the Gold Hill mines and will releive the pressure on the pumps now draining the Consolidated Virginia, Ophir, Mexican and other mines of Virginia City.

Sutro Tunnel—In five years $100,000 have been spent in repairs on this tunnel, and $200,000 in prospecting the Comstock mines connected with it. It is reported that at present only one mine, the Ophir, has reached a stage of paying expenses.

Consolidated Virginia—The Reidler pumps installed on the 2100-ft. level are pumping 40,000 gal. of water a minute and are holding back the water successfully for the time.

White Pine County—Ely

Nevada Consolidated—The company is now producing at the rate of over 60,000,000 lb. of copper per year at a cost of about 7c. per lb. Dividend action is looked for soon as no further construction is now planned beyond that already in hand. Five steam shovels are operating at the property and at the Steptoe reduction works the fourth reverberatory was put in commission on Sept. 27, and the fifth is to be completed on Dec. 1. The blast furnace to handle miscellaneous cleanings and coarse material is to be ready on Oct. 30. The fifth converter stand and a Nordberg blowing engine for this department are to be completed on Jan. 15, at which date it is expected that the construction account will be closed, and operating profits will go into the company treasury. Nothing will be done this year toward the construction of the fifth section of the concentrator, this work having been postponed indefinitely.

Cumberland-Ely—It is authoritatively stated that the Veteran shaft is in good working condition and that a new shaft will not be sunk when operations are resumed at this property. The caving system has been employed in the mine, but not near enough to cause injury to the Veteran shaft, which is in practically as good condition as when the mine closed on July 1, as a result of labor troubles.

Giroux Consolidated—The development of the new Giroux shaft is being pushed to determine the character and extent of the direct smelting ore, tonnage estimates of which are not yet made public by the company. The type and size of smelter have not yet been determined. The company has its concentrating plant at Kimberley. Funds are reported in the treasury to equip and develop the mine.

Steptoe Smeltery—The September output is estimated at 5,000,000 lb. of copper.

New Jersey

WARREN COUNTY

The first shipment of copper ore from the old mines at Pahaquarry, recently reopened, was made last week. It included a carload of sorted ore and was sent to New York to be tested. There is no railroad connection with the mine, and the ore had to be teamed about 12 miles.

New Mexico

LINCOLN COUNTY

Parsons Mining Company—This company, of Mishawaka, Ind., will not undertake work on the Eagle mine at Parsons before spring.

SOCORRO COUNTY

United States Treasury—A bonanza strike has been made by the new operators. The same orebody has also been exposed in the White Eagle shaft. The ore is high in gold. There is considerable activity in the camp which is near Chloride.

Germany Mining and Development Company—Properties near Kelly in the Magdalena district have been sold to the company. The ores contain lead, zinc and silver. The company reports $250,000 for development.

Ohio

Card & Prosser Coal Company—The Burnitt farm just north of Lisbon has been leased by this company. A new shaft will be started on the property at once to take the place of the old West Pittsburg shaft.

Pennsylvania

Banning Connellsville Coke Company—Contracts are to be let at once for the building of 100 coke ovens near Banning, in the Lower Connellsville district. Enoch Abraham, of Connellsville, is president.

Gates Coal and Coke Company—This company has bought 234 acres of land on the Waynesburg coal seam in the Klondike field, near Masontown. The price was $250,000 for the coal rights and 40 acres of surface land for the plant.

South Dakota

BLACK HILLS DISTRICT

Ama Queen—The property at Custer Peak will be unwatered, and this shaft deepened.

Montezuma—Diamond drill explorations are being made on this property at Rochford.

Utah

BEAVER COUNTY

Harrington Hickory—The Mammoth company mine has commenced the shipment of silver lead ore. The electric installation is completed and the machinery ready for operation.

Western Mining and Leasing Company—The company has been organized to hold the Comet group in the San Francisco district. The negotiations are supposed to be in the interests of the Newhouse company.

CARBON COUNTY

Consolidated Fuel Company—A new mine will soon be opened at Miller Creek. The mine is planned and equipped for an output of 2000 tons per day. A new town, called Hiawatha, has been built for the accommodation of the miners. Shipments will begin in November. Rail connection is with the Utah Southern.

JUAB COUNTY

Colorado—President Jesse Knight reports that a strong fissure has been found below the ore bed.

Centennial-Eureka—The tunnel to tap the shaft is now in 100 ft. Work is being carried on at both ends, and it is expected that it will be continued at the rate of 400 ft. a month, completing the project in eight months.

Uncle Sam—Both ore reserve and shipments have been increased recently.

Tintic Smeltery—The fires were drawn Sept. 29. As a result of the closing of the smeltery the Dragon mine, which furnished the flux, is also closed.

Gemini—According to Superintendent J. H. McChrystal, the pumps are handling the water without difficulty and work will not be suspended in the lower level as reported.

Sioux Consolidated—The improvement of the ore at 450-ft. level is reported by Manager C. E. Loose.

SALT LAKE COUNTY

Utah Consolidated—The tramway to connect Bingham with smeltery at Tooele will be complete by Jan. 1. Work is now being done upon the superstructure.

Emma Copper Company—All outstanding debts have been paid and the directors have authorized the resumption of work on the property at Alta, W. W. Wantland, manager.

Columbus Consolidated—On the 400-ft. level an orebody was found in new ground.

SUMMIT COUNTY

American Flag—The shaft at Park City is down 1,155 ft. and the lower levels drained.

Silver King Consolidated—On the 1000 ft. level the orebody on the contact vein is being explored east and west. It apparently extends into the lime.

Virginia

FLOYD COUNTY

Brinton Arsenic Mines Corporation—This company has been incorporated with a capital stock of $100,000 to develop arsenic properties. Its officers are: Caleb R. Brinton of Brinton, president; R. B. Brinton of Richmond, vice-president; Jacob S. Coxey of Massillon, O., secretary-treasurer. Arsenic from the Brinton mines will be utilized for manufacturing paris green at Norfolk in a plant to be built by the Dominion Chemical Company, of Norfolk. Operations at Brinton were started some five years ago by the United States Arsenic Mines Company, of Pittsburg, Penn., but have been suspended for over two years past.

Washington

FERRY COUNTY

Kettle River Mining Company—A concentrator will be installed.

Rio Tinto-Treadwell—A contract for a 400-ft. tunnel has been let. G. B. Dennis, Curlew, manager.

SNOHOMISH COUNTY

Imperial—The owners are arranging for the construction of a concentrator and arsenic plant with a daily capacity of 300 tons.

National Milling and Mining Company—The suit against James Piccolo to recover title in the Silver Creek Mining district has been won by the company.

Good Hope—The mine at Silver Creek is shipping two cars of ore from the Evening Star to the Tacoma smeltery. The property has 1000 ft. of development.

CHELAN COUNTY

Holden Gold and Copper Mining Company—Work is progressing rapidly in all of the tunnels.

West Virginia

Parkesburg Zinc Company—The plant at Northview, near Clarksburg, has been sold to F. P. Pearlman, of Philadelphia, lessee, for $42,000.

RALEIGH COUNTY

Milburn Coal and Coke Company—This company has been organized to develop a large tract of coal land, and arrangements have been made to begin work at once. R. M. Lucas, of Columbus, O., is at the head of the company.

Canada

BRITISH COLUMBIA

British Columbia Copper Company—The third furnace is in commission. Work will be started shortly on a fourth furnace to provide capacity for the ores from the New Dominion company.

Consolidated—The annual production of gold for the year ending June 30, 1909, was 114,920 oz.; silver, 2,443,475 oz.; copper, 4,637,931 lb.; lead, 43,675,077 lb. The total value was $5,505,526. The number of tons smelted for the year was: Lead furnaces, 61,398, and for copper furnaces,

313,069; total, 374,467 tons. Smeltery is at Trail. W. H. Aldridge, managing director.

ONTARIO-COBALT

Little Nipissing—A new discovery of high-grade ore under Peterson lake has been made.

Shamrock—In the workings north of the shaft at the 200-ft. level smaltite ore carrying native silver has been discovered.

Temiskaming & Hudson Bay—Drifting and crosscutting on all four levels have resulted in additional good showings. On the 200-ft. level, close to the Nipissing corner, a winze is being put down for an additional 50 ft., where drifting will be again started. Should high silver contents be maintained a new main shaft will be put down.

Bailey—Foundation work has been started for the new compressor house. The compressor will have a capacity of five drills to be driven by electricity by one of the companies on Montreal river.

Red Jacket—An important stake has been made on this property indicating an extension of the silver-producing area. The company has spent $35,000 in development. The main shaft is sunk on a calcite vein, and at a depth of 125 ft. rich ore shot with native silver was encountered and the vein had widened to 35 inches.

Silver Cross—The equipment of the mine has been greatly improved latterly, and No. 2 shaft is being put down to the 200-ft. level on a calcite and smaltite vein, the silver contents of which are increasing with depth.

Beaver—The vein struck at the 200-ft. level, from which about half a car of high-grade ore was taken, was encountered again at 250 ft. after a winze had been sunk for 50 ft. After stoping out enough ore to complete a car of high-grade the vein will be followed.

Ore Shipments—Shipments of ore from Cobalt camp for the week ending Sept. 25 were as follows: Buffalo, 57,110 lb.; Cobalt Central, 40,610; Cobalt Lake, 61,380; Coniagas, 62,530; Crown Reserve, 187,300; Kerr Lake, 62,020; La Rose, 195,010; McKinley-Darragh, 86,140; Nancy Helen, 41,300; Nipissing, 62,430; Right of Way, 117,950; Silver Cliff, 60,000; total, 1,033,780 pounds.

Mexico

CHIHUAHUA

Yoquivo—The new mill is arranged so that no slimes are elevated except in filtering. Overstrom tables serve as classifiers for feeding the tube-mill cone. The tube mill is equipped with ribbed liners, two man holes, spiral feeder and special end-liner shapes which permit feeding pebbles to the mill while in operation. Air agitation and vacuum filtration are provided. The mill is being built.

The Batipolis Mining, Smelting and Refining Company, Ltd.—The company has been organized in London with a capital of £300,000 to hold the controlling shares in the American company which owns the extensive property in western Chihuahua. The new company announces an extensive program of exploration and development.

Candemania—Examination of this mine, near Ocampo, is being made in the interests of a New York company.

Corona Consolidated Mining Company—The company has been incorporated as successor to the Porvenir Mining Company at Parral. Nat P. Wilson, manager. A mill will be erected.

DURANGO

San Fernando—J. T. Canfield and associates have struck good ore in this mine in the Topia district. It was at one time extensively explored by T. L. Livermore, of Boston, presumably for the Calumet & Arizona company and was abandoned.

GUERRERO

Suriana—A copper-lead smelter has been shipped from El Paso to this property, near Balsas. J. Gordon Hardy, engineer.

HIDALGO

Doña Phoebe—W. C. Bronson is planning development on this property, located in the unproven gap between the La-Blanca vein and the Pachuca veins.

Blaisdell-Coscotitlan—The syndicate, treating the old tailings of the Pachuca district, has completed the enlargement of its plant and will be soon handling from 700 to 800 tons daily.

JALISCO

Virginia & Mexico—The new mill is treating only 50 tons per day owing to fuel difficulty.

El Favor—The annual report shows development of 7846 ft. Ore shipped net, $51,985. A 20-stamp plant and cyanide annex is being erected.

OAXACA

Los Ocotes—The Teziutlan company is making arrangements to resume shipments. For several months exploration and development work have been carried on.

SONORA

Cienegulta—Concentrating mill and one reverberatory furnace will be started on ore taken out in development.

Guanajuato—Governor's annual message reports that the district's production for 1908-1909 was 8,077,010 pesos, on which the direct tax was 121,155 pesos. This is equal to the record output of 1850, the highest in the century.

Promontorio—The option to the Clark Copper Company has expired and has not been renewed. The mine is at Alamos.

Africa

TRANSVAAL

The production of ores, other than gold, in the Transvaal for the seven months ended July 31 was: Copper ore, 2184 tons; tin ore, 1365 tons; lead ore, 1278 tons. Production of other minerals was valued at £14,554 for flint; £39,950 for lime; £1031 for magnesite; £9061 for asbestos, graphite and minor products.

RHODESIA

Gold production in August was 54,253 oz. fine, making a total of 408,211 oz. for the eight months ended Aug. 31. Last year the reports were made in bullion; this year they are in fine gold. A comparison by values shows, for the eight months, $8,330,736 in 1908, and $8,361,576 in 1909; an increase of $30,820 this year.

Asia

INDIA—MYSORE

Kolar Goldfield—Gold production reported in August was 45,173 oz. bullion. For the eight months ended Aug. 31, it was 348,834 oz. in 1908, and 354,556 oz. in 1909; an increase of 5722 oz. The bullion reported this year was equal to $6,595,797, or 319,100 oz. fine gold.

Central America

SALVADOR

Santa Ana—A 5-stamp mill and tube mill and cyanide plant will be installed on the property of Sres. Gonzales and Vides near Santa Ana. The ore is gold and soft.

New Caledonia

Shipments of minerals from the colony for the six months ended June 30 are reported by the *Bulletin du Commerce* of Noumea as follows: Nickel ore, 23,843 metric tons; cobalt ore, 414; copper ore, 7; iron ore, 10; chrome ore, 9644 tons.

South America

BRITISH GUIANA

Exports of gold from British Guiana for the eight months ended Aug. 31 were 42,163 oz. bullion in 1908, and 41,280 oz in 1909; a decrease of 883 oz. The bullion exported this year was equal to $716,242, or 34,652 oz. fine gold. Exports of diamonds were 3112 carats, valued at $20,354; an increase of 442 carats over last year.

Turkey

Arghana Copper Mines—The state department at Washington has received notice that the Turkish government will consider bids for the concession for these properties. American companies are interested in the bidding.

Metal, Mineral, Coal and Stock Markets

Current Prices, Market Conditions and Commercial Statistics of the Metals, Minerals and Mining Stocks

QUOTATIONS FROM IMPORTANT CENTERS

Coal Trade Review

New York, Oct. 6—The Seaboard bituminous trade is improving and the markets show a better tone. Orders are coming in more freely, especially from New England territory, where the manufacturers are beginning to lay in their winter supplies and are taking coal on a larger scale than they have done for some time past. Some car shortage is beginning to develop, for the first time in two years, and the railroads are not moving coal as promptly as they have been. The effect of West Virginia competition is still being felt and has prevented any rise in prices, notwithstanding the increase in business.

The anthracite trade is steady and quiet, without any special incident. Shipments of anthracite to the West are increasing and it looks as if that section would take about its usual proportion of hard coal.

In the West reports from the principal centers are favorable, and business continues to improve. The exception is found in the Lake trade which is still rather slow. There are signs, however, that the present month will see a heavy shipment to the Northwest.

Agitation continues in the Pittsburg and Eastern Ohio districts over the alleged inequality of rates from various districts to Lake Erie ports.

The proposed merger of independent coke interests in the Connellsville region appears to have fallen through, and the options taken on a number of properties are being allowed to lapse. Lack of money to finance the merger is the probable cause of the failure.

Coal Traffic Notes

Coal and coke tonnages originating on Pennsylvania railroad lines east of Pittsburg and Erie, year from Jan. 1 to Sept. 25, short tons:

	1908.	1909.	Changes.
Anthracite	3,728,132	3,496,008	D. 232,124
Bituminous	24,120,390	26,667,834	I. 2,547,244
Coke	5,035,528	7,826,990	I. 2,791,262
Total	32,884,050	37,990,832	I. 5,106,482

The total increase this year to date was 15.5 per cent.

Coal receipts at St. Louis, seven months ended July 31, were 3,573,083 short tons in 1908, and 3,838,603 in 1909; increase, 265,520 tons.

Receipts of domestic coal at San Francisco, seven months ended July 31, were 894,187 short tons in 1908, and 1,000,191 in 1909. Increase, 106,004 tons.

Shipments of coal from Seattle and Tacoma, Wash., seven months ended July 31, were 347,700 tons in 1908, and 192,607 in 1909; decrease, 154,192 tons. The shipments are to California and Alaska ports.

Coal passing Davis Island dam on the Ohio river, seven months ended July 31, was 1,615,965 short tons in 1908, and 2,354,070 in 1909; increase, 738,105 tons.

Coal passing through the locks on the Monongahela river, seven months ended July 31, was 4,839,100 short tons in 1908, and 5,494,720 in 1909; increase, 655,620 tons.

Bituminous coal and coke shipments, Pennsylvania and West Virginia, seven months ended July 31, short tons:

	Coal.	Coke.	Total.
Balt. & Ohio	12,249,933	2,450,710	14,690,643
Buff., Roch. & Pitts.	3,531,033	269,083	3,800,116
Buff. & Susquehanna	812,811	190,680	1,003,491
Penn. lines, N. Y. C.	3,996,137	54,820	4,050,957
Pitts. & L. Erie	4,886,023	2,725,125	7,611,148
Norfolk & Western	7,446,616	1,402,204	8,848,820
Ches. & Ohio	7,279,971	265,272	7,545,243
Total	40,192,524	7,357,894	47,550,418
Total, 1908	34,651,139	4,560,430	39,211,559

Total increase this year, 8,338,859 tons, or 21.3 per cent. In addition to the above, the Baltimore & Ohio carried 440,584 tons anthracite in 1908, and 455,745 in 1909; increase, 15,161 tons.

Coal tonnage of railroads in Ohio Coal Traffic Association, seven months ended July 31, short tons:

	1908.	1909.	Changes.
Hocking Valley	1,444,791	1,525,042	I. 80,251
Toledo & Ohio Cent.	695,578	657,046	D. 38,532
Baltimore & Ohio	771,191	752,224	D. 18,967
Wheeling & L. Erie	1,489,099	1,670,910	I. 181,811
Cleve., Lorain & Wh.	1,352,969	1,274,280	D. 78,689
Zanesville & Western	613,514	582,094	D. 31,420
Toledo Div., Pen. Co.	863,911	970,097	I. 106,186
L. Erie, Alliance & Wh.	517,868	541,508	I. 23,640
Marietta, Col. & Clev.	26,332	43,208	I. 16,876
Wabash Pitts. Term.	....	11,608	I. 11,608
Total	7,775,253	8,028,017	I. 252,764

The total increase in tonnage this year was 3.3 per cent. Only the Ohio lines of the Baltimore & Ohio are included above; the main line is given elsewhere.

Coastwise shipments of coal from chief Atlantic ports, seven months ended July 31, long tons:

	Anthracite.	Bitum.	Total.	Per c't.
New York	8,578,430	5,962,152	14,540,582	62.0
Philadelphia	1,193,559	2,576,600	3,770,159	16.1
Baltimore	148,099	1,944,006	2,092,105	8.9
Newport News	....	1,929,710	1,929,710	8.2
Norfolk	....	1,145,653	1,145,653	4.8
Total	9,910,088	13,557,921	23,467,609	100.0
Total, 1908	10,444,489	12,827,249	23,170,738	..

Total increase this year, 296,871 tons or 1.2 per cent. New York includes all the New York harbor shipping points.

New York

Anthracite

Oct. 6—The anthracite market shows no special change and little increase in business. There seems to be no disposition to lay in stocks yet, and sales are limited to the usual current trade.

Schedule prices for large sizes are unchanged at $4.75 for lump and $5 for egg, stove and chestnut, all f.o.b. New York harbor. For steam sizes quotations are: Pea, $3.10@3.25; buckwheat, $2.25@2.50; No. 2 buckwheat or rice, $1.75@2; barley, $1.35@1.50; all f.o.b. New York harbor. Some individual and washery coal can be had at about 10c. below quoted prices.

Bituminous

The general tone of the market is better, and there is more inquiry for coal, but no improvement in prices. The feature of the trade is the development of some shortage in cars. The resulting fact that buyers cannot get their coal as promptly as they have been doing has hurried up some, who are now seeking to put in stocks ahead, instead of buying only as they needed the coal. The shoal-water ports are also beginning to hustle for winter supplies, which has helped to improve trade. The Sound ports are also waking up, and are taking more coal. New York harbor trade is coming in rather irregularly.

Prices remain about the same as they have been for several months. Contract deliveries are being called for more freely.

Car supply, as above stated, is not good, and there is difficulty in getting cars enough, for the first time in two years. Transportation is irregular on nearly all the railroads, and cars take several days over schedule time to get to tidewater.

The coastwise vessel market is still overcrowded; agents and skippers are hunting for cargoes, and are willing to take them at the current low rates. New York harbor quotes on small vessels 50c. around the Cape, with 5 to 15c higher to special points. Philadelphia quotes on large vessels 60@65c. to Boston, Salem and Portland, 65@70c. to Portsmouth, 70@75c. to Lynn, and 75@80c. to Newburyport.

Birmingham

Oct. 4—Coal operations in Alabama continue to improve. There is yet some room for a better demand in steam coal, but in the other grades the conditions are quite prosperous. The output at the mines is increasing right along. There is a little scarcity of labor reported, as additional mines are put to work again. A large number of white miners left this district

during the depression and while word has been sent to many of them, they are slow in returning. The furnace companies reported last week that they were forced to withdraw from the open market on coal, the furnaces and coke ovens requiring all their coal. The coke situation is strengthening and the best output possible is being sought. The erection of a number of by-product coke ovens to use coal from the Yolande mines is proposed, the plant to be located in the vicinity of Bessemer, and about 12 miles from Birmingham. The Tennessee Coal, Iron and Railroad has its plans drawn for the construction of by-product ovens in the vicinity of Ensley and Wylam, 6 and 10 miles from Birmingham.

Chicago

Oct. 4—The coal market continues strong. Sales of nearly every kind of bituminous, steam and domestic, are large, and anthracite sales are increasing at a rate very satisfactory to dealers. Fine coals from Illinois and Indiana mines are weak and not likely to strengthen, for the market is now well converted to its post summer schedule. The expected overshipment of some kinds of coal has occurred; Illinois screenings generally are 5 or 10c. off on forced sales to escape demurrage, and some lump from the same mines has been sold at slightly reduced prices for the same cause, while smokeless exhibits something of its old-time wobbly tendency, with both lump and run-of-mine occasionally sold at cut prices to escape railroad charges for delay. These cases point to the need of caution in sending coal to the Chicago market, notwithstanding the large and increasing sales. It is a market that is easily flooded when producers divert to it any unusual amount of coal.

Illinois and Indiana coals bring, for lump, $1.75@2.50; run-of-mine, $1.65@1.75; screenings, $1.10@1.40. Hocking, at an advanced price of $3.15, is in good demand. Smokeless also finds good sale at $3.45@3.55 for lump, and $2.95@3.05 for run-of-mine. Gas coals are quiet. Youghiogheny ¾-in. bringing $3.15 per ton.

Cleveland

Oct. 5—The demand for steam coal is good, and sales have been large. Some large contracts for Pocahontas are reported. Operators are inclined to ask higher prices on long contracts. The trade in domestic coal is improving.

Prices are firm, but have not advanced. The current quotations on Ohio steam coals are: No. 8 district lump, $1.90@2.05; run-of-mine, $1.70@1.80; slack, $1.35; Middle district 5c. lower on all kinds; Massillon domestic coal is $2.05 for washed lump. Pittsburg coal is $2.10@2.25 for lump; $2@2.05 for run-of-mine; $1.35@1.45 for slack. Pocahontas brings $3.05 for lump and $2.35 for run-of-mine.

Indianapolis

Oct. 5—Steam coal continues in good demand, and dealers in domestic coals are still putting in stocks, so that business is looking well all around. Mines are working better time for the most part.

Interest just now centers in the meeting of the United Mine Workers. Several questions have come up for consideration, the most important being the explosives difficulty in the Pittsburg district.

Pittsburg

Oct. 5—Demand for coal from manufacturers and retail dealers has continued to show an increase, while Lake shipments are fairly heavy. The improvement has not affected prices favorably, and they are still shaded. While mine-run is fairly steady to retail dealers at $1.10, sales to manufacturers are made at $1.05 in some cases but frequently at $1. Slack on attractive orders is selling at 55@60c. Labor is somewhat scarce and many of the large operators could employ additional miners.

Connellsville Coke—The market continues excited, and operators are imbued with the idea that the recent advance will not only hold, but will be followed by others. Many operators are staying out of the market entirely for next year, although the prevailing range on furnace coke is $3 for first half and $2.90 for the entire year. Various summaries are being made by coke interests, the showing invariably being that the increase in blast-furnace capacity already experienced since 1907, and that in prospect by the early part of next year, decidedly exceeds the increase in coking capacity. The view of buyers, however, is that most of the increased demand has been experienced already, and that when running, in the past month, about 33,000 ovens out of a theoretical total of 38,500 the coke industry has met the demand fairly well, while with additional labor between 3000 and 4000 ovens could be added to the active list. The labor supply increases very slowly, but there is every prospect of a general wage advance Jan. 1 or earlier. The present scale is based on a mining rate of $1.20 per 100 lbs., which compares with $1.35 paid from Jan. 1, 1903, to Dec. 16, 1903, and again from March 1, 1907, to Jan. 1, 1908.

A curious feature is that foundry coke does not show a spread above furnace coke for next year, while in the past fortnight prompt lots of foundry have sold at less than similar lots of furnace. We quote the market as follows: Prompt and fourth-quarter furnace, $2.75@3; 72 hour foundry, $2.50@3. For 1910, furnace coke, $3 for first half, $2.90 for all year; 72-hour foundry, $3@3.25, for the year.

The *Courier* reports the production in the Connellsville regions in the week ending Sept. 25 at 418,056 tons, a decrease of 8000 tons from the previous week; shipments at 4949 cars to Pittsburg, 7510 cars to points west of Pittsburg and 891 cars to points east of Connellsville, a total of 13,350 cars.

St. Louis

Oct. 4—With the advent of October the coal market is back to a semblance of the rush times of 1906 and 1907. Dealers are taking all the high-grade coal they can get. Prices are not so much of an object as heretofore; the question now is to get the coal. Dealers are complaining that when they order 10 cars they get two. As the weather has been warm and balmy up to date a heavy rush is anticipated with the first cold weather.

Standard and lower-grade coal is moving freely, though the supply is plentiful. Prices on the lower grades are a little stiffer than last week, though the heange is not so marked as it is in the higher grades. The screening market is still easing off and has reached a point where Standard screenings are hard to move at 10c. per ton f.o.b. mine. It is expected that they will be going begging for the freight in another two weeks. Carterville screenings are holding up to about 40c. per ton at the mine. This price has been cut several times to clean up an accumulation of coal on hand.

Steam sizes in nut coal are also lower and Standard 2-in. nut is being offered at 50c. per ton at mine and Carterville at 90c. at mine. Carterville 6-in. lump or egg is bringing from $1.50@1.60 at mine, or $2.17@2.27 f.o.b. St. Louis; 3-in. Carterville nut is quoted at $1.20 at mine, or $1.87 St. Louis. Franklin county coal is offered at $1.75 at mine for 6-in. lump or egg, or $2.52 St. Louis.

Standard coal is being quoted nominally the same as last week, though the general tone of the market is stronger; 6-in. lump is bringing about $1.10 at mine, or $1.62 St.Louis. Staunton, Mt. Olive and Springfield district coals are bringing about $1.30 at mines, or $1.62 St. Louis, while 3-in. lump is going at 5 or 10c. per ton less.

The market on hard coal is very strong and seems to exceed the supply local jobbers are able to obtain; they complain that the mines are getting farther and farther behind on shipments. The situation has changed very much in the last 30 days; a month ago there was a quantity of anthracite up to demurrage, while now nearly everyone is sold up for a month ahead.

Foreign Coal Trade

Transvaal Coal—Coal production in the Transvaal for the seven months ended July 31 is reported from 28 shafts. The total mined was 2,814,385 tons, the total sold and shipped was 2,054,261 tons.

British Coal Exports—Exports of fuel from Great Britain, with coal sent abroad

for the use of steamships in foreign trade, eight months ended Aug. 31, long tons:

	1908.	1909.	Changes.
Coal	41,126,874	41,176,754	I. 50,880
Coke	705,907	721,094	I. 15,287
Briquets	1,037,985	999,515	D. 40,470
Total exports	42,869,166	42,897,343	I. 25,177
Steamer coal	12,948,762	12,949,655	I. 126,893
Total	55,072,928	55,824,998	I. 152,070

The larger exports this year were 6,939,541 tons to France, 6,065,011 to Germany, 6,045,087 to Italy and 2,467,784 tons to Sweden.

German Coal Trade—Exports and imports of fuel in Germany, seven months ended July 31, metric tons:

	Exports.	Imports.	Excess.
Coal	12,615,414	6,502,860	Exp. 6,112,554
Brown coal	18,489	4,738,420	Imp. 4,719,931
Coke	1,897,607	383,859	Exp. 1,513,748
Briquets	888,730	114,449	Exp. 774,281
Total	15,420,240	11,739,588	Exp. 3,680,652
Total, 1908	14,517,108	12,053,008	Exp. 2,464,100

Of the briquets exported this year 257,685 tons were made from brown coal, or lignite. The total coal exported was 12,633,903 tons; imported, 11,241,280; excess of exports, 1,392,623 tons.

Welsh Coal Prices—Messrs. Hull, Blyth & Co., London and Cardiff, report current prices of coal as follows, on Sept. 25: Best Welsh steam, $4.20; seconds, $4.02; thirds, $3.78; dry coals, $3.96; best Monmouthshire, $3.48; seconds, $3.36; best small steam, $2.22; seconds, $1.80. All per long ton, f.o.b. shipping port.

Iron Trade Review

New York, Oct. 6—Activity in the iron and steel markets still continues, although there is a little slackening off from the rush of the closing days of September. This is not enough, however, to give cause for any predictions of a falling market, but is rather the result of the heavy supplies which consumers have obtained for their probable needs.

Sales of foundry pig continue, but are in rather smaller lots than recently. Basic iron is less active, but is still selling in considerable quantities. Prices have remained firm, but have not advanced during the week, and some observers think that they have very nearly reached a turning point. Sales in September were very large, and it is estimated that the orders going to the merchant furnaces during the month were a little over 1,000,000 tons. Orders now accepted are under the conditions that immediate deliveries cannot be made but buyers must take their turn.

In finished material contracts still continue to be placed. Structural steel is not quite so active, purchases being mainly for smaller lots, although some good sized contracts are still pending. The greater demand just now is for bridge work. Reinforced material orders are increasing and a good quantity of plates and shapes is being taken by the car builders. Sheets, bars and wire products continue in steady demand.

Rail orders for 1910 delivery continue to come in and the mills will enter the new year with a very good tonnage ahead.

It is understood that basic pig from German furnaces has been offered here at $17.50 per ton on dock at an Atlantic port. It is said that some orders have been placed, but the business is difficult to trace.

Texas Iron Ore—A large tract of iron-ore land in Cass county, Texas, has been acquired by Charles M. Schwab and associates, and is to be connected with the Atchison, Topeka & Santa Fe road by a branch line about 40 miles long. The Texas Railroad Commission has granted the railroad company the right to make a special low rate on ore to Port Bolivar for shipment thence by water.

Baltimore

Oct. 5—Exports for the week included 788,823 lb. tin scrap to Rotterdam. Imports included 4700 tons iron ore from Cuba.

Birmingham

Oct. 4—Pig iron is being sold in this district now right along for immediate or future delivery at $15 per ton, No. 2 foundry. Some of the companies which are now selling for delivery during the first quarter of the coming year are not selling indiscriminately, but are stipulating limited quantities. That the quotations are to go up appears to be the belief of many of the manufacturers in the South. The preparations looking to a decided improvement in the make in this section are being pushed. The iron make should be materially increased during October, as seven furnaces will resume operation during this month. The stocks of iron on furnace yards in this district belonging to the producers are beginning to dwindle rapidly. The iron belonging to brokers and speculators stacked about the furnaces here is moving out slowly but steadily. Some small shipments of iron for foreign countries have been made from the Birmingham district. Costa Rica, for instance, receiving a few hundred tons.

Cast iron pipe and other interests in this section are all doing well.

Chicago

Oct. 5—Steady buying of moderate amounts of pig iron by melters has marked the last week. The tendency of prices is decidedly upward, although not by sudden jumps. Prices of Southern iron are now plus $1 per ton in many instances at $15 Birmingham or $16.25 Chicago, for No. 2. Some iron is available at $14.50 Birmingham. Northern iron brings $18.50 @19 for No. 2 and is much in demand, being thus lower-priced than Southern, the available local furnace production being more readily disposed of. Buying is for first-half needs mostly, with a sprinkling of belated last-quarter purchases in small amounts and the bulk of the business centering in the first quarter. Confidence in the future is expressed by sellers of pig iron; they look for higher prices and an unchecked volume of sales for an indefinite time. Foundrymen are rapidly enlarging their output and the end, for them, is not in sight. Iron and steel products of every kind sell heavily. Coke is strong, with the best Connellsville holding to $4.85 Chicago.

Cleveland

Oct. 5—Shipments of iron ore down the Lakes are heavy, and the docks are crowded. It is difficult to get cars enough to relieve the pressure.

Pig Iron—Inquiries are heavy, and many sales are reported. Prices have been advanced sharply and no shading is reported. No. 2 foundry is quoted at $18.25; No. 2 Southern, $17.85; gray forge, $16.25@16.50, all Cleveland delivery.

Finished Material—Demand is active and mills are falling behind on deliveries. Some large contracts have been let. The Upson Nut Company has awarded the contract for the erection of the buildings for its new steel plant to the Riter-Conley Manufacturing Company, Pittsburg. About 750 tons of steel will be required. The open-hearth construction will be by S. R. Smythe & Co., Pittsburg.

Philadelphia

Oct. 6—The volume of pig-iron dealings has not been as great, but the market is extremely strong. Several good lots have been taken by local industries. Virginia furnaces have sold some iron for early delivery, but are reluctant to quote for next year. No. 2X foundry is selling at $18.50@19 for early delivery, with $19.50 named for first-quarter and $20 for second-quarter contracts. Basic is $18.50 for prompt and $19 for first quarter. Forge brings $17.25@17.50 for prompt.

Steel Billets—An active demand has sent prices kiting, $27.50@28.50 being quoted for ordinary billets, while as high as $30 has been done for forging billets.

Bars—Good business has been done at about 1.50c. for refined iron and 1.55@1.60c. for steel bars. Mills do not want to quote on next year.

Plates—Business is a little slower, but still good. More orders are coming to Eastern mills, and they will not name prices for next year, while selling at $1.65@1.70c. for fourth quarter.

Sheets—The mills are taking business at a fair rate and are quoting a point higher on ordinary gages.

Structural Steel—No heavy contracts this week, but a good total of small orders. Deliveries are falling behind, all the mills being full.

Scrap—The market is strong enough to warm the hearts of dealers, and is still gaining. No. 1 railroad has brought $20.50 @21, and machinery cast $19@19.50. There is a loud call for heavy steel melting scrap, which brings $17.75@18.25. It is understood that large lots of this kind have been bought abroad.

Pittsburg

Oct. 5—Finished-steel products continue to show an advancing tendency. Following the advance in black and galvanized sheets effective Sept. 28, noted in last report, corrugated sheets have been advanced 5c. per square to $1.60 for painted and $2.85 for galvanized, 28 gage.

Effective Oct. 1, the long expected advance in merchant-steel pipe occurred, amounting to one point, or about $1.90 per ton of 2000 lb. The new discount, in large lots to jobbers, is 80 and 5 off list. Steel boiler tubes were at the same time advanced one point, and the manufacturers of charcoal-iron boiler tubes have followed this with an advance of two points in their product. Bars, plates and shapes show a strong tone, but have not realized the advance for first-quarter delivery which was expected. Within the past week bars have sold at 1.40c. for first quarter, and plates at 1.50c., these being prices which were expected to rule only for this year's delivery. The buying of finished-steel products in the past fortnight has not been as heavy as formerly, and more attention is being given to the question of how much of the buying of the past few months represented the replenishing of the greatly decreased stocks in the hands of jobbers and consumers last spring.

Pig Iron—Since last report bessemer pig iron has scored a straight advance of 50c. a ton, to $18.50, Valley, this being the minimum for any delivery, with fully 20,000 tons sold, in various small lots for fourth-quarter and first-half delivery. The bessemer average for September was $17.434, Valley, or $18.334, Pittsburg, $1.20 increase over August, and $2.85 advance over October, 1908, and May, 1904, both months having shown low points at $14.58, Valley. The actual advance during September was from $16.75 at the beginning to $18.50 at the close of the month. The general feeling is that bessemer pig iron has been advancing too rapidly, and the criticism extends to other grades as they have advanced in sympathy, although not so sharply. A lot of 10,000 tons of basic for this year's delivery is reported to have sold at $17.50, Valley, and this, if true, would show a sharp and possibly unsound advance. Foundry iron for this year has advanced to a minimum of $17, Valley, while a sale of 2000 tons was made this week at $17.75, Valley, for first half delivery. Several furnaces have withdrawn from the market, their idea being all of $20 at furnace, for pig iron for next year. At this rate there will be a great deal of iron to be sold at further increases over the present advanced prices and serious question is raised whether the market will be able to absorb it.

Steel—The market for crude steel is very strong, as there is very little available, mills using their usual surpluses in their own finishing departments. Billets are quotable at $25@25.50 for bessemer and $26@26.50 for open-nearth and sheet-bars at $27@27.50 for bessemer and $28 for open-hearth, f.o.b. maker's mill, Pittsburg district, for early delivery, contracts for forward delivery being usually at an advance.

Ferromanganese—The market continues strong, with an advancing tendency. While odd lots of prompt can sometimes be picked up at $42.50, Baltimore, regular deliveries command $43@45, depending on the period. The freight to Pittsburg is $1.95 per ton.

St. Louis

Oct. 4—The demand for pig iron is heavy, and some large buyers are in the market. Inquiries for large lots have been received this week. Producing companies in general are practically all sold up for this year, and are now holding what little extra they may have to sell at $15 per ton Birmingham, or $18.75 f.o.b. St. Louis. Nearly all the available pig iron for this season is in the hands of jobbers who bought earlier in the season on a speculative basis. The above price is also the prevailing one for delivery for the first quarter of next year. A number of inquiries are on hand for pig for delivery for the first half of next year. The majority of companies are not selling that far ahead, but those who are quote $15 @15.25 per ton f.o.b. Birmingham, or $19 @19.25 per ton f.o.b. St. Louis.

Iron Ore—The market for iron ore remains unchanged at $3.50 per ton f.o.b. St. Louis for 50 per cent. ore. The supply of Missouri ore is increasing and it is reported that some of it is now being shipped to furnaces in Kentucky. Heretofore the entire output has been used locally.

Foreign Iron Trade

British Iron Trade—Exports and imports of iron and steel, and of manufactures, in Great Britain for the eight months ended Aug. 31, are valued by the Board of Trade returns as below:

	Exports.	Imports.	Excess.
Iron and steel	£24,719,088	£ 5,200,805	Ex. £19,519,189
Machinery	18,764,543	3,148,196	Ex. 15,616,347
New ships	4,067,536	.....	Ex. 4,067,536
Total	£47,552,067	£ 8,349,001	Ex. £39,203,066
Total, 1908	52,155,516	8,251,081	Ex. 43,904,435

The decrease in exports was 8.8 per cent.; increase in imports, 1.2 per cent. The total quantities of iron and steel were, in long tons:

	1908.	1909.	Changes.
Exports	4,774,[illegible]	4,[illegible],000	D. 74,[illegible]
Imports	[illegible],[illegible]74	[illegible],[illegible]20	I. 88,146

In addition to the above, exports of scrap iron and steel were 87,558 long tons in 1908, and 105,244 in 1909; increase, 17,686 tons. Imports of scrap, 15,490 tons in 1908, and 15,767 in 1909; increase, 277 tons.

British Iron-ore Imports—Imports of iron ore into Great Britain, eight months ended Aug. 31, were 3,914,460 long tons in 1908, and 4,026,942 in 1909; increase, 112,482 tons. Of the imports this year 3,018,697 tons were from Spain.

German Iron Production—The German Iron and Steel Union reports the make of pig iron in Germany and Luxemburg in August at 1,100,671 metric tons, being 9612 tons more than in July, and the largest monthly output reported for two years past. For the eight months ended Aug. 31 the total production was, in metric tons:

	1908.	1909.	Changes.
Foundry iron	1,486,623	1,592,409	I. 105,786
Forge iron	451,592	460,189	I. 8,597
Steel pig	632,989	716,835	I. 83,846
Bessemer pig	269,402	273,473	I. 4,071
Thomas(basic)pig	5,155,330	5,397,786	I. 242,456
Total	7,995,936	8,440,692	I. 444,756

The total increase this year was 5.6 per cent. Steel pig includes spiegeleisen, ferromanganese and all similar alloys.

Metal Markets

New York, Oct. 2—The metal markets have been generally rather quiet, with no important changes in quotations. For most metals consumption is on the increase, but supplies are abundant.

Gold, Silver and Platinum

UNITED STATES GOLD AND SILVER MOVEMENT

Metal.	Exports.	Imports.	Excess.
Gold:			
July 1909	$16,661,782	$ 3,269,885	Exp. $13,391,897
" 1908	4,845,272	2,949,179	Exp. 1,896,093
Year 1909	80,496,119	23,405,477	Exp. 57,090,642
" 1908	58,363,098	29,357,075	Exp. 29,006,172
Silver:			
July 1909	5,049,366	3,926,117	Exp. 1,123,249
" 1908	4,959,746	3,068,581	" 1,891,165
Year 1909	34,409,032	26,798,145	" 7,610,887
" 1908	30,445,291	24,180,929	" 6,264,362

Exports from the port of New York, week ended Oct. 1. Gold, $200,250, chiefly to Panama. Silver, $895,005, chiefly to London. Imports: Gold, $109,725; $43,999, from Mexico, Central and South America.

Movement of gold and silver at the port of San Francisco, eight months ended Aug. 31:

Gold	Exports.	Imports.	Excess.
Coin	$ 5,000	$ 14,353	Imp. $ 9,673
Bullion	12,018,412	2,146,242	Exp. 9,872,170
Total gold	$12,023,412	$2,160,615	Exp. $9,862,797
Silver			
Coin	$171,970	$204,351	Imp. $ 32,381
Bullion	5,083,238	1,583,448	Exp. 3,499,790
Total silver	$ 5,255,208	$1,787,799	Exp. $3,467,409

Gold exports were almost entirely in June, July and August, and were to Japan.

Gold—The price of gold on the open market in London continued at 77s. 9½d. per oz. for bars and 76s. 4½d. per oz. for American coin. Russia is still a buyer in the London market, and some gold was also taken for German account. In New York $1,000,000 in gold was engaged for shipment to Japan by way of San Francisco.

Platinum—Business is active and there has been a further advance in the price of the metal. Dealers are now asking $27 per oz. for refined platinum and $30.25 for hard metal. Some offers recently made of metal at lower prices have been withdrawn.

Silver—The silver market has been steady to firm. Supplies have been readily placed at current quotations. The market closes a little higher on reports of Continental buying.

SILVER AND STERLING EXCHANGE

Sept.-Oct.	30	1	2	4	5	6
New York....	51	51 1/8	51	51¼	51½	51½
London.....	23¾	23¾	23¾	23½	23¾	23 15/16
Sterling Ex.	4.8605	4.8605	4.8600	4.8600	4.8600	4.8590

New York quotations, cents per ounce troy, fine silver; London, pence per ounce sterling silver, 0.925 fine.

Exports of silver from London to the East, Jan. 1 to Sept. 23, as reported by Messrs. Pixley & Abell:

	1908	1909	Changes
India.....	£ 6,882,913	£4,596,200	D. £2,286,713
China.....	516,400	1,555,200	I. 1,038,800
Straits.....	112,385	82,800	D. 29,585
Total.....	£ 7,511,698	£6,234,200	D. £1,277,498

Copper, Tin, Lead and Zinc

Sept.-Oct.	Copper. Lake, Cts. per lb.	Copper. Electrolytic, Cts. per lb.	Copper. Longlots, £ per ton.	Tin. Cts. per lb.	Lead. New York, Cts. per lb.	Lead. St. Louis, Cts. per lb.	Zinc. St. Louis, Cts. per lb.
1	12¾			30¾	4.32½	4.20	5.77
2	12¾		59½	30¾	4.35	4.22½	5.80
3	12¾		59	30¾	4.35	4.22½	5.80
4	12¾				4.32½	4.20	5.77½
5				30¾	4.35	4.22½	5.80
6	12¾				4.32½	4.20	5.80
7	12¾		58½	30	4.35	4.22½	5.82½
8	12¾				4.32½	4.20	5.82
9	12¾		58	30½	4.35	4.22½	5.85
10	12¾				4.32½	4.20	5.82½
11			58	30½	4.35	4.22½	5.85

London quotations are per long ton (2,240 lb.) standard copper. The New York quotations are for electrolytic copper, for spot delivery, and represent the bulk of the transactions. Lake copper is a specialty commanding a higher price. The prices of electrolytic copper and of electrolytic cathodes are 0.125c. per lb. higher than those of electrolytic. The "Lake" has "held premium" which adds about one-half to the price per pound. The quotations for Lake copper are for delivery Western mills, and electrolytic is delivered.

Copper—The market during the past week has been more or less affected by the conditions in London, where a fall in the speculative price of standard has developed, owing nominally to the reported large increase in visible stocks. Some sales of considerable quantities of copper from second hands in New York also had an unfavorable effect. Producers have not been pressing copper for sale, but there has been some unloading by speculators who seem to have been unable to carry their holdings longer, and were compelled to drop them at a shade below the current quotations. Moreover, there is now a disposition to await the statistical figures, which are expected to disclose a further increase in the stocks in this country. The fortnightly statistics published in London show an increase in the visible supply on the other side of 3500 tons. The close is easy at 13@13¼c. for Lake copper, and 12¾@12⅞c. for electrolytic copper in cakes, wirebars, or ingots. Casting copper is quoted nominally at 12⅝@12¾ cents.

Copper sheets are 17@18c., base for large lots. Full extras are charged, and higher prices for small quantities. Copper wire is 14½c. base, carload lots at mill. Business continues on a good scale.

The standard market in London has suffered throughout the week from the realization of holdings of tired-out speculators, and as a result has crumbled away from day to day, closing practically at the lowest point, £58 for spot and £58 17s. 6d. for three months.

Refined and manufactured sorts we quote: English tough, £62; best selected £61@62; strong sheets, £73@74 per ton.

Imports of copper for the week from New York and Philadelphia were 1068 long tons. Our special correspondent gives the exports from Baltimore at 4164 tons of copper. Copper exports from the United States in September are estimated at 20,060 long tons.

Visible stocks of copper in Great Britain and France on Oct. 1—including 8200 tons afloat from Chile and Australia—were 93,850 tons, an increase of 3400 tons over the Sept. 15 report.

Tin—The London market has been irregular, declining after the Banka sale and again quickly advancing toward its former basis. The decline toward the end of last week caused a good deal of interest in the domestic market, and no doubt the orders which were sent from here to the other side caused the subsequent advance abroad. The close is somewhat uneasy abroad, while more anxiety is shown here to market tin and in some instances prices below the import point have been accepted. London is called at £139 5s. for spot and £140 7s. 6d. for three months, while the domestic market may be quoted at 30@30¾ cents.

Tin output of the Federated Malay States eight months ended Aug. 31, was 33,385 long tons in 1908, and 31,115 in 1909; decrease, 2270 tons.

Visible stocks of tin Oct. 1, in long tons, were:

	In Store.	Afloat.	Total.
London.....	7,410	4,988	12,398
Holland.....	2,539	187	2,726
U. S., exc. Pacific ports....	3,537	2,758	6,295
Total.....	13,486	7,933	21,419

The total shows an increase of 2237 tons over the Sept. 1 report.

Lead—The market is quiet and unchanged at 4.32½@4.35c. New York, and 4.20@4.22½c. St. Louis.

The London market is again higher, the close being cabled at £13 5s. for Spanish, and £13 7s. 6d. for English lead.

Spelter—Business in this metal has again been on a relatively very large scale. The old stocks which had been overhanging the market for so long a period are said to have been entirely distributed, and as the current consumption appears to be in excess of the output, the course of the market should cause no surprise. The close is strong and advancing at 5.97½@6c. New York, and 5.82½@5.85c. St. Louis.

New York quotations for spelter Sept. 30-Oct. 2, inclusive, were 5.92½@5.95c.; Oct. 4, 5.95@5.97½c.; Oct. 5 and 6, 5.97½@6 cents.

The London market has also advanced, the close being cabled at £23 5s. for good ordinaries and £23 10s. for specials.

Base price of sheet zinc is 7½c. per lb., f.o.b., LaSalle-Peru, Ill., less 8 per cent discount.

Other Metals

Antimony—Business is dull and prices unchanged at 8⅝@8¾c. for Cookson's, 8⅛c. for Hallett's, 8@8¼c. for U. S., and 7⅞@7⅞c. for outside brands.

Aluminum—No change can be reported. No. 1 ingots can be had at 20@23c. per lb. in large lots, with the American maker holding to the higher figure.

Quicksilver—The demand is good and prices are firm at the recent advance. New York quotations are $46 per flask of 75 lb., with jobbers asking 0.50@0.5c. per lb. for small lots. San Francisco prices held at $44@45 for domestic orders and $42@43 for export. The London price is now £8 7s. 6d., with second hands selling at £8 1s. per flask.

Magnesium—The price of pure metal is $1.50 per lb. for 100-lb. lots f.o.b. New York.

Nickel—Large lots, contract business, 40@45c. per lb. Retail spot, from 50c. for 2000-lb. lots, up to 55c. for 500-lb. lots. The price for electrolytic is 5c. higher.

Cadmium—Current quotations are 75c. per lb. in 100-lb. lots at Cleveland, Ohio. In Germany 45@47½ marks per 100 kg. at factory in Silesia.

Imports and Exports of Metals

Exports and imports of metals in the United States, seven months ended July 31, are reported as follows, in the measures usual in the trade.

Metals:	Exports.	Imports.	Excess.
Copper, long tons	188,480	83,667	Exp. 104,813
Copper, 1908...	191,868	43,370	Exp. 148,428
Tin, long tons....	265	25,037	Imp. 24,772
Tin, 1908.....	142	20,359	Imp. 20,217
Lead, short tons.	59,100	68,619	Imp. 9,519
Lead, 1908.....	41,636	61,591	Imp. 19,955
Spelter, sh. tons.	2,219	3,054	Imp. 835
Spelter, 1908...	1,991	261	Exp. 1,730
Nickel, lb.	6,942,984	11,953,841	Imp. 5,010,857
Nickel, 1908....	6,736,938	10,067,112	Imp. 3,330,174
Antimony, lb.....	6,648	6,270,943	Imp. 6,264,295
Antimony, 1908.	.....	4,648,253	Imp. 4,648,253
Platinum, oz.....	.....	62,554	Imp. 62,554
Platinum, 1908...	.....	18,276	Imp. 18,276
Quicksilver, lb	176,810	.....	Exp. 176,810
Quicksilver, '08	105,674	.....	Exp. 105,674
Aluminum, value	$218,361	.....	Exp. $218,361
Aluminum, 1908	219,345	.....	Exp. 219,345
Ores, etc.:			
Zinc oxide, lb. ..	17,122,097	.....	Exp. 17,122,097
Zinc oxide, '08..	15,001,413	.....	Exp. 15,001,413
Zinc dross, lb....	11,782,224	.....	Exp. 11,782,224
Zinc dross, '08..	12,627,926	.....	Exp. 12,627,926
Zinc ores, kg. tons	8,094	67,875	Imp. 59,781
Zinc ores, 1908.	16,728	26,590	Imp. 9,862
Antim'y ores, lb.	504	3,386,708	Imp. 3,386,204
Ant. ores, 1908.	.....	709,769	Imp. 709,769
Chrome ore, tons	.....	19,676	Imp. 19,676
Chrome ore, '08	.....	.....	.....

Copper, lead and nickel include the metal contents of ores, matte, bullion, etc. The exports given include reëxports of foreign material. Chrome ore was not reported separately last year.

British Metal Imports and Exports

Imports and exports of metals in Great Britain, eight months ended Aug. 31, figures in long tons, except quicksilver, which is in pounds:

Metals:	Imports.	Exports.	Excess.
Copper, long tons	111,844	40,903	Imp. 70,941
Copper, 1908....	113,901	42,352	Imp. 71,549
Tin, long tons....	27,024	27,209	Exp. 185
Tin, 1908.....	30,070	27,240	Imp. 2,830
Lead, long tons.	139,744	31,858	Imp. 107,886
Lead, 1908	156,206	35,288	Imp. 120,918
Spelter, l'g. tons.	73,687	5,063	Imp. 68,624
Spelter, 1908....	70,493	5,298	Imp. 65,195
Quicksilver, lb...	2,998,851	656,572	Imp. 2,351,979
Quicksilver, '08	3,069,698	1,087,946	Imp. 1,981,752
Ores			
Tin ore and con.	16,427	.....	Imp. 16,427
Tin ore, 1908...	17,722	.....	Imp. 17,722
Pyrites	518,690	.....	Imp. 518,690
Pyrites, 1908...	547,946	.....	Imp. 547,946

Copper totals include metallic contents of ore and matte. Exports include reexports of foreign material. Of the imports in 1909 the United States furnished this year 180 tons copper matte, 44,890 tons fine copper and 23,519 tons lead.

Zinc and Lead Ore Markets

Joplin, Mo., Oct. 2—The highest settling price of the week was $52 per ton for zinc sulphide ore, the base ranging from $46 to $49 per ton of 60 per cent. zinc. One bin sold for next week's delivery on a $49.50 base. Zinc silicate sold as high as $30, on a base of $23@25 per ton of 40 per cent. zinc. The average price, all grades, was $44.76. No lead ore was reported sold higher than $55.50. The market continues weak, with only two companies buying. The average price, all grades, was $55.28 per ton.

A large tonnage of zinc ore has accumulated which is held for a $50 base price, and aside from this is a tonnage of ore produced in excess of what the smelters have been shipping. The total ore in bins is approximately 7600 tons, of which about 3500 tons is withheld from the market on present prices.

SHIPMENTS, WEEK ENDED OCT. 2.

	Zinc, lb.	Lead, lb.	Value.
Webb City-Carterville	3,666,100	466,160	$ 99,088
Joplin.....	1,896,890	275,650	53,174
Duenweg.....	748,850	75,250	18,516
Miami.....	643,700	273,100	18,451
Aurora.....	636,420	.....	11,452
Galena.....	416,570	33,810	10,182
Carthage.....	406,620	.....	10,165
Alba-Neck.....	368,340	.....	9,208
Zincite.....	355,170	.....	8,879
Prosperity.....	209,990	112,450	8,054
Badger.....	286,900	8,260	7,108
Oronogo.....	242,050	3,780	5,019
Spurgeon.....	157,940	72,260	4,571
Quapaw.....	199,430	4,070	4,323
Granby	218,980	7,500	3,350
Cave Springs.....	125,650	.....	2,932
Carl Junction.....	63,910	.....	1,598
Sarcoxie.....	58,840	.....	1,382
Stott City.....	56,740	.....	1,333
Peoria.....	70,230	.....	877
Totals	10,849,320	1,332,290	$279,682

40 weeks.....450,556,400 68,038,150 $10,674,606
Zinc value, the week, $242,854; 40 weeks, $8,819,299
Lead value, the week, 36,828; 40 weeks, 1,855,297

MONTHLY AVERAGE PRICES.

Month.	Zinc Ore. Base Price.		Zinc Ore. All Ores.		Lead Ore. All Ores.	
	1908.	1909.	1908.	1909.	1908.	1909.
January....	$37.60	$41.25	$35.56	$38.46	$46.88	$52.17
February..	36.63	36.94	34.92	34.37	49.72	50.50
March.....	36.19	37.40	34.19	34.71	49.90	50.82
April.....	35.40	38.63	34.08	37.01	52.47	55.63
May.....	34.19	40.06	33.39	37.42	56.05	56.59
June.....	33.06	44.15	32.07	40.35	60.48	57.52
July	34.55	43.06	31.67	41.11	59.90	56.74
August	36.53	48.25	33.42	44.54	60.34	57.60
September...	37.63	47.70	34.44	44.87	54.59	56.11
October.....	35.95	.....	33.28	.....	52.63	.....
November...	39.13	.....	35.02	.....	54.53	.....
December...	42.75	.....	39.63	.....	49.68	.....
Year.....	$36.63	.....	$34.31	.....	$53.93	.....

NOTE—Under zinc ore the first two columns give base prices for 60 per cent. zinc ore; the second two the average for all ores sold. Lead ore prices are the average for all ores sold.

Platteville, Wis., Oct. 2—The top price paid this week for zinc ore was $49, the base price, 60 per cent. zinc, was $48.50 per ton. The base price of lead ore was $56@57 per ton.

SHIPMENTS, WEEK ENDED OCT. 2.

Camps.	Zinc ore, lb.	Lead ore, lb.	Sulphur ore, lb.
Platteville	569,690	147,000	292,400
Cuba City.....	556,130	74,005	140,130
Highland.....	502,400	80,000	.....
Hazel Green .	417,900	.....	.....
Benton.....	308,820	.....	141,400
Livingston.....	160,000	.....	.....
Harker.....	146,160	.....	.....
Linden.....	131,290	.....	.....
Rewey	127,000	.....	.....
Galena.....	88,000	.....	.....
Strawbridge.....	80,000	.....	.....
Dues Siding	80,000	.....	.....
Shullsburg.....	.....	80,000	.....
Total.....	3,167,190	81,005	573,930
Year to Oct. 2 ..	104,587,200	6,549,855	9,845,845

In addition to the above there was shipped to the American Zinc Ore Separating Company, 587,700 lb., and to the Joplin Separator Works, 358,500 lb. zinc concentrates.

Chemicals

New York, Oct. 6—The markets show little or no change since last week's report. Outside of contract business trading was rather light and prices are generally stationary.

Copper Sulphate—Business is not especially active, but quotations are maintained at $4.10 per 100 lb. for carload lots and $4.35 per 100 lb for smaller parcels.

Arsenic—There has been little business during the week. Quotations for white arsenic are 2.70@2.75c. per lb. for spot, while 2.85c. per lb is asked for next year's delivery. A new company has been organized to work the deposits at Brinton, Va., and to manufacture the arsenic into paris green and other products at Norfolk.

Nitrate of Soda—The market is quiet, with quotations at 2.10c. per lb. for both spot and futures

Potash Salts—Berlin despatches report that the Kali-Syndikat has been finally disrupted, owing to the secession of the Sollstedt and Aschersleben mines, which have large contracts with American consumers, and the Einigkeit mine, which is controlled by the Virginia-Carolina Chemical Company. The other producers, it is reported, will continue to act together.

Mining Stocks

New York, Oct. 6—The general stock market has been moderately active though still largely a professional market. The celebrations in New York last week had some effect in decreasing activity. As a whole, the quotations have been fairly steady, some reactions being balanced by exceptional activity in a few stocks. Chief among these was Steel common, which reached a high point during the week at 64⅞, but reacted sharply and unexpectedly to 60 yesterday

The Curb market was irregular, being active in spots. The copper stocks were in fair demand and generally maintained quotations, although there were declines in Boston Copper, British Columbia and Cumberland-Ely. The Cobalt shares were generally firm on moderate trading. The Nevada gold stocks were out of the running, being dull, though without any notable losses in price. Industrial stocks were not in any special demand. Southern Iron and Steel was steady, but Standard Oil was lower.

Boston, Oct. 5—Copper shares continue disappointing and today saw a sharp decline, following the weakness in New York stocks due to the Steel Corporation episode. Prices in the main have held fairly steady the past week, while specialties have been both active and [illegible] times

A splendid opportunity was lost today to gather a little strength and create [illegible]

a little movement in coppers. Word received this morning told that the long sought for lode had been encountered at the 5th level and that it came in good. The first result was to put Lake Copper stock up to $38.50, its record price. It closed at $37, however, and the hope is that the opportunity has not been lost to make it a market factor. A short selling movement caused a small decline in Utah Consolidated to $43. Osceola spurted from $151.50 to $160, but reacted to $156. U. S. Coal and Oil moved up $3 to $37.25. The company's annual report showed the equivalent of $2 earned on the 120,000 shares of stock. It carried $200,000 to surplus after apportioning $63,000 for depreciation. American Zinc rose $2.37½ to $35.12½ and has been a strong feature all the week. This company's annual report showed earnings of $3 on the outstanding 80,000 shares of stock, but the money was put into betterments and additions.

Amalgamated Copper prices have followed those of New York pretty closely, the extremes for the week being $84.50 and $82.12½, with the final tonight at the last named. North Butte has held a firm front, although it broke to $60 today. Greene-Cananea had a rise to $10.62½.

On the Curb prices have shown little variation. Davis-Daly affairs are yet mixed, but the advent of two Boston brokerage firms into soliciting proxies adds to the strength of the Jarvis-Erb committee. First National has shown a good degree of strength.

STOCK QUOTATIONS

NEW YORK Oct. 6 Name of Comp.	Clg.
Alaska Mine	‡.11
Amalgamated	82
Anaconda	48¼
Balaklala	‡2⅛
British Col. Cop.	6¼
Buffalo Mines	3½
Butte Coalition	25½
Colonial Silver	‡⅛
Cum. Ely Mining	7⅛
Davis-Daly	6
Dominion Cop.	7
Douglas Copper	1
El Rayo	2⅛
Florence	2
Foster Cobalt	‡.32
Furnace Creek	‡.05
Giroux	9⅛
Gold Hill	⅜
Goldfield Con.	6
Granby	90
Greene Gold	‡⅜
Greene G. & S.	‡⅞
Guanajuato	2½
Guggen. Exp.	91
Hanapah	‡15
Kerr Lake	9⅛
McKinley Dar.	91
Miami Copper	15¼
Micmac	1
Mines Co. of Am.	1
Montezu. of C. R.	16
Mont. Sho. C.	1½
Nev. Utah M. & S.	1⅛
Newhouse M. & S.	5⅛
Nipissing Mines	11½
Old Hundred	⅜
Silver Queen	35
Stewart	⅞
Tennessee Cop'r	36
Tri-Bullion	¼
United Copper	10
Utah Apex	‡4½
Utah Copper	49
Yukon Gold	5⅛

‡Last quotation.

BOSTON Oct. 6 Name of Comp.	Clg.
Adventure	6
Allouez	58
Am. Zinc	34¼
Arcadian	4¼
Arizona Com.	45½
Atlantic	8¼
Boston Con.	15
Calumet & Ariz.	103
Calumet & Hecla	665
Centennial	40
Copper Range	79½
Daly West	8½
East Butte	11⅛
Franklin	17½
Greene-Can.	10¼
Hancock	10
Isle Royal	24
Keweenaw	3½
La Salle	15
Mass.	7
Michigan	10¼
Mohawk	61½
Nevada	21⅛
North Butte	59½
Ojibway	8¼
Old Colony	65
Old Dominion	54
Osceola	156
Parrot	31¼
Quincy	88
Rhode Island	‡4¼
Shannon	16
Superior	57
Superior & Bost.	15⅛
Superior & Pitts.	15⅛
Tamarack	70
Trinity	12
U. S. Smg. & Ref.	56⅛
U. S. Sm. & Re., pd.	53
Utah Con.	43¼
Victoria	3⅛
Winona	7⅛
Wolverine	150
Wyandotte	2⅛

‡Last quotation.

N. Y. INDUSTRIAL	
Am. Agri. Chem.	46¾
Am. Smelt. & Ref.	98⅞
Am. Sm. & Ref. pf.	112
Col. Fuel & Iron	44⅛
Federal M. & S., pf.	90
National Lead	86¼
National Lead, pf.	‡111
Pittsburg Coal	18⅛
Republic I. & S.	17½
Republic I. & S. pf.	106½
Sloss-Sheffield I.	92
Standard Oil	‡685
U. S. Steel	90⅝
U. S. Steel pf.	128¼
Va. Car. Chem.	46½

BOSTON CURB	Low
Ahmeek	225
Chemung	16
Chino	7½
Gila	8¾
Indiana	5¾
Mason Valley	2
Ray Central	2¼
Ray Con.	19¾
San Antonio	8
Yuma	1¼

Furnished by Hornblower & Weeks, N. Y.

ST. LOUIS Oct. 2 N. of Com.	High.	Low.
Adams	.40	.30
Am. Nettie	.09	.07
Center Cr'k	1.80	1.60
Cent. C. & C.	84.00	[illegible]
C. C. & C. pf.	[illegible]	82.00
Cent. Oil	115.00	100.00
Columbia	9.00	7.00
Con. Coal	18.00	17.00
Doe Run	115.00	105.00
Gra. Bimet.	.30	.25
St. Joe	12.50	11.00

LONDON Oct. 6 Name of Com.	Clg.
Dolores	£1 5s 0d
Stratton's Ind.	0 3 3
Camp Bird	1 10 0
Esperanza	3 0 7
Tomboy	1 0 0
El Oro	1 5 6
Oroville	0 14 0

Cabled through Wm. P. Bonbright & Co., N. Y.

NEVADA STOCKS. Oct. 6.
Furnished by Weir Bros. & Co., New York.

Name of Comp.	Bid.
COMSTOCK STOCKS	
Belcher	88
Best & Belcher	59
Caledonia	41
Chollar	.28
Comstock	‡.28
Con. Cal. & Va.	1.37
Crown Point	86
Exchequer	29
Gould & Curry	23
Hale & Norcross	.58
Mexican	1.42
Ophir	1.27
Overman	.75
Potosi	.60
Savage	.55
Sierra Nevada	.54
Union	.73
Utah	.05
Yellow Jacket	1.37
TONOPAH STOCKS	
Belmont	.75
Extension	.55
Golden Anchor	...
Jim Butler	11
MacNamara	28
Midway	.18
Montana	.95
North Star	02
Tono'h Mine of N.	6.62
West End Con.	25
GOLDFI'D STOCKS	
Adams	01
Atlanta	.11
Blue Bell	.02
Booth	.09
C.O.D. Con.	.07
Columbia Mt.	.07
Comb. Frac.	.70
Cracker Jack	.02
Dia'dfield B. B. C.	.01
Florence	2.92
Goldfield Belmont	04
Goldfield Daisy	07
Great Bend	04
Jumbo Extension	14
Kendall	02
Lone Star	02
May Queen	04
Oro	.04
Red Hill	.04
Sandstorm	05

Name of Comp.	Bid.
Silver Pick	11
St. Ives	05
Triangle	01
BULLFROG STOCKS	
Gibraltar	02
Homestake King	‡01
Mont. Shoshone C.	1.75
Tramp Cons.	04
MISCELLANEOUS	
Cumberland Ely	6.93
Giroux	9.00
Greenwa'r Copper	03
Nevada Con.	23.75
Nevada Hills	70
Navada Smelting	87
Nevada Wonder	60
Nevada-Utah	1.68
Penn-Wyoming	..
Pittsburgh S. Pk.	65
Ray Central	2.06
Ray Con.	19.00
Round Mt. Sphinx	05

COLO. SPRINGS Oct. 1 Name of Comp.	Clg.
Acacia	.07¼
C. C. Con.	.03¾
Doctor	.09
Elkton	.74¼
El Paso	63⅛
Findlay	12½
Gold Dollar	13½
Gold Sovereign	.04⅞
Isabella	18
Jack Pot	‡08½
Jennie Sample	07¼
Jerry Johnson	06⅛
Lexington	‡01¼
Mary McKinney	46¾
Old Gold	04½
Pharmacist	‡03
Portland	83½
U. G. M.	‡08
Vindicator	74
Work	‡07

Assessments

Company	Delinq.	Sale.	Amt.
Alta Gladstone, Utah	Sept. 15	Oct. 20	$0.00
Black Traveler Copper, Ida.	Sept. 27	Oct. 27	0.005
Brunswick Con. Va., Nev.	Oct. 1	Oct. 12	0.02
Bullion, Nev.	Oct. 5	Oct. 25	0.05
Caledonia, Nev.	Oct. 21	Nov. 11	0.10
Challenge Con., Nev.	Sept. 28	Oct. 18	0.10
[illegible], Ida.	Oct. 1	Oct. 18	0.001
[illegible], Ida.	Sept. 20	Nov. 20	0.002
East Buffalo, Ida.	Sept. 10	Oct. 10	0.005
Hale & Norcross, Nev.	Sept. 21	Oct. 11	0.10
Hancock Con., Mich.	Oct. 10		1.00
Julia Con., Nev.	Oct. 14	Nov. 8	0.03
[illegible], Ida.	Oct. 7	Nov. 8	0.001
San Antonio Copper, Mex.	Dec. 1		1.00
[illegible] G. & S. Mining, Utah	Sept. 28	Oct. 30	0.05
Sierra Nevada, Nev.	Oct. 12	Nov. 3	0.10
Silver King Con., Utah	Oct. 4	Oct. 23	0.10
So. Columbus Con., Utah	Sept. 20	Oct. 20	0.005
Square Deal M. & M., Ida.	Oct. 14	Nov. 4	0.001
St. Louis, Nev.	Oct. 22	Nov. 12	0.01
Utah, Nev.	Oct. 26	Nov. 16	0.05

Monthly Average Prices of Metals

SILVER

Month	New York 1908.	New York 1909.	London 1908.	London 1909.
January	55.678	51.750	25.738	23.834
February	56.000	51.472	25.855	23.706
March	55.365	50.468	25.570	23.227
April	55.505	51.428	25.133	23.708
May	52.795	52.905	24.377	24.343
June	53.663	52.538	24.760	24.166
July	53.115	51.043	24.514	23.519
August	51.683	51.125	23.858	23.588
September	51.720	51.440	23.877	23.743
October	51.431	.....	23.725	.....
November	49.647	.....	22.933	......
December	48.766	.....	22.493	......
Total	52.864	.....	24.402	..

New York, cents per fine ounce; London, pence per standard ounce.

COPPER

	New York Electrolytic 1908.	New York Electrolytic 1909.	New York Lake 1908.	New York Lake 1909.	London 1908.	London 1909.
January	13.726	13.893	13.901	14.280	62.386	57.688
February	12.905	12.949	13.098	13.295	58.786	61.198
March	12.704	12.387	12.875	12.826	58.761	56.231
April	12.743	12.56¼	12.928	12.93¾	58.331	57.363
May	12.598	12.893	12.788	13.238	57.387	59.338
June	12.675	13.214	12.877	13.548	57.842	59.627
July	12.702	12.880	12.933	13.363	57.989	58.556
August	13.462	13.007	13.639	13.296	60.500	59.393
September	13.388	12.870	13.600	13.210	60.338	59.021
October	13.354	.....	13.646	.....	60.139	....
November	14.130	.....	14.386	.....	63.417	......
December	14.111	.....	14.411	.....	62.943	.....
Year	13.208	.....	13.424	.....	[illegible]	.....

New York, cents per pound. Electrolytic is for cakes, ingots or wirebars. London, pounds sterling, per long ton, standard copper.

TIN AT NEW YORK

Month.	1908.	1909.	Month.	1908.	1909.
January	27.380	28.060	July	29.207	29.125
February	28.978	28.290	August	29.942	29.966
March	30.577	28.727	September	28.815	30.293
April	31.702	29.445	October	29.444	...
May	30.015	29.225	November	30.348	...
June	28.024	29.322	December	29.154	...
			Av. year	29.465	...

Prices are in cents per pound.

LEAD

Month.	New York 1909.	New York 1909.	St. Louis 1909.	London 1908.	London 1909.
January	3.691	4.175	4.025	14.469	13.113
February	3.725	4.018	3.868	14.250	13.313
March	3.838	3.986	3.835	13.975	13.438
April	3.993	4.168	4.051	13.469	13.297
May	4.253	4.287	4.214	12.938	13.226
June	4.466	4.350	4.291	12.600	13.031
July	4.744	4.321	4.188	13.000	12.563
August	4.580	4.363	4.227	13.375	12.476
September	4.515	4.342	4.215	13.125	12.781
October	4.351	....	......	13.375	.....
November	4.330	....	......	13.538	......
December	4.213	....	......	13.156	.....
Year	4.200	....	......	13.439	.....

New York and St. Louis, cents per pound. London, pounds sterling per long ton.

SPELTER

Month	New York 1908.	New York 1909.	St. Louis 1908.	St. Louis 1909.	London 1908.	London 1909.
January	4.513	5.141	4.363	4.991	20.563	21.425
February	4.788	4.889	4.638	4.739	20.875	21.563
March	4.665	4.757	4.527	4.607	21.075	21.438
April	4.645	4.965	4.495	4.815	21.344	21.531
May	4.608	5.124	4.458	4.974	19.906	21.975
June	4.543	5.402	4.393	5.252	19.000	22.000
July	4.485	5.402	4.338	5.252	19.031	21.969
August	4.702	5.729	4.556	5.579	19.350	22.125
September	4.769	5.796	4.619	5.646	19.563	22.906
October	4.801	.....	4.651	.....	19.750	...
November	5.069	.....	4.909	.....	20.875	......
December	5.137	.....	4.987	.....	20.625	.....
Year	4.726	.....	4.578	......	20.163	...

New York and St. Louis, cents per pound. London, pounds sterling per long ton.

The Engineering and Mining Journal

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Coal and Ore Loading Plant, New Rhine Harbor

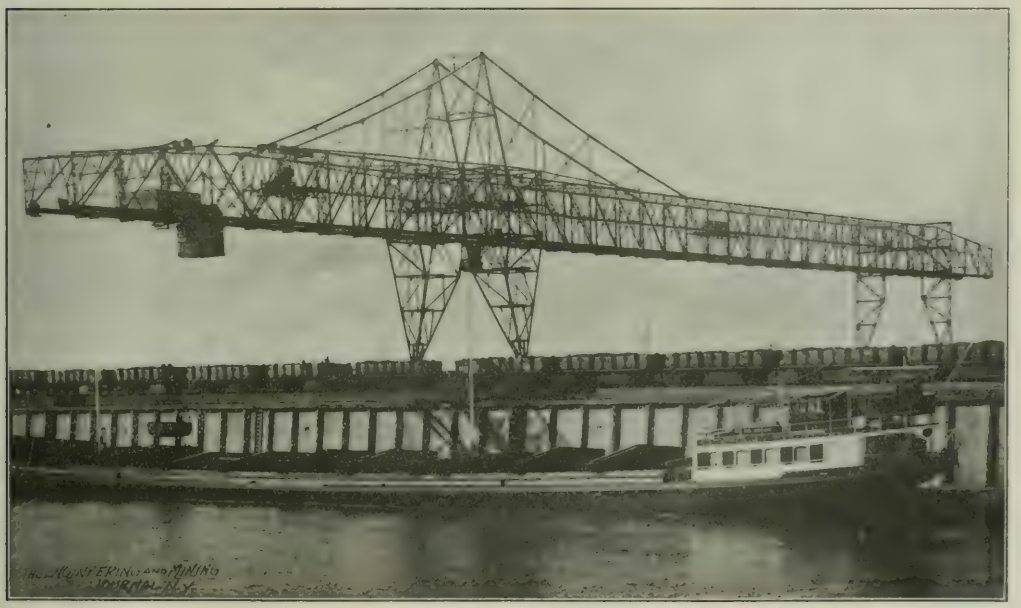
Plant Comprises Six Swing, Two Double Jib and Two Bridge Cranes; Capacities Vary from Six to Eight Tons. All Steel Construction Used.

BY J. B. VAN BRUSSEL*

The accompanying illustrations refer to a large plant for the handling of ore, coal and iron, between railways, steamer and stockyard, which has recently been erected at the new Rhine harbor, Schwelgern, near Bruckhausen, Germany. The plant, which is the property of the Gewerkschaft Deutscher Kaiser, of Hamborn, comprises six traveling swing cranes, mounted on the quay wall; two large traveling cranes, with double jibs, which run on parallel tracks and serve the stockyard, which is laid with railway tracks and reaches up to the quay wall; and two other traveling bridges extend over additional stockyards abutting on the quay walls of the harbor bays. The double-jib cranes and bridges deal chiefly with material passing between ships and the stockyards, and their outer ends project over the edge of the quay; the tracks supporting the crabs, are mounted at sufficient hight to enable the swing cranes which effect the transference of goods from ship to rails, to pass underneath. In all cases the hoisting plant is fitted with hinged buckets or self-acting grabs, according to the class of goods to be handled, and they can also be equipped for dealing with piece goods, such as iron.

Swing Cranes

The lifting capacity of the swing cranes is six tons. Four of them have a reach of 48 ft. and the other two 51 ft. The hight above the rails is 49 ft., and the distance between the track rails 16 ft. The lattice frame rests on four wheels, power being transmitted to one wheel on each side, through worm and pinion gearing, from a motor above. A motor-operated band brake holds the frame stationary in any position, and prevents it from shifting under the influence of the wind. When not in use, the cranes are fixed in position by clamps acting on the rails. The counterbalanced jib is pivoted on a lattice standard, so that the top vertical strain and bottom horizontal thrust are taken up by a step bearing on the frame, the upper horizontal strain being transmitted by rollers to a throat ring attached to the frame. The lifting gear is mounted on the swing, the latter consequently turning with the driver's cab, which turns with the jib. The braces connecting the throat bearing with the under frame are mounted so as not to obstruct the view of the driver. The journal of the step bearing is hollow, for the passage of the cable. To reduce the diameter of the lifting ropes, the load is suspended from two ropes, between which the grab rope is arranged. The lifting motor drives the two drums through intermediate pinion gear-



VIEW OF ONE OF THE TRAVELING BRIDGES

*Brussels, Belgium.

ing. The grab rope is wound on a drum between the two lifting drums, a friction clutch causing this drum to turn automatically with the others, while the grab drum can be held in any position, for operating the grab, by a double band brake, which is held off by a brake motor during the raising of the load. This brake is connected with the reversing lever of the lifting switch, and is therefore operated concurrently with the latter. The swing motion is transmitted from the motor through a horizontal worm and pinion, to a toothed crown on the frame; a brake holds the jib in any position and stops it from being blown round by the wind. The switches are mounted at the driver's stand, one of them controlling the lifting, and two fitted with universal control mechanism, for the traveling and swing motions.

The Double Jib Cranes

In the large double-jib cranes a lattice tower supports a double-sided lattice girder, carrying the rail track for the crab which has a lifting power of eight tons. The girder projects equally on both sides of the tower. The jibs are hinged on the outer ends of the girder, and can be turned up, to enable the slips to be worked alongside the quays, and also to leave space for the two cranes to pass each other. The crab has a free passageway between the walls of the tower, and has a total traverse of 262 ft. The tower is mounted on 16 wheels, running on a double rail truck 47½ ft. between centers, each track being of 40-in. gage, and the gantry spans three sets of railway tracks. The hight of the crab track above the rails is 49 ft. Power is transmitted to four wheels on each side of the tower from a motor in the middle of the structure, through worm gearing and pinions; and the crane can be kept stationary in any position by a motor-operated brake. To prevent the crane from being displaced by strong winds, motor-operated clamps are provided to grip the rails, the motors for this purpose being, like all the others, controlled from the driver's stand.

The 49-ft. jibs are raised and lowered by a motor situated above the crab track in the tower, and operating winding drums, the ropes from which work in blocks at the rear heads of the jibs. The drums are conical in order to equalize the consumption of power during the raising and lowering of the jibs. The descent is braked by a number of plates, which are pressed together by the axial pressure of the worm shaft. Either jib can be operated by means of a coupling thrown in or out of gear. When the jibs are lowered their weight is supported by articulated fish-plates, thus relieving the strain on the ropes.

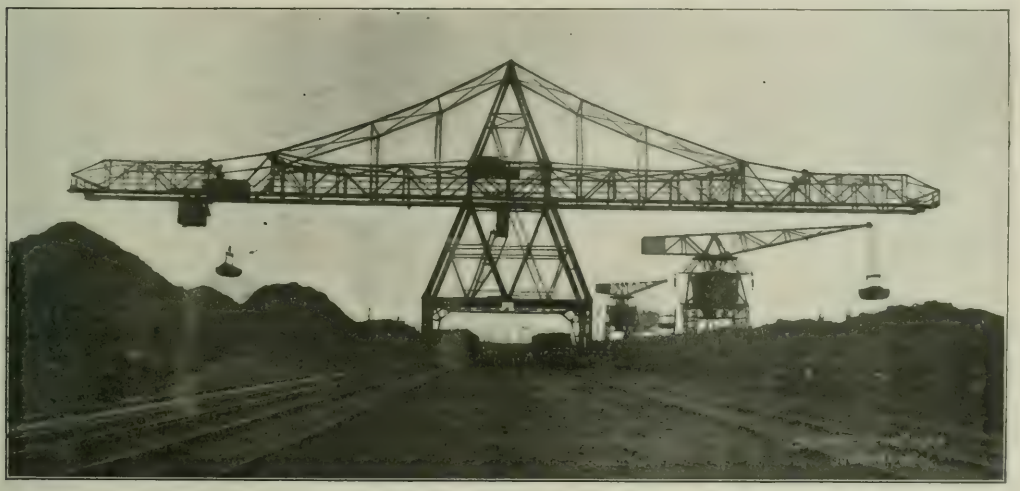
The crab carries the lifting and traveling motors, and also the driver's cab, which is slung below the girder, so that the driver always has the load in sight and a clear view over the whole traverse of the crab. The lifting gear is very similar to that on the swing cranes. The traveling motor acts on all four wheels of the crab through intermediate pinion gearing; and a brake is mounted in connection with the motor switch. When the crab reaches the end of the track, the current is shut off automatically; hydraulic buffer stops are provided at the ends. The cab is equipped with the switches controlling the crab motion, and the lateral travel of the crane, while the switch for raising and lowering the jibs is arranged in a cab on the platform; indicators, showing the exact position of the jibs at any time, are also provided there. A stairway in the tower leads to this platform, and also to a footway extending the whole length of the crab track from which the contact rails, through which the current is supplied, can be reached.

Traveling Bridges

The bridges are built of double lattice girders, the upper members of which are

SIX-TON SWING CRANES IN POSITION

braced together, and carry an internal railtrack for an 8-ton crab. The outer end carries a movable jib. Each bridge is supported at one end on a tower, and at the other on a simple upright lattice frame. The distance of the two supports between centers is 280 ft., the girder projecting 66 ft. beyond the rear support and 90 ft. beyond the tower. The jib at the front end is 54 ft. long so that total length of the crab track is 490 ft. The lower edge of the bridge girder is 41 ft. above the railway track. The tower is mounted on two four-wheel radial bogie trucks, and the rear support on two articulated two-wheel axles. In each case one-half these wheels are actuated by spur and bevel pinion, shafts and intermediate pinion gearing, from a motor in the girder, midway between the two supports. In other details the bridges are similar to the double jib cranes.



DOUBLE-JIB CRANE IN OPERATION

The lifting speed is 3 ft. per sec. in the swing cranes, 2¼ ft. per sec. in the double-jib cranes, and 3⅛ ft. per sec. in the bridges. The swing cranes turn at a speed of 9¾ ft. per sec. and the travelers on the double-jib cranes and bridges run at a speed of 9¾ ft. and 11½ ft. respectively. The lateral travel of all three classes is 40 in. per sec. and the jibs take 100 sec., in raising and lowering. The lifting motors for both kinds of cranes develop 100 h.p., and those of the bridges 125 h.p. The swing motor is of 15 h.p. and the crab traveling motors 30 h.p., while the motive power required for the lateral travel is 22, 45 and 112 h.p. respectively. The capacity of the three classes respectively is 6x120 tons, 2x140 tons, and 2x160 tons per hour.

The electric fittings are constructed for polyphase current at 500 volts and 50 periods. The current is supplied through double tripolar live rails laid in iron conduits, with a narrow slit for the passage of the shoes. For lighting, the current passes through a stepdown transformer, to reduce it to 110 volts. The cabs are heated by electricity. The whole installation was carried out by the Maschinenfabrik Augsburg-Nürnberg, to which I am indebted for the illustrations and details.

Conditions in the Urals

By F. W. Draper*

In the article of its London correspondent in the Journal of July 24 regarding investment in Siberian mines, and your editorial comment on that article, the Journal brings up a question which is of great importance both to investors and to the future development of the mining industry in Siberia.

While it is unfortunately true that several British owned enterprises have either come to grief, or have entirely failed to fulfil the promises made at the time of their flotation, the causes lie much more with the methods of flotation than with the mines themselves, and this should not be taken as an indication of the failure of Siberia as a field for safe investment.

Mining Developments

Siberia from the Ural mountains to the Pacific ocean is almost an undeveloped country. Considerable quantities of gold, platinum and copper have been obtained for many years past but the methods of exploitation have been of the crudest, and systematic exploration and development have scarcely been attempted by any native companies. In the Ural mountains, where mining has been carried on for a hundred years or more, in the majority of cases the mines have not reached a depth of over 500 ft., and nothing is known of the orebodies below that depth. The deepest workings in the Urals (at Nijni Tagil) are 966 ft. East of the Urals is a vast stretch of country in which practically no systematic search has been made for metal-bearing veins, although these are known to exist in many places and there are extensive placer areas. Several companies are now working copper deposits in the Kirghiz steppes and it is known that the copper ores are widely distributed.

The present condition of Russian companies in the Ural is most unsatisfactory. The known orebodies are mostly included in very large concessions held from the government on a royalty basis. Until within the last 10 years, most of these concessions yielded very large profits, and were the basis of some large fortunes, but failure to equip and develop the mines properly and to maintain the reduction works has proved fatal, and at the present time, with the exhaustion of the easily and cheaply extracted surface ores, and in competition with better designed plants in other parts of Russia, they are no longer able to conduct operations at a profit. This failure to properly maintain their equipment has resulted in a condition which will require large expenditures of capital to rehabilitate the properties, and place them on a profitable basis; and this capital, the Russians themselves seem unable to provide.

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Coal, Iron and Timber Resources

In the past, the Ural district has produced iron, copper, gold and platinum in paying quantities. Coal of good quality is not produced, the only known coal beds producing a semi-anthracite of rather high ash but quite satisfactory for steam raising; certain parts of the field produce a coal from which a very poor quality of coke can be made. Good coke must be brought from South Russia, and costs in Ekaterinburg about $10 gold per long ton. The forest area is very large and covered mostly with pine and birch from which good charcoal can be made; and with proper attention to forestry, the supply will be practically inexhaustible. There are also very large areas of peat of good quality, and in many places this is cheaper fuel for steam generation than wood or coal.

In many places, there are large deposits of very high-grade iron ores, a yield of 60 per cent. Fe being common. A year's average at Nijni Tagil of all ores sent to the furnace was 63 per cent. Fe, and the phosphorus content is low. A most excellent charcoal iron may be cheaply made. The whole district is dotted with small charcoal furnaces (many of them having valuable water-power rights) which have not kept pace with modern progress until now the more modern plants in South Russia and even in Poland can undersell them in their home market.

Copper Operations

Copper ores, both sulphide and oxide, are widely distributed, but have been handled in the crudest manner in plants which should have been discarded long ago. Even with these unfavorable conditions they have been profitable except in cases where their management has been very bad. It is only within the last two years that any steps have been taken toward working along modern lines.

Precious Metal Mining

Gold is obtained from both placers and veins, but in both cases the plants provided have been badly arranged and badly worked. Systematic exploration and operation are unknown and no advantage has been taken of improvements made in other parts of the world. The platinum placers are too well known to call for comment. This metal has been found in place in the Tagil district, but it is not known whether or not the rock can be profitably handled. As much of the country is covered with soil and forest, and outcrops are few, prospecting is somewhat slow and expensive.

Labor Conditions

Labor is cheap but not efficient, and while plentiful in winter is rather scarce and inclined to be independent and lazy in summer. Skilled labor, carpenters, masons, etc., is of good quality if given proper supervision, especially where work can be done by contract. In the old concessions, one of the conditions was that employment must be furnished all the time to a certain number of workmen. As the profits began to decrease it became difficult to fulfil this condition, and the companies resorted to decreased wages, shortened hours of labor, and encouraged the workmen to remain idle on all holidays, of which there are about 135 in the year. They kept in view only the necessity of employing numbers, regardless of the amount of work done by each man. This inevitably tended to greatly lower the standard of labor and to diminish still further the possibility of profitable operation. Now, the average workman shows a distinct disinclination to do a fair day's work, and unfortunately this is not limited to the lower classes of labor. The government has, however, seen the effect of this clause of the concession and has now allotted land to the men in lieu of the right to have work at all times. Although labor is not of the best, I have found it tractable and easily managed, and capable of being slowly developed to good efficiency if properly handled.

Our cost at Blagodatny mines of $2.50 to $2.75 per short ton, exclusive of office and general expenses, for smelting copper sulphide ores in shaft furnaces in a small plant of 2000 tons monthly capacity, not designed for labor economy, will compare favorably with similar operations on the same scale elsewhere.

Difficulties Met

The great difficulty in learning the Russian language and the unfamiliarity of foreign engineers with Russian conditions, together with the almost impossibility of selecting satisfactory and trustworthy men for minor executive positions from among the Russians are serious drawbacks for foreign companies and necessitate careful consideration by intending operators in this field. The failure of some of the British owned companies may be traced directly to this cause, although some of them have possibly been the victims of not overscrupulous promoters in Russia.

Foreign companies must also contend with a great inclination to steal on the part of the workmen. The Russian workmen argue that gold is made by God and not by man and that it is not wrong to steal it. And he seems to apply the same line of reasoning to anything else which can be converted into gold. The greatest care is necessary to prevent excessive losses in this direction.

The Russian owners of concessions have in most cases given no personal attention to the properties, taking only the profits and allowing nothing for plant improvement. The local agents in whose hands they left matters have proven in nearly every case entirely incompetent to direct the working of the properties, and have allowed a very low standard of efficiency to develop among all classes of employees.

Opportunities in the Ural

The Ural is not a place for small operators, but for strong companies with suitable professional and financial equipment, there are good opportunities for profitable investment of capital, and present indications point to the absolute necessity of securing this capital outside of Russia. The Russian owners must, however, realize that their present equipment is in most cases worthless, and that it will be impossible to capitalize their past profits as a basis for present negotiations. Throughout Siberia the conditions which hold good for Ural are true, although the country is almost entirely undeveloped.

The mining laws are somewhat paternal in character and if strictly enforced would be a serious bar to all operations. The officials seem, however, to be quite fair in their interpretation and I think that the editorial remark that the government is hostile to foreign enterprise is not at present justified. In fact practically all the successful companies in Ural today are foreign owned.

Vice-Consul-General Charles B. Perry, of Calcutta, reports that while manganese is one of the advancing industries of India, the trade has received a setback, the quantity exported falling from 42,570 tons in the fiscal year 1907-8 to 24,968 tons in 1908-9, while the value declined from $254,329 to $156,763. These results are believed to be due to a revival of the Russian manganese industry, which had received a severe check owing to the troubles in that country. The exports to the United Kingdom in 1908-9 were less than one-half those of the preceding year, those to Holland ceased altogether, while those to France decreased considerably; those to Belgium, however, increased. The United States took only a small quantity of the ore, but even then it was an increase on that taken in 1907-8.

According to the *Iron Age*, the largest day's production of pig iron on record was made by Duquesne Furnace No. 1, which turned out 832 gross tons of bessemer iron on March 30, 1906. On the same day the four Duquesne furnaces produced 2882 tons of iron. The best week's record was made by these four furnaces March 24 to 30, 1906—a total of 18,028 tons. The best month's record for the four Duquesne furnaces was that for March, 1906, when the total output was 78,119 tons. It will thus be seen that in the best day's record for the group the average per furnace was 720½ tons; in the best week's record the daily average per furnace was 644 tons, and in the best month's record the daily average was 630 tons per furnace.

Paralysis of Mining by the Holding of Idle Claims

To Stimulate Actual Digging or Abandonment of Claims, a Direct Tax of $100 per Claim Is Proposed in Place of Annual Assessment Work

BY EDMUND B. KIRBY*

The young man who for the first time follows a mining rush to the point of some new discovery sees an interesting and, to him, a strange phenomenon. Men by dozens, then hundreds, then thousands, are hurrying to the spot, followed by supplies of every kind. Ore is accumulating on dumps, or moving out on road or trail. Around the lucky discovery, as a center, is a busy scene, the ever widening area of active claims, the driving of shafts and tunnels into the ground searching for ore. Beyond them are the miles of claims staked by the late-comers.

As each new point of discovery is announced, an outlying camp springs into existence. Buildings and towns appear, as if by magic. At the focal point men swarm, and money pours in from every part of the country. Trading progresses night and day; the important feature of the boom camp is the buying and selling of claims; the capitalization of hopes and chances into stock issues and the sale of these to an excited country which uses them as chips in the great game of the stock exchanges. Fortunes are made on every hand; a few out of ore, but the majority out of other people. The game is wild, boldly played, and with big stakes.

If the young man returns a few years later he finds the scene has changed to an industrial one. The few fortunate mines are digging, shipping, milling, smelting. Their employees and the merchants who supply their wants are prosperous, but with pay-roll prosperity. All others have disappeared. The day of fortunes has gone. Around the industrial center is a scene of desolation and waste. Digging there has ceased and the surrounding hills have become a cemetery. In every direction appear decaying headframes and mine buildings and the scars of innumerable excavations, each one marking the grave of some buried hope. The swarming town has shrunk to a factory village. In the outlying sections is the silence of industrial death. The years roll on and as the discovered ore becomes exhausted, one by one the great mines stop, and the desert, calmly waiting, resumes its ancient away.

And, after the man has seen other booms, and has learned of mining in other lands, and other times, he awakens at last to the fact that the life process he has been noting is the same for every district, differing only in its length, or in details, these depending upon the country and the character of the discoveries. But, what is the reason for such a peculiar process? What is it that so quickly stops exploration work? What is that strange paralysis which appears so promptly at the extremities of the district, and presses so steadily and resistlessly toward its center? To such questions, the inquirer receives from mining men the ready answers: "Perfectly natural." "Necessary reaction." "No ore." "Dug out." "Game over." "Everybody gone home."

But, suppose he has a brain that thinks, that is not put to sleep by ready-made answers, but wants to know: Why is paralysis natural? Why did the digging for ore stop so suddenly and simultaneously, and why does it stay stopped? Was all the ore in this great area discovered in that brief spurt? Were those holes the intelligent work of experienced miners, or the reckless attempts of ignorant speculators? Is the camp really dug out? Why did everybody have to go home? Are such questions any more foolish than those of the men who first asked: Is smallpox natural? Is diphtheria necessary?

Idle Claims

Investigate the paralyzed area and on nearly every claim we find that the owner, whether an individual or a corporation, has practically finished all the digging he is ever going to do there. His money has run out, or the chances on that claim are too poor, in his judgment to warrant the risk of more; or, he has never intended to do any more than the 10-ft. discovery hole and the pretense of annual assessment work necessary to hold the claim, awaiting the developments of the country, the improvement of transportation and methods of treatment, etc. The vast majority throughout the West and Alaska are of the latter class. Not 1 per cent. of idle-claim owners seriously intend to dig and are making active efforts to raise money for that purpose. All are waiting. Much of the dead area is owned by defunct mining companies. Their stocks are scattered over the country; their officers have vanished and any attempt to do business with one of these concerns is a task the difficulties of which can be appreciated only by those who have tried it.

Examine the work done on each claim and we find that in the great majority referred to, the trifling discovery and assessment work has been merely perfunctory, and has furnished little or no evidence as to the mineral chances of the ground. These are still unknown; as good or as bad as they were before. In the cases where some real digging has been done, it is often found misplaced, or so unwisely executed that it has not settled the question at issue. Hence, most of the area tied up is still untested; still capable of discoveries, great and small. It still needs the work of the prospector and the miner, but has been permanently locked up out of their reach.

Extent of the Paralysis

Analyze all the varied plans and motives of these idle-claim owners, and we find that most of them are waiting either in the hope of profiting in some way by the work of other men, or, with the expectation that in the distant future, investors will pay prices which they now decline. The deadlock thus produced is the deadly paralysis which curses the mining industry today. There is nothing to break it; nothing to force action. There are no expenses. The assessment work of $100 annually on unpatented claims is usually faked, and the taxes are nothing, or so trifling as to be merely nominal.

Owners can wait forever, and they do so, generation after generation, hoping that some time, in some way, the worn title deeds, or faded stock certificates, will enable them to extract a fortune from other men. And so, a great industry languishes, while paralysis, partial or complete, blights every district from the Mexican line to the frontiers of Alaska. And prospectors have nowhere to go, and miners lack work, while investors and the representatives of mining capital are searching this and other countries for opportunities to mine.

That the mining industry can move at all under this handicap is proof of its wonderful vitality. This is always struggling, ever breaking through the spell into new life here and there. Nature is prodigal, and the desire to mine is strong. Men still pay the price and take a chance. Some camps are so rich that development discoveries have slowly grown and extended for many years, bringing to life again, for greater or less periods, large portions of the dead margin. In others, the great mines have lasted for generations.

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NOTE—Address delivered at the meeting of the American Mining Congress, at Goldfield, Nev., Sept. 27 to Oct. 2, 1909.

Sometimes new discoveries or improvements in methods of mining and reduction have brought dead tracts to life again. But, over the greater part of the vast mineral area, paralysis reigns supreme. The industrial life appearing and reappearing here and there is, at best, only a mere indication of its latent possibilities; of what the mining industry might be if the disease which now represses it were eradicated. Dug out? Why, mining in this country has only just begun!

Idle-claim owners, whether large or small, are doing only what any other men would do in their places. They are operating within the rules of the game. So are the bacilli of tuberculosis or of typhoid. But, the disease which such ownership produces in the industrial system has always been more or less evident to the perceptions of all men. The common sense of miners has always declared that rights to mineral, like rights to water, should exist only with use. To hold them otherwise is an injury to all.

In the freest and finest expression of that common sense, the old district mining laws of the West, made and enforced by the working miners, two intentions always appear: (1) To prevent monopoly and give everyone a chance; (2) to force every claim owner to dig or to get off so that others may dig. The principle of the latter requirement still appears in the present United States law in its provisions for annual development work, the continuous operation of tunnels, etc.

Intention of the Law

The history of mining law shows that men have always maintained a difference between the right to mineral and that to other forms of land. It was clearly seen that mineral is valuable only when discovered and mined, and that it is injurious to the State to permit such private ownership as will hold it out of use.

For centuries past mining laws have been saying that no man has the right to hold mineral land idle; that he must dig, or allow others to dig. The application of this principle was effective in small frontier camps where the miners who made the law stood on the ground to enforce it, but as it passed into general law covering vast areas and became dependent upon the cumbersome machinery of government for enforcement, it was found impossible to compel the continuous operation desired. Some codes were more effective than others but even the old Mexican law, the finest product of accumulated experience, was only partially successful in this matter.

The reason for this strange fact is a simple one. It seems easy to frame a law which will order a man, under penalty, to do continuously, but as a matter of fact this is so difficult that it never has and never can be accomplished. How much digging, how shall it be measured and by whom? In what place and at what rate? How about delays from misfortune, delays to supplies? What single rule will fit the poor prospector and also the rich corporation? Who is to stand over half a million claims and see that the work is done? At whose say shall a man lose his property? By the time all these points have been provided for, they have so weakened the law as to make it ineffective, and all that it is capable of doing is to retard, more or less, the progress of paralysis.

As another remedy, a penalty tax upon idle claims has often been proposed, but when the attempt is made to define the difference between idle and working claims, all the difficulties aforesaid at once appear, and it is evident that this plan has no possibility of success.

The New Remedy

However, the world is progressing not only in electricity and aëronautics, but also in other branches of knowledge, and a new light has been thrown upon the problem which has so baffled past generations. It has been discovered that the way to force the use of any natural resource is to tax it, not lightly in the ordinary way, but heavily enough to make it uncomfortably expensive to hold without using. The holder is then impelled either to let go, or to utilize it in some way. Here, at last, is a new way to solve this old problem; a way to accomplish perfectly what the mining world has always been wanting and trying to do. It is the way to end promptly and forever the paralysis of mining districts. The old method was to give men orders which could not be enforced. The new method gives no orders. It lets every man do as he wills, but it applies to each man a new and subtle force, continuous, persistent, non-evadable, the force of his own pocketbook making him now want to dig, or get off the claim.

But the question may be raised, how can it help an industry to tax it? The answer is that the industry, the digging out of the mineral, is not taxed. Every man is made to pay for occupancy; for holding a reservation of mineral ground away from other people who want it. Such a payment, when made just large enough to be uncomfortable, or painful, on an idle claim, would be only a small item in the expense list of an operating claim, for it takes money to mine. Such an item would never stop nor discourage digging. In producing mines, it would be far less than the royalties now paid everywhere by miners to idle-claim owners. When a man has to pay for the privilege, he will not hold more ground than he intends to work. When the privilege of holding is free, he will naturally grab everything in sight and wait in order to hold up someone else who may want to use it. Let the dog in the manger pay for his manger.

Strange as it may seem at first sight, the way to boom an industry is to tax the natural resources it uses. The way to discourage it, is to tax anything else it uses, or to tax its products. This scientific principle of modern taxation is now as firmly established as any law of chemistry or physics, and is slowly but steadily forcing its way into the tax systems of civilized countries. If you want to encourage the utilization of water power, tax water falls so heavily that no one can hold one idle, or away from would-be users, and only actual users can pay the tax. To discourage use, tax the buildings, machinery, supplies, or income.

The best and the scientific method of applying the tax to claims would be by assessment according to their actual value. But any method will work, so long as it is carried far enough to produce the effect. It will, of course, be necessary to prevent tax dodging. Any state, or any county, may apply the remedy at will, for even if there are limits to the tax levy it may impose, there are none to its powers of assessment. It can apply the pressure and steadily increase it, watching the effect, until this has reached the point desired.

As a starter, which will serve to give partial relief, promptly and generally, a certain improvement may be made in the United States assessment law. This is to change the present requirement of $100 worth of assessment work yearly on unpatented claims into a cash payment of $100. The object of this change would be to make a weak law more effective by converting it into a taxation scheme. At present, it is better than nothing, but still a failure, for the simple reason that there is no way to stand over hundreds of thousands of claim owners and see that each one does his work and that it is really worth $100, and so this provision is evaded in various ways. The payment in cash, however, would be clear and definite, and much harder to evade.

Dodging may be prevented entirely by suitable provision in the law. This amount acting as a tax and made non-evadable would set free for the prospector at least one third of the claims now held in the United States and Alaska. The remaining work would have to be done by state and county taxation, and by Congress for Alaska. The present assessment law is all that is left of past efforts to make men dig or get off the claim, and it should not be altered, except for the deliberate purpose of converting it into a more effective instrument. It may be added that an incidental advantage of the improvement suggested is that the record of payments made will do away with many of the present title uncertainties now due to pretended assessment work.

Relief to Prospectors

It will be argued that a tax of $100, to say nothing of additional state and county taxes, would ruin the prospector. As a matter of fact, it will have exactly the opposite effect and nothing can be more to his benefit than measures which tend to check monopoly and force every one to dig. Suppose he has to let go of his single claim; what has he made out of it? It has never yielded him anything but dreams. Are not hundreds of thousands of claims just as good, or better, now thrown open to him to prospect, or to hold when he pleases? It is simple arithmetic. Lose one and gain a hundred thousand, which is the better? Will not the surface of the earth once more be open to him to prospect as in the old days?

Today, the land is shut off, staked and monumented far as the eye can see. He is like the Indian and the cowpuncher. His business is gone. The judgment and skill in finding ore deposits, gained by years of experience, are now useless. A few young and less experienced men may reach the unstaked frontier in Alaska, but he cannot. He asks despairingly, where can I go? What can I do? So, he settles down upon some fourth-class chance, which the crowd of claim stakers have passed by or abandoned, and hangs grimly on to his last hope.

Let us look squarely at the facts. A very small percentage of the idle mineral claims is owned by prospectors. The overwhelming bulk is held by mining companies, or by individual investors, who have shut off the prospector and destroyed his business. In most cases, the few claims he is supposed to own are in reality only partly his. The investors who furnish his grubstake own a half or three-quarter interest and the tax money would, like other expenses, come from them. The prospector is virtually only their watchman or caretaker. The fact is that the prospector himself is not a success at the game of idle claims, and rarely makes it pay. His real business is not claim staking, or watching stakes, but the discovery of ore deposits. Give him back his regular business, and his chances of making a fortune will be multiplied a hundred fold. The prospector does not have to be mollycoddled. He can stand any laws which are necessary for his own and the general good, and can raise tax money, when wanted, in the same way that he now raises his expense money.

Mining investors are always eager for opportunities and every prospector who makes a real discovery, worth holding, is promptly beset by men who crowd their money upon him. If the claim is not valuable enough to interest others, he will not hold it, and so will pay no tax. If it is desired to force large companies with areas of two, four or ten square miles of valuable mineral land to dig or get off the claim, the prospector must do likewise. A far more profitable business awaits him and with the flood of prosperity which will follow more digging and free mineral land, he will never want a job or a grubstake, or financial backers and purchasers for his discoveries. Abolish the "claim-staker" and give the real prospector a chance once more, and you will hear of new discoveries from every quarter.

The question may present itself whether a tax of $100 per claim, while applying the necessary pressure to ordinary claim holders, will not be too small to be felt by mining companies. This would be true in many cases, but this tax is only suggested as a convenient and universal starter. The further pressure needed in such cases must be applied by state and county taxation. As a matter of fact, however, nothing is more sensitive than the pocket of a corporation, particularly if that corporation is idle, or the pocket empty. Even the tax of $100 will have a wonderful effect in causing mining companies to trim their edges, and further pressure may be made to squeeze their holdings down to actual working needs.

Claim Holders and Investors

Another question which will be raised is whether the taxation of mining claims would not interfere with property rights; destroy the value of investments; scare away investors, etc. What rights? The right to hold a claim without using it? Do you not want to discourage that? Has not the mining world for centuries forbidden it and tried in every way it knew to prevent it? Investments in what? In idleness? In a hold-up of industry? Will this scare those who want to dig; to do real mining; to build mills, smelteries, railways, towns? On the contrary, you will draw them in swarms because when holders have to dig or get off the claim all who have claims worth mining will make their offers for working capital attractive enough to get it.

What first excites and draws investors into mining ventures, is the chance to find ore by actual digging. This is what they ask for. It is the chance of discovery and not the acreage of a property which brings their money. At first they are not, as a rule, interested in the other game of waiting to hold up some future producer, and, in fact, do not even think of this unless fortune turns against them and work comes to a standstill. Then they naturally want all the chances for salvage that the rules permit and paralysis ensues. Is it not right to say to these men: "You have had a miner's chance. Sorry your money is lost, but it is gone and there is no reason why you should take it out of some other man's pocket; these claims are worthless until ore is discovered and mined. The State wants this done and will not let you paralyze its mining industry. If you are through digging, get off, so that someone else may dig." That is what the common sense of miners has always said. It is what the mining laws of the world have always said, but with a feeble voice. Is it not time to say it now with a loud voice and make it go? "Dig, or get off the claim!"

Even idle holders themselves see that they have brought on a deadlock which is not to their own advantage. Very few really make any money at it. Men grow old and sink into the grave, still dreaming of the purchaser who never comes. In the great majority of cases, all that holders will really lose by the proposed change in the rules, are their visions, their hallucinations. In exchange for these, there will be the countless opportunities of a rejuvenated industry.

Is it not clear as day that by the pressure of increasing taxation, every claim may be forced into use or release? When from Mexico to Alaska every claim is either working, or open to prospectors, does it take a prophet to see the result? Does not every prospector know of areas he would like to explore? Does not every miner, every operator, know of places where he would like to dig? After the real mining industry begins, cannot everyone foresee in its general, steady and permanent prosperity, a better living and more chances for a fortune than are possible under the present paralysis? Men of the mining world, the new era awaits your call. You have but to say the magic words: "Dig, or get off the claim!"

Copper Production in Russia in 1909

The production of copper in Russia in the first six months of 1909 was 8290 metric tons against 8319 tons in the first half of 1908. This quantity was made up as follows: Urals 3908 against 4378; Caucasus, 2880 against 2464; Altai and Siberia, 1095 against 1172; and in the chemical works and refineries 407 against 305 tons. The falling off in the Urals and Siberia was due largely to changes in the Demidoff group.

According to the superintendent's report for the year ended May 31, 1909, the Alaska Treadwell Gold Mining Company sent 708,128 tons of ore, of an average value of $1.575 per ton, to the mills during the year. Mining cost $1.1361 per ton, milling $0.080, and general $0.2370, total operating costs $1.5431: Construction and repair costs amounted to $0.0330 per ton bringing the total operating and construction cost per ton to $1.5882.

Iron Mining at Coleraine, Minnesota

By Albert H. Fay

The town of Coleraine is the terminus of the Duluth, Missabe & Northern Railway, at the western end of the Mesabi range in Itasca county, Minn. The railroad was completed to this point in July, 1906, when active development work began. All work in this district is being done by the Oliver Iron Mining Company, and it has been planned on a large scale, for the future as well as the present. The village is on ground that has no iron under it and all the buildings are substantially built. A $90,000 school house has been completed and plans are out for a $40,000 town hall. The streets were paved and a complete water, light and sewer system was installed by the mining company before the town was incorporated last April.

The district has a population of about 4000 people, 1000 of whom are employed by the mining company. The townsite was laid off in lots, 75x100 ft., with wide streets. A large number of houses have been built by the company and rented to the employees at a reasonable price. There is also a scheme whereby those so desiring may make monthly payments on the house, in place of rent, and in five years' time will receive a deed to the house and lot at a price which merely covers the cost of the house and lot. When the company sells lots, there are certain restrictions in the deed designating whether the lot is to be used as a place of business or for a dwelling house.

There is also a clause which prevents the sale of liquor on the lot without a special agreement with the company. In this agreement there is a clause in which the owner of the saloon must pay a commission to the bartender on the sale of soft drinks. There are only two saloons in the village and gambling is prohibited. Under this system the company can control the number of saloons in the place and prevent them from becoming such a nuisance as they are in many of the mining camps. In fact the town is built very much like Gary, Ind., though not on so large a scale.

Mining Operations

The principal mining operation is that of the Canisteo mine, one half mile north of the village. There is a large deposit of iron ore covered with 60 ft. of glacial drift, 4 to 8 ft. of shale containing fossils and 8 to 10 ft. of taconite. Seven 2½-yd. steam shovels have been at work for the last year and a half stripping this ground. The best record for any one shovel in this district for 10 hours is 2000 cu.yd. Twelve locomotives are employed in disposing of the waste material, all of which [illegible] on average two miles before it is dumped. Along the line of the conservation of our mineral resources it might be mentioned that the taconite, which is a low-grade iron ore, is being stored by itself so that it may be used in the future, should there be a demand for ore of this character.

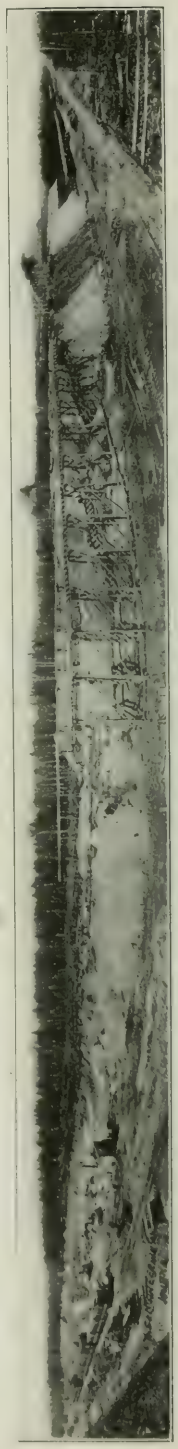
A central pumping station has been installed and by means of a drift underneath the orebody and a raise to the bottom of the pit, all of the water is easily taken care of. The same system of handling the water is being carried out at Marble where the company is opening a pit by steam-shovel work. This pit is over one mile long and several hundred yards wide. The first train load of ore was shipped from the Canisteo mine, July 29, 1909. At Taconite, mining operations are also conducted on a large scale; the first load of ore was shipped from the Holman mine on May 17, 1909. These three mines are within a space of about two by three miles and are operated from the main office at Coleraine under the management of J. C. Greenway. The district promises to be a large producer and much money has been spent in preliminary work. Some of the ore contains a large percentage of sand, thus reducing its iron content. This necessitates the installation of a washing plant. However, a large portion of the ore will be shipped to market as it comes from the mine. The low-grade ore from the three mines will go to the same mill.

Milling Equipment

A small experimental mill has been in operation for several months. The mill has a capacity of about 40 or 50 tons per hour, and is equipped with one conical trommel, picking belt, double log washer, one Oliver turbo and one Overstrom table. The work of this experimental plant has been so satisfactory that a large mill is now being constructed.

The new mill will cover a ground area of 160x255 ft. It is a steel structure sheeted with 2-in. tongue and grooved plank and this covered with corrugated iron. It will contain five units which may be increased indefinitely. Each unit will have one 2-in. mesh, conical revolving trommel, 48 and 84 in. by 14 ft.; two double log washers, 25 ft. long; one picking belt; two settlers; two Oliver turbos and 20 tables of the Overstrom or Wilfley type.

A steel trestle has just been completed as an approach to the mill. The distance from the top of rail on the receiving bins to the top of the rail beneath the bins for the finished product is 90 ft. The ore will be handled by gravity all through the mill. A dirt embankment, from 90 to 100 ft. high, about 2000 ft. long, and wide enough for double tracks, forms the approach to the steel trestle at the end of the mill. This is shown in the illustration, just back of the trestlework. The receiving bins have a capacity of 250 tons per unit. A pressure tank, 120 ft. high, will hold 100,000 gal. of water for milling purposes.

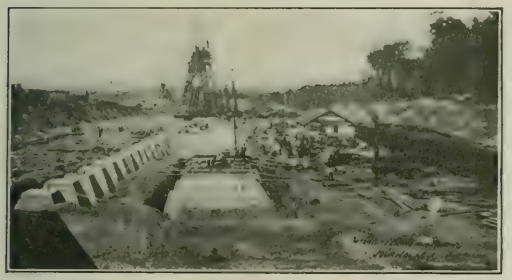


EXCAVATION FOR WASHING PLANT. CONCRETE FOUNDATIONS FOR MILL AT LEFT. FIRST SECTION OF 90-FOOT FILL AT RIGHT, SHOWING TRESTLE ABOUT 35 FEET HIGH. STEEL STRUCTURE BEGINS NEAR WHERE CABIN IS SHOWN. TAKEN MAY 15, 1909

The water is supplied by a 30-in. main from a pumping station on Trout lake. The intake is 48 in. in diameter, and extends into the lake 450 ft., making the total length of the pipe from the intake to the mill 6000 ft. Prescott pumps of the Mesaba type are used and have a capacity of 8,000,000 gal. per 24 hours. The mill is supplied with power from a steam plant of 1500-h.p. capacity. All the machinery in the mill will be operated by electricity.

Flow Sheet of Mill

The ore from the mine is brought to the mill in 50-ton, bottom-dump, steel cars on an up-grade of 1.75 to 2 per cent., and dumped into the receiving bins. From here it passes through the trommel, from which the oversize goes to a picking belt yielding two products, heads and tails. The undersize from the trommel passes into a settling tank where the surplus of slimes is drawn off and the ore passes from the bottom of the tank to the log washer. Instead of the regular type of washer with end water feed, the water is fed through the bottom of the first 6 ft. of the trough, which is inclined 1 in. per foot.



CONCRETE FOUNDATION FOR MILL; 90-FOOT STEEL TRESTLE APPROACH. AUG. 1, 1909

EXCAVATION FOR MILL FOUNDATION. BASE OF 90-FOOT FILL IN BACKGROUND. APRIL 15, 1909

The heads from the log washer go direct to the shipping bin. The tailings go to a settling tank and from this pass into the Oliver turbo. This turbo is built in 12 sections, each of which is 18 in. long and so arranged that the flow of water can be varied to suit the condition of the ore. The feed water enters through the bottom from each section. The turbo is similar to a double log washer, but turns much slower. Its principal difference is in the method of applying the feed water. The turbo is inclined 1 in. per foot. By varying the feed water the heads leave the turbo quite dry. This is one of the principal advantages of this machine.

The heads from the turbo go direct to the shipping bins while the tailings are sent to the concentrating tables where two products are made. The heads from the tables go to the same bins as the finished products from the log washer and turbo; the tailings are sent out as waste. It is possible that later a middle product will be made from nine tables on each side of the unit, and this sent to the tenth table for further concentration.

There are four loading tracks and ore from any bin may be loaded on each track. The tail tracks have a down-grade to the mill so the cars may be pinched out without the use of an engine. The capacity of the new mill will be approximately 500 tons per hour, and will be ready for operation in April, 1910. This is the first washing plant to be installed in the Mesabi district, and it marks the beginning of a new era in the mining industry, as ores that were heretofore considered worthless will now be made to yield a fair percentage of profit. I am indebted to J. C. Greenway, general superintendent, and to M. Curley and Charles Claypool for many of the above data and for the many courtesies shown me while at Coleraine.

The Technical Application of Titanium*

Titanium so far has found only one application; namely, coloring porcelain, artificial teeth, leather and textiles. Almost ten years ago an English firm made the first attempt to utilize titanium compounds for coloring purposes.

H. W. Kearns and Doctor Barness applied on Dec. 5, 1896, for letters patent on titanium compounds, tannic compounds and similar compounds for coloring vegetable fibers (cotton, linen, jute, etc.) in raw or manufactured state during any stage of manufacture. Experiments made by Dr. Franz Erben[1] proved that a fiber treated with a tanning compound as a mordant and then subjected to the action of titanium ammonium oxalate furnishes a saturated golden yellow color of great durability withstanding the action of boiling and washing. This coloring is preferable to that produced by chlorinated primalin and even the best sulphur colorings on the market. Dr. C. Dreher[2] is less enthusiastic concerning this tannin-titanium yellow in application to leather. However, Doctor Erben claims a favorable experience during nine years.

By the addition of small quantities of auranein G or O, acid orange or similar products the shades of yellow or orange can be modified at will. The tannin-titanium base allows the improvements of many other colorings as for instance, red green, blue, etc.

Introduction of Titanium into Metallurgical Processes

The man who did most for the introduction of titanium into metallurgical processes is Dr. Auguste J. Rossi. In his contribution to the *Iron Age*, Feb. 6 and 20, 1896, he summarizes his conclusions concerning titaniferous iron ores as follows: (1) These ores have been certainly smelted in Sweden for years without any difficulty. (2) Their metallurgical treatment for a certain number of years in England by Doctor Forbes, in a large furnace, has proved a perfect success. (3) Furnaces were run for years in the Adirondacks with these ores with excellent results. (4) The metal they yield, either as pig metal, iron or steel, possesses special valuable qualities. (5) These ores, which are found in large masses in many States of the Union, are almost invariably "bessemer ores," and as such it is asserted have been used in Pennsylvania furnaces with great advantage. (6) When containing very large percentages of titanic acid (as much as 38 to 40 per cent. and even 48.60 per cent., like the ilmenite of Canada), and consequently a very small amount of iron (32 to 35 per cent. or less), their treatment though perfectly successful metallurgically speaking, has not proved economical as to fuel. However, it would be more proper indeed to call an ore like the St. Urbain ore (Canada), which contains 48.6 per cent. of titanic acid, corresponding to 29.1 per cent. titanium and

*Abstract of an article by Isador Ladoff in *Journ. Ind. and Eng. Chem.*, September, 1909.

[1]*Chem Zeit* No. 14, 1905.

[2]Faerber Zeit. 8, 255, 1902

only 28.49 per cent. iron, a titanium ore than to call it an iron ore.

Doctor Forbes' treatment consists in adding to the titaniferous ores as fluxes, limestone and quartz or silica-bearing materials in such quantities to form, with the titanic acid, a compound reproducing approximately a natural mineral of titanium, known to be fusible at a moderate temperature (3 of scale of Dana), the sphene or titanite, a silico-titanate of lime, containing about 35 per cent. TiO_2, 25 to 33 per cent. lime and 28 to 35 per cent. silica. Doctor Rossi's method obviates the addition of silica, taxing the capacity of the furnace to excess. He introduces magnesia to a good amount into the slag by using a magnesia limestone, a dolomite. The alumina from the stone and ash of fuel and that generally present as principal basic constituent of these ores furnishes all the amount which is required to form the tribasic compound with the magnesia and lime of the stone and the titanic acid of the ore. In the same manner that magnesia introduced in certain proportions into an alumina lime silicate renders the latter more fluid and fusible, the addition of magnesia to a titano-silicate of lime and alumina considerably increases its fusibility and especially its fluidity.

Doctor Rossi ran in a very small furnace, with a blast at a temperature not over 250 or 300 deg. F. at the most, without any difficulty, slags of the following composition: SiO_2, 16.63; TiO_2, 34.66; CaO, 26.03; Al_2O_3, 7.26; MgO, 10.27; FeO, 7.12. Oxygen ratio 4.3 practically; actually 4.31. The ore smelted in that furnace contained only 1.5 to 2 per cent. silica or 20 per cent. titanic acid. The conclusions arrived at by Doctor Rossi are as follows: (1) Titanic acid can form definite compounds, perfectly fusible, if properly fluxed, containing as much as 35 to 50 per cent. of titanic acid, with alumina, lime and magnesia as bases, and admissible as slags, in blast-furnace work. Larger percentages still, such as 65 per cent., can enter into a compound, and it remains fusible. (2) In running a furnace under special conditions of temperature and pressure of blast, no troubles have been experienced from titanium deposits.

Smelting of Titaniferous Ores

That the smelting of titaniferous ores containing less than 20 per cent. titanic acid by means of an electric furnace is easier, than in an ordinary furnace, was proved by recent investigations, accounts of which were published in the technical literature.

Reference is here made to a case not yet published. In December, 1906, Prof. W. Borchers, of the Technische Hochschule [illegible], Germany, prepared a mixture of titaniferous iron sand of Java with lime and carbon, in proportions calculated to produce a scorification of the gangue during the reduction to iron. A resistance furnace was used and a direct current of about 500 amp., with a pressure of 50 to 60 volts, was applied. The fusion of the mineral proceeded with the greatest ease. At the expiration of 1½ hours after the operation was started the temperature of the fused mass in the furnace was found to be somewhat higher than 1900 deg. Centigrade.

After this operation the slag, which was quite fluid, was transferred to one crucible, while the metal was tapped into another crucible. A solid homogeneous ingot of metal weighing 1 kg., 620 grams, was obtained. The slag was black and had a vitreous fracture.

The analysis of the mineral was as follows: Silicon, 1.6 per cent.; aluminum, traces; protoxide of iron, 28.5 (Fe = 22.18); peroxide of iron, 49.95 (Fe = 34.97); oxide of manganese, 0.98; lime, 0.37; magnesia, 2.35; sulphuric acid, 0.69 (S = 0.027) phosphoric acid, 0.096 (P = 0.042); copper, 0.012; arsenic, 0.005; titanic acid, 16; loss on ignition, 0.068.

The analysis of the metal was as follows: Carbon, total, 3.05 per cent.; manganese, 1.52; sulphur, 0.01; phosphorus, 0.11; silicon, 0.37; iron, 94.94; total, 100.

There is, therefore, little doubt that titaniferous ores of less than 20 per cent. of titanic acid can be profitably smelted. All metallurgists agree that the qualities of the iron made from titaniferous ore and steel obtained from titanic pig metal are excellent. This fact gave Doctor Rossi the idea to use an alloy of iron and titanium made in the electric furnace as an improver of steel.

The addition of titanium to steel increases the transversal strength from 17 to 23 per cent. Bars 1 in. square, loaded at center, with 12 in. between supports, were used for transverse strength tests. For tensile tests round bars 1⅛ in. in diameter and from 18 to 24 in. long were used. The ferro-titanium added to the steel contained about 12 per cent. of titanium and from 6 to 8 per cent. carbon. About 1 lb. to every 100 lb. were added in small portions. There seems to be no advantage in using a ferro-titanium containing more than 25 per cent. titanium. Titanium also increases remarkably the elasticity of steel. The function of titanium in steel consists in its high affinity for oxygen and especially nitrogen.

At the Alaska Treadwell during the year ended May 30, 1909, the 300-stamp mill, operated by waterpower, lost 130 days 14 hours and 8 min., 369,149 tons were crushed. The 240-mill, operated both by steam and water power, lost only 15 days 12 hours and 7 min. and crushed 192,470 tons of ore.

Graphite in Germany

Graphite consumed in Germany is obtained in Bavaria and Bohemia, although Siberia and Ceylon supply the best grades. According to the report of U. S. Consul-General Robert P. Skinner, of Hamburg, covering this subject, Germany also imports graphite from the United States, Japan, China, Australia, Mexico, Great Britain, Italy, Sweden, Belgium and France. The last returns available show that the importations at Hamburg for 1907 amounted to 5421 tons, $608,183, of which 583 tons, $104,765, were from the United States.

The graphite marketed in Germany is graded into: Select, 78.14 per cent.; prime, 67.3; seconds, 54.1, and better grades less commonly. The average prices per 100 kg. (220 lb.) run: Bohemian, washed and finely ground, $2.50; pieces, $2.85; Ceylon, finely ground, $4.28; carefully cleaned, $28.56, and acid-cleaned, $69. Retort graphite, obtained from pig iron and retorts in gas works, is quoted on the average at: $4.82 per 100 kg. in pieces; $16.85, granulated, and $21.64, prepared.

Montana Tonopah Mining Company

The annual report of this company submitted to the stockholders, Sept. 14, is as follows: During the year ending Aug. 31 1909, there was mined and milled 41,692 tons of ore, which gave a net profit of $127,963. The entire indebtedness incurred in the construction of the 40-stamp mill has been liquidated and the company begins the new fiscal year with $42,979 in cash. The report shows a total of 8015 ft. of underground work done during the year. The stockholders empowered the the board of directors to proceed with the plan of segregating the mine and mill and to consider the advisability of adding another 20 stamps and treating the product of another company. It is also predicted that the increase in capacity will decrease the cost of milling about one dollar per ton.

In Mexico it is customary to yoke the oxen by the head, the yoke being firmly bound to the horns by leather thongs. This method, which differs from the American U-yoke, is decried by Americans, but those who have tried American methods in the Mexican field find that the animals do better work under the Mexican yoke. It seems to be cumbersome and inhumane, but nevertheless it has back of it the usage of centuries, and probably is more effective than the American yoke, all things considered. The Mexicans are past masters in the art of ox and mule transportation, and they have little to learn from the Americans who come to Mexico.

The Utilization of Atmospheric Nitrogen

Birkeland & Eyde and Schönherr Produce Gas Containing 2-Per Cent. NO. 250,000 H. P. Utilized in the Norwegian Air-Saltpeter Plant

BY A. BERNTHSEN*

Of the two chief constituents of the atmosphere, we have hitherto been accustomed to look upon oxygen as the fundamentally important element. We are compelled to breathe it in order to support life; it is indispensable to almost every process of heating and combustion, and in the form of oxides, salts and the like it constitutes nearly one-half of the earth's crust. Nitrogen, on the other hand, we regard as a gas which will not support combustion, and it is generally characterized by a great disinclination to enter into chemical reaction. In spite of this, however, compounds of nitrogen play such an important part in the nutrition of all living organisms, that the task of finding out and opening up new sources of nitrogen compounds has become one of the most interesting and pressing problems of the day.

Methods of Fixing Atmospheric Nitrogen

The different methods employed in the fixation of atmospheric nitrogen can be divided into three groups: First, the direct formation of ammonia from its elements, nitrogen and hydrogen, both of which have to be isolated for the purpose; second, those processes in which the nitrogen is isolated, and then converted into metallic nitrides and cyanogen compounds, which, in their turn, can be subjected to chemical reaction, and lead to the production of ammonia; and, third, methods which aim at the direct oxidation of atmospheric nitrogen, and the conversion thereof into nitrates and the like. In this last case the air itself is used directly, and a previous isolation of the nitrogen is unnecessary.,

It is not difficult nowadays to obtain nitrogen from the air; several methods can be employed on a large scale. One method consists in passing the air over red-hot copper, which retains the oxygen, forming copper oxide. This latter has to be reduced again by passing generator gas over it, and it is then able to absorb a fresh quantity of oxygen from the air. An alternative method consists in liquefying air according to Linde's process, and then separating the nitrogen from the oxygen by fractional distillation. Such processes, however, always increase the cost of the total operation. Hydrogen can also be obtained without great difficulty, since it results as a by-product, for instance, during the electrolysis of potassium and sodium chloride, but here again its cost depends upon the price which can be obtained for the other products of the electrolysis, namely, chlorine and the alkali.

Considering the direct combination of nitrogen and hydrogen, we are at once met by great difficulties, since, at the high temperature at which the combination takes place, the reverse reaction also sets in, and the ammonia formed is to a great extent decomposed back again into its elements. Consequently only a small fraction of the gases can be converted into ammonia, while the rest remains unchanged.

Second Group of Methods

The second group of methods of fixing atmospheric nitrogen depends on the property of nitrogen of combining with certain metals to form nitrides, or with metals and carbon to form cyanogen compounds, either simple or complicated. These nitrides and cyanogen compounds are then made to undergo a further chemical reaction, produce ammonia and metallic oxides and carbonic acid or other carbon derivatives. These methods consequently bring about an indirect synthesis of ammonia from its elements. The intermediate products formed during the reaction are sometimes of such importance that they are manufactured in this manner, without being finally worked up for ammonia. This is particularly true of the cyanides, especially potassium cyanide, which is used in great quantities in the extraction of gold from its ores.

Frank, in Berlin, and Nikodemus Caro, in Lodz, working in collaboration with Rothe, in Hamburg, noticed that when nitrogen was made to react with carbon and barium carbonate or with barium carbide, some barium cyanide was formed, but at the same time large quantities of another body were obtained, which differed from barium cyanide in containing a smaller proportion of carbon. This body is barium cyanamide. The matter was then taken up by the Cyanid-Gesellschaft, which was formed for this purpose by Siemens & Halske, the Deutsche Gold- und Silber-Scheide-Anstalt and Dr. Frank Pfleger had suggested that the barium carbide be replaced by calcium carbide, which can be so easily obtained by heating lime and charcoal in an electric furnace. On carrying out this suggestion, a raw product was obtained that contained no calcium cyanide at all, but consisted chiefly of calcium cyanamide, mixed with graphitic carbon; it contained lime and carbon as impurities, was black in appearance and had an unpleasant odor, but the chief point was that it contained 20 per cent. of fixed nitrogen. The preliminary production of calcium carbide was subsequently found to be unnecessary, a mixture of lime and carbon being substituted. The product is now generally known by the name "Kalkstickstoff" or nitrolime. A similar product, "Stickstoffkalk," was obtained by Polszenius by carrying out the process in the presence of small quantities of calcium chloride, which had the effect of causing the reaction to take place at a lower temperature. Certain other salts possess a similar influence.

The cyanamides, on being treated with superheated steam, are split up with the formation of ammonia, and so this constitutes another process for the indirect synthesis of this compound. Kalkstickstoff or nitrolime has other uses. After being applied to the ground as a manure it is acted upon by bacteria and the like, giving rise to ammonia, and consequently must be applied to the soil before the seed is sown. According to published researches it can only be used on heavy absorbent soils. It also produces different effects on the various classes of plants, and Wagner has come to the conclusion that the farmer should not pay for the nitrogen contained therein, more than 80 per cent. of the price paid for an equal weight of nitrogen in the shape of Chile saltpeter, or in the saltpeter obtained from the air.

Great hopes have been laid on the further development of these processes, and an industrious agitation has led to quite a number of companies being floated; most of the factories though are still in the state of construction. It is interesting to learn that at Piano d'Orta, at the first nitrolime factory erected, a plant has has already been put down for converting it into ammonium sulphate, instead of using it as manure, and, according to recent reports, other works are following this example.

Third Method of Combining Nitrogen

The third method of bringing nitrogen into a state of combination, suitable for use on a practical scale, consists of converting it by direct oxidation into oxides of nitrogen, which are then transformed into

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NOTE—Abstract of an address delivered at the Seventh International Congress of Applied Chemistry, London, 1909, from *Journ. Ind. and Eng. Chem.*, p. 466, July, 1909.

nitric acid and nitrates. Although, as mentioned before, nitrogen shows little tendency to enter into chemical reaction, it can, under certain conditions, be made to combine with oxygen. The first compound formed is nitric oxide, NO, a colorless gas. On mixing it with oxygen or air, it assumes a yellowish red color, owing to the formation of a higher oxide of nitrogen, which is termed nitrogen tetroxide, or nitrogen peroxide, and which possesses a constitution corresponding to the formulas NO_2 or N_2O_4. This is then converted into nitric acid, or into some other form suitable for practical purposes.

The direct combination of nitrogen and oxygen is brought about by means of high temperature, but the degree of combination is limited by the fact that the same temperature which brings about the formation of nitric oxide also tends to decompose it back again into its components. Only at a temperature under 1200 deg. C. is nitric oxide stable against the action of heat, but, at this temperature the amount formed is exceedingly small. Even at 1500 deg. C., only 1/10 per cent. of the nitrogen in the air is converted into nitric oxide, and a very much higher temperature is necessary to bring about a reasonable degree of oxidation. Muthmann and Hofer, and especially Nernst and his pupils, have found that at a temperature of 2200 deg. C. the gases contain 1 per cent. of nitric oxide, at 2571 deg. C. they contain 2 per cent., at 2854 deg. C. they contain 3 per cent., and at 3327 deg. C. they contain 5 per cent. The equilibrium constant is given by the equation

$$K = \frac{C^2_{NO}}{C_{O_2} . C_{N_2}}.$$

From the figures just quoted, it is apparent that, in order to be able to work profitably, the air must be heated to as high a temperature as possible, and then cooled down again with the utmost rapidity, so that as little opportunity as possible is given, for the nitric oxide, formed at the high temperature, to decompose back again into its elements.

Function Performed by Electricity

It is generally accepted that electricity brings about the reaction by means of the high temperature produced, but on the other hand, it is possible that it exercises also a specific electrical action on the gases, for we know that nitric oxide is produced from its elements by the action of silent discharges, as well as by the action of spark discharges and electric arcs. All efforts in this field have been applied to the production of series of sparks of electric arcs, and during the last decade, an intense activity has been developed, both in the laboratory and also on the practical scale.

Bradley and Lovejoy Operation

One class of scientists started by assuming that in order to use up the electrical energy to the best advantage, it should be distributed over a large number of small sparks or arcs. Bradley and Lovejoy founded their process on this assumption, and the Atmospheric Products Company was floated toward the end of last century, with a capital of one million dollars, and carried out their process at Niagara, making use of power obtained from the falls. They employed iron cylinders about 4½ ft. high and 4 ft. in diameter. In the axis of each of these a steel shaft rotated, containing, mounted one above the other, 23 zones of electrode arms, each zone containing 6 arms, and each arm being provided with a platinum sparkling terminal. The wall of the iron cylinder formed the other electrode, and was provided with a similar number of platinum terminals or poles, situated opposite to the terminals of the rotatable electrode. When the shaft was put into motion, the electrode poles, attached to the ends of the arms, came within sparking distance of the poles on the cylinder, and sparks sprang across from one pole to the other. As the motion of the shaft continued, the electrode poles were separated from one another, and the arc was drawn out and finally snapped, only to be formed again as soon as the next pair of poles came within sparkling distance of each other. A direct current of 10,000 volts was employed and no fewer than 414,000 arcs or sparks were formed and extinguished every minute. Air was passed through the cylinder. According to Muthmann, the yield amounted to 430 kg. saltpeter per kilowatt-year, a small yield, which, coupled with the complexity of the apparatus as well as its initial expense and the expense of keeping it in order, sufficed to prevent the process being worked at a profit.

Birkeland and Eyde Process

The first practical success in this direction was obtained in 1903 by Prof. Kristian Birkeland in Christiania, who worked in collaboration with the Norwegian engineer, Samuel Eyde. It was already known that if an electric arc, fed with an alternating current, be made to burn between the poles of an ordinary magnet, or of an electromagnet which is excited by a direct current, the arc assumes the form of a disk. More correctly, the arc is blown into a half disk at every half period, but the impression on the eye is that of a quietly burning disk, like the sun. Birkeland and Eyde inclosed this in a flat iron-clad furnace of fireproof clay, and passed a strong current of air through it, and they thus obtained considerable yields of oxides of nitrogen.

Since their first experiments, the furnaces have gradually been increased in size, until those now used are so large that each of them is fed with 700 kw. at a tension of 5000 volts, and the disk of flame is over 2 yd. in diameter. Each furnaces uses up nearly 1000 h.p., that is, 100 times as much as those of the Atmospheric Products Company. The utilization of this large quantity of electricity in a single discharge constitutes the great difference between Birkeland and Eyde's process, and those of the earlier experimenters.

Method of Otto Schönherr

The great importance attaching to the possibility of fixation of atmospheric nitrogen had, several years before that time, been recognized in the Badische Anilin- u. Soda-Fabrik, and special attention was paid to this new problem. As the result, Otto Schönherr succeeded, in 1905, in discovering, and with the assistance of the engineer Hessberger, working out a process of producing an electric arc, and was thus enabled to solve the problem in a surprisingly simple manner, presenting considerable advantages over the method of Birkeland and Eyde. It is not a mere modification of their process, as has sometimes been falsely assumed, but differs fundamentally from it. Schönherr dispenses entirely with magnets and magnetic fields, and produces his arc inside an iron tube of comparatively small diameter, at the same time passing the air through the tube, and thus bringing it into contact with the arc.

The manner in which the arc is developed is in itself very peculiar and interesting. The iron tube, or arc tube, contains an insulated electrode at one end, and can itself serve as the second electrode. The arc, at its formation, springs from the insulated electrode to an adjacent part of the arc tube which is only a few millimeters away, but the air, which is passing through the tube, being preferably introduced with a tangential or rotary motion, immediately carries the end of the arc along the wall of the tube, so that it either enters the tube at a considerable distance from the electrode, or it ends on a special electrode placed for the purpose, say, at the other end of the arc tube. A column of flame is obtained, burning quietly in the axis of the tube, and surrounded by the air which is being passed through the tube. The arc emits an intense light, and is quite stable. The air passing through the tube comes into contact with the arc, becomes partially converted into nitric oxide, and is then rapidly cooled down by contact with the outside layers of air, and consequently a decomposition back again to nitrogen and oxygen is avoided. The cooling action is still further increased by surrounding the upper end of the arc tube with running water, after the manner of the Liebig condenser. The gases leaving the tube contain about 2 per cent. of nitric oxide, that is, from one and a half times to nearly twice as concentrated as the gases which Birkeland and Eyde produce.

The method of introducing the air can be subjected to many variations.

With the aid of Schönherr's invention, it is possible to send extraordinarily large quantities of electrical energy through a single tube. The experimental furnaces at Christiansand are fed with about 600 h.p. at 4200 volts, and although it appears possible to build furnaces which could consume 2000 h.p., those regularly used will probably be built for 1000 h.p. These furnaces require about 40,000 cu. ft. of air every hour, and the arcs produced are nearly 8 yd. long.

Construction of Schönherr Apparatus

In the furnace on the large scale, the air passes into the arc tube through a number of tangentially bored holes in the part of the tube surrounding the electrode, and over these holes is an iron ring or cylinder, which can be moved from the outside by means of a lever, so that any desired number of the holes can be closed, and the strength of the rotary motion of the air regulated; this in turn assists in regulating the length of the arc. The insulated electrode can be cooled by means of water or air, and it is also provided with a central hollow space through which passes an iron rod. The arc actually springs from this iron rod, and as it burns or volatilizes away, it can be pushed forward by a simple arrangement; the rate of burning, however, is very slow. An ignition lever, or other simple arrangement, is provided so that the arc can be started afresh, if necessary. The furnace itself is connected electrically to earth, so that any part of the apparatus, with the exception of the insulated electrode, can be handled with impunity. The gases which leave the arc tube pass down a channel lined with brick, and concentrically surrounding the inner parts of the furnace. They are thus made to give up a portion of their heat to the air which is entering the furnace, and which is subsequently passed through the arc tube, thereby raising it to a fairly high temperature. This apparatus is extremely simple and durable; ordinary iron tubes are employed; there are no movable parts and no expensive electromagnets, and the manufacture runs smoothly without interruptions.

Though in this process there is very little loss of electrical energy in producing the arc, yet only a few per cent. of the energy serve to bring about chemical reaction; the rest is converted into heat. This latter, however, is not by any means wasted; 30 per cent. of it is employed producing hot water, 40 per cent. heats the boilers, 10 per cent. has to be removed by cooling, and only 17 per cent. is lost by radiation. The evaporation of the calcium nitrate solutions obtained is carried out solely by the heat generated in the arc. Another process worked by Pauling and utilized near Innsbruck by the Salpetersäure-Industrie-Gesellschaft of Gelsenkirchen depends on the use of divergent electrodes. From the data given by the author the process is inferior to the Badische process.

Commercial Features of Process

After the nitrogen has been converted into nitric oxide, according to any of the processes referred to, the actual combustion of the nitrogen is completed, but on cooling the reaction gases, as soon as the temperature reaches a certain point lying at about 600 deg. C., the nitric oxide begins to combine with the excess of oxygen, forming nitrogen tetroxide. The oxidation does not go past this stage of its own accord.

The next task is to bring these oxides of nitrogen into a marketable state, that is, either into the form of nitric acid, nitrates, or nitrites; also nitrogen tetroxide as such will be capable of isolation.

Up to the present time both nitric acid and nitrites have been manufactured from saltpeter by chemical reaction, nitric acid being produced by heating saltpeter with concentrated sulphuric acid, while nitrites result on heating sodium nitrate with metallic lead, which extracts one atom of oxygen, and is itself converted into lead oxide. Both nitric acid and nitrites are consequently more expensive than saltpeter. Nitrogen in concentrated nitric acid is two and a half times, and that in nitrites is one and a half times as valuable as nitrate-nitrogen.

Acid Absorption Process

It would, therefore, be more profitable to make nitric acid and nitrites, provided the consumption of these compounds were sufficiently great; but since the demand is limited, the chief aim of every large factory is to convert the supply of nitrogen into the form of saltpeter, for which there is an unlimited market. Before the nitrogen tetroxide contained in the furnace gases, after they have been cooled, is capable of yielding nitric acid, it requires to be combined with a further atom of oxygen, and this combination is generally brought about by the action of water. The gases are passed through an absorption tower down which water is trickling, and during the reaction which takes place, two-thirds of the nitrogen is converted into nitric acid, while one-third is regenerated as nitric oxide, which combines again with the excess of oxygen present in the gases forming nitrogen tetroxide, and this goes through the same course of reactions again. This constitutes the so-called acid-absorption process. The absorbing liquid can be run down the tower several times, each time becoming richer in nitric acid, until a 40 per cent. acid is obtained. (This must be further concentrated before it is marketable.) On neutralizing this acid with soda, a concentrated solution of sodium nitrate is obtained, and can be evaporated until the solid salt crystallizes out. On a practical scale, however, ordinary limestone is employed instead of soda, and calcium nitrate is obtained. This is at least as valuable as sodium nitrate for manuring purposes, and is consequently isolated as such, and brought on the market under the name of Norwegian or air-saltpeter.

Other Conversion Methods

Nitrates can be obtained directly from the furnace gases, by employing sodium carbonate or milk of lime as the absorbing agent, and at the same time maintaining the temperature and other conditions, such that, during the absorption, the gases contain equal quantities of nitrogen tetroxide and unaltered nitric oxide. According to this process, the Badische Anilin- u. Soda-Fabrik manufacture, at Christiansand, the sodium nitrite they require in their dye factory at Ludwigshafen.

Finally, if the reaction gases be cooled down to a temperature considerably below zero, nitrogen tetroxide separates out as a liquid, or, if the temperature be sufficiently low, it can even be obtained in the solid state, like ice of snow. Should the gases contain moisture, more or less dilute nitric acid is produced, the quantity depending on the amount of water present.

A further method of working up the furnace gases consists in passing them over quicklime. Halvorsen carried out this process at ordinary temperature, while Schloesing obtained better results by working at a raised temperature. The latter employs briquets of quicklime, prepared by molding slacked lime into the required shape, and then reheating it, and he places these briquets in iron vessels, and heats them on the counter-current principle, by means of the furnace gases, to from 300 to 350 deg. The final product of absorption contains dry calcium nitrate in admixture with free lime, and some calcium nitrate.

The absorption at Notodden is at present carried out according to the acid process; the first product is dilute nitric acid, which is subsequently converted into calcium nitrate. In order to recover the oxides of nitrogen which remain unabsorbed, the gases are finally treated with milk of lime or soda, and give rise either to a mixture of nitrate and nitrate, or to pure nitrite. More recent experiments at the Badische Anilin- u. Soda-Fabrik have shown the possibility of effecting the absorption directly with milk of lime, and, in this case, the acid absorption would be dispensed with and the initial outlay on plant greatly reduced.

Utility of Product

The calcium nitrate, obtained by means of the operations described, can, without further treatment, replace Chile saltpeter for the purposes of agriculture. Even a certain quantity of free lime, say 20 per

cent., appears to have no deleterious action on vegetable life, and the same remark applies to any calcium nitrite mixed with the nitrate. It is conceivable that calcium nitrite will become the artificial manure of the future, especially as its manufacture is so simple, and it is richer in nitrogen than calcium nitrate (it contains 21.2 per cent. of nitrogen). It possesses the further advantage of being less hygroscopic than calcium nitrate.

Plants in Construction and Operation

Both the process of the Badische Anilin- u. Soda-Fabrik and of Birkeland and Eyde require cheap water power, before they can be carried out profitably. The waterfalls in Norway, which, owing to the climate, have a fairly constant supply throughout the year, are particularly suitable. The Badische Anilin- u. Soda-Fabrik secured the right of using several falls there, and commenced by putting down an experimental plant at Fiskaa near Christiansand, A few thousand horsepower were available, and manufacture was started in the autumn of 1907.

In the meantime the Norsk Hydro Elektrisk Kvaelstof-Aktieselskab, that is, the Norwegian-French Company founded by Birkeland and Eyde, has commenced building a factory at Notodden to use up 30,000 h.p. Finally, toward the end of 1906, the Badische Anilin- u. Soda-Fabrik and its two allied firms, the Farbenfabriken vorm. Friedr. Bayer & Co., of Elberfeld, and the Actiengesellschaft fur Anilinfabrikation, in Berlin, on the one side, and the Norwegian-French concern on the other side, combined forces and floated two new Norwegian companies. These were: (1) A power company with a capital of 16,000,000 kronen, whose duty it is to develop and bring into harness further Norwegian waterfalls, and (2) the Norsk Salpeterverker with a capital of 18,000,000 kronen, which is concerned in building and running Norwegian saltpeter factories, making use of the power supplied by the first company. The two parties have come to an arrangement as to the exploitation of their patents outside Norway, and the granting of licenses lies in the hands of the Badische Anilin- u. Soda-Fabrik. The works at Christiansand and Notodden remain the special property of the original owners.

The first large factory erected by the new Norwegian companies will be situated in the interior of Telemarken on the Rjukan, one of those immense waterfalls in Norway. The total fall of 1820 ft. is divided into two steps, and, with a flow of about 11,000 gal. of water per sec., is capable of yielding a quarter of a million horsepower. The upper fall is now being developed, and with 10 turbines will provide about 140,000 h.p. It is expected that the factory will start running in about two years' time. The saltpeter will be carried along 29 miles of standard gaged railway, and by a ferry along Lake Tin, which is 25 miles in length, until it reaches Notodden, from here it will be transported via Skien to the sea. At present, the Norsk Hydro Kvaelstof-Aktieselskab is using up 30,000 h.p. at its factory at Notodden, where 35 of Birkeland's furnaces have been erected, and, at the present time, an experimental plant on the system of the Badische Anilin- u. Soda-Fabrik is being constructed there, in order to determine which type and size of furnace is most suitable for erection at Rjukan. Water power on the Matre and on the Tin in West Norway have been acquired, and will be held in reserve for future use.

In Germany, the water power suitable for the production of saltpeter is very limited. In South Bavaria, the Alz is able to supply sufficient power for a moderately large factory, and negotiations have already taken place with the Bavarian government, with regard to a scheme for the production of 50,000 h.p., and the erection of a factory near Burghausen. Negotiations have also been going on for some time with a view to the introduction of the manufacture into this country, but here also suitable water power is hard to find.

Nitrolime or Air Saltpeter

The production of air-saltpeter requires, it addition to electrical power, only the very cheapest materials, namely, water and limestone, whereas, in order to produce nitrolime, coal has to be employed, and, in addition, the nitrogen used in the process cannot be taken in the form of air, but first must be separated from the oxygen. Moreover, there are other points in favor of the production of air-saltpeter. Not only has the nitrogen contained in it a higher value than that in ammonium sulphate, or in nitrolime, but, by the oxidation of nitrogen, the nitric acid, nitrates and nitrites which are so indispensable in the chemical industry are obtained. These compounds have a higher value than air-saltpeter, the nitrogen in nitric acid being worth more than twice as much as that in ammonia. The prospects of a profitable conversion into nitric acid, of the ammonia obtained from nitrolime, appear very doubtful.

Another factor which must not be underestimated when considering the advantages of the new air-saltpeter industry, is its non-participation in the destruction of the valuable coal deposits, which have been stored up for us during such countless ages. It obtains the power it requires from water, or as it has been fancifully termed, "white coal," which can be employed over and over again without being exhausted. It is significant, too, that for this industry the larger the waterfalls the greater is their usefulness.

We have consequently every reason, from such different points of view as those of the agriculturist, the industrial chemist, and the whole of mankind, to hope that the new process for the combustion of nitrogen will continue to develop and flourish.

Sand Lime Brick

According to the U. S. Geological Survey, the sand-lime brick industry is a comparatively new one in the United States, having had its beginning in Michigan City, Ind., in 1901. Its progress was slow at first, the value of the production in 1903 being only $155,040. From that time the value increased each year until 1907, when the maximum of $1,225,769 was reached. In common with other building materials there was a decrease in 1908 in the production of sand-lime brick to $961,226. The number of plants reporting made a rapid growth from 16 in 1903 to 94 in 1907, with a slight decrease in 1908 (to 87).

Common, front, and fancy brick were manufactured from sand and lime in 1908. The average price per 1000 for common brick was $6.63, as against $6.61 in 1907, and $6.71 in 1906; for front brick the price was $12.16, against $10.96 in 1907 and $10.42 in 1906. In 1908 common brick composed 83.57 per cent. of the value of all bricks and front brick 15.37 per cent.

Thirty States reported both in 1907 and 1908, Alabama dropping out of the list in 1908 and Montana appearing. Of the individual States Michigan, as in 1907, was the leading State in 1908, reporting bricks valued at $138,809. Florida was second in both years.

Transvaal Gold Returns

At the beginning of August there were 72 mines and mills operating in the Transvaal, the mills reporting a total of 9620 stamps. The gold production for August and the eight months ended Aug. 31 was, in ounces:

	1908.	1909.	Changes.
August.....	587,913	611,637	I. 33,724
Eight months	4,572,225	4,869,889	I 296,764
Eight months Value.....	$94,507,891	$100,642,003	I. $6,134,112

The increase for the eight months was 6.5 per cent. The labor return shows that on Aug. 31 there were 146,921 negroes and 5361 Chinamen employed; a decrease of 2553 negroes and 9 Chinamen, as compared with July 31. As compared with August, 1908, there was an increase of 14,582 negroes and a decrease of 7052 Chinamen.

At the Carn Brea & Tincroft mines, according to the directors' report just published, total costs per ton of ore mined have been reduced, during the half year ended June 30, 1909, from 23s. 2.81d. to 22s. 5.13d. During this period 2035 tons more of lode material were raised and treated than during the preceding half year; the material mined produced 34.55 lb. tin per ton of ore.

The Central Zinc Company

The works of the Central Zinc Company (a subsidiary of the Sulphide Corporation), recently erected at Seaton Carew, near West Hartlepool, on the northeast coast of England, were described in *Engineering*, Jan. 29, 1909, of which the following is an abstract. The works are laid out for a capacity to smelt about 35,000 tons of blende per annum, producing 10,000 to 12,000 tons of spelter. A general plan of the works is shown in Fig. 1.

The works are designed to recover sulphuric acid. The distillation furnaces are of the recuperative type.

The pottery is 315 ft. by 55 ft. 9 in., inside. At one end it has two rooms, the full width of the building and 50 ft. long, which contain the clay-crushing and molding machinery. The bottom floor of the remainder of the building is left open, and waste gases from the distillation furnaces are carried through flues underneath, so as to dry the clay which is stacked above. The upper floor of the building is divided into 15 rooms, heated by steam for drying the retorts. A corridor runs the entire length of the building in front of the drying room. A cross passage leads over a bridge to the distillation-furnace houses. The upper floor of the pottery is constructed of reinforced concrete, and is equipped with a tramway of 2-ft. gage. The building itself is a steel-panel structure, the walls and partitions being constructed of hollow concrete blocks. The blocks for the outer walls are 10 in. thick, 32 in. long and 9 in. deep, with a 3½-in. air space. The blocks for the partition walls are 4½ in. thick by 32 in. long by

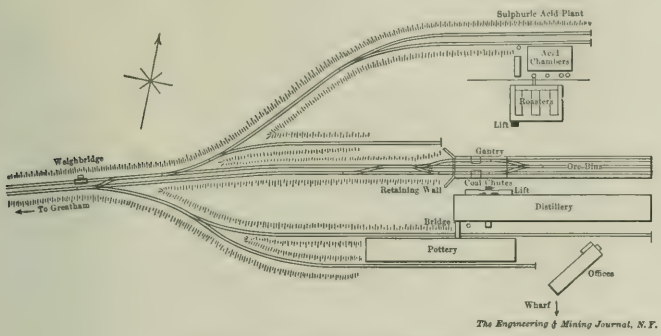


FIG. 1. GENERAL PLAN OF WORKS

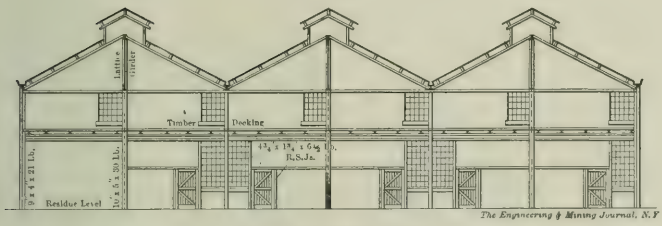


FIG. 2. ROASTING HOUSE

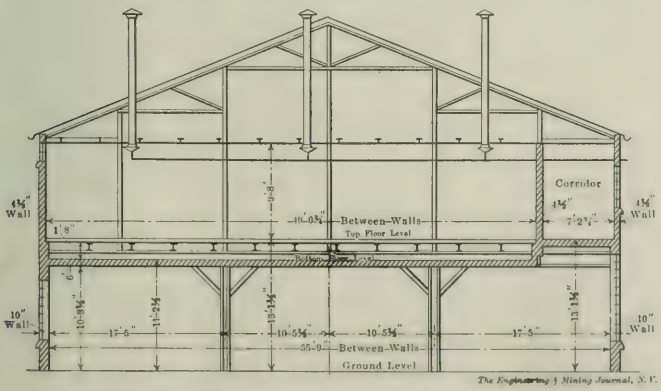


FIG. 3. DISTILLATION BUILDING

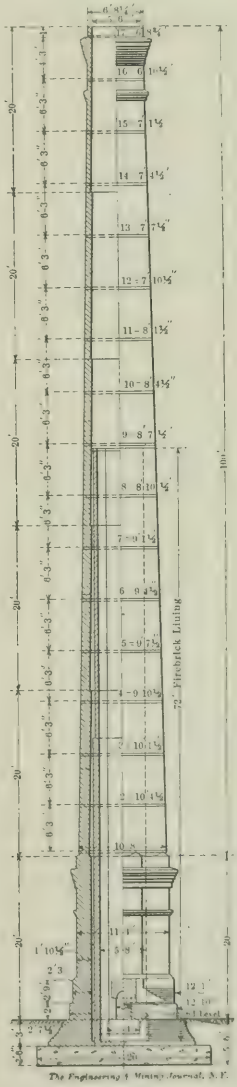


FIG. 4. CUSTODIS CHIMNEY

9 in. deep, with an air space 1½ in. wide.

The floors of the drying room are double, i.e., above the reinforced concrete a second floor of timber grids is laid. The steam-heating pipes pass between these floors. Each room is 47 ft. long and 17 ft. wide, and when full contains 300 to 400 retorts. There are ventilating holes in the bottom floor and in the roof which enable the circulation of air to be controlled properly.

The roasting furnace is a steel-panel structure 105 ft. long by 76 ft. wide, the walls of this building being hollow concrete blocks 4½ in. thick. This building is shown in sectional elevation in Fig. 2. The roof is laid with boards, over which rubberoid is placed.

The distillation-furnace building is a steel frame, 414 ft. long by 56 ft. 6 in. wide, covered with galvanized corrugated iron. It is designed in the modern way with upper floor for the service of the furnaces. This floor is built of reinforced concrete.

Tin Deposits of the Transvaal

SPECIAL CORRESPONDENCE

The Transvaal geological survey has just issued a valuable report on the Transvaal tinfields. From the mining point of view the most interesting part is the chapter by the inspector of mines for the Pretoria district on the economic possibilities of the various prospects referred to in it.

The Potgietersrust tinfield is the only one from which any quantity of tin has yet been produced. The tin ore now mined here is of high grade, but occurs in the form of peculiar cylindrical pipes or chimneys in granite, in which it is found expensive to work. These occurrences range over five farms, namely, from south to north, Solomonstempel, Sterkwater, Roodepoort, Groenfontein and Zaaiplaats. The first and last of these belong to two companies named after the farms. Of the former the government inspector of mines has a poor opinion, and states that the "ore chimneys have died out or become impoverished." In view of the small amount of prospecting that has been done there his condemnation seems altogether too sweeping. Zaaiplaats has proved the best of the line. The remaining farms belong to and are being worked by the Transvaal Consolidated Lands, Ltd., and are spoken of well.

The most promising tinfield, however, is the Rooiberg, but the inspector of mines practically contents himself with a description of the plant and gives no clue as to what its possibilities are.

The Rooiberg, or Red hills, lie some 40 miles west of the village of Warmbaths. The owners of the tin claim of that name are exploiting five different tin-bearing fissures in the quartzites and have opened up a mine to a depth of 300 ft. vertically. A large amount of development work has been done, and about 50 tons of black tin per month are being produced. The ore-bearing fissures have in many cases been worked by the ancients, and tin prospectors are reminded that until quite recently these were not recognized as tin deposits and were neglected under the impression that they were iron deposits, though they possess all the characteristic features of tin deposits. In one of the several types of lode in this area rich tin ore was found parallel to the bedding planes of the wall rock; but it is from the poorer and more regularly defined lodes that a steady production of tin is looked for.

Not far off is the Weynek tin mine. The ore here occurs in two small parallel veins in quartzite, filled with crushed lode matter and carrying varying amounts of tin. They are about 18 in. wide, show for a considerable distance on the strike, and have been largely worked by the ancients—as they are termed in the report, probably incorrectly—who have extracted quantities of the softer and richer portions of the tin ore. The present owners are concentrating their work upon one of the tin-bearing veins and have sunk an inclined shaft to a depth of 400 ft. in the orebody. A reduction plant is in full swing, and about 75 tons of tin have been produced. "It is fortunate that the capital of the company is small, as the property is of limited extent and low grade," says the report.

At Doornhoek, worked by the South African Tin Company, the tin occurs in fissures in shales which have been filled with brecciated shale and fine-grained tourmaline rock, and show signs of permanency on both strike and dips. "In my opinion," says the inspector, "the payable ore is at present confined to the eastern portion of the property where a large amount of development has disclosed some good runs of tin-bearing rock. The best and eastern portion of the property has been opened up to a depth of 200 ft. and, generally speaking, it would appear that as a low-grade proposition, the property has considerable possibilities.

A first-class reduction plant is in course of construction and ought to be producing tin in a few weeks. The adjoining farm Kromkloof has similar tin-bearing fissures in the shales; the ore contents, however, have so far proved poor and the property has been closed down for some time. Work is to be started in the lower levels again shortly.

The Bischoff company reports a large area of payable tin-bearing alluvial ground on its farm Zwartkloof, which want of water has hitherto prevented it from working. Now that the construction of a large dam has been sanctioned, this area should be thoroughly tested during the next 12 months. A full and extensive report upon this alluvial area was made by two well known engineers some time ago, their opinion being that the venture given water, was a highly payable one. It would be absurd for anyone to criticize the Bischoff alluvial report without taking the same time and pains in testing that the company's engineers devoted to the work and, until the water test is applied, their opinions must be accepted as correct. Speaking generally, the Transvaal has not yet discovered any first-class alluvial propositions, deep alluvial deposits over large areas being rather exceptional and values being seldom evenly distributed enough to support large companies.

About six miles from the Bischoff property and close to Warmbaths, a large alluvial tin deposit was reported some time ago on the flats along the Plat river. Investigations showed that the alluvial deposit was of exceptional depth and extent, but beyond small quantities of iron derived from the surrounding formations no other minerals were discovered.

A certain amount of so-called alluvial tin has been obtained in the vicinity of the rich orebodies at Potgietersrust but the mineral is directly derived from the disintegration of the rich pipes and has not traveled any distance.

The tin industry is comparatively new in the Transvaal, and it has taken and will take some time for the ordinary prospector to accustom himself to the work of efficiently testing all classes of Transvaal tin-bearing formation. In the granites the mineral is usually easy to determine by the naked eye and in the pan, but even in this class of rock varieties of ironstone are apt to be mistaken for tin. In the felsites, shales and quartzites the tin is often very finely divided indeed, and prospectors, unless they have an intimate acquaintance with the vanning shovel, may easily overload it, or considerably underestimte the actual value of a particular ore.

The inspector of mines includes his report as follows: "In my opinion we have no tin property at present that will support the enormous capital usually placed on the shoulders of a new mining industry, but we will obtain comparatively small quantities of metal from a number of working mines if they are given fair chances."

As a matter of Pacific coast history, it may be mentioned that the first application for a patent for a mine under the act of July 26, 1866, was for the Penon Blanco mine two miles north of Coulterville, Mariposa county, Cal. That act was the first passed in the United States relating to mining and was the predecessor of the present law of May 10, 1872. Another historical fact in connection with California is that in Jameson's *Mineralogy*, published in Edinburgh in 1816, it is stated on the authority of Humboldt that "on the coast of California there is a plain of 14 leagues in extent, covered with an alluvial deposit, in which lumps of gold are dispersed."

Death from Electric Shock at Clifton Colliery

By Sydney F. Walker*

Unfortunately a good many deaths have occurred in collieries in the United Kingdom, from electric shock, and a large proportion of them have been at the face of the coal, in connection with electrically driven coal-cutting machines. In all cases the accident has occurred through the failure of the insulation of some part of the machine, or of the trailing cable. The electrically driven coal-cutting machine presents the most difficult problem that, to my mind, the electrical engineer has to deal with. For safety he requires space, and space cannot be allowed him at the face. For efficiency also he requires weight, and the lighter the machine the more suitable it is for working at the face.

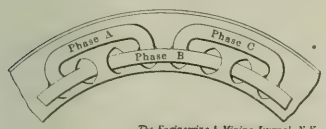


FIG. 1. SHOWING HOW THE WIRES ON THE STATOR COILS OF A THREE-PHASE MOTOR CROSS, AND THE DIFFICULTY OF INSULATING THEM WHERE THEY CROSS

Putting aside for the moment the question of efficiency, the matter of space for insulation is of the greatest importance, and it is not easily provided. In coal-cutting machines driven by continuous-current electric motors, space must be found for the starting resistance and switch, and it is, therefore, of considerable advantage to employ three-phase motors, providing that the squirrel-cage form of rotor is used, with which no starting resistance is required. To enable the squirrel-cage rotor to be used, however, a certain amount of efficiency has to be sacrificed, but the additional security is certainly well worth the sacrifice

The Insulation of the Wires

Under the best conditions, however, the matter of the insulation of the wires is a difficult one. The stator windings of the three-phase motor must be connected directly to the electrical service, and the full pressure of the service, whatever it may be, usually 500 volts or so, must be present in the stator coils. Hence, if one of the coils is connected with the frame of the machine, the machine itself becomes part of the electrical service, and will give anyone a shock who touches it, unless special arrangements are made to prevent it.

The insulation of the stator coils is also difficult, on account of the space available. A study of any diagram of a three-phase motor will show one of the reasons of the difficulties of insulation. There are three distinct sets of coils of wire on the inside of the containing cylinder of the motor, each set of coils receiving currents of the same pressure, but quite independently of each other, and the working of the motor depends upon the three sets of coils being carefully insulated from each other. As will be seen from the diagram, Fig. 1, the coils are obliged to overlap each other at the ends of the containing cylinder, and it is there that space is required for insulation. Further, in the construction of the stator, if a small bur is left in one of the channels in which the wires are laid, the vibration of the machine will gradually cause the bur to wear through the insulation, and connect that coil with the electrical service.

Another point where difficulties of insulation arise is in the connection to the supply service. It is now the common practice to fix what is called a gate-end box, as conveniently to the machine as possible, a flexible cable carrying the current from the box to the machine. The gate-end box contains a switch and fuses, and connection is made to the machine, by a plug, on something the same lines as those that are used pretty well everywhere now, for connecting flexible cords to portable lamps, in houses, offices, etc. The plug is a great possible source of weakness. It is exposed to constant vibration, to dirt, oil, etc. In some cases the cable is taken through an insulated bush in the frame of the machine, and connected permanently to the terminals of the motor. In those cases the weak points are the insulated bush and the ends of the cable. In one case which occurred in Scotland, the insulating bush failed, one of the conductors in the flexible cable came into contact with the frame of the machine, and a man was killed when taking hold of the haulage rope. There is the danger also of the ends of the wires breaking off, or becoming loose, and coming into contact with the frame of the machine.

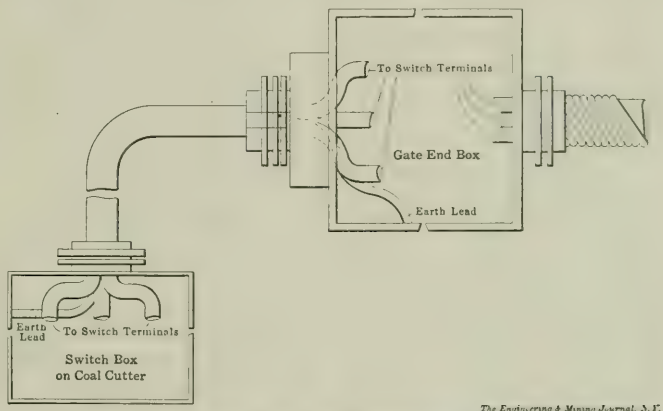


FIG. 2. SHOWING HOW CONNECTIONS ARE MADE BETWEEN THE GATE-END BOX AND THE COAL CUTTER. THE FIGURE SHOWS 3 WIRES IN A CABLE AND A FOURTH FOR EARTH

The Only Remedy Is "Care"

There is one really sound remedy for all these troubles, and only one, viz., care. As electrically driven coal-cutting machines are better known, and a class of workers grows up who have some knowledge of electricity, and who have learned care, probably accidents will become less and less. Meanwhile, the present method adopted, as instructed by the Home Office regulations, is to earth the machine, and various devices are employed for the purpose. There are two difficulties in connection with this. It is difficult to obtain good earth at the face of the coal, in a great many collieries, and in addition, there is always the danger of the earth wire breaking, or connection between it and the machine failing, as it did at Clifton colliery.

The electrical engineer of a group of North country collieries has introduced a gate-end box and a cable, which he claims provide against all of these troubles. The cable contains three or four wires, as the case may be, three wires with a continuous-current service, and four wires with a three-phase service, the fourth wire being the earth wire. Earth is made by means of the armor of the cable, and it is arranged that unless the earth wire at the machine is connected to the machine, and that the machine itself is earthed, the gate-end switch cannot be closed, and, therefore, no current passes to the machine. The weak point of this appears to me to be that the earth itself may fail, if the armor of the cable is broken by a fall.

Earthing the whole apparatus protects anyone who touches it by making the pressure between it and the ground, and, there-

*Consulting engineer, Bloomfield Crescent, Bath, England.

fore, between it and the man who touches it, nil. Fig. 2 shows a typical arrangement for earthing the machine by using a fourth wire in the flexible cable between the gatesend box and the machine.

Safety Precautions in Alabama Coal Mines

SPECIAL CORRESPONDENCE

The following circular letter has been sent out in the mining districts of Alabama, to avoid, if possible, catastrophes in the collieries:

OFFICE OF STATE MINE INSPECTORS.

Birmingham, Ala., Oct. 4, 1909.

To the Alabama Coal Mine Operators:

About one year ago the United States Government opened an experimental and testing station at Pittsburg, Penn., for the purpose of experimenting with coal dust and gas, to ascertain their explosive qualities, and to test the different explosives that are used in coal mines for blasting purposes. As a result of these tests the United States Geological Survey, which department has charge of the testing station, issued a list of explosives that have been tested and considered safe in coal mines. Neither black powder or dynamite appear on the list of permissible or safety explosives.

This department has been making an effort to prohibit the use of dynamite in the mines of this State, and has been very successful. We have also condemned the use of black powder where it is practicable to use one of the safety explosives, especially in dry and dusty mines. We have condemned the use of dynamite in all coal mines.

All the large coal-producing companies and a number of smaller ones are using safety explosives, but there is some dynamite being used; and it is with a view to stopping the use of dynamite entirely, and black powder where it is possible to do so, that prompts this department to issue this circular.

As cold weather approaches, the danger of explosions from dust and blown-out or windy shots increases. This department desires and solicits the coöperation of the coal operators in our efforts to prevent a recurrence of the disasters that have occurred each winter for the past five years, and which have been very destructive to life and property, and in order to do this we make the following recommendations:

1. That you prohibit the use of dynamite in your mines and use one of the permissible explosives in its place.

2. That where it is practical or possible to use one of the permissible or safety explosives in the place of black powder, and especially in mines that are dry and dusty, or that generate large quantities of explosive gas, safety explosives be used.

3. That where your mines are dry and dusty, you have them watered, roof, sides and bottom, as often as necessary to keep down the dust.

4. That you send clay into the mines and distribute it along the headings where it will be convenient for the miners, and that they be required to use it for tamping their shots.

5. That the operators of mines where black powder is being used have tests made with safety explosives, and if the safety explosive proves successful in breaking the coal, that it be used instead of black powder.

These recommendations are made in compliance with Section 1026 of the mining law, and you are respectfully requested to comply with same.

ED. FLYNN,
Chief Mine Inspector.
JAMES HILLHOUSE,
ROBERT NEILL,
Associate Mine Inspectors.

F. F. ROGERS,
JAMES BEATTIE,
GEORGE BARBOUR,
T. H. TINNEY,
Board of Examiners.

Cooperative Coal Mining

SPECIAL CORRESPONDENCE

In an attempt to solve some of the problems respecting the relation of capital and labor, an experiment has lately been inaugurated in the form of a coöperative coal mine near Terre Haute, Ind. Some of the features of this venture are unique. The property consists of 1260 acres of coal land, and the mine is capable of producing about 600 tons per day. The plant is equipped with modern machinery and the physical conditions relating to the coal seams are unusually favorable.

The miners are mostly native Americans, and many of them are already owners of property. The miners entered into negotiations with the owners of the property, and as a result, the following provisions were embodied in a one-year lease: 1. The miners shall form a corporation with legal responsibility. 2. All supplies for repairs about the mine and all labor must be paid in cash. (This was necessary so that no labor or material liens could be entered against the property.) 3. The mine must be operated in accordance with the plan already adopted for its development, and in accordance with the best engineering practice. The mine must be kept in good physical condition.

COMPENSATION FOR MINE OWNERS

The compensation for the mine owners was to be determined as follows: 1. Rails, props, and other necessary supplies shall be bought out of the gross receipts for coal sold. 2. For three months miners and all laborers employed in producing coal shall be paid in full in accordance with the scale governing the miners' union in the Terre Haute district, before any profits shall be distributed. 3. For the first three months the lessor company shall receive one-fourth of the net profits after deducting wages and expenses. If there are no profits, the owners of the mine receive nothing for the coal taken out or the use of their machinery. 4. After three months the lessor company shall receive 5c. a ton and one-fourth of the net profits after deducting wages and expenses.

A charter was obtained from the State of Indiana incorporating the concern as the "Union Mining Association." A company was formed; it adopted by-laws containing the usual provisions and the following distinctive ones:

1. All stockholders must sign these by-laws.

2. No debts shall be incurred by this company and no director or body of directors shall have authority to contract any debts or obligations. Purchases must be made only for cash.

3. The association and members of this association shall be governed by the Terre Haute agreement concerning scale of wages and mine conditions.

4. Every person working in or around the mine shall be a stockholder in the Union Mining Association.

5. Every stockholder agrees to divide losses accruing by reason of the operation of this mine and hereby instructs the bookkeeper of the company to check off his wages any losses which accrue to said company by reason of the operation of the mine.

6. Every stockholder hereby agrees to have the said bookkeeper check off his wages the sum of $5 to pay for one share of stock in the Union Mining Association.

7. Any member shall have the right to give up his membership by assigning his certificate of stock back to the treasurer of this company. The Union Mining Association, however, shall be in no wise liable for the return of the $5 paid for such stock. Only one share of stock shall be issued to one member, and each member shall have only one vote.

9. Each member hereby agrees to hold no other member, or the association as a body, responsible for his death or any accident which may befall him during his work in or around the mine.

The company started out with a membership of 85. The capital stock at first, therefore, was only $425. A large capital is not necessary for such an association, as the principal outlay of money in coal mining is for miners' wages, and in the matter of wages the men were both creditors and debtors.

The miners elected seven of their number as directors. The directors elected a president, secretary-manager, treasurer, and sales agent. The only salaried officer besides those in or above the mine was the secretary-manager, who receives $100 a month, with his salary subject to assessment in case losses accrue to the company.

A careful examination of the company's books and pay-rolls shows that up to the present time the scheme has been quite a success. The pay-roll for one month shows that every man received as much as $100; one miner was paid $210 for the month. The mine has run steadily while other mines in the locality have worked only three or four days in the week.

On one pay day the assessment ran as high as 25 per cent. However, even at that rate, the monthly wages still ranged from $80 to $150 a month—twice as much as the miners in other neighboring mines were earning.

The friends of this plan of coöperative mining claim that the scheme will solve many of the problems and difficulties that now exist between employer and employees. These advocates also say that the plan gives the mine owner in a low market a minimum price for the depletion of his coal land. That it gives the miner, for his wages, all that the product of his labor brings in the market. That in a good market it gives the mine owner a share in the good times, and gives the miner compensation for lower wages in hard times, and automatically increases his wages without waiting for the often tardy advance of the employer. It is also argued that this kind of coöperation will settle many labor disputes, and that it will help conserve the great fuel resources of our nation.

A Safety Lamp Glass Test

SPECIAL CORRESPONDENCE

G. Chesneau, secretary of the Permanent Commission of Scientific Researches on firedamp and explosives used in mines, has presented a new manner of testing the glass of safety lamps. It must be reminded that these glasses are constantly submitted to varying temperatures and that such variations may be quite sudden and cause the glass to break. Therefore, it is of the utmost importance to get glass that will show a great resistance under the circumstances obtaining in mines.

The tests designed by Mr. Chesneau are simple. The first one consists of placing the glass in boiling water and quickly placing same in cool water at 15 deg. C. The second one is called by Mr. Chesneau the Berzelius burner test and is described by him as follows:

METHOD OF TESTING

The glass to be tested is left for 24 hours in a dry place and then put cold over and just in line with the axis of a circular Berzelius gas burner of ordinary pattern with three burners. The burner used by Mr. Chesneau is 45 mm. outside diameter, the mean diameter being 40 mm. and the slot 2 mm. wide. The air inlet consists of three circular holes 14 mm. diam. fully opened during the test. The glass rests upon another circular sleeve of glass or metal 50 mm. diam., which rests upon the support of the burner. The position of this sleeve is so adjusted that the bottom of the glass to be tested is about 8 mm. above the orifice of the Berzelius burner. Over the glass another glass or metal sleeve of the same diameter and hight is placed. Asbestos rings are put between the various sleeves. By this arrangement a powerful draft is obtained as well as a regular flame which entirely fills the tested glass. Gas is introduced in the burner under a pressure of 50 mm. of water, controlled by a pressure gage fitted on a small header of at least 1 liter capacity and connected to the burner by a hose, 1 ft. long at the most. The supply of gas under this pressure is regulated by two valves placed one before and one after the header in such a manner that the hight of visible flame is between 25 and 30 millimeters.

When everything has been adjusted as explained above, gas is lighted and the time elapsing, before the glass breaks, is reckoned.

In any case gas is shut off after 5 min., because the glass, being red hot at that time, no change would occur by a longer heating. It is obvious that under identical circumstances, the longer the time spent before the glass breaks, the greater will be its resistance to the variations of temperature.

Mr. Chesneau has shown that this test was reliable because similar glass will break after the same length of time, and that experiments carried on on the same lines as above will show the same results.

The glass which gave Mr. Chesneau the best results came from the Iéna glass works and the Baccarat glass works. The Iéna glass is a silicoborate of sodium but little alkaline, with very small quantities of lead and zinc. It is somewhat yellowish and has a very small coefficient of expansion. The proportion of glass which broke in the Berzelius test was 10 per cent., while all the samples stood the water-cooling test.

The Baccarat glass is intended to have a greater elasticity. Its composition is as follows: Sand, 75 parts; Co_3NaH, 13; Co_3Mg, 9; ZnO, 6; minimum, 50 parts.

These glasses are also yellowish. Tests carried on 10 glasses proved that all stood the water-cooling test, and also that on 20 glasses, all stood the 5-min. Berzelius test.

Such qualities of glass should be adopted by the colliery owners for their safety lamps. They are more expensive than the other lead glasses used in mines for this purpose, but they last longer and may prove to be economical. In any case their reliability should be taken into account.

Indiana Coal Report

SPECIAL CORRESPONDENCE

The tenth annual report of James Epperson, State mine inspector, was issued during the past week in connection with the 39th annual report of the State geologist's department. Mr. Epperson's report goes into detail and says that coal is produced in 18 counties of the State. According to his report there were 11 new companies organized during the year (ending June 30), making a total of 104 coal-mining companies operating in the State. The number of mines abandoned for various causes was 28, two old mines were reëquipped and 12 new mines opened and installed with modern equipment.

The total number of men employed in the mines was 19,092, to whom were paid in wages $10,304,869.44. The mines used 401,347 kegs of powder, and the total production of all mines working more than 10 men was 11,999,304 tons. There were 45 fatal accidents, 375 serious accidents, and 452 minor accidents. There were 13 accidental injuries to mine property and 98 prosecutions of owners and employees for violations of the State mining laws.

RECOMMENDATIONS BY STATE INSPECTOR

Mr. Epperson supplements his report with a number of recommendations for the consideration of the next legislature. One is, that the law governing the use of powder be amended so as to regulate more effectively the amount of powder to be used in a "shot." He recommends that a law be enacted making it unlawful to recharge a drill hole which has once been charged and fired or attempts made to fire it. He also deems it advisable to have the drill-bit law amended so as to prevent the use of bits larger than 2½ in. in diameter and would prevent miners clearing a working place of gas by the method known as "bushing." Mr. Epperson further recommends that the law be amended so that when violations occur and extreme negligence is in evidence resulting in the loss of life, the charge should be manslaughter and the violators punished accordingly.

Mr. Epperson, in his report, cites two cases of record during the year where justice demanded that the violators be punished by imprisonment. One of these was the case of the mine superintendent, who compelled a number of miners to go into the mine before it had been examined

by the fire-boss; the other was the case of a man who, over the protest of his fellow employees and against the dictates of good judgment, placed a shot which caused the loss of two lives.

Mr. Epperson states in his report that the mines of Indiana are being sunk to coal beds lying at greater depths each year, thus increasing the avenues of danger which are attendant on deep-vein mining, and while some benefits may be derived by invoking the aid of science, without discipline, the daily and yearly increase in the number of mine accidents can never be checked.

Mine Ventilation

By H. J. Nelmes

Efficient ventilation is now regarded as the principal factor in the design and operation of a modern coal mine. Possibly the best method of ventilation that can be designed is what is known as the four-entry system in which you drive four main entries and four face entries; in this plan, two entries are used for intake and two for return. This method, however, is costly when you compute the amount of coal used up in driving four entries, the extra gob that must be handled, the yardage which has to be paid for and the brattices.

A Suggested Method of Development

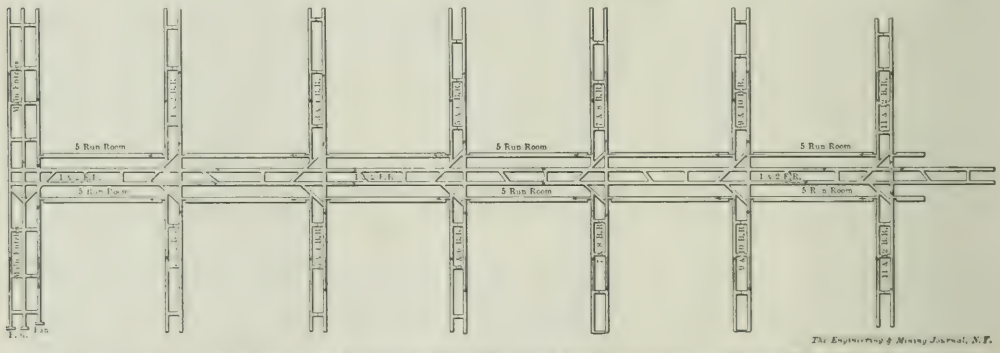
Instead of driving four entries, I would suggest that coal operators try the method projected on the accompanying plan.

Three main entries are driven, and two main face entries are turned off at 90 deg. Other main entries are driven every 1400 ft. The main and face entries are driven on 50 ft. centers, and should be from 10 to 12 ft. wide. Parallel to every face entry, and on each side, drive a room 15 ft. wide, which will be used for a return airway. This room will not cost anything for yardage. It is driven on 50 ft. centers from the face entry. The rib between Nos. 1 and 2 rooms should be about 27 ft. wide, and No. 1 room instead of being widened out from the face entry as the plan shows, should be widened out toward the face entry so that when the face entries are finished and the stumps and chain pillars are being removed, the rib between No. 1 and No. 2 rooms can be gotten from No. 1 room.

In this plan, the air is intake on two of the mains and also on both face entries; this insures a split at the top of the face entries, and it is not necessary to keep brattices or doors on the face entries, except at the last pair of butts turned. Of course, the room that is used for a return airway must be driven as fast as the face entries.

By putting in an overcast at the bottom of any pair of butts, it is possible to split the air at any desired point. Splitting the air is certainly the best method of mine ventilation, and it is a fact that you can get more splits by this method than any other which I have seen. The overcasts and doors necessary to this plan of ventilation are not shown on the accompanying plan, as they are simple in the extreme, and can be easily located.

If a mine is using electric locomotives for haulage, this method insures a convenient plan for mine haulage. The locomotives would be able to pull the empties in on the No. 2 face entry and get the loads off No. 1 face; it would also be unnecessary to do any swinging.



A SUGGESTED SYSTEM OF COAL-MINE DEVELOPMENT THAT INSURES GOOD VENTILATION AND ENABLES EFFICIENT HAULAGE

In a gassy mine where it is considered dangerous to convey electric current to the coal face, the general power advocated in such cases is compressed air. This does not mean, however, that the compressors should be located on the surface, but rather that advantage should be taken of the cheapness and efficiency of electricity as a distributing agent, and consequently, install the compressor plant at the shaft bottom, or as near the face as electric current can be safely conveyed.

The Falsification of Coal Miners' Certificates

Special Correspondence

On Wednesday, Sept. 27, the grand jury of Lackawanna county, sitting in Scranton, returned presentments against 17 members of the old miners' examining boards. Six of the members are to be charged with extortion, and the presentments go on to say that the mine inspectors of the county have omitted to inquire into the validity of the miners' certificates, although the letter and spirit of the mining laws enjoin upon them the duty of seeing that these certificates are regularly and properly issued.

In a general way the grand jury finds that the mining laws have been violated continuously, and they place the responsibility for this state of affairs upon the mine examining boards and upon the mine inspectors.

It should, in justice to the mine inspectors, be pointed out that they absolutely deny that the law imposes upon them the duty of guaranteeing the validity of miners' certificates. They are called upon in specific terms to use all care for the protection of life in the mines, but they do not exercise, and by law are not required to exercise any supervision over the miners' examining boards, although they must have known, and indeed many of them could not deny, if they were inclined to do so, that these forged certificates have been in use among the miners, not only of Lackawanna county, but of every county in the anthracite-coal regions during the past 20 years. The grand jury holds them morally responsible for this state of affairs. But the law does not, and it now remains for the next legislature to make them legally as well as morally responsible for the validity of the certificates issued under the auspices of the mine examining boards, if it can be brought to do so.

The Miners' Examining Boards

The miners' examining boards are independent institutions, independent of control, either of the mine inspectors of the State Bureau of Mines or any other executive body. They are all miners. They were appointed by the county court judges and upon the court in the last analysis, if anywhere, the moral responsibility for their transgressions rests.

"Instead of the members of the examining boards meeting in public," says one section of the presentments, "and sitting together and holding examinations as required by law, every member of the board since his appointment has held meetings alone and has issued certificates alone, and has either signed the names of the other two examiners, or has had them signed in blank before the examination."

The grand jury also finds that in many cases, if not indeed in the majority of instances, no satisfactory evidence was brought before the miners' examining boards that the applicants worked two years in the mines as mine laborers. They find also that the provision of the act requiring the applicants to answer twelve questions in English has been invariably disregarded. In fact, the grand jury has only confirmed by its deliberate and official judgment what was a matter of unqualified notoriety in the anthracite regions during two decades.

One-half the Miners' Certificates Are Illegal

It has been asserted and reasserted, and seldom, if ever, denied, both in the public press and on the public platform, that 50 per cent. of the miners working in the anthracite regions at the present time are following their occupations upon illegal certificates. Many of these miner's certificates are alleged to be downright forgeries, others are said to have been sold to those who are in possession of them, while the vast majority of them have been issued under false representations of the qualifications of the men who obtained them, in one way or another. The issue of false or fabricated certificates to miners has become a public scandal in the anthracite coalfields, one that has been growing in volume and audacity with the impunity of those who have betrayed their duty and ignored the obligations which their position stipulated and implied.

The laws of Pennsylvania provide that no miner's certificate shall be issued to any person engaged in the coal industry unless he has passed an examination before a miners' examining board, and that he shall not be permitted to register for such an examination unless he has worked two years consecutively in the anthracite mines of Pennsylvania as a laborer, and that he shall be able to speak English, although it is not necessary that he shall be able to read it. In other words, that he shall be able to apprehend the instructions given to him by those who are over him. This law has been in existence during the past 18 years. It is a mooted point whether it would not have done much more harm than it has effected good, if it were honestly and scientifically enforced. But as it is, it is claimed by those who understand its operation, that three-fourths, if not four-fifths, of the fatal accidents that occur in the mines are unqualifiedly to be attributed to it.

It is not merely a source of imposition, but it is one which leads to the maximum of danger in the mines and the minimum of prevention. Since this measure became a law, fatalities in the anthracite mines have enormously increased, although it may be assumed that fatalities and accidents of a serious character would not be eliminated to the extent that some presuppose if a miner's certificate was a diploma of his efficiency, instead of being as it is under present conditions little better than a sham. As it has been so often said, mining is a dangerous occupation, its risks being inseparable from its pursuit. It might, however, be made much safer than it is, if preternatural ignorance was not guaranteed by the commonwealth of Pennsylvania to be the hall-mark of experience and efficiency through a miner's certificate, obtained through fraud or purchase.

One Recent Case

The death of a foreign "miner" at one of the Scranton collieries a few weeks ago has brought this question to a head This man secured a miner's certificate through the usual channel. This certificate was signed ostensibly by the members of the examining board. One of the examiners did actually sign the certificate, and signed it also on the part of his fellows with the prefix "per." Under these circumstances, a certificate is absolutely worthless from a legal and an official standpoint. The man to whom it was issued was only 11 months in the country and never saw a mine in his life until he came to Scranton. He had only worked two weeks in the mine under the miner's certificate when he was killed. A saloon keeper who knew him informed the district attorney's office, and the matter eventually was brought to the attention of the coroner who held an inquest As this man's death and the circumstances with which it is involved are not yet before the court, I will not discuss the matter here.

The question has been brought to an issue by this man's death, and that merely through an accident; but there are hundreds if not thousands of so-called miners working under similar conditions throughout the length and breadth of the anthracite coalfields, and this state of affairs will continue to exist until the law is abrogated or essentially modified. Although this act was pushed through the legislature by the political pressure brought to bear on the miners' representatives, so far from serving the end which the men had in view, it has had a diametically opposite effect, if we consider the problem in the light of an economical issue.

Twenty years ago, the mines throughout the anthracite regions were practically manned by native Americans, Englishmen, Scotchmen and Irishmen. But at that time, it was believed by the operators that unless there was some amelioration in the labor conditions at the mines, the English speaking miners would be able to command their own terms. Foreign laborers were introduced, and it is doubtful if the operators have gained anything by this move. Certain it is, that unprejudiced observation in the anthracite region has strengthened the opinion that the foreigner has demoralized the mining industry by driving out the English speaking miner to a greater or less extent.

Foreign Labor is Not Cheaper

If at his first introduction, the labor of the foreigner was cheaper, it is not so now. With a forged certificate and a union card in his pocket, he commands the same wages as the English speaking miner, and as a rule he is more arrogant, intractable and insubordinate. I heard an experienced mining engineer say a few days ago with all the responsibility attached to a public declaration, that the death rate in the anthracite mines would continue to increase, *pari passu*, with the increase of foreigners in the mines, and that his elimination would be an unmitigated economic blessing. However, as things now are, it is impossible to eliminate him. He is here, and he is here to stay. Is it possible to educate him? It is impracticable, if not impossible to do so in the mines, and it is almost hopeless to try to do so outside of the colliery.

Chief Inspector James Roderick of the Pennsylvania State Bureau of Mines, told me himself that he is rather underestimating than overestimating the number of forged certificates in the hands of foreigners when he places the total at 50 per cent. of the number that have been issued to foreign miners during the past 18 or 19 years. Things are not as bad as they were perhaps 10 or 12 years ago, for public opinion has in a measure been aroused to a sense of the danger which this state of affairs has created.

Chief Roderick has declared that very few English speaking miners have forged or faked certificates, according to his experience. Those of them who have been born in this country have been practically raised in the mines. They have graduated from being breaker-boys to mule-drivers or gate-tenders, from gate-tenders to

laborers, and from laborers to miners. As miners, they should, and Mr. Roderick says they do know the practical side of mining. A certificate neither adds to their knowledge or certifies to its exactness. It is also true that those men who enter our mines after having worked the mines of England, Scotland or Wales, have a native conception of their personal dignity, which prevents them from seeking a certificate by other than fair means. It may be taken for granted, therefore, that the forged miners' certificates are for the most part in the hands of so-called foreigners, and the question is, as the law stands in Pennsylvania, can anything be done effectively to deprive these miners of the benefits that have accrued to them through laxity in the enforcement of the law, and the perjury, duplicity and corruption of the miners' examination boards.

The state legislature of Pennsylvania will not meet for nearly two years. During that time the law will remain as it stands. The grand jury of Lackawanna county which is investigating these forged certificates and the manner in which they were issued, will probably make recommendations and advocate a repeal or the amendment of the law. But this investigation, or even the conviction and punishment of a few members of the examining boards cannot lead to the cancellation of the certificates that are now in the hands of those who are not entitled to them. A miners' certificate duly signed by a board of three or more examiners is a legal certificate, and there it stands, the credential of a man, perhaps, who never saw a mine before he purchased what to him, and unfortunately too often to the foreman who accepts it at its face value, is the criterion of his ability as a miner.

It should always be remembered in discussing this phase of the situation, that before a man is entitled to work in a mine as a miner, he must have worked two years underground as a laborer, and that when he presents himself before a miners' examining board, he must be able to answer 12 questions in English. How can a man who is not able to speak two words of English consecutively and intelligently answer 12 questions in a language to which he is an absolute stranger? Yet it is under these circumstances and to men to whom the English language is as enigmatical as Sanscrit that 50 per cent of the miners' certificates in the anthracite regions have been issued.

Under the Employers' Liability Act of the State of Pennsylvania, any accident caused by a miner having a miners' certificate bears the operator or operating company of all responsibility. Consequently, while this law stands and while there are thousands of forged certificates in the hands of ignorant foreigners, the discipline at the mines will not improve.

"The great number of fatalities in the mines of Pennsylvania," says Chief Roderick in his last report, "show the necessity of remedial measures. Legislation of a proper kind would no doubt bring about a reduction, but the most prolific cause—carelessness on the part of the mine officials and employees—can only be removed by greater discipline; discipline that will enforce obedience to the laws and rules governing safety; discipline that will mete out severe punishment to the man in charge and to the employees who by their carelessness and recklessness place in constant jeopardy the men in the mines."

This is all true, but the recognition of a truth and alleviation of the abuses which it indicates are two different matters, as no one knows better than Mr. Roderick himself.

Colliery Notes

In any gassy place, the joints, if any, made in trailing cables, should be soldered. Screw clamps of any kind should not be used for this purpose.

When transmission lines from the generating station to the shaft or mine mouth are strung overhead, such lines should be supplied with lightning arresters.

Experiments in Germany have shown that to improve the product of a badly coking coal it is advisable to compress the charge by means of stampers in a special mold, of exactly the shape of the oven. The binding agent is simply the moisture left in the washed small coal. It is advisable to retain about 10 per cent of moisture in the coal if the charge requires compression.

One of the most important points to consider before selecting an exhaust steam turbine for colliery use, is whether a low-pressure or a mixed-pressure turbine should be installed. The low-pressure turbine utilizes the steam at a pressure between one atmosphere absolute and vacuum, the low-pressure machine should be installed in cases where a sufficient amount of exhaust steam is always available from such sources as fan engines or central power-station engines, or where a large supply is available, such as that from hoisting engines, etc. In cases where electric power is always required and where the source of supply is intermittent, or is only available for part of the working day, a mixed-pressure turbine should be installed.

Recent experiments carried on to investigate the stresses on hoisting rope in shafts show that a rope 1¾ in. in diameter with a hoisting rope and 780 ft. long, at a speed of 6 in. with a load of 4150 lb. Other experiments with different lengths and sizes of rope showed that the stretch was directly proportional to the load and the length of the rope, and inversely proportional to the frictional area; it was also proved that a live load would produce twice the extension of a static load. It was concluded after these investigations, that there is a time lag between the movements of the drum and the movements of the cage, and that the vibratory action thus set up is sufficient to mask the true acceleration of the hoisting drum.

Mine managers in America must eventually come to recognize the great value of the exhaust-steam turbines at colliery plants. It is conservative to estimate that 50 lb. of steam are required per hour per horse-power for all coal hoisted up a shaft; it is, therefore, certain that thousands of pounds of steam are poured into the atmosphere every hour from colliery hoisting engines alone. This great quantity of waste exhaust steam would be sufficient to drive hundreds of turbo-alternators. From actual practice it may be stated that the cost of installing an exhaust-steam turbine varies from $30 to $40 per kilowatt. The exhaust-steam turbine is practically the only machine that will turn the waste of the steam-hoisting engine to good account by providing a cheap, although limited, supply of electric power.

The opponents of the underground sprinkling system point to the fact that the disease known as ankylostomiasis has ravaged Westphalian mines, in Germany, to a greater extent than any other coal district. They also claim that the saturated currents, that are provided in these German mines, have affected the focus of the eyes of many miners, thus intensifying the presence of rystagmus among the miners. In solving this dust problem, a plan has been adopted at various collieries, whereby certain portions of the main roadway are kept scrupulously clean, and sometimes very wet. These particular stretches are known as isolating zones and are used to prevent the extension of an explosion through a certain stretch of entry. This practice is based on the belief that where combustible material is cut off, an explosion will cease. Certain considerations should be observed in providing these isolated zones, such zones should be specially constructed so that the solid coal will be largely excluded, it is also advisable to enlarge the area of the zone, or in some way reduce the velocity of the air current to a speed such that no coal dust will be lifted from the top of the cars that travel through. The length of a zone should be about 600 ft. and each zone should be whitewashed at regular intervals, and if possible, the track should be ballasted with small stones. In coal mines on the Continent, the general practice is to locate each isolating zone at a point just inside of where the air has been split, and where the velocity of the current is not high.

Concentration at the Blue Bell Mine

Some interesting data have been contributed by William Fleet Robertson, the provincial mineralogist of British Columbia, in the *Annual Report* of the minister of mines, regarding the early history of the Blue Bell mine and the concentration methods that have been adopted by this historic lead-zinc property, near Ainsworth, in the Kootenay Lake country. The outcrop was discovered in 1825 but little was done toward its development until 1864, when Sen. Hearst, of California acquired the property. The distance from transportation at that time ultimately led to its abandonment. In 1878, all the ground on the peninsula was located by R. E. Sproule and subsequently relocated by Thomas Hamill, litigation resulting. Sproule retained control of the Blue Bell but the mine was sold at sheriff's sale to pay the costs of the case. Hamill bought an interest for the Ainsworths, of Portland, Ore., and was shot and killed the next year by Sproule. The property then passed through various ownerships until purchased in 1905 by the Canadian Metal Company, which upon development found a sufficient body of concentrating ore to warrant the erection of a plant. The old smeltery at Pilot Bay was dismantled and such material and equipment as was available was transferred to the site of the new mill.

Mine Conditions

The general arrangement of the plant is such as to permit of increase of capacity at relatively small expense. In detail, the planning of the mill, which was designed by S. S. Fowler, general manager of the company, has not involved any radical departures from well established lines of ore dressing, although there have been introduced some minor innovations. As a corollary, the general scheme of development adopted for the mine has been such as to make practicable its exploitation at low cost. At the time construction of the mill was undertaken, it was estimated that about 300,000 tons of ore were available for stoping—about five years' supply for the mill.

This ore contains lead and zinc, with a small amount of silver. It lies above the adit level, so no hoisting or pumping will be necessary for several years. The distance the ore has to be hauled from the faces to the mill is not more than 1000 ft., and haulage is by mules. The only power machinery in use for the mine is a five-drill air compressor, driven by water conveyed three miles in a 16-in. spiral-riveted steel pipe and affording a static head of 725 feet.

Milling Process

The main mill building is 156x50 ft. and about 60 ft. high; other buildings include a magnetic-separator house and a machine shop. The following outline of the ore-dressing process will give an idea of the mill equipment: The ore is hauled in cars from the mine to the mill, where, after being weighed, it is dumped into a pocket which feeds a 20x10 Blake crusher, which crushes it to not larger than 4 in. in size. An incline belt conveyer takes it thence to a storage bin, capacity 150 tons, situated at the top and back part of the mill.

It is next fed automatically to a second Blake crusher, and then passes through three sets of cornish rolls which reduce it to ⅜ in. A 60-ft. bucket elevator then lifts it to the top of the mill, whence it goes to the trommels. The coarser material, passing through the 5- to 10-mm. screens, is taken to eight 2-compartment jigs, where the coarse lead is extracted. The middlings from the jigs is again passed through rolls and once more elevated to the top of the mill; thence it goes to the trommels and together with the fines from the 1- to 5-mm. screens, is treated in four double five-compartment Hartz jigs.

All the ore under 1 mm. and the zinc and lead middlings from the Hartz jigs go to a Ferraris ball mill and a Huntington mill for finer grinding. The pulp from these mills is elevated by two centrifugal pumps to the top of the mill, where it is discharged into a Callow dewatering tank. The thickened pulp is then passed over two Callow screens which separate the coarser from the finer part of it, the latter going to three Callow settling tanks. These Callow screens and tanks classify the pulp and distribute it to ten No. 5 Wilfley tables, which separate the lead, zinc and iron, the lead going to bins for shipment. The lead concentrate contains about 60 per cent. lead and some silver, and is shipped to the smeltery at Trail. During six months—July to December, 1908—the output was about 2220 tons of lead concentrates. As the proportion of ore to concentrate is about 8 to 1, the quantity of ore milled may be placed at, approximately, 18,000 tons.

"The ore contains about 30 per cent. pyrrhotite, which leaves the tables and finer jigs with the zinc blende and after being dewatered, is conveyed to a drying furnace, cooled and elevated to a magnetic separator installed in another building, 50x70 ft. The zinc separation plant was not, at the close of 1908, in full operation but it was expected to make a product of about 40 to 45 per cent. zinc. No arrangements had then been made for marketing the zinc concentrate, the lack of interest shown by buyers making it advisable to proceed slowly.

Zinc Separation

"The mill plant is run by four 50-h.p. Doble water wheels, set up in the roof trusses and supplied with water from the system previously mentioned. The waste water from these wheels is used as wash water throughout the mill. Not only is the milling plant complete, but being located near the water's edge, it is consequently favorable to low operating costs. Besides the milling machinery already mentioned, there are machine shops equipped with power tools, etc., and an electric light and heating system, the latter including two 60-h.p. boilers which heat all the buildings in the camp, as well as providing an auxiliary power in case of a break-down in the water system.

The Flake Graphite Industry in the United States

By Frederick D. Chester*

Various efforts have been made during the last 10 or 15 years to organize and maintain the flake-graphite industry in the United States, but merely as an industry for the production of graphite in its crude form independent of the manufacture of graphite products it has rarely been a success. Today there are more abandoned mines and costly plants than those in operation, and the question might be asked, why does this condition of things exist?

Every enterprise which has ever started has been founded on hope, and large sums of money have been ventured by promoters and organizers who have had very little true idea of commercial facts as applied to graphite, and still less of the technical side of its milling operations. Thus where mistakes have been made it has frequently been at the start, due to errors of judgment, which in turn have been the result of inexperience. Experience is costly, and mistakes must be made before it is gained, and where this cost has to be met by a host of stockholders, the latter are liable to lose confidence too soon, and often on the very eve of success.

Milling of Graphite Ores not Reduced to a Science

It should be understood that the technology of graphite is as yet in a formative stage, and that there is no established system or scientific basis, such as applies to most of the mining industries, and for this reason operators are groping more or less in the dark. The industry is as yet too unimportant to attract the attention of the best experts in ore dressing, and it has been largely in the hands of local mechanics, who lack the proper scientific training and broad knowledge, so necessary to the working out of a difficult problem. The difficulties are still further increased by the variable characteristics of the ores of different mines, making each problem in a measure a local one, so that while some mines which have had longer experience than others may have worked

*Manager and treasurer, Chester Graphite Company, Chester Springs, Penn.

out a satisfactory system of milling for their own type of ore, this experience may be inapplicable to someone else. But what has been most lacking has been the absence of fundamental principles to form a basis of guidance, resulting in too much haphazard empiricism and too many costly undertakings which were fundamentally wrong.

Commercial Features of Industry

Thus while success is in a large measure dependent on the direction given the technical side of the industry it is not altogether that, and the business side is equally important. It is largely a question of the difference between the cost of production and the market value of the product, and this balance is determined by a variety of conditions. If flake graphite were a staple product like copper, lead or silver, produced by established methods and salable at all times in the open market at the fixed market price, the sales end would be simplified, but it is a manufactured product, of variable quality and market value, and is subject to laws of competition, which are also unusually severe because American flake has as yet to win a secure place in the market. Even if graphite could be considered as a raw material, and could be sold on some uniform basis of price, as so much for each unit of carbon, the marketing of the product would be simplified, and it would be fairer both to the producer and the buyer. But no such system of determining values has ever had general application.

In general the cost of producing flake graphite is so high, and the price at which it is sold so low, that even under the most economic conditions the margin of profit is small. In many cases the cost of production has considerably exceeded the returns, and inevitable failure has eventually followed. Many ores are of too low a grade, or the expense of mining and milling them too high, to be profitable. Other ores are of such a character that the percentage of extraction under existing methods is unsatisfactory. These are weak points at the very start, which an experienced man should be able to see, before any money is spent on what is sure to be an unprofitable venture.

Grade of the Ore

Just what grade of ore can be handled with a profit depends on the expense of mining, cost of reduction, and its milling qualities. There are instances where ores yielding as low as 2 per cent. of graphitic carbon can be handled at a profit, but probably this approaches very close to the limit. By this is meant an actual yield in marketable graphite of 40 lb. of actual carbon to each ton of ore handled; it does not refer to the actual percentage of crude graphite in the ore. Graphite investors are extremely misled by assay reports. These assays are frequently made from selected samples, and even when an honest effort is made to obtain an average sample it is invariably a flattering one, and rarely represents the ore handled over a long period. For this reason there is only one method of getting at results of practical value, and that is to go by actual mill tests of a definite quantity of ore, determining the weight and actual amount of carbon in the resulting concentrates.

Notes on Economic Geology of the Cobalt Area

By Glenn Anderson*

In the Cobalt district as in all new fields, the occurrence of ore and its geologic relations to the rocks are of paramount importance to the miner as well as the investor. From the time of the discovery of Cobalt to the present day, various theories attempting to limit or define the ore occurrence have been advanced, many of which have been abandoned in the light of later discoveries. For an understanding of the conditions in this field, a brief description of the rocks is necessary, and the following is an excerpt from the report of Willet G. Miller. The rocks of the district, beginning with the lowest and underlying, comprise the following:

Keewatin—This series is an igneous complex consisting of metamorphosed igneous rocks.

Laurentian—Granite, intrusive into the Keewatin but not into the Huronian; great unconformity.

Lower Huronian—This series comprises conglomerate, breccia, quartzite and graywacke slates; unconformable.

Middle Huronian—Lorraine arkose, conglomerate and quartzite.

Diabase and Gabbro—These igneous rocks cut through the Keewatin, Lower Huronian, Middle Huronian and all other Pre-cambrian series in the field. The exact age is unknown; unconformable.

Niagara—Limestone and sandstone.

During the early days of mining in the district, the ore occurrence was thought to be limited to the Lower Huronian; later the diabase was admitted to fellowship as an orebearing rock, and more recently important discoveries have been made in the Keewatin. On looking over the area today, the most significant facts noticed are that practically all the ore occurrences of any importance are in or near the Keewatin, or rocks derived from it, viz., the Lower Huronian, and are also close to igneous contacts of either diabase or granite.

Granite-Keewatin contacts have not as yet been sufficiently explored to determine their economic importance. It is true that some good veins have been found in Keewatin near granite intrusions, but they are also near diabase contacts and the probabilities are that the ore is due to the latter intrusive. Likewise the central portion of large areas of a single rock such as Keewatin alone or diabase alone have not proved productive.

From the foregoing considerations, it would seem probable that the Keewatin or its derivatives, notably the Lower Huronian conglomerate, were the source of the valuable minerals and that the eruptive diabase furnished the necessary fracturing and heat for the formation and filling of the veins. It naturally follows that a contact between these two rocks would be the most favorable for productive veins.

*Mining engineer, Cobalt, Ont.

Dredging Troubles in California

Special Correspondence

The city trustees of Oroville, Cal., have been trying to prevent the Ophir Dredging Company from dredging its own land within the city limits. The outcome of this has been that the Ophir Dredge Company has obtained from the United States circuit court a temporary restraining order preventing the trustees from passing or enforcing an ordinance to prohibit the company from dredging its own land within the city limits. The company claims that its property within the town is in a "morass" not near any human habitation, and the dredging operations are of sanitary benefit to the town instead of a detriment. The Oroville trustees are also giving trouble to the Indiana Dredging Company. The company claims it is keeping within its contract with the city, having to November 1 to level its cobble piles. After that date a company must keep within ten days of the boat until the summer months come when they are allowed 30 days to follow behind the boat with the leveling operations. The old tailings piles are now nearly leveled.

At a recent meeting of the Anti-Débris Association a letter was received from parties who want to operate a mine on the Forest Hill, Placer county, and asking if the association would require them to build a dam. The attorneys wrote in response that the object of the association was to prevent injury to the rivers by débris from any source and that as far as dredge mining was concerned it would insist that such mining be conducted without depositing material in the rivers. In numerous cases where dredge mining was being conducted, the evidence before the association was that no injury was being done, and in other cases where injury was shown suits had been brought to enjoin operations.

The Anti-Débris Association is to adopt new tactics in the dredge-mining matter by getting land owners along the banks of the rivers to bring suits for damages against the dredging companies. So instead of injunction suits, litigation is to be begun in the names of individuals who allege damage where evidence will justify.

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The Copper Statistics for September

An unfavorable report for September was expected, but so large an increase in the stock was hardly looked for. The rate of production increased still further, exports advanced a little over August, but domestic deliveries fell off to a large extent. If we take a figure approximating the average of the domestic deliveries during the last three months, say 60,000,000 lb., we shall probably come near to measuring the present domestic consumption, which has revived strongly since the beginning of the year. This is very close to, if not actually in excess of, any previous rate and consequently there is no fault to be found with the copper-manufacturing industry, or any reason to say that this branch of trade lags behind iron and steel and the others that are now manifesting a feeling of buoyancy.

The trouble with copper is the over-production, which continues upon such an ever increasing scale that it is difficult for consumption to catch up with it. The reason for this over-production is the handsome profit that the principal concerns find even in the prices that have been realized during 1909. We see no reason to anticipate that so long as the present level of price prevails there will be anything else than a continuing increase in the rate of production. The idea that there will be a check because the first of the important mines now in development will not come in for a year yet is fallacious. While it is undeniable that the mines are primarily the source of production, a factor that is closer to the market is the smelting capacity, there being many mines that are able to furnish ore for increase in the latter as fast as it is provided. Thus, when mining was suspended by the Cumberland Ely a few months ago on account of the strike its share of the Steptoe smeltery was immediately utilized by Nevada Consolidated, and the output of Ely has been increasing right along as new furnaces have been added to the Steptoe works, an easy matter in the case of a plant designed for large expansion. Does anyone doubt that when the Tooele works begin operations in 1910 and take away a part of the present supply of Garfield the latter will fail to find use for its capacity thus relieved? It is in this gradual way that production always increases—when Miami, Ray Consolidated and the others begin they will also be gradual—and the only condition that may check it is a decline in the market that will cause more or less of the productive capacity to become unprofitable.

Indeed, the only condition that can lead to the advance in price that producers hope, or even sustain the present price, is a stride in consumption that will outstrip, or at least equal the production. We referred not long ago to the market being in a state of equilibrium, but that equilibrium has been artificial, depending upon the financing of copper loans and it has always been doubtful how long it could be maintained. Heretofore the undertaking has been comparatively easy through the cheapness of money, but the recent advance in interest rate and the cold water that has been thrown specifically upon copper speculation by the German banks have altered the situation.

The problem, in a nutshell, is: Will the holders of the accumulation of copper be able to carry it until consumers are ready to absorb it without making a sacrifice to hasten absorption? For this absorption we are bound to look largely to Europe. If American consumption has already attained 60,000,000 lb. per month it is unreasonable to anticipate a further large increase here in the immediate future, no matter how healthy is the state of business. The daily rate of production by the American refineries in January, 1909, was about 3,617,000 lb.; in September, 3,934,000. A mere maintenance of the present rate would correspond to an increase of 115,000,000 lb. in the production of a year as compared to the rate of only nine months previous. The situation does not encourage hopes for a lasting advance in the price for copper during the coming winter.

The Boston & Colorado Smelting Company

The decision of the directors of the Boston & Colorado Smelting Company to wind up the business and dissolve the company deserves some notice as the passing of an old and long a prosperous industry. The company was formed 44 years ago, in 1865, and two years later started its plant at Black Hawk, under the charge of Professor Nathaniel P. Hill. It remained at that place until 1878, when it was removed to the present site in Denver. The old plant was the first to treat successfully the pyritic ores of Colorado,

using copper as a base. For many years it paid dividends regularly on a steady and profitable business. During the last nine years, however, the company has had only four years of profit, and the losses of the other five years exceeded the profits of the four. Its refinery was destroyed by fire three years ago, and has never been rebuilt. So far as its current finances are concerned, it is out of debt, and the present time is considered a favorable one to close up its affairs, as a fair dividend can be made to the stockholders.

The result has not been brought about so much by direct competition as by the gradual narrowing of the field from which it has drawn the ores treated, and by changes in the ores still available which would require a remodeling of the plant, at an expenditure on which it was doubtful whether a profit could be earned. The plant has done good work in its day, but the day has passed, and the decision of the directors is probably a wise one.

California Oil Conditions

The petroleum operators in California have been much disturbed by recent rumors and occurrences. The first was a report that the Associated Oil Company was about to retire from active participation in the oil business as a result of the competition of the Union independents, and that an order for certain new pipe lines had been countermanded; this is emphatically denied by the Associated company. Instead of restricting its activities the company is about to enlarge them. It now markets over half the oil products of the State and is about to add to its pipe lines. The new line from Coalinga to Port Costa will be finished by the first of the year and the 72 mile line from McKittrick to Coalinga will be completed a little later.

The announcement that the United States Land department is to withdraw from entry thousands of acres of oil lands in Kern and Fresno counties has brought [illegible] of men up in arms. This is part of the Government plan of conservation [illegible] and is intended to prevent [illegible] and waste of oil [illegible] But the men who [illegible] and dig [illegible] and build [illegible] are [illegible] future generations [illegible] This [illegible] on the part of the Government will doubtless restrict prospecting new ground to a large extent because it is not yet clear what disposition is finally to be made of the lands. They are merely to be withdrawn from entry for the present and until Congress takes some definite action with regard to future proceedings. Meantime those operating in oil lands are rather at sea and not sure of what course to follow.

Notwithstanding these drawbacks, new prospecting continues. A company has been organized to bore deep for oil in the Half Moon bay region of San Mateo county where formerly many attempts were made to find oil in paying quantities. Such oil as this section has yielded ranges from 45 to 54 deg. gravity, and carries about 85 per cent. of illuminants with little asphalt in the residues. It is now proposed to bore much deeper than any wells heretofore bored and to get through the broken formation.

Death Rate in Transvaal Mines

In response to a question recently put in the British Parliament, the colonial secretary submitted a return showing the number of men employed in the Transvaal mines during the quarter ended March 31 last, and the average yearly death rate per 1000 men for the same period. The figures are given in the following table:

	No. Employed		
	1907.	1908.	1909.
Whites	19,350	19,193	21,814
Chinese	53,738	28,797	10,527
Negroes	130,351	160,696	196,674
Total	203,439	208,686	229,015

	Deaths per 1000 per Year		
	1907	1908.	1909
Whites	20 05	19 59	18 34
Chinese	16 38	15 70	15 96
Negroes	31 36	30 62	35 11
Total	27 94	25 60	32 89

The death rate among the white employees, while not very high, is not a low one, considering that the white men in the mines are mostly of the more favored class, holding superior positions. The Chinese death rate is the lowest, and speaks rather well for the condition of that class. It must be remembered, of course, that the Chinese brought over to the Transvaal were picked men, selected for their good physical condition and health appearance.

The high death rate among the negroes, the rate of which was very nearly twice that among the whites, and more than twice that of the Chinese. Some of the high death rate is said to have been due to the extension of recruiting which has brought in many from the districts up near the equator, the men from which often suffer from disease when brought to the high tablelands of the Transvaal; some is also due to the pressure for men, which has led to some carelessness in accepting them. The negro, as a rule, does not stand exposure to cold and climatic changes as well as a European. Moreover it is difficult to enforce sanitary rules among them, and perhaps the effort is not always strenuously made. Pulmonary complaints seem to be the chief cause of the high death rate.

In the Transvaal a great body of ignorant laborers is employed under conditions which, in some respects, approximate the slave labor of former times in South America. Modern opinion and knowledge have materially bettered those conditions, and human life is no longer a factor entirely disregarded. Nevertheless, there are some serious problems to be solved there, and the high death rate seems to be one of them.

The Selection of a Mill Site

There is a natural desire to build the mill as near to the mouth of the shaft as possible for obvious reasons. In connection with many kinds of ore deposits there was no danger in this, and even today there might be no hesitation in planting a mill near the outcrop of an ore deposit corresponding to the old idea of a true fissure vein. Unless, however, a substantially correct understanding of the character of the ore deposit is possessed, it is possible that a mill erected too near the mine will prove sooner or later to be over an unsuspected orebody that it will be desired to extract.

This has been the case recently at several mines in the newer camps of Nevada. Indeed, only a few weeks ago the cyanide tanks of the Combination mill at Goldfield caved into the mine, the mill being practically wrecked. Of course, if the builders of the mill had thought that mining would ever be done under their foundations they would have selected another site. Such experiences teach simply that it is inadvisable to build too near the mine unless we can be sure of the ground.

The Coal and Phosphate Lands

Richard A. Ballinger, secretary of the interior, has made the following statement:

The disposition of the phosphate lands of the Rocky Mountain States presents emergencies calling for legislation. All the known areas of phosphate lands in the public domain are now under temporary reservation, awaiting Congressional action. Common prudence demands that this fertilizer be disposed of with such restrictions as will require its domestic use so far as possible in the renewal of the fertility of the American farm rather than to permit of its exportation.

Respecting coal lands, since 1906 no coal-land entries have been permitted to be made in Alaska, pending requests upon Congress for legislation to prevent the monopolization of the vast fields of this valuable deposit lying in this territory, and to secure authority for permanent reservation for naval purposes.

Too much cannot be said in favor of legislation which will prevent the absorption of valuable coal deposits by private interests with the design of monopolization.

Philadelphia & Reading Coal and Iron Company

This company owns, leases and controls an extensive estate in the anthracite region of Pennsylvania. It is controlled by the Reading Company, which also holds the stock of the Philadelphia & Reading Railroad Company. The report for the year ended June 30, 1909, gives the fixed liabilities as follows: Stock, $8,000,000; collateral bonds, $1,200,000; due Reading Company, $74,800,255; the last-named amount representing advances made.

The anthracite statement for the year is as follows, in long tons:

	1907-'08.	1908-'09.	Changes.
Coal mined.	10,218,392	9,283,961	D. 934,431
Coal purchased	1,083,682	955,620	D. 128,062
Total	11,302,074	10,239,581	D. 1,062,493
Coal sold	10,992,976	10,076,210	D 916,766
Added to stock	309,098	163,371	D 145,727

The total production of anthracite from lands owned, leased and controlled by the company in 1908-9 was 10,773,306 tons, 1,489,345 tons having been mined by tenants. The total is a decrease of 1,140,848 tons, or 9.6 per cent., from the previous year. The cost of coal mined and purchased was 7.6c. per ton higher than in the previous year; the price realized was 0.9c. per ton higher, making a decrease of 6.7c. per ton in the profit. The decrease in coal sold was 8.3 per cent., in coal mined and bought, 9.4 per cent.

The income account for the year is as follows, in condensed form, averages being calculated on the tonnage of coal sold:

	Total.	Per Ton.
Gross earnings	$34,792,694	$3.45
Coal added to stock	478,868	0.05
Total	$35,271,562	$3.50
Mining and purchase of coal	$21,635,365	$2.15
Transportation of coal	9,080,328	0.90
Selling and general expenses	1,809,043	0.18
Total expenses	$32,524,736	$3.23
Net earnings	$2,746,826	$0.27
Depletion of coal land funds	$465,768	
Fixed charges and taxes	106,876	
Colliery improvements	1,172,205	
Interest on Reading Co. loans	935,003	
Total charges	$2,679,852	
Surplus for the year	$66,974	

Gross earnings include $33,411,277 for sales of anthracite; $909,810 sales of bituminous coal; $471,608 rents, royalties and miscellaneous. Mining coal includes $18,091,769 for mining and repairs of collieries; $2,111,246 for anthracite bought; $838,169 for bituminous coal bought; $504,182 royalties on leased collieries. Coal added to stock is credited at $2.93 per ton. The apparent profit on bituminous coal was $71,640.

The expenses last year were divided as follows: Cost of coal at mines, 66.5 per cent.; transportation, 27.9; selling and general, 5.6 per cent. The total expenses were 92.2 per cent. of gross earnings.

As compared with the previous year the gross receipts decreased $3,943,786; the expenses, $3,098,241; and the net earnings $845,545. The decrease in coal sales was the result of a comparatively mild winter and of light sales of steam coal to manufacturers.

Depletion of coal lands fund, to which 5c. per ton mined is credited, amounted to $1,990,852 at the close of the year, including the year's contribution and interest. Of this amount $1,497,168 has been invested in coal lands and improvements, and $300,000 in securities, leaving $193,684 in cash.

The employees' beneficial fund shows receipts of $159,084 from 30,855 contributors and $4400 from interest. The total of 4373 benefits paid was $153,677. The balance of $9807, with $33,539 brought forward from previous year, left $43,346 on hand at the close of the year.

The statement of the Philadelphia & Reading Railroad gives the following figures for coal traffic:

	1907-8.	1908-9	Changes
Anthracite	13,537,464	11,586,840	D. 1,950,624
Bituminous	10,816,439	10,574,314	D 242,125
Total moved	24,353,903	22,161,154	D 2,192,749
Ton-miles	2,776,062,041	2,561,567,593	D 214,494,448
Av. haul, miles	114	115.5	I. 1.5
Earnings from coal	$18,577,272	$17,698,227	D $879,045
Av. per ton mile	0.669c	0.691c	I 0.022c

The average haul is increased and the average receipt per ton mile decreased by the large proportion of bituminous coal carried. Coal earnings were 42.9 per cent. of the total receipts of the road.

Peat Beds in Indiana

The extensive peat deposits in northern and northeastern Indiana are beginning to attract attention. Within the last year the experts of the United States Geological Survey investigated the deposits of this fuel and their investigation leads them to believe that there is great value in these beds. Charles A. Davis, of the Survey, who has charge of the peat investigations, declares that there are possibilities in utilizing peat for fuel, but he realizes, he says, that these possibilities may not be generally appreciated until after the supply of coal and other mineral fuels are gone.

He calls attention to the fact that at least 10,000,000 tons of peat are prepared annually in other countries for use as fuel by various processes, and that smaller quantities are manufactured into bedding for stock, into packing materials, into fertilizing filler, into powder or mull for disinfecting and other sanitary purposes and into a variety of articles of importance.

Mr. Davis says the primary use of peat is as a fuel for domestic purposes—for cooking and heating in private houses. When properly dried it is particularly suited to such purposes. It makes a good hot fire, burns with a long, clear flame and makes but a small amount of ashes and no clinkers. Mr. Davis further stated that peat charcoal and peat coke are being manufactured in considerable and increasing quantities in Germany and Russia, where these products are used instead of wood charcoal in iron manufacture and other metallurgical processes, including copper refining and steel making.

In discussing the possibilities for developing the peatfields of Indiana, he said a successful plant could be installed for about $100,000. There is at present a small plant in operation at Garrett, Indiana, in the heart of the peat-deposit territory. This plant is making mosslitter and mull.

Peat makes good paving blocks and is said to resist wear better than some materials now in use. Mr. Davis expresses surprise that its use for paving material and other uses named has not attracted the attention of the manufacturers in Indiana. He predicts that the peat deposits in Indiana will soon be developed into a valuable industry and what has long been deemed a worthless material will prove to be a valuable commodity.

The under secretary for mines states (*Report* of the Department of Mines, Queensland, for the year 1908) that the death rate per 1000 in Queensland during 1908 was: In metalliferous mines, 2.1; in coal mines, 1.79; in all mines, mills and reduction works, 1.61. The higher rate in metal mines is due to two serious accidents which occurred at Mt. Morgan.

New Type of Hoisting Engine

The Cleveland-Cliffs Iron Company has recently installed at its Lake shaft, near Ishpeming, Mich., a hoisting engine which embodies some unusual features. This hoist consists of a 6x6-ft. cylindrical drum, keyed to the shaft and driven through a gear and pinion by two 14x18-in. slide-valve reversing engines. The drum carries two 1¼-in. steel ropes, 850 ft. long, and hoists in balance from two compartments of the shaft. It is capable of a net load of nearly six tons, which may be hoisted at from 720 to 860 ft. per min., depending on the engine speed which varies from 150 to 180 r.p.m. Steam is furnished at 150-lb. pressure.

This hoist differs from other second motion, slide-valve plants in its steam economy, which is estimated to be equivalent to that of a Corliss hoisting engine, designed for the same service. This unusual efficiency is gained by automatic regulation of the point of cut-off of the slide valves.

It may be asked, "Why is not the Meyer cut-off with handwheel adjustment suitable for hoisting engines?" Leading to variations in steam pressure and load adjust the cut-off by hand in this instance is out of the question, since it is necessary for the engines to take steam the full length of the stroke, in starting the load; when the load is fully underway, the cut-off must be set in its shortest position. The cut-off must be lengthened again at the end of the hoist for the next load, and this operation repeated each trip. It is evident that no engineer has time to operate the screws between trips, nor would it be possible for him to set the cut-off at its most economical point each time, owing to variations in steam pressure and load.

Sullivan Automatic Device

The objection to using Corliss engines on geared plants, and thus gaining the desired economy, is that the Corliss valve gear and cut-off cannot be operated above a certain speed, so that the cylinders must be built with such a long stroke as to render the plant unduly expensive.

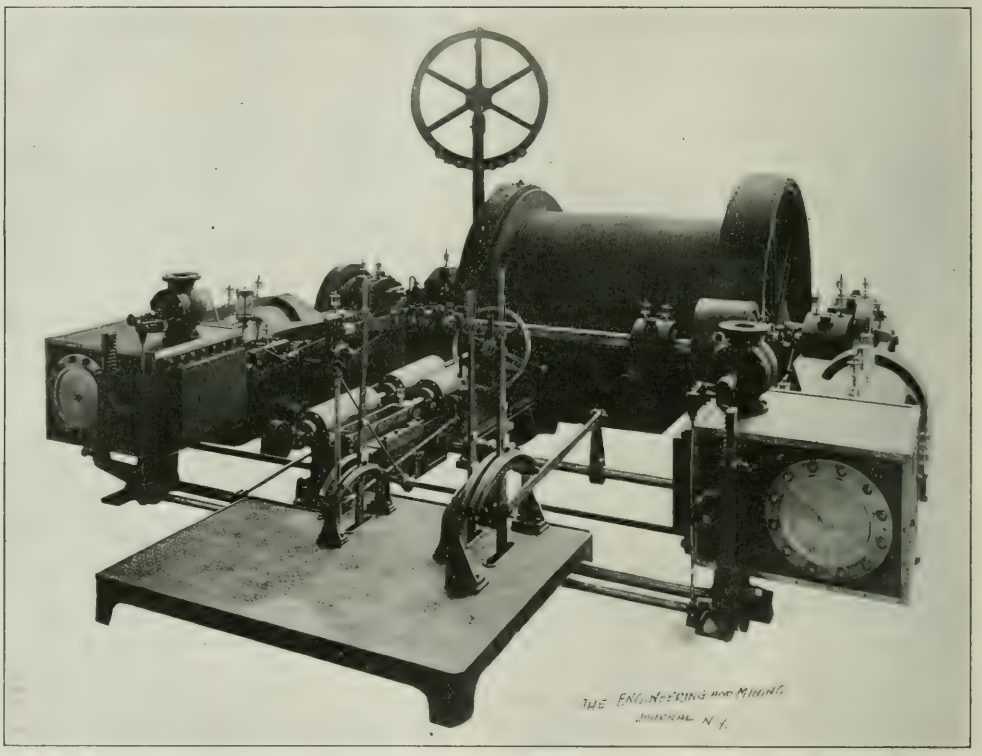
The device employed for doing this work automatically does not in any way limit the speed at which the engines may be run, thus permitting the engine of the most economical size and speed to be selected for a given duty, yet at the same time, it is possible to control the steam distribution as closely as in a Corliss engine, instead of wasting fuel by carrying steam the whole length of the stroke, as heretofore customary in slide-valve engines.

This invention, therefore, renders available a type of hoisting engine long sought by mine operators, one having moderate capacity and speed, with high steam efficiency and obtainable at a price well within ordinary means. Credit for this new regulating device is due the engineers of the Sullivan Machinery Company, who have employed an entirely new method for controlling the cut-off of the Meyer slide valves.

A double valve is used, as in the case of engines in which the steam distribution is controlled by hand adjustment. When starting the load, steam is admitted to the cylinders for the entire stroke. When the acceleration period is completed, the Meyer cut-off is automatically set at its shortest position in the manner shown in the accompanying drawing.

Details of Operation

When the throttle valve hand lever *A* is thrown, the main throttles are opened



SULLIVAN HOIST AT LAKE SHAFT OF CLEVELAND CLIFFS IRON COMPANY

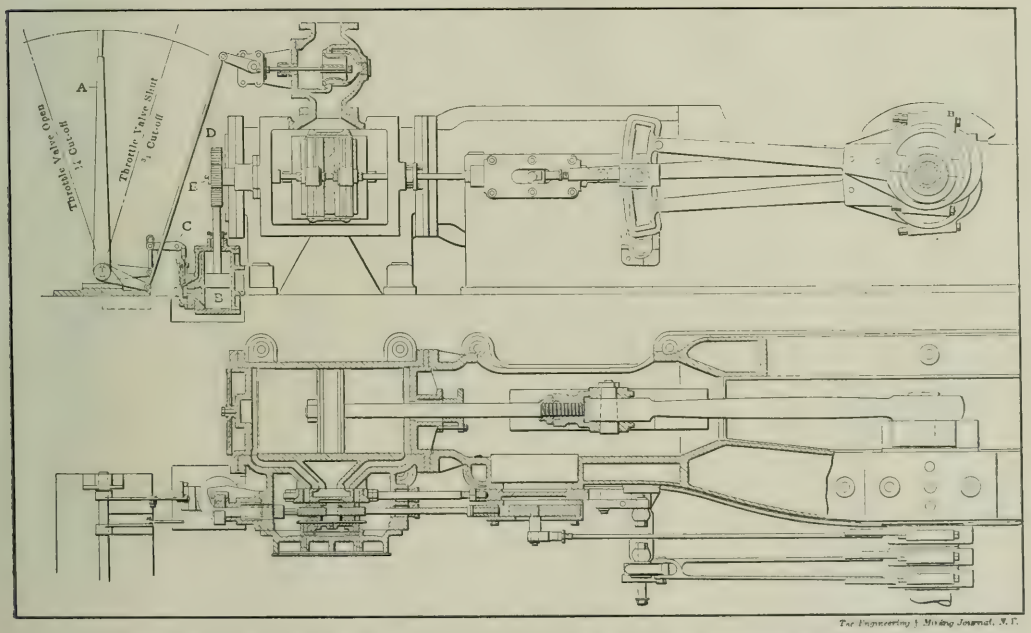
by the first two or three inches of the movement, admitting steam to start the load. As the lever is pulled back, it permits steam to enter cylinder *B*, through the valve mechanism *C*. The piston rod of this cylinder ends in a vertical rack *D*, which engages a horizontal pinion *E*, at the outer end of the spindle of the Meyer valve gear. When the steam enters cylinder *B*, by the movement of the throttle lever, the action of the rack and pinion automatically places the steam valves in the position of shortest cut-off. At the end of the trip, the reversal of the lever to close the main throttles admits steam to the opposite side of the piston in cylinder *B*, and the cut-off is restored to its first position, to start the load from the bottom.

a horizontal position. This enables the cut-off of both cylinders to be handled by one cylinder. The racks, in this instance, are operated by bell cranks.

The drum is fitted with a heavy band brake, steam operated, with a wheel for setting the brake by hand at any point, for inspection or repairs when the plant is not under steam. The gear and pinion are made of cast steel with cut teeth, the teeth being of such a shape that several of them are in mesh at once, thus rendering the action of the hoist smooth and quiet, even while lowering unbalanced. The engines are mounted on heavy-duty frames, the pillow-block section and guide section being cast in one piece. The bottom of these frames form inclosed boxes, to prevent oil from touching the foundations.

Coalinga Pipe Line, California

The Associated Pipe Line Company of San Francisco is installing 13 direct-acting Jeanesville pumps to transfer oil a distance of 175 miles. The pumps are triple expansion and the diameter of each steam cylinder is 18, 28 and 48 in., respectively, with a 3-ft. stroke. The oil plunger is 9½ in. in diameter, and works under a pressure of 800 lb. per sq.in. The steam will be superheated and condensers used, so that the amount of steam necessary to operate the pumps will be about one-half that used on the Bakersfield line, which has a like capacity—18,000 to 22,000 bbl. per day. The pumps will be installed at intervals along the line, the longest distance between any two stations being 24



SECTIONAL PLAN AND ELEVATION OF SULLIVAN HOIST AT LAKE SHAFT OF CLEVELAND-CLIFFS IRON COMPANY

It will be seen from the above description that the apparatus employed is simple and its action positive. It is entirely automatic, requiring no especial effort or attention on the part of the engineer, after the eccentrics have been set to secure the most economical operation possible with the prevailing service factors of load and steam pressure. The slide valves are operated by separate eccentrics, with the usual link motion, the third eccentric being for the cut-off. The range of the cut-off is from three-quarters to one-quarter at the latest setting, and from four-tenths to one-tenth at the earliest.

General Features

It will be noted that the automatic cut-off engine shown in the halftone is in

Hoists of this pattern are built in several stock sizes, and all parts are interchangeable, enabling them to be made and sold at a smaller cost than is possible when each plant is of special design. It is expected that they will be employed extensively in mines where the requirements of depth, speed and load do not warrant the purchase of a first-motion Corliss plant, but where economy of fuel is nevertheless a factor.

The combined output of the 50 chrome iron-ore mines operating in the Ural, as estimated by U. S. Consul J. W. Ragsdale of St. Petersburg, is about 1,600,000 poods (26,210 metric tons) per annum. The ore is quoted at 20@25 copecks per pood (10@13c. per 36 lb.) at Ekaterinburg.

miles. The line starts at Coalinga and connects with the Bakersfield line via Mendota. The pipe is 8 in. in diameter, 5/16 in. thick, and is to work under a pressure of 800 lb. per square inch.

At each station the oil is pumped into a large tank where the oil and water are separated. The oil is drawn into a second tank from which it is taken by the next pump, and delivered to the succeeding station. As the oil enters the suction pipe it passes through an exhaust-steam heater to raise the temperature to about 90 deg. Each pump weighs 80 tons and occupies a ground space of 14 ft. 6 in. by 42 ft. The high-pressure steam cylinder works at 170 lb. per sq. in. The pumps are being shipped from the factory at the rate of one per week

Details of Practical Mining

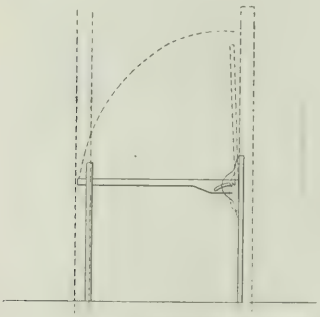
Notes of Interest to the Operators of Small Mines as Well as of Large Mines. The Things That Have to Be Done in Everyday Mining

REPORTS FROM EXPERIENCE

Readers of the JOURNAL are invited to contribute to this department. Articles should be brief, thoroughly practical, and preferably illustrated by drawings or sketches. Our draftsmen will prepare properly any kind of a pencil sketch that is intelligible. Something that is an old story in one district may be quite unknown in another. Articles accepted and published are suitably paid for.

Gate Bar at Shafts

The accompanying illustration shows a bar that is easily made, and that will remain open when so desired. The bar may be 1½-in. pipe or a ¾x2-in. piece of iron. The essential part is that the hinged end be flattened and a 3-in. slot



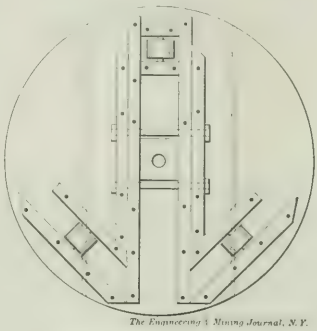
The Engineering & Mining Journal, N.Y.

GATE BAR AT SHAFT

cut as shown, through which a ¾-in. bolt will pass. When the bar is lifted, it slides back on the bolt, thus giving sufficient leverage to hold it upright. When closing the bar is lifted 3 in. and then turned down in place.

A Homemade Turntable

The accompanying illustration gives details of a turntable which any carpenter can easily make. It is 4 ft. in diameter and suitable for 24 in. gage track. The floor is of 2-in. planks. The support in the center is 7 in. square, through which a hole is bored for a 2-in. pipe. A band is bolted around the pivot block to prevent it from splitting. The sills are made of two 2x8-in. planks securely bolted together on each side of the pivot with ¾-in. bolts. The planks are 8 in. high in the center, and are chamfered at the end to about 3½ in. high. The



The Engineering & Mining Journal, N.Y.

HOMEFASHIONED TURNTABLE

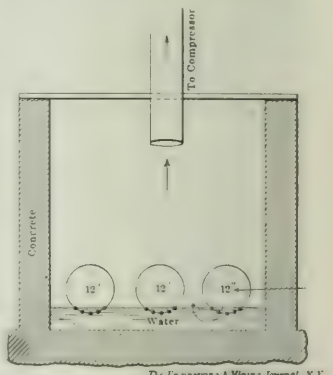
rollers may be made of 4-in. pipe cut in 4-in. sections with a wood center driven in, through which a 1-in. hole is bored for a spindle. A 4-in. coupling will also serve the same purpose.

Acetylene Lamps

The Republic Iron Company has been using acetylene lamps in the mines for about one year. When the lamps were first introduced, they were sold to the miners at the same price as the ordinary lamps in which "sunshine" was used. After all the men had been supplied, the additional lamps were charged out at the rate of 75c each, which is actual cost. With ordinary care one lamp will last six months. They require ½ lb. of carbide per day. This amount is handed out to the miner at the beginning of each shift, at which time he returns an empty can which is filled during the day and thus is ready for the next morning. Each lamp burns about two hours before it is necessary to recharge. The lamp is small and light, and is worn on the hat, the same as the ordinary oil lamp. The great advantage in the use of these lamps is cleanliness. There is no oil and no soot. They also give a better light and do not foul the air to such an extent as some other illuminants. The actual cost of using these lamps is about one-fourth that of candles, and one-half as much as "sunshine" or oil.

Washing Air for Compressors

The site of the compressor plant of the Penn Iron Mining Company is on a sandy bottom-land at the base of a hill that furnishes more or less sand during windy weather. As the result of these conditions sand would get into the compressors and cause trouble. A scheme for washing the air was resorted to which is shown in the accompanying sketch. A concrete box 5½ ft. wide, 5 ft. high and 16 ft. long was constructed. In



The Engineering & Mining Journal, N.Y.

CONCRETE BOX FOR WASHING AIR

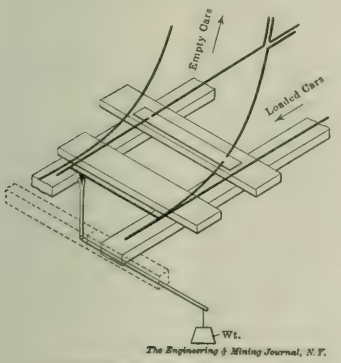
the bottom of the box three 12-in. cast iron pipes were laid, extending the full length of the box. The pipe is supported by the end walls. The lower side of the pipe is perforated with the sufficient number of ½-in. holes to allow the air to enter. Water is placed in the box so as to cover the perforations in the pipe 1 in. deep. This, however, is adjustable and can be arranged for any depth necessary.

The box is covered with plank so that all the air must enter through the water-covered holes in the 12-in. pipe. The intake pipe from the compressor enters from the top of the box but does not extend to the water, and therefore does not take up much suspended water. However, the air does absorb a certain amount of moisture as it passes through the water. To reduce the amount of

moisture in the air, the air is cooled as it passes from the first stage of the compressor to the second stage by passing through 150 ft. of water-cooled pipes. A small perforated water pipe is placed above the air pipe to furnish water for cooling the air. There is a trap between the two stages of compression to catch the condensed water. L. F. Armstrong, mechanical engineer for the company, designed this apparatus.

An Automatic Switch

The accompanying illustration shows a switch operated by gravity instead of a spring. It can be easily used on trestles where there is space beneath the tracks. It consists simply of the ordinary two short rails fastened together as in the case of a spring switch. Beneath the connecting bar is a small lug which is engaged by an L-shaped lever. One arm of the lever is 2 ft. long, and the other 1 ft. At the angle point it is fastened

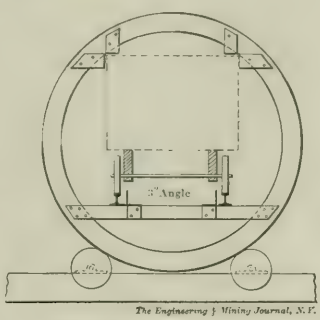


GRAVITY SWITCH FOR ORE CARS

to a post or beam. The short arm has a wide opening which engages the lug on the bar above, and by means of a small weight on the end of the lever it throws the switch. It works satisfactorily, and has been in use by the Cleveland-Cliffs Iron Company for a number of years. It is arranged so that it is opened by the loaded cars and then closes, thus throwing the empty cars on another track upon their return.

Revolving Tipple

The revolving tipple for mine cars has the advantage that it simplifies the construction of the car. It saves a large number of castings and no hinges are necessary. The car can be made much lighter on this account—simply a sheet-iron box mounted upon wheels. The tipple may be made any size, but a convenient one for a car that one man can handle is 50 in. in diameter and 6 ft. long. The two rings are made of ¾x4-in. steel bars, held together by 3-in. angle irons at the top which engage the top of the car. The ends of the angle iron are split and bent back on the ring and fastened.



REVOLVING TIPPLE FOR ORE CARS

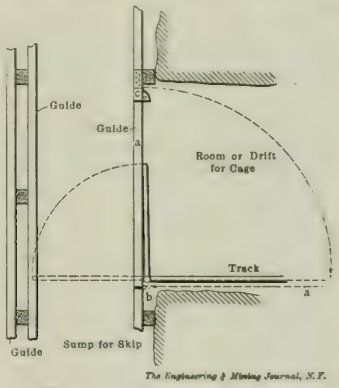
Rails are fastened in the bottom of the ring as shown in the accompanying sketch. The track is 24-in. gage and the entire frame is mounted upon four ordinary car wheels, two at each end. With the loaded cars the center of gravity is above the center of the circle and the car is practically self dumping. When the car has been emptied, the center of gravity is below the center of the circle and the car again returns to its original position. The car will dump easier and quicker than does the end type when operated by hand.

Catenary Hoisting Cable

There is an unusual installation of a hoisting cable at the Republic mine, Republic, Mich. In order to utilize a central power plant, it became necessary to have a cable operate across a small lake a distance of 1800 ft. before the headframe of the shaft could be reached. The shaft is about 800 ft. deep and is inclined at an angle of 70 degrees. In constructing the cable across the lake, the towers for supporting the cable would be very high if an attempt had been made to keep the cable in a straight line from the drum to the shaft. A catenary curve between the two places was figured out on the basis of the breaking load of the cable. Towers were erected at intervals of 100 ft. entirely across the lake, the one near the center being only 10 or 12 ft. above the level of the lake. The catenary is so flat that the cable has no tendency to lift off the pulleys and at the same time the friction on the pulleys is less than it would be if the cable were worked in a straight line. A large saving also resulted from the construction of smaller towers.

Device for Changing from Skip to Cage in Shafts

At the Dunn mine, Crystal Falls, Mich., the main hoisting shaft is large enough for only two skips, running in balance, and a manway for ladders and pipes. In hoisting ore it is not practicable to have safety appliances on the skip, for in the rapid descent of the skip the rope slackens and allows the dogs to injure the runners or guides. Furthermore, it is not safe to hoist men on the skips without a safety device, and since there was no room for a cage compartment, it became necessary to provide a safe way in which to hoist men. An ordinary cage is used for this purpose, having its full complement of safety devices. The shaft is about 1400



ARRANGEMENT FOR INTERCHANGING SKIP AND CAGE

ft. deep. The arrangements for replacing the skip with the cage were made at the lower level. A drift 12 to 15 ft. long was cut in the wall rock at one side of the shaft and a track put down. A truck is operated on this track for the transfer of the cage from the mine to the shaft. The skip is lowered into the sump and the cable detached. The guide *a* (hinged at *b*) is opened, and the track let down across the shaft. The cage which is on the truck is then run into the shaft and the cable attached. The skip in the other compartment is run in balance with the cage. After the men are all hoisted or lowered, as the case may be, the cage is placed on the truck and run out to the side of the shaft, where it remains until a change of shift. The sleeve *c* is made of $\frac{1}{16}$ or $\frac{1}{8}$-in. sheet steel, and is countersunk in the guide to make a smooth joint. The movable portion of the guide *a* is held in place by a pin inserted in the hole shown in the drawing

Personal

Mining and metallurgical engineers are invited to keep THE ENGINEERING AND MINING JOURNAL informed of their movements and appointments.

An assistant editor is required for THE MINERAL INDUSTRY. The character of this well-known work indicates the qualifications that are necessary. Applicants are requested to address this office.

F. F. Sharpless is examining mines in the vicinity of Denver, Colorado.

B. W. Traylor, vice-president Traylor Engineering Company, is at Parral, Mexico.

Charles Herzig sailed from London, Oct. 2, on his way to Nicaragua, by way of New York.

S. W. Traylor, president Traylor Engineering Company, has returned to New York from a recent trip to Cobalt, Ontario.

H. V. Croll has been appointed general sales manager of the Traylor Engineering Company, with office at Allentown, Pennsylvania.

George L. McKenzie, of Tucson, Ariz., has been visiting mines in northern Washington and neighboring parts of British Columbia.

Ernest Levy, manager of the mines at Rossland, B. C., of Le Roi No. 2, Ltd., lately spent several days at Spokane, Washington.

H. S. Chapman has been appointed manager of the Coalition-Queen-National mill at Rawhide, Nev., in place of L. M. King, resigned.

C. C. Williams, formerly with the Shannon Copper Company, is now with the Arizona Commercial Company at Globe, Arizona.

S. F. L. Dean has been appointed general manager of the Columbus & Hocking Coal and Iron Company, with office at Columbus, Ohio.

J. W. Bryant, mining engineer for the Tyee Copper Company, has returned to Victoria, B. C., from an extended visit to southeast Alaska.

P. E. Van Saun, chief engineer of the Mill and Smelter Engineering Company, of New York, has left for Nevada on business for his company.

M. E. Purcell, superintendent of the Centre Star group of mines, Rossland, B. C., lately visited several mining camps in the northwestern States.

R. W. Brock, director of the Geological Survey of Canada, was in British Columbia recently on his return from Yukon Territory and Alaska.

C. R. Wilson, recently with the Jones & Adams Company, of Chicago, has been appointed manager of the Uniontown, Penn., office of the Moreland Coke Company.

Jules Labarthe, manager of the Consolidated Mining and Smelting Company of Canada's plant at Trail, B. C., has been spending a vacation at Seattle, Washington.

Francis T. Havard, of Helena, Mont., has been appointed assistant professor of mining and metallurgy in the University of Wisconsin, at Madison, Wis. He is well known as an expert metallurgist.

Herbert Carmichael, assistant provincial mineralogist for British Columbia, has returned to Victoria from an official inspection of a number of mines in the Portland canal district, northern British Columbia.

C. O. Schmitt, of the Consolidated Goldfields of South Africa, Ltd., has sailed for England this week, after a short visit in the United States. His address will be at the Rand Club, Johannesburg, Transvaal.

Julius Lewisohn and J. Parke Channing, of New York, have been visiting the mines of the British Columbia Copper Company and the New Dominion Copper Company, in the Boundary district of British Columbia.

P. S. Elwell has been appointed general manager of the Pittsburg Coal Company, in place of C. P. White, resigned. T. F. Blackmar succeeds Mr. Elwell as secretary of the company, and J. P. Eaton as treasurer.

R. W. Coulthard, of Toronto, Ont., formerly with the Crow's Nest Pass Coal Company at Fernie, B. C., has been appointed manager of the West Canadian Collieries, Ltd., with headquarters at Blairmore, Alberta.

W. Fleet Robertson, provincial mineralogist for British Columbia, was among the Canadian members of the American Institute of Mining Engineers who attended the autumn meeting held in Spokane, Wash., at the close of September.

W. Weston, with Arthur Lakes, Jr., as assistant, made an examination of the Waldorf group of mines on McClelland mountain, above Silver Plume, Colo., recently, for E. J. Wilcox, president and manager of the Waldorf Consolidated Mining Company.

Obituary

Parker Price, who died suddenly at Pottsville, Penn., Oct. 7, aged 60 years, was a life-long resident of the anthracite country. He was at one time an independent operator, but later became connected with the Lehigh Valley Coal Company; for over 19 years past he had been with the Philadelphia & Reading Coal and Iron Company.

Societies and Technical Schools

American Society of Mechanical Engineers—Meetings of this society are to be held during the month of October as follows: In New York, on Tuesday, Oct. 12, in the Engineering Societies building; in St. Louis, jointly with the Engineers' Club of St. Louis, on Saturday, Oct. 16; in Boston, on Wednesday, Oct. 20, jointly with the Boston Society of Civil Engineers

Quebec Technical School, Montreal—On Oct. 4 the corner stone of the new technical school which is being constructed by the provincial government of Quebec on Sherbrooke street, Montreal, was formally laid by the Canadian premier, Sir Wilfrid Laurier, in the presence of a large and distinguished audience. In the course of his speech the premier enlarged on the vital necessity for technical education in view of modern industrial development more especially in connection with electric power. Other speakers were Sir Lomer Gouin, premier of Quebec, F. D. Monk, M. P., and Bishop Farthing. The school will occupy an entire block and will cost $1,000,000 in all.

American Institute of Chemical Engineers—The second annual meeting of the institute will be held in Philadelphia on Dec. 8-10, 1909. While the headquarters will be in that city, excursions are being arranged to some of the very interesting centers of industry in its vicinity. Early announcement of details will be made. A number of most important papers have been promised, and no doubt many more will be secured. Members are urged to advise the secretary immediately of subjects which are to be presented. The committee on meetings is desirous of having copy of papers early in order to secure a discussion by members interested. If possible, printed copies of papers will be ready in advance.

American Electrochemical Society—The autumn meeting will be held in New York City, Oct. 28-30. The convention will be opened by a meeting at the Chemists' Club on the afternoon of Oct. 28. A number of papers will be presented and discussed, and Prof. Edgar F. Smith, of the University of Pennsylvania, will deliver a lecture on recent developments in electro-analysis. Oct. 29 will be devoted to a visit to Bayonne, N. J., where a number of plants will be visited, including those of the Standard Oil Company, the National Sulphur Company, the Pacific Coast Borax Company, and others. On Oct. 30, two sessions will be held at Columbia University for the reading and discussion of papers. The social features of the meeting will include a banquet on the evening of Oct. 29, and a smoker at the Chemists' Club on Oct. 30. Dr. Leo H. Baekeland is president of this society, and Dr. J. W. Richards, Lehigh University, South Bethlehem, Penn., is secretary.

Special Correspondence from Mining Centers

News of the Industry Reported by Special Representatives at Butte, Denver, Salt Lake City, Goldfield, Cobalt and Toronto

REVIEWS OF IMPORTANT EVENTS

San Francisco

Oct. 7—The closing down of the property of the Lightner Mining Company at Angels, is quite a severe blow to that district, and will have its effect also on the total bullion output of California, since the mine has been a large producer for nine years, and has been paying dividends to a number of stockholders. The shaft is in such a shape that it is considered unsafe to longer operate the mine under present conditions. The surface ground on the footwall is settling so fast that it is impossible to maintain the hoisting machinery, boilers and compressors on their present foundations. Indeed, it has been necessary for some time to keep the machinery in line by "jacks" which have been in constant use. The plant has now been closed down until the company can secure ground for a new shaft and machinery. The property is not to be abandoned altogether, as there is over 500,000 tons of good ore in sight above the 600 level. It is noteworthy in connection with this property that for a long time it was unprofitable, and finally the stockholders, principally residents of Stockton, decided to make a change in management and put Alex Chalmers in charge. He was not a miner or metallurgist in any sense, but he started to run the mine on business principles and has made a success of it. During the nine years he has been in charge the entire plant was destroyed by fire at one time, and was rebuilt. He put in chlorination works to handle the sulphurets from the 60-stamp mill and put the plant in good shape so that the whole venture has been profitable. All the debts were wiped out and the property put on a dividend-paying basis.

Locations covering some eight miles or more of the river bed of the San Joaquin river in both Fresno and Madera counties in the old Millerton district above and below Fort Miller, have recently been made. The locations are from Fort Miller to Cassidy Bar, famous in early days of California as rich placer diggings. The river at this point works its way through a narrow gorge. Numbers of speculative attempts have before this been made to mine the river bed in this section but labor and money were lost. The locators in this instance supposed that some of the power companies were about to turn the water out of the river leaving the bed bare. The land covered by the locations is patented on both sides of the river so there is little chance that these locations will ever amount to much from a mining point of view.

There is talk of a dredge to work the Cash Sock mine on the Middle Fork of the American river about four miles south of Forest Hill, in Placer county. A dredge has been doing some intermittent work in that section, but it went down the gorge last winter. This supposed big river mine has never been put on a paying basis, and has had one misfortune after another, the last being the loss of the dredge. Dredge mining in torrential streams is not always what it is supposed to be and people with any experience keep away from such places with dredging machinery.

The North Star Mines Company, of Grass Valley, the most productive gold mine in the State, is paying 16 per cent. per annum in dividends on a capitalization of $2,500,000, besides carrying a reserve fund of nearly $1,000,000. In addition to this the company is constantly adding to its holdings and making permanent and extensive improvements about the property.

An important strike is reported in the Oriflamme mine in Alleghany district, Sierra county, where a vein was encountered in the crosscut tunnel being driven to intersect the Sixteen-to-One ledge. The ledge found is an entirely new one paralleling the Sixteen-to-One. The ore is of the same high grade found in the veins of the Alleghany section. The Oriflamme managers suppose that the Sixteen-to-One ledge runs through their ground and will continue the crosscut tunnel ahead to cut it.

Denver

Oct. 8—In the Cripple Creek district, the Jerry Johnson company's estate on Ironclad hill, during September, reports a production of about 850 tons of ore yielding 1½ oz. gold per ton, or about $25,000 gross value. Leasers on the Prince Albert, on Beacon hill, report a surface discovery of a flat orebody 10 ft. thick, assaying from $15 to $30 per ton. The ore is being quarried. The September production from the Mary McKinney main shaft, under the lease of the Western Investment company, was 725 tons, valued approximately at $21,000. Other lessees on the same property shipped about 700 tons of milling ore as well. The Chicken Hawk, adjoining the above property, is producing ore containing from 1 to 2 oz. gold per ton from a depth of 650 ft. Charles Waldron, manager. Six sets of leasers are working the old Victor mine, on Bull hill, and 20 carloads were shipped during September, the average value being given as $20 per ton. F. D. Roscoe, of Victor, is manager. The Portland Gold Mining Company has declared a quarterly dividend of 2c. a share, payable Oct. 15, amounting to $60,000, and bringing the total amount paid to $8,347,000. It is estimated that the new mill will be ready for a trial run by the middle of December.

The State Bureau of Mines gives the gold production of Summit county from lode and placer for 1908 at $171,235. This year it is now estimated that the production will be between $800,000 and $900,000—a very healthy increase.

It is reported here today that the old Harrison smeltery at Leadville has been purchased by Denver men, and has contracted with the Robinson mine at Kokomo for a supply of zinc ore, for the treatment of which the plant was recently equipped.

At Leadville the Yak tunnel is under the South Evans amphitheater, and pushing on under the Mosquito range, having been driven 3½ miles from its portal. The manager is Walter W. Davis, of Leadville.

The Camp Bird gold mine at Ouray has paid nearly $6,000,000 in dividends up to September 1.

By a decision of Judge Allen, in the district court, on Oct. 6, it was established that when a leasing company had done sufficient work to prove that the lease was unremunerative, it might abrogate the lease and be relieved from making other efforts to find ore, as required by the contract.

The Mine and Smelter Supply Company has filed a suit in the United States Court against the Hendrie & Bolthoff company, and the Card company. The plaintiff claims to have purchased the rights to the Wilfley ore-concentrating table from Arthur Wilfley, the inventor, and avers that the two defendant companies are manufacturing and selling this table under another name, thereby infringing on its rights. Rights to other machinery sold by Wilfley to the plaintiff company, are, it is alleged, also being infringed upon. An injunction and damages are asked for.

In Gilpin county, shipments of concentrates from the Golden Flint mill at Perigo and from the Smuggler mine in the same vicinity, are now being made via Rollinsville, on the Moffat road, to the new Modern smeltery (pyritic) at Utah Junction, on that railroad.

The Colorado School of Mines is preparing to erect an experimental ore-dressing and metallurgical plant, which will provide not only a laboratory for the school, but also a modern testing plant for the benefit of the mining industry. President Victor C. Alderson has issued a circular to the engineers throughout the State, asking for comments, suggestions and criticisms on the preliminary plans, which accompany the circular.

The Bull-Domingo, at Silver Cliff, which is credited with a past production of $1,500,000, is to be re-opened, and exploitation work commenced from the 1000-foot level. The mine has been unwatered, and a new hoisting plant installed. It has had a more or less checkered career, having been opened and closed four times, twice by fire, which destroyed the surface plant. Its product has been chiefly silver-lead. J. H. Robeson and others, of Denver, are lessees.

At Fluorine, in the Black Range district of New Mexico, about 30 miles from Engle, on the Santa Fe, a belt of gold- and silver-bearing veins of great richness is reported as having been developed during the summer. It is stated to be 15 miles in length by two in width, and the country rock to be andesite, traversed by porphyry dikes.

Another one-time celebrated Colorado mining camp has apparently got its second wind and is coming to the fore again, for at Creede, in Mineral county, the Humphreys tunnel is being driven with machine drills and the Humphreys mill, the property of the Creede United Mining Company, is being put in working order. A. E. Humphreys is general manager. The above company is credited with $187,500 dividends paid in the past on its $500,000 capitalization. The North Creede Mining Company, lately organized with a capitalization of $500,000, has a large area of comparatively undeveloped ground, which will be at once systematically explored. Charles J. Hughes, Jr., and C. S. Thomas are the main owners.

In Gilpin county, the Central City, Russell Gulch and Black Hawk gold-mining districts have actually taken on new life. The Newhouse tunnel has cut a big vein which contrary to usual results in such cases shows pay values at the intersection, and which as nearly as can be determined at such depth below the surface, and with the unknown quantity of vein dip, is the Kansas Burroughs vein. The great California vein will be intersected shortly after the first of next year, and great things are expected. Henry P. Lowe is actively working the Topeka and Frontenac, and the Scotch thread people, the Coates Brothers, are working the Dead [illegible] mine, on the same vein as the Frontenac, under Max Boehmer, and paying steadily.

The Royal Oak mine, in Taylor park, Gunnison county, is said to be the scene of a new strike of 10 ft., of ore running 40 to 80 per cent. lead and a small amount of silver. All that is needed to make many shippers of lead ores in this region is railway facilities, of which at present it is devoid.

The Camilla mine, on Pomeroy mountain, at Hancock, on the Colorado & Southern, near Buena Vista, is putting in supplies for a winter siege. The vein is large and well defined on the surface, and carries from four to five feet of silver-lead ore; and in one fork of the vein at 11,500 ft. elevation a large pocket of almost solid gold was found; but owing to the great elevation and rugged character of the mountain, the veins could not be worked from the surface, so a long crosscut tunnel was driven from the valley, which will tap the vein 800 ft. below the surface. This tunnel is now in 1809 ft., and has about 200 to 300 ft. to drive to reach the vein. The property is owned by a Denver syndicate. Ex-Lieut. Gov. W. G. Smith, president and manager.

Butte

Oct. 8—The Pilot-Butte Mining Company has called a special meeting of stockholders to consider the financial condition of the company and to devise ways and means for the resumption of operations. In the notice of meeting it is stated that the company owns in fee one-half of the Pilot quartz claim and that there remains due on the purchase price of the remaining one-half the sum of $70,000; that the other indebtedness of the company amounts to about $85,000 secured by mortgage on the property; and that recent developments upon the adjoining Elm Orlu mine indicate that the Pilot claim should become a producer when developed to a depth of 1000 ft. To raise funds for further development the directors suggest the issuance of first mortgage bonds on the property in the sum of $375,000, payable three years after date, with interest at 8 per cent. payable annually.

Considerable interest has been aroused in the German Gulch district, situated about 16 miles west of Butte, owing to the fact that Charles Kemmerer, manager of the Conrey Placer Company, has taken an option on about 600 acres of placer ground at the head of the gulch. Mr Kemmerer states that he will put in Keystone drills during the winter and prospect the ground, and if satisfactory results are obtained install dredges next spring. It is estimated that in the early days $15,000,000 of placer gold was taken out of the district.

President Gross of the East Butte company states that the company is now producing its copper for 10c., and that it is now in shape to produce 7,000,000 lb. of copper annually. Owing to the low price of the metal the company is bending its energies toward developing the property rather than toward production. Should the price of copper warrant it, the company's second furnace at the Pittsmont property can be put in commission at short notice.

Goldfield

Oct. 8—The Goldfield Consolidated has discovered a new body of high-grade ore on the 730-ft. level of the Clermont shaft. An average sample from 15 mine cars gave returns of $1502 per ton, and from nine cars, $1822 per ton. Alunite is freely distributed throughout the ore, a feature which is characteristic of the high-grade orebodies of the Mohawk vein system. The company will add 40 or 50 more stamps to take care of the increased reserves.

The Combination Fraction company, which recently made the discovery of rich ore, has announced a dividend of 10c. per share, amounting to $93,000. The company is controlled by George Wingfield, and has an agreement with the Consolidated in regard to extra-lateral rights.

It is stated authoritatively that the construction of the extension of the Tonopah & Tidewater railway from Goldfield to Ely will be begun before the end of this year. The line will probably go via Hamilton, White Pine district, and although there is some difficult country to pass through, the maximum grade will be only 1.5 per cent.

Joplin

Oct. 9—The conditions in the Kansas zinc camps have been greatly improved by reason of the discovery of a deeper ore horizon and the installation of large modern mills. On the Falenbach land south of Galena and on a tract controlled by O. C. Ihlseng north of Galena, ore has been found at a depth of 300 ft. in limestone, with very little flint. Another deep orebody has been developed south of Badger-Peacock mine, by O. DeGraff, and also on the Hubbard farm in the same locality. The idea prevails that all of the small orebodies are underlaid with a deeper run of ore and extensive exploration to prove this theory has now been undertaken in the district.

Cobalt

Oct. 9—Good reports come from Montreal river, in the Miller, Everett and Le Roy Lake districts. At Everett lake the Everett Lake Syndicate has had a force of men at work all summer and 50 veins have been discovered. On some of these silver has been found at the surface. The Le Roy Lake Syndicate is sinking three shafts, one of which is down a depth of about 100 ft. At this point some good silver values were obtained. Another good discovery of ore carrying

about a thousand ounces silver has been made on the Welch claim. The Harman, McDougall & Ross Syndicate, operating to the east of Le Roy lake, has had a small force of men engaged in surface trenching, and several promising veins have been discovered. This syndicate will shortly commence operations on a much larger scale. The wagon road from Elk lake to Gowganda has now reached Le Roy lake, and this will aid very materially in opening up this district. The German Development Company, which has been operating quite largely around Miller and Everett lakes, intends to dispose of its holdings, and will confine its attention solely to large coal deposits which it has in the west. In Gowganda itself the results so far have been rather disappointing. This is in great measure attributable to the enormous price of supplies. During the coming winter this section of the country will come in for a good deal more attention, and the good roads that are being built will enable many of the small companies to get in supplies at a figure that will permit them to carry on their work. Many good discoveries have been made on the properties round Gowganda, but the country is still suffering from the effects of the subsequent reaction of the boom of last winter. There is practically no possibility of a repetition this season. It is currently reported that the Larder Lake district will come in for a good deal of attention as soon as the winter roads are in shape.

Toronto

Oct. 8—The provincial department of mines has received reports of material gold discoveries in Whitney township and neighborhood lying to the west of Nighthawk lake near Porcupine lake. Samples of the ore were also received which show visible gold. The department is making investigations. The interest in the new field is increasing and already 500 prospectors are on the ground, the route to which is by the Driftwood river, a tributary of the Abitibi.

The reports which have been in circulation of a contemplated merger of the large steel and coal industries of Canada appear to have some foundation. James Ross, president of the Dominion Coal company, admits that he has more than once been approached with a proposition to purchase his extensive holdings in the company at a good price. He states that he refused to entertain the proposal, unless the interests of the other stockholders were included upon equal terms.

Ten thousand acres of bituminous coal land have been located on the Peace river in British Columbia, just west of the Alberta boundary by a syndicate of eastern Canadian capitalists represented by R. Brutinel, of Edmonton. Although small seams of coal had previously been found along the Peace river, the existence of so large a workable deposit was not known until the claim was recorded. Theodore Davis, a mining engineer acting for the syndicate, has made a survey of the property and declares the coal to be excellent both for manufacturing and domestic purposes, and that it will coke to the extent of 86 per cent. The syndicate will not be able to do much to develop the property for four years, owing to the want of transportation facilities. By that time it is anticipated that the Morinville branch of the Canadian Northern railway will be extended to Peace river, when it will be feasible to ship the coal down the river to the railway.

As the result of strong representations made to the Ontario government as to the injurious effect of high royalties upon mining investments and industries, it is understood that the question of considerably reducing the royalties now payable by some of the Cobalt mines is receiving favorable consideration. The companies now subject to royalty are the Right of Way, Townsite, Nancy Helen, Cobalt Station Grounds, Railway Reserve, Jackpot and O'Brien 25 per cent.; Wright Mining Company 15 and 25 per cent. according to value of ore; Chambers-Ferland and Temiskaming & Hudson Bay 15 per cent. and Crown Reserve 10 per cent.

Mexico

Oct. 10—The report of the new discoveries in the Asientos district of Aguascalientes have attracted attention. In fact, the reports are somewhat misleading. The actual discoveries made recently are not "new," merely the encountering of the surface oxidized ores in the sulphide zones, but much more promising in size and content, and this has caused the recent new life and vigorous prospecting and development in the camp. This discovery has been retarded chiefly on account of lack of concentrated effort and capital, many properties being in the hands of poor owners. The only really "new" discovery has been made by T. H. Hamilton, superintendent of Santa Francisca mines of the American Smelting and Refining Company, who has taken up about 60 claims for this company in an hitherto unexplored portion of the district, about 2 km. north of the Santa Francisca mines. These properties are said to contain good gold veins. The other discoveries have been made on extensions of veins already explored, or in depth as previously stated. On the Alta Palmira vein, Charles Lucas and John Henderson have struck ore in the adjoining claims, the Esperanza and Hannah Francis, and Abram Rapp is opening up a fine body of sulphide of copper with good silver values at water level in the old Alta Palmira mines. He has attained a depth of 350 ft. The Aguascalientes Metal Company, George Crowder in charge, is in good ore of exceptionally large width at the 450-ft. level, and has a large tonnage of both shipping and concentrating ore opened up. This is the largest developed copper property in this camp. On the Santa Rita and Purisima claims of El Tabor y Anexas Company, Bruno Newman, manager, crosscutting has started from the main shaft at the 325-ft. level, and it is expected that the continuation of the surface ores will be found, as has been the case in the "Aguas" Metal company mines, the adjoining property. The Santa Francisca silver mines of the Smelting company continue a daily output of 200 tons, all of which is shipped to the smeltery at Aguascalientes. These mines, despite the low silver values and the heavy timbering and pumping expense, are earning a fine profit. Several good lead-silver-gold prospects are showing up well, but development is retarded because of the low lead and silver prices. The future of lead production in this camp is promising. In Tepezalá the Guggenheim Exploration Company has also found new orebodies at depth, and is blocking out a large tonnage for shipment to the Aguascalientes smeltery. These mines have been steady and very profitable producers for this company for about 15 years, and yet are explored but little. The Leonora mines, belonging to J. M. Daniels, at Jalpa, have produced high-grade silver concentrates without interruption, packing them 70 km. on burros to the Aguascalientes smeltery, and experiments are now being made to treat their large lower grade dumps, which cannot stand the heavy haulage charges.

The application of electric power to mining in Mexico is becoming very widespread. One of the most important projected installations is that headed by Dr. F. S. Pearson. This contemplates the erection of a dam on the Conchos river near Santa Rosalia, Chih., for the purpose of generating power, which will be transmitted to all of the Chihuahua mining districts. In the western part of Chihuahua the Mines of Mexico Company, a Denver company, has a concession for the installation of a hydraulic plant on the Mayo river in Sonora to supply the mines of western Chihuahua. Work will be undertaken soon on the hydroelectric project on the Altar river, Sonora. This installation will supply a number of the mines and will be used for irrigation purposes also. The Chacala company in Jalisco has obtained a loan of $2,500,000 from the National Loan bank of Mexico City for the purpose of installing a hydroelectric plant on the Santiago river near Guadalajara. A concession has been granted for a hydroelectric installation on the Quepalta river in Queretaro. Another concession has been granted for the Matamoras river in Puebla. These are some of the important projected installations which indicate the very general introduction of hydroelectric power in connection with the development of Mexican industries.

Mining News from All Parts of the World

New Enterprises, Installations of New Machinery, Development of Mines and Transfers of Property Reported by Special Correspondents

THE CURRENT HISTORY OF MINING

Alaska

Fairbanks—The quartz-lode development in the district is reported promising.

Big Thing—The mine at Skagway will build a compressor and tramway this winter, costing about $80,000. W. H. Vance, superintendent.

Gold Bullion—A clean-up of $12,000 in the 13-day run is reported on this property on Willow creek at Knik.

Seward—Reports from Valdez creek indicate a good cleanup this season.

Nome—Much development work has been done on the Dutton-Chilberg copper-gold property. A tunnel is being driven which will permit of it being worked far below the outcrop.

Arizona

Cochise County

Courtland Copper Company—The company has been organized with $5,000,000 capital to develop claims near the Calumet & Arizona property at Courtland and near the Commonwealth mine, Pearce.

Calumet & Arizona—Shipments are being made from Courtland to the Douglas smeltery.

McKittrick—Ore is being shipped from Gleeson to the Copper Queen smeltery, Douglas. It is reported that the Copper Queen interests have control of the McKittrick and Costello properties.

Bisbee Camp—The September production of the Copper Queen was 9,050,000 lb of copper. The Calumet & Arizona smelter output for the month was 4,500,000 pounds.

Bunker Hill—The Chicago Exploration company, William Wallace, representative, is planning to open this property at Tombstone. The shaft on it is now down 555 feet.

April Fool—Final payment on this property at Courtland has been made by Calumet & Arizona company. The company is taking up other options in the district, including the Maid of Sunshine and the King Solomon mines.

Black Queen—The property at Paradise has been purchased by Renwick White and is being developed.

Bisbee Courtland—A Cyclone drill is being used to prospect the ground near the depot.

Gila County

Globe—The survey of the Miami railway to the mine is being made by Southern Pacific engineers.

Old Dominion—The September copper output was 2,672,000 lb.; in 1908 it was 3,181,000 lb. The net earnings for the month are reported at $60,000, and the cost of copper is estimated at 10¾c. per pound.

Schulze—The claims at Globe have been acquired by Salt Lake company in which Samuel Newhouse is interested. The development work has been started with J. C. Dick in charge.

Gibson—The mine is yielding high-grade copper ore which is teamed to the Old Dominion smeltery. The ore occurs in the Pinal schists.

Graham County

Shannon—The company is interested in the projected extension of the Gila Valley & Globe railroad, east to Guthrie, connecting with the Arizona & New Mexico railroad. This would make possible an outlet for the new Shannon road.

Gold Belt—A 10-stamp mill will be installed at this mine by Morrison & Berstein, of Morenci.

Yavapai County

Crown King—The mine in the Bradshaw mountains has been sold at receiver's sale to the Yavapai Consolidated company for $75,000.

United Verde—The company is going to install a Knudsen smelting furnace, which will be the first of this type in North America. It is being built by the Colorado Iron Works Company, of Denver.

California

Amador County

Defender—The mine at Pine Grove has been closed. The cyanide plant was closed some weeks since, it being reported that some of the solution going into the Mokelumne river was poisoning the fish.

Bunker Hill—Twenty stamps will be added to the 20-stamp mill.

Butte County

Tiger—Ore has been struck in the mine at Bucks Ranch, under bond to John MacBean.

North California—Several camps are being put in order at Big Bar. A. E. Jackson, manager.

Calaveras County

Abriel—The mine, Mokelumne river district, has been bonded and has been supplied with new cars, drills, and air compressor.

Duck Bar—At the property near Murphy, W. H. Matteson, Stockton, manager, coarse gold is being taken out.

El Dorado County

Encinal—The gravel mine on Cedar creek near Placerville will start up, C. S. Bolton, in charge.

Modoc County

Hoag District—Work is progressing on the mill ditch near Fort Bidewell and the buildings, ditches, etc., will soon be in readiness for the new mill for custom ores.

Nevada County

Black Swan—Sowell Brothers have found the lode in this mine at Mooney Flat. The mine is an old one.

Yellow Metals—The Grizzly hill mill buildings are being hauled to the mine at Bowman's dam.

Placer County

Gravel Channel—Leo P. Harris, of Colfax and N. L. Neilson, of San Francisco have taken a bond on the J. G. Dodds land at the head of Big Secret cañon, near Colfax. There is a wide gravel channel which has not been worked. A shaft is to be sunk.

Bogus Thunder—The old mine near Deadwood is being reopened after 30 years' idleness.

Cash Rock—Superintendent Brule is about to construct a dredge to take the place of the one wrecked last winter near Cash Rock.

Plumas County

Poplar Creek—The company has recently acquired 160 acres of mineral land in Poplar valley. The gravel is now to be opened.

Plumas-Eureka—The mine, long idle, but once a famous producer, is to be again worked and preparations to that end are being made.

Claybank—At this mine, near La Porte, now controlled by Oregon men, 15 men are at work retimbering the tunnel and preparing for reopening.

New York—The Greenville Pacific Development Company, W. S. Haskins, manager, will probably renew its bond on this mine near Greenville.

TRINITY COUNTY

Headlight—The new owners of this mine, near Carrville, have begun erecting a 40-stamp mill and chlorination plant.

TUOLUMNE COUNTY

Karmac—The company has purchased the Standard and Daniels claims five miles west of Jamestown, and on the Hancock mine it is sinking.

La Fiesta—The holdings of the company near Groveland, have been sold by the sheriff. There is a 10-stamp mill.

Colorado

CHAFFEE COUNTY

Ben-Della—Tellurium ore is reported in this property near Salida.

Colchester—The property on the White ranch at Cleora will be operated by a new company, represented by Messrs. Foster and Sullivan, of Salida.

CUSTER COUNTY

Humboldt—The mine at Rosita has been leased to Humphrey and Thompson, of Cripple Creek, and the shaft will be sunk to a greater depth.

Jenny—The shaft is being sunk on this property in the Spalding district and the new hoist installed.

Terrible—This mine at Isle has been bonded for $250,000. Plans for development are announced.

GUNNISON COUNTY

Abe Lincoln—A lease on the property near Bowerman has been taken by Frank L. Fuller, of Denver, and David R. Snead, of Salina. The property has a 10-stamp mill.

SAN JUAN DISTRICT

Favorite—Felix Leavick has made a discovery of gold ore on this property at Ophir.

Peerless San Juan—Work on the reduction plant is being pushed to complete it before the first of the year.

Silver Lake—High-grade silver ore has been discovered on this property by leasers.

TELLER COUNTY—CRIPPLE CREEK

Portland—Excavations are completed and part of the structural material on the ground for the 300-ton cyanide mill for the treament of the raw low-grade ore of the district. The mill will be completed Feb. 1.

Roosevelt Tunnel—The tunnel advanced during September 355 ft. The north heading from the intermediate shaft is now in 3045 ft. The tunnel has now been driven beyond the 11,000-ft. point.

Isabella—Bids for leases are asked for the Empire shaft ground.

Portland—The Doyle-Burns suit involving this mine has been settled out of court. The action involved a million dollars and has been in the Iowa courts for several years.

Idaho

BANNOCK COUNTY

Ft. Hall Mining and Milling—The company is unwatering the mine in the Ft. Hall district, near Pocatello, and remodeling the mill. Frank W. Mosher, of Chicago, has been reëlected president of the company.

LEMHI COUNTY

Salmon River Placers—John Berger, of Spokane, is installing a turbine wheel and constructing a 700-ft. ditch to pump 1,500,000 gal. each 24 hours to the high-bar placers.

SHOSHONE COUNTY

Star—Work on a 6000-ft. bore to tap the ore belt 850 ft. deeper than present workings is commenced. The portal is in Grouse gulch.

Snow Storm Extension—Development will be started on a large scale. The tunnel now in 700 ft., will be continued under contract let to Edward Eisman.

Nabob—A tunnel 2015 ft. long is being driven to tap the ore and drain the mine. It is now in 82 feet.

Illinois

DOUGLAS COUNTY

A 4-ft. seam of coal has been struck by boring on the Martin farm, near Newman. The coal is overlaid by 4 ft. of shales.

FRANKLIN COUNTY

A tract of 4000 acres of coal land has been sold to a syndicate including Loren N. Wood, A. Newell and others, of New York. Mines are to be opened at once, and spur tracks built to connect with the Chicago, Burlington & Quincy and the Illinois Central railroads.

Michigan

COPPER

Lake—The crosscut from the 5th level has cut the lode 100 ft. from the shaft and at the intersection shows a mineralization equal to that in the levels above.

North Lake—An outcrop has been found and the drill hole will be started from this point, which will eliminate the trouble on account of heavy overburden. The copper lode in No. 3 hole is now believed to be the Lake lode.

Keweenaw—The Osceola lode has been found by the diamond-drill operations. This lode has not carried commercial copper in any of the properties north of the Calumet & Hecla. The two shafts on the Kearsarge lode are in good copper ground.

LaSalle—Shipments are to be made to the Allouez-Centennial mill and will come from the stock pile and the openings of No. 1 Tecumseh shaft.

Ahmeek—Shafts Nos. 1 and 2 are down 800 ft. and the deepest openings and extensions yield ground up to the high average. Rock hoisted is shipped. The new shafts 3 and 4 are down 300 feet.

Franklin—The shaft on the Pewabic lode is nearing the 27th level. It is in the footwall and crosscut to the lode. Openings at the 23d, 24th and 25th levels are proving a good grade of stopping ground.

Oneca—No. 1 drill hole has reached 650 ft. No. 2 hole is down over 200 feet.

Adventure—Encouraging copper-bearing ground in the two crosscuts from the old works has been encountered. The lode exposed is probably the same opened on the Mass tract and known as the new Mass lode.

South Lake—Diamond drilling has started on the footwall of the Evergreen lode and will ultimately strike the zone of the lodes disclosed on the Adventure land.

IRON

Republic—The Cambria Steel company will ship 175,000 tons from this mine this season.

Cleveland Cliffs—Work on the water-power project for the Carp river will not be undertaken until spring. The company has much development work under way in the Swanzy district, and is developing new area at North lake, west of Ishpeming.

Hiawatha—The Buffalo & Susquehanna company is installing an electrical plant for this mine in the Iron River district. Exploration work has developed an important orebody.

New York State Steel Company—The company which has been operating on the Mesabi has taken options on the Goodman and Ziskofsky mines, which have been explored by the Gleason company. The new company will continue explorations and development.

Minnesota

IRON

Holman—The property at Coleraine is being stripped over a mile long and several hundred yards wide.

Shagawa—This property on section 30, at Ely, is expected to ship next season.

Montana

BUTTE DISTRICT

Butte & Milwaukee—This property in the North Butte section, controlled by the Butte-New York company, will resume operations.

Anaconda—A large output of glance ore is coming from the 2200 and the 2400 levels.

Butte-Duly—A canvass of the stockholders in Montana shows that F. A. Heinze has most of the proxies. No further contest is expected at the Oct. 15 meeting.

Butte & Superior—The contract has been let to the American Metal Company to erect a mill near Butte for the treatment of the zinc ores of the mine.

East Butte—The second furnace is ready to blow in and will be placed in operation as soon as the copper market justifies it. work has not been abandoned on the old East Butte property as reported.

Butte Copper Output—The copper production of Butte for September was 23,918,180 lb., which is 2,220,000 lb. less than August, due to one holiday in the month and a four-day shutdown, due to the labor troubles.

Bullion Output—The United States assay office at Helena received during September bullion from Montana in the sum of $163,030, a gain of $75,000 over the same month, 1908. Fergus county leads with an output of $51,641.

Jefferson County

Independence—Messrs. Carpenter, Knotts and Truscott are working the property at Amazon under an 18-months lease and bond for $10,000. The tunnel is in 150 ft. which gives a depth of 110 ft. The face of the tunnel is in ore.

Blizzard—The property, two miles west of Wicks, is under bond to Thompson and Joynt.

Black Jack—The property, 1½ miles northwest of Corbin, which has been operated for two years, was closed last week, temporarily.

Minneapolis-Corbin—The shaft on the Copper King claim is now down 185 ft. and several stringers of ore have been cut.

Sun and Bohemia—These claims at Corbin have been bonded to an English company for $125,000, and development to 1000 ft. is to be undertaken

Lincoln County

Victor-Empire Mining & Milling Company—The company, incorporated with a capital of $600,000, owns five silver-lead claims, 10 miles southwest of Libby. The main tunnel is in 850 ft. and there is another tunnel in 69 ft. and a 25-ft. shaft. A 3-drill compressor has been ordered. W. B. Dilley, manager.

Nevada

Clark County

Monte Cristo—So far during 1909 this mine, controlled by Douglas White, Los Angeles, has shipped about 4000 tons of manganese, averaging about 45 per cent. The mine is eight miles from the railroad, the cost of carting the ore thereto and loading on cars being $2.25 per ton. A freight rate of $8 per 2000 lb. to Kansas smelting points has lately been secured.

Esmeralda County

Lucky Boy—Miller & Adams have started operations on their own account on the Hubbard lease.

West End Consolidated Mining Company—The annual report shows total work for last year, 4223 ft., and total shipments, 7605 tons. The financial statement shows a deficit of $71,816. Six thousand tons of ore are on the dump.

Goldfield-Belmont—The Burke lease is entered into a new ore shoot, yielding high value.

Eureka County

Cortez District—Properties adjoining the old Cortez mine, which is said to have yielded $50,000,000, have been purchased by Patsey Clark and associates. Active work is being undertaken on other properties in the camp.

Buckhorn—George Wingfield has paid $100,000 for claims at Buckhorn. Davis & Loftus have purchased additional adjoining ground.

Nevada Treasure—Two shafts are down 200 ft. on vein. Good gold content is reported. The property is in the new camp of Kearns about 30 miles southward of Battle Mountain. Patsy Clark in charge.

Lincoln County

Nevada-Utah and Ohio-Kentucky—The settlement between these companies at Pioche has resulted in the resumption of work. The Susan Duster shaft has been reopened, and the No. 1 shaft of the Nevada-Utah. The Day mine of the Nevada-Utah at Jackrabbitt has been forced to suspend shipment owing to the close of the Tintic smeltery.

Gold Prince—A 60-h.p. gasolene engine has been installed for the compressor. Mine at Pioche, George Coxe, manager.

Los Angeles Cyanide Company—About 75 tons a day of tailings is being treated at the Keystone mill at Sandy.

Quartette—The mine at Searchlight has encountered the orebody on the 1100-ft level.

New Year's Gift—A. W. Crittenden has another lease at 20 per cent. royalty from the Homestead company at Searchlight.

Yellow Pine—The mine at Goodsprings is sinking on a zinc-lead orebody.

Lyon County

Mason Valley—Additional reserve ore has been developed by the extension of the lower tunnel level. Fred A. Flindt, manager.

Nye County

New Bennie Claim—The company has authorized the reconstruction of the mill in the Gold Mountain district.

Pioneer Consolidated Mines Company—The company has been organized by D. R. C. Brown, of Aspen, Colo., and George Wingfield to operate the Valley View mine at Pioneer. The company also has Ophir d'Oro, Conservative, three claims of the Bullfrog-Pioneer company and the K. K. claim of the Tobin Brothers. Plans for a large mill are included in the company's program.

Lucky Jack—James C. Conner, of Colorado Springs, will resume operations on this property adjoining the Shoshone at Rhyolite.

Storey County

Sutro Tunnel—The work of repairing has now been completed to 14,500 ft. from the portal and is going on at the rate of 100 ft. per day. There remains 3100 ft. to complete to make a connection at No. 5 switch.

Mexican—Work has been started on this property adjoining the Ophir on the north. A drift will be run on the 2300-ft. level to cut the orebody exposed on the 2200-level.

White Pine County

Military and Manhattan Ely—Options are out on these properties, presumably for the Cole-Ryan interests.

Giroux Consolidated—The Ely-Giroux Extension and the Blackfoot have been deeded to the company. It is expected that the company will secure also the Military group and other property south and west of its present estate.

Nevada Consolidated—The fourth reverberatory furnace and the fourth converter stall now being in operation at the Steptoe reduction works, the October output of copper is expected to show a decided increase over previous months.

Cumberland-Ely—The proposed merging of this company with the Nevada Consolidated is again engaging attention, and it is reported that an offer has been made on a basis of 3¼ shares of Cumberland-Ely in exchange for one of Nevada Consolidated, equivalent to about $7.50 per share for Cumberland-Ely. Opposition has already been manifested by minority shareholders who maintain that while Nevada Consolidated can show approximately 10 tons of ore developed to one in Cumberland-Ely, this condition is claimed to be due merely through lack of development at the latter property

New Mexico

Grant County

Burro Mountain—Phelps, Dodge & Co. has purchased these mines in the Burro Mountain section, including over 1000 acres.

Socorro County

La Luz—Concessions for mining on this grant have been issued to Joseph Vezetti. The mines are 20 miles west of Socorro.

Mistletoe—The mill at Kelly is ready and will start as soon as the tramway is finished.

Oregon

Baker County

Mormon Basin—Active development is under way in the old placer district on quartz lodes. The Rainbow mine, owned by the Commercial Mining Company, of Portland, is now down 240 ft., and has opened a gold vein said to run 2 oz. The Humboldt on the same vein is opening up lower-grade ore. Both mines have mills. The ore is free-milling in the district to 200 ft., at which it changes to arsenical sulphides. The orebody is on the footwall of a basalt dike, carrying low gold values throughout.

Independent Mine—The mine of the Consolidated British American Company of Spokane has made a rich strike at Sumpter at a depth of 200 feet.

South Dakota

Black Hills District

Echo—A new company is taking this property near Deadwood, now opened up 200 ft., and will develop and explore the orebody already disclosed.

Tinton—The mill has been overhauled and the company will resume.

Texas

Brewster County

Terlingua—The erection of two new quicksilver furnaces in the district is planned. The Gaines syndicate is doing development work on several properties.

El Paso County

El Paso Tin Mining and Smelting Company—The company has been organized by by C. R. Morehead, El Paso, to develop tin deposits at Mundy Spring, 14 miles from El Paso.

Utah

Beaver County

Grand Dominion—A blende oreshoot 18 in. wide has been disclosed.

Emery County

Castle Valley Coal Company—The new mine in Cedar creek cañon is well advanced, but no shipments will be made before February next. A branch line seven miles long is being built down Cedar cañon to connect with the Utah Southern road.

Grand County

Placer Mining—Placer mining in Grand county is making big strides. Arrangements are being made for a stamp mill as the gravel remaining in the pan has been found to contain gold.

Juab County

Lower Mammoth Extension—All the stock of the Lower Mammoth Extension Mining Company has passed into the hands of James C. Jensen, of Heber City.

Chief Consolidated—At the 1400 level good ore has been found in a crosscut. Walter Fitch, manager.

Salt Lake County

Yosemite Mine Company—The company has been formed to take over the Cluster claims and the Mississippi in the Bingham camp.

Summit County

Little Bell—Large bodies of ore in new territory are being disclosed by the development at Park City. The drifts are in a section never before explored. From the development work the company is shipping 350 tons a month.

Tooele County

Lucy L.—At the Deep Creek property the discovery of tungsten has been made. Frank L. Wilson, manager.

Wasington County

Reef Mining Company—The company has been formed with H. Welte manager, to operate in the old Silver Reef camp. The silver and copper is in a sandstone formation. A leaching process will be used.

Washington

Snohomish County

Imperial—The Independent mine concentrator has been purchased and will be used for the Imperial ore on a large scale.

Pierce County

St. Paul & Tacoma Lumber Company—The company will erect an iron furnace at Tacoma at a cost of $100,000.

Okanogan County

Centaur—The company has let a contract for a free-milling ore-treatment plant. C. H. Paxon, secretary.

Ferry County

Republic Company—A lease of the Midget mine, formerly the Tom Thumb, has been taken, and ore shipments will be commenced.

Belcher—The erection of a 400-ton smeltery is being considered.

Stevens County

Jay Gould—Work will be resumed in charge of F. C. Bailey.

United Copper—The spur from Chewalah is nearly completed. Production on a large scale will be started soon

Wisconsin

Zinc-lead District

Fox—This property is reported sold to the Mineral Point Zinc Company.

Mills—Operations at Hazel Green will be resumed soon.

Forcite—Heavier pumps are being installed at this Benton mine.

Wallace—The company at Highland will build a mill.

Wyoming

Carbon County

Alameda—A new company has purchased the property nine miles northwest of Encampment and will continue development. P. J. Winters, manager.

Bighorn County

Hart Mountain Gold Dredging Company—The company has been organized to operate placers in Wyoming. A. R. Williams, Cody, manager.

Canada

British Columbia

James A. Moore, president of the Irondale Steel Company, of Irondale, Wash., has bought a large tract of coal and timber land on Graham island, and proposes to start work shortly on a coal mine.

Extension—An explosion at the coal mine of the Wellington Company at Nanaimo resulted in a heavy life loss.

Ontario—Cobalt

Peterson Lake—At a special general meeting of the shareholders in Toronto, Oct. 6, a vote was carried by a small majority expressing confidence in the present directors and approving of their action in resorting to litigation to settle the dispute between the management and D. M. Steindler and J. A. Jacobs, the former president and secretary. Messrs. Jacobs and Steindler addressed the meeting offering to submit all matters in dispute to arbitration.

Ophir—Instead of making the main station at the 100-ft. level the management has decided to go down to 200 ft. and cut a station there. The shaft is now down 130 feet.

Prince—This property, 20 acres in extent, adjoining the Temiskaming and the Pan-Silver, has been sold to an American syndicate headed by Colonel Bunker, of Chicago. The price is reported to be $250,000.

Cobalt Central—A new vein was recently discovered on the Gamey lot in a waterworks trench.

Badger Mines—The company will commence to sink the shaft to 400 feet.

White Reserve—The mine was closed down a short time ago, but will recommence operations Nov. 1.

Hargraves—In the workings on the new vein near the Drummond, ore carrying silver has been located.

Cobalt—The main shaft is down 250 ft. and drifting and crosscutting are being carried on at the 240-ft. level, where the vein is 14 in. wide of calcite and quartz heavily mineralized. Four other veins carrying low silver contents have been encountered in crosscutting. A shaft will be put down this fall on the vein near the Dubiosa, which makes a good showing a few feet from the surface.

Silver Leaf—The shareholders of the company have authorized the leasing of the property to the Crown Reserve for five years, subject to a renewal for a similar term. For the first five-year term the Crown Reserve is to pay a royalty of 25 per cent. on the output, and if the lease is continued for another term the royalty is to be increased to 35 per cent. The Crown Reserve is to spend $20,000 for the first year and $10,000 each subsequent year on the property.

Wettlaufer—The new vein has strengthened at the 68-ft. level, and become more regular. Ore has been taken out running as high as 5000 oz. silver to the ton.

Right of Way—The shareholders have approved the action of the directorate in securing a controlling interest in the Cobalt Merger by acquiring 1,000,000 shares of the stock. The Right of Way will advance funds for the development of the Merger.

Ore Shipments—Shipments of ore from Cobalt for the week ending Oct. 2 were as follows: Crown Reserve, 125,095 lb.; La Rose, 150,803; McKinley-Darragh, 41,472; Nipissing, 67,721; O'Brien, 192,095; Right of Way, 63,294; Trethewey, 128,000; total, 1,068,480 pounds.

Ontario—Port Arthur

Silver Mountain District—Samples of native silver ore brought in from this district to Port Arthur have attracted a great deal of attention.

Yukon Territory

Dawson—The Canadian Klondike company will install two dredges next year. The Stewart River Company is prospecting at McQuesten and will purchase a dredge next year. The Yukon Basin Company is operating No. 1 dredge steadily with good success. In the Bonnifield district Frank Berry and James Hamel are operating a hydraulic property covering 28,000 acres. A ditch covering 5000 in of water is being constructed.

Mexico

Aguascalientes

Tepezala District, El Mineral—The explorations of gold and silver by George Mitchell have been functioning satisfactorily and there is every appearance of plenty of pumping work.

Durango

Guanacevi—This mining company has recently been organized by R. B. Koering, of Alamos, Sonora, to develop properties at Chinipas.

La Dura—The company, in La Dura camp reached from Moroles, has in erection a 100-ton cyanide plant. Manager, A. H. Maloney.

Rio Plata—The finding of a 3-ft. body of 85 oz. silver ore at the Santa Barbara mine, Guazapares, is reported. The cyanide plant is operating at partial capacity on tailings.

Naica—Coincident with the announcement of the intention of the Naica Company to erect a smeltery on the line of the Central, comes the report of increased mining and prospecting activities in the camp. The main producers are Lepanto, Gibralter, Ramon Corona and Fernandez. A new company has been organized for the Sensitiva-Zola-Carolina properties, and the Naica Mining Company, H. L. Dignowity, manager, and the Mines of Naica Company, T. H. Thofehrn, manager, are developing; the former is planning the use of diamond drills, while the latter has lately contracted for sinking machinery.

Coahuila

Torreon Smeltery—Official statements following the meeting of stockholders are that the reported sale is unfounded. Arrangements have been made for starting of the 30-ton converter.

Mazapil—The lead smeltery at Saltillo is in successful operation, and its enlargement is planned. Manager, O. E. H. Carr.

Durango

Mexico Consolidated—The company has nearly paid off outstanding indebtedness and negotiations are under way for capital to install new equipment at the property at Guanacevi.

Jalisco

Amparo—The company has purchased $30,000 of electrical equipment preparatory to operation with power expected Jan. 1 from the Chapala Hydroelectric and Irrigation Company. The company has a contract for 700 h.p. at 100 pesos per h.p. a year, and expects to effect a saving of 30,000 pesos a year. Ten stamps will be added early next year, making a total of 60. The present mill is handling 5000 tons monthly. The fourth quarterly dividend of 40 per cent. will be paid Nov. 10.

Tapalpa—A shipment of 604 lb. of precipitates has been made from the recently improved extraction plant. The first clean-up amounted to 19,000 pesos. The mill is handling 70 tons daily.

Hidalgo

Pachuca—The Hidalgo company is developing its properties, employed about 400 men. Hoisting ore ahead to justify a proposed new 200-ton smeltery. Sidney Ludlow, manager.

Sinaloa

Choix Consolidated—A 100-ton smeltery is being built at the mines near Choix. A. M. McDermott, manager.

Sonora

Candelero—The new mill at La Barranca, operating three Tremain units, is crushing 48 tons in 24 hours through 30 mesh. S. Ben. Smith, superintendent.

Mina Blanca—Work on the property in the Moctezuma district is being vigorously continued. New shaft is 200 ft. deep, below the point of the old workings. The mine is operated by the Mendorico Mining Company, E. P. Butt, manager.

Duluth-Moctezuma Company—Shipments at 40 tons per month are being made from the Monte Cristo mine, 30 miles east of Moctezuma. C. H. Jones, in charge.

Promontorio—Development work in the lower level has developed new ore ground. The mine is at Moctezuma; R. S. Vickers, manager.

Carmen Consolidated—The affairs of the company are being adjusted and plans are under way to commence work on the Sta. Maria, adjoining the Pedrazzini property.

Babicanora—The mine at Arizpe has been acquired by J. A. Evans and will be operated by him. Machinery for a 600-ft. shaft is being installed.

Santa Rosalia—A 3-compartment shaft is being sunk to develop the old workings. J. H. Hooper is in charge. Property is in the Arizpe district.

Transvaal—The diamond drill has been installed on the Cobre Rico mine 25 miles west of Cumpas, and is now down 225 ft. in concentrating sulphide ore. Work on the Buckeye has been discontinued. H. C. Beauchamp, manager.

San Felipe—Operations are under way on this and the Ventana mines in the Arizpe district acquired by the Calumet & Arizona company. This company has in all 2500 acres at Huepac and is constructing wagon roads from Poza. The bond on the mines is for $250,000.

Greene-Cananea—The September production was 3,854,000 lb. copper, 78,820 oz. silver, and 510 oz. gold.

Australia

New South Wales

Broken Hill Proprietary Company—The September production of the mines and refinery was 287,715 oz. silver; 7249 tons lead, 55 tons hard or antimonial lead. Of this production only 62,463 oz. silver and 728 tons lead were from ores mined by the company, the rest being from purchased ores. In addition to the above, there were made 7141 tons zinc concentrates, containing 95,614 oz. silver, 277 tons lead and 3334 tons zinc.

Metal, Mineral, Coal and Stock Markets

Current Prices, Market Conditions and Commercial Statistics of the Metals, Minerals and Mining Stocks

QUOTATIONS FROM IMPORTANT CENTERS

Coal Trade Review

New York, Oct. 13—Coal trade in the West is on an advancing basis still. Reports from the principal centers show increasing business in steam coal almost everywhere; while domestic coal begins to be a more prominent feature as the season advances. The Lake trade is still slow, however, and it begins to look as if the Northwest would be behind in putting in its winter stocks. Complaints of car shortage are beginning to be heard from various quarters. There is some tendency to advance prices, but this has been held in check by the usual tendency to overshipments.

Bituminous trade in the East is improving also, and shippers are looking forward to an active fall trade. Complaints of car shortage are louder than in the West, and for the first time in two years mines have had trouble on this account. Prices continue generally low, notwithstanding the better demand. There is too much competition to permit any increase at present.

The anthracite trade continues steady and without any special feature.

Rates on Cumberland Coal—The Pennsylvania, the Baltimore & Ohio and the Reading companies have applied to the United States Circuit Court for an injunction to restrain the Interstate Commerce Commission from enforcing the lower rates ordered on coal from the Cumberland basin to tidewater. Their contention is that the rates are unreasonably low. The new rates were to have taken effect Oct. 1, but the change is now postponed until the case has been heard by the court.

Coal Traffic Notes

Coal and coke tonnages originating on Pennsylvania railroad lines east of Pittsburg and Erie, year from Jan. 1 to Oct. 2, short tons:

	1908.	1909.	Changes.
Anthracite	3,826,497	3,584,449	D. 242,048
Bituminous	24,847,307	27,467,161	I. 2,620,854
Coke	5,168,371	8,096,720	I. 2,928,349
Total	33,842,175	39,148,330	I. 5,316,155

The total increase this year to date was 15.7 per cent.

Coal tonnage originating on the lines of the Southern Railway, seven months ended July 31, was: Tennessee district, 735,964; Alabama district, 1,317,201; total, 2,053,165 short tons, an increase of 538,355 tons, or 40.1 per cent. over last year.

Anthracite coal shipments in September were 4,416,120 long tons, being 217,847 tons more than in August, but 794,927 tons less than in September, 1908. For the nine months ended Sept. 30 the shipments were, in long tons:

	1908.	1909.	Changes.
Reading	8,827,368	8,406,477	D. 420,891
Lehigh Valley	8,049,249	7,317,277	D. 731,972
N. J. Central	6,181,431	5,666,239	D. 515,192
Lackawanna	7,341,801	6,907,670	D. 434,122
Del. & Hudson	4,704,767	4,540,278	D. 164,489
Pennsylvania	4,386,946	4,174,584	D. 212,362
Erie	5,424,355	5,542,291	I. 117,936
N. Y., Ont. & West.	2,104,171	2,032,063	D. 72,108
Total	47,020,088	44,586,888	D. 2,433,200

The total decrease this year was 5.2 per cent. Only one line, the Erie, showed a gain. The heavier decreases were on the Lehigh Valley and the New Jersey Central.

New York

Anthracite

Oct. 13—Business remains quiet and steady. The continued warm weather has held back the domestic trade, and dealers are hoping for a cold snap to start up business. This may be expected at any time now.

Schedule prices for large sizes are unchanged at $4.75 for lump and $5 for egg, stove and chestnut, all f.o.b. New York harbor. For steam sizes quotations are: Pea, $3.10@3.25; buckwheat, $2.25@2.50; No. 2 buckwheat or rice, $1.75@2; barley, $1.35@1.50; all f.o.b. New York harbor. Some individual and washery coal can be had at 10 or 15c. below quoted prices.

Bituminous

The tone of the market continues good, and inquiries are increasing. The Far East makes the best show just now, as the shoalwater ports are coming to the period when winter stocks must be laid in. Business along the Sound is fair. New York harbor trade is still irregular, coming by spurts. Supplies are good enough to prevent any advance, and prices remain about the same as they have been for some time. Contract deliveries are being called for on a good scale, better than they have been for some time.

A good many complaints are heard about car supply and the trouble seems to be increasing. At some mines there is said to be a very short supply and the allotments of cars are being carefully watched. Transportation continues irregular on most of the railroads, few cars coming through on schedule time; most are delayed several days on the road.

The coastwise vessel market is still rather oversupplied, though there is a little better call for small vessels which can enter the shoalwater ports. However, agents and skippers are anxious for cargoes, and willing to take them at current low rates. New York harbor quotes on small vessels 50c. around the Cape, with 5 to 15c. higher to special points. Philadelphia quotes on large vessels 60@65c. to Boston, Salem and Portland, 65@70c. to Portsmouth, 70@75c. to Lynn, and 75@80c. to Newburyport.

Birmingham

Oct. 11—A resumption of development in the coalfields of Alabama is the interesting event in the coal-mining industry. Three new mines have been started, one of them to be a large slope by the Tennessee Coal, Iron and Railroad Company in the Pratt Mines division, but in the vicinity of Wylam, 10 miles from Birmingham. The coal production in this State is showing improvement every week. There is a large shipment of coal away from here while the home consumption is steady. The railroad companies are bringing in empty cars to handle the increasing trade that appears to be certain in the next few weeks.

The production of coke continues to give a little worry, the demand growing stronger every week for coke, with the make not improving as well. However, there are a number of batteries of ovens which are being put in condition rapidly and during the next six months a large number of ovens will be constructed, so that by the middle of the coming year it is believed that every demand can be met.

Chicago

Oct. 12—Sales of steam coals continue to increase satisfactorily to agents and wholesale dealers; in the domestic field there is some complaint that the retailers are not buying largely enough since the increase in prices on some coals with the first of the month. But in general the overabundance of some domestic coals may be explained by the law of supply and demand. Shipments to this market have increased so that there is considerable demurrage coal on tracks constantly, with the result of sacrifice prices on such coals. Screenings naturally have fallen in price, being a summer fuel for most manufacturers in the Chicago market, and have been sold at $1@1.10 in the last week. All kinds of Indiana and Illinois

coals have had some sacrifice sales of late and the market for eastern coals, notably smokeless, is not so strong as in previous weeks. The general situation, in short, is that the consignments to Chicago have been somewhat too large in nearly all cases and care should be used about sending more until the market is again somewhat free of overshipments.

Illinois and Indiana coals bring, in general, $1.75@2.50 for lump, $1.65@1.75 for run-of-mine and $1@1.30 for screenings. Smokeless holds to $3.55 for lump and $2.95 for run-of-mine, and Hocking to $3.15. On forced sales these quotations are cut 10 or 15c., except that there is practically no surplus Hocking on the market and the higher grades of smokeless hold up well. Gas coals are steady and quiet, Youghiogheny selling for $3.15. Anthracite is in fair demand, though no heavy sales are expected until there is a touch of cold weather, and all sizes are in good supply.

Cleveland

Oct. 12—Lake carriers are urging shippers to get coal forward as fast as possible, to avoid congestion later. Local trade is active, both for steam and domestic coal. Complaints are beginning to be heard about short car supply, notwithstanding the good weather.

Prices are firm. No. 8 district steam is quoted $2@2.15 for lump, $1.80 for run-of-mine and $1.40 for slack. Middle district is about 10c. lower on all grades. Massillon domestic coal is $2.95 for lump. Pocahontas is selling at $3.05 for lump and $2.35 for run-of-mine.

Indianapolis

Oct. 11—Business reports continue good, and trade has been active in steam coal; while the dealers in domestic coal are busy putting in stocks. Mines are making good time for the most part, and some of them are doing more than at any time for two years past.

There was an advance in the price of Indiana coal at the mines of 15c. a ton on Oct. 4. This had the effect of causing retail dealers to advance the price 25c. to the consumers and the demand was greatly stimulated lest another advance should be announced before the winter's supply was stored.

Pittsburg

Oct. 12—Demand for coal continues good, and Lake shipments have increased somewhat, it being now the hight of the season. Prices are unchanged, generally ranging from $1.05 to $1.10 for mine-run at mine, although there continues to be cutting down to $1 in extreme cases. Slack is 75@80c. Labor continues scarce, and some additional miners could be employed.

Connellsville Coke—The market is steady and strong, the high prices recently reached being maintained. The price of $2.90 on Connellsville furnace coke on contract for next year was first touched the middle of September, and since then the market has been steady at $2.90@3, depending on brand, etc. On Sept. 1, quotations of $2.50 were made and were considered high by consumers. Eliminating coke produced by consumers and coke on long-term contracts, fully half the market coke for next year has been sold. A little was sold last August, and some was sold on scale contracts, based on pig iron, for first half or the entire year, the balance being sold on contract at flat prices, $2.85@3 during the past three or four weeks. Furnaces requiring somewhat in excess of 200,000 tons a month are still to cover, including in particular some steel works in eastern Pennsylvania and New York State, and a number of merchant interests in the Central West. The principal transaction of the week was a contract for upward of 25,000 tons a month for the first half, at $2.90. A number of 1000- to 2000-ton lots of prompt coke were sold at $2.75, $2.80 and $2.85 respectively. Foundry coke has been very quiet, and there is little interest in it for next year. We quote the market as follows, furnace coke being well established, while foundry-coke quotations are partly nominal: Furnace coke, $2.75@2.85 for prompt, $2.90@3 for first half or whole year; 72-hour foundry coke, $2.60@2.90 for prompt; $3@3.25 for next year.

The *Courier* reports the production in the Connellsville and lower Connellsville region in the week ended Oct. 2, at 423,819 tons, a gain of 5000 tons over the previous week, and shipments at 5042 cars to Pittsburg, 7034 cars to points west of Pittsburg and 882 cars to points east of Connellsville, a total of 13,858 cars.

St. Louis

Oct. 11—The weather has been unusually warm for October and the demand has eased up a little on this account. The market is readily absorbing all the coal that is being produced and prices are firm, though the upward trend has been temporarily checked. With the first touch of cold weather it is certain that there will be a rush for coal. Business is slow locally on account of the Centennial celebration, which is the largest held here since the World's Fair. A number of business houses have closed one-half day every day this week.

A large tonnage is moving to the country, especially on high grade coal, the demand for which is strong. A slight improvement has been noted in the car situation in southern Illinois and the majority of the mines had a fair week's run.

Carterville 6-in. lump or egg is bringing about $1.60 per ton at mines or $2.27 St. Louis. No. 1 nut is offered for $1.20 at mines or $1.87 St. Louis. Screenings are 35@40c. at mine or $1.07@1.12 St. Louis.

Franklin county 6-in. lump or egg is selling at $1.75 at mine or $2.42 St. Louis and Franklin county nut is bringing $1.30 at mine or $1.97 St. Louis. Staunton, Mt. Olive or Springfield district coals are $1.35 at mine, or $1.82 St. Louis for 6-in. lump; 3-in. lump is $1.25 at mine or $1.72 St. Louis and nut coal is 85c. at mine or $1.37 St. Louis. Standard 6-in. lump is $1.10 at mines or $1.62 St. Louis; 7-in. lump, 90c. at mine or $1.42 St. Louis. Standard screenings are being offered for as low as 5c. per ton at mines or 57c. St. Louis. Screenings are getting so weak now that they will be given away for the freight in a very few days. Steam nut coal is offered for 50c. at mine or $1.02 St. Louis. Carterville washed No. 1 brings $1.65 at mines or $2.32 St. Louis, with No. 2, about 35c. less.

The price on anthracite coal is $6.95 per ton f.o.b. St. Louis for chestnut, stove or egg sizes and $6.70 per ton for lump.

Foreign Coal Trade

French Coal Production—Coal production in France for the six months ended June 30 is reported as follows, in metric tons:

	1908.	1909.	Changes.
Coal mined	17,810,421	18,122,169	I. 311,748
Coke made	994,734	990,892	D. 3,842
Briquets made	965,244	1,077,434	I. 112,190

The increase in coal mined this year was 1.8 per cent.; the decrease in coke made was 0.2, and the increase in briquets 11.6 per cent.

Weish Coal Prices—Messrs. Hull, Blyth & Co., London and Cardiff, report current prices of coal as follows, on Oct. 2: Best Welsh steam, $4.20; seconds, $4.02; thirds, $3.78; dry coals, $3.96; best Monmouthshire, $3.48; seconds, $3.36; best small steam, $2.22; seconds, $1.80. All per long ton, f.o.b. shipping port.

Iron Trade Review

New York, Oct. 13—The iron and steel markets continue to show marked activity and a strong demand for material.

In pig iron there have been heavy sales of foundry and basic iron in the East, while in the Central West there has been a call by the steel companies for bessemer and basic iron from outside furnaces. This indicates a larger demand than was expected, since the large companies are not able to meet it from their own blast-furnace capacity. Prices are naturally strong, but there is a limit to the possible advance. Foreign iron has been freely offered at seaboard points by agents, and it is evident that this must limit the point to which pig iron quotations can be put.

In finished material the demand for

structural steel is hardly as strong as it has been; but this has been made up by the call for plates, bars, sheets and other classes of material. A good deal of bridge material is wanted. The demand for nails and smaller building material continues large and steady. Prices are strong; no material advances are recorded this week, but those made recently are well held.

The Pennsylvania Railroad Company has ordered 200,360 tons of rails for 1910 delivery, the order being divided among the following companies: Illinois Steel, 56,200; Carnegie Steel, 27,100; Cambria Steel, 41,800; Pennsylvania Steel, 41,800; Lackawanna Steel, 19,550; Bethlehem Steel, 13,910. The Steel Corporation gets 41.6 per cent. of the order, 58.4 per cent. going to independent companies.

Pig Iron Production—The reports of the blast furnaces, as collected by the *Iron Age*, show that on Oct. 1 there were 299 coke and anthracite stacks in blast, having a total weekly capacity of 564,900 tons; an increase of 39,900 tons over Sept. 1, and of 162,900 tons over Jan. 1. The estimated production of pig iron in September, making allowance for the charcoal furnaces, was 2,415,000 tons; for the nine months ended Sept. 30 it was 17,831,000 tons. The September production was the largest ever made in one month, and was more than 50,000 tons greater than that of October, 1907, which was previously the record

Baltimore

Oct. 12—Exports for the week included 3,137,200 lb. steel billets to Liverpool; 796,300 lb. galvanized pipe to Antwerp. Imports included 664 tons ferromanganese from Liverpool and 1175 tons iron ore from Cuba

Birmingham

Oct. 11—Southern pig iron is strong, and the quotations are again looking up despite the fact that but a few days ago $15 per ton for No. 2 foundry was reached. There have been a few sales made above $15, delivery during the latter part of this year, while some iron is about to be sold for delivery during the first half of next year stipulated. There companies in the Birmingham district are yet out of the market, but are protecting their regular customers. A runaway market is imminent. The demand is sharp, while home consumption is steady. The make in Alabama for September showed an increase of more than 20,000 tons as compared to September a year ago. There was a difference of more than 11,000 tons in the make in September as compared to August of this year There appears to be no doubt that October will show a greater increase. The furnaces in blast are doing well while the number of furnaces in operation is again to be increased. The Sloss-Sheffield company expects to produce 35,000 tons of iron during this month, the largest amount in two years and over. Other companies are making the same record. There is no accumulation of pig iron. The steel plant of the Tennessee company at Ensley is working steadily on orders in hand. The cast-iron pipe makers, foundries and machine shops in this district continue to work on full time

Chicago

Oct. 12—Quiet conditions exist in the iron market, but sales of pig iron are very general to founders if not of large amounts, and the selling element of the market has lost none of its confidence in the upward tendency of prices, though buyers are apparently more cautious. The general situation looks as if the melters had caught up with their requirements, prospective and immediate, and had resolved to go rather slowly for a time. That this is the situation appears from the fact that inquiries are considerably more numerous than sales, and are for iron to be delivered in the second quarter of the coming year. For the remainder of 1908 and for first-quarter deliveries, purchases are based on $15, Birmingham, for Southern No. 2 ($19.50, Chicago), and $19 for Northern No. 2, with Northern more active than Southern, because of its relatively lower price and ready supply from increased production. Lake Superior charcoal iron is steady and in good demand at $19.50@20. Much of the buying now being done is for first quarter, with scattering lots remaining in demand for the requirements of the last quarter of 1909. Some sales of Northern are made at $18.50, but they are few.

Sales of iron and steel products continue large, though some lines, such as structural material, show a lull. Railroad supplies, on the other hand, continue actively in demand. Coke is plentiful at $4.85 for the best Connellsville.

Philadelphia

Oct. 13—Eastern Pennsylvania pig-iron interests have not been disturbed during the past week by many large transactions, or by further advances on actual sales. A temporary resting stage has been reached. Most consumers have been buying liberally for some time past. This forward buying has been discouraged by the advances that have been made. The strongest on the list is basic pig, but at the present asking price only most urgent needs will be covered. The rising necessities of railroads for rails will affect bessemer and a further advance is regarded as probable The furnace people are indulging in optimistic views and some managers believe that the larger concerns will not postpone very long the covering of requirements for at least half of 1910 Others express a less confident view. The movement in forge iron has subsided largely. Special brands of foundry are scarce and nominal quotations were advanced 50c. as there is no disposition to sell. No. 2X is quoted as high as $19, forge in some cases $18. Basic is strong at $18.50 per ton.

Pittsburg

Oct. 12—The volume of finished-steel business placed has shown a material falling off, but this is attributed to the fact that mills are indisposed to book orders for next year, sales for such delivery being conducted in a very conservative way. The tone of the market is strong, as buyers appear to expect high prices to prevail, but mills are afraid of speculative buying, and wish to restrict buying to asbolutely known requirements.

Pig Iron—The purchases of the Cambria Steel Company constituted the chief movement in bessemer in the past week. This company took from the Bessemer Pig Iron Association 11,000 tons at $18, Valley, for this quarter delivery and 38,000 tons at $18.50, Valley, for first quarter, a total of 49,000 tons. It also took from the association 3000 tons of basic at $17, Valley, for early delivery. From W. P. Snyder & Co., it took a fair tonnage of bessemer for this month's delivery at an advanced price. Another sale of 3000 tons of basic is recorded at $17, Valley, for early delivery, and a sale of 2000 tons of bessemer for November-December delivery at $18.50, Valley. Bessemer is quotable at $18.50@19, Valley, supplies available for any early delivery being very limited. It is doubtful if much basic could be had at $17, Valley, as high as $17.50 being quoted. Foundry iron has been decidedly quiet the past week or two, and the market is not as buoyant as it was, although it is not absolutely weaker. Consumers had bought heavily, and may have even overestimated their requirements, so that a quiet market is expected until the actual rate of melt increases. No. 2 foundry is quotable at $17, Valley, for prompt or fourth quarter and at $17.25@17.75 for next year, forge being 75c. to $1 below No. 2.

Steel—Unfinished steel has become scarcer and only odd lots can be picked up. Mills, generally speaking, are refusing to make prices for next year on billets, sheet-bars or rods. Nominal quotations, f.o.b. mill, may be named at $25@25.50 for bessemer billets, $26@26.50 for open-hearth billets, $31.50 for bessemer rods, $32 for open-hearth rods, $27 for bessemer sheet bars and $28 for open-hearth sheet-bars.

Sheets—The market is firm at prices as advanced Sept 28, with demand active and mills rather conservative as to selling ahead, and some producers quoting a premium on black sheets Regular quotations are 2.30c. for black sheets, 3.35c. for galvanized, $1.60 for painted corrugated roofing and $2.85 for galvanized corrugated roofing, all 28 gage

Metal Markets

New York, Oct 13—The metal markets have been rather irregular, showing strength in some directions, but in others inclining to weakness and slightly lower prices.

Gold, Silver and Platinum

UNITED STATES GOLD AND SILVER MOVEMENT

Metal.	Exports.	Imports.	Excess.
Gold:			
Aug. 1909	$ 9,230,000	$ 5,649,000	Exp. $ 3,881,000
" 1908	6,507,101	4,257,255	" 2,349,846
Year 1909	89,726,119	28,754,477	" 60,971,642
" 1908	64,960,348	33,614,330	" 31,346,018
Silver			
Aug. 1909	4,910,000	3,191,000	Exp. 1,719,000
" 1908	4,130,553	3,194,126	" 936,427
Year 1909	39,319,032	29,989,145	" 9,329,887
" 1908	34,576,144	27,375,355	" 7,200,789

Exports from the port of New York, week ended Oct. 9: Gold, $100,000, to Brazil; silver, $750,418, chiefly to London. Imports: Gold, $110,589; silver, $14,771, both chiefly from Central and South America.

Gold—There was a good demand for gold on the open market in London, and quotations were 77s. 11⅜d. per oz. for bars, and 76s. 4¼d. per oz. for American coin.

Platinum—Business continues good, and dealers are inclined to add 25c. to the high price of $27 per oz. quoted last week for refined platinum. Hard metal is $30.50 per oz. For good scrap $22@23 per oz. is paid.

Our special correspondent reports from St. Petersburg, under date of Sept. 30, that an increase in prices is to be noted, as it has been expected by the principal dealers. From Ekaterinburg it is reported that there some crude platinum, 83 per cent. metal, was sold recently at 22,000 rubles per pood for Paris buyers. Small quantities are, however, to be obtained at the former price, at 5.25 rubles per zolotnik. In St. Petersburg the crude metal is quoted at 21,500@21,750 rubles per pood. These prices are equivalent to $19.74 and $21.19 per oz., respectively.

Silver—The market has shown a slight recession, owing in a measure to speculative sales. Inquiry continues and supplies are absorbed at current prices. The probability is that the market will continue fairly steady for the present.

SILVER AND STERLING EXCHANGE

Oct.	7	8	9	11	12	13
New York	51	51⅛	51⅛	51⅛	51⅛	51
London	24¾	24¾	24¾	24¾	24¾	24¾
Sterling Ex.	£.8570	£.8570	£.8570	£.8580	£.8580	£.8590

New York quotations, cents per ounce troy, fine silver. London, pence per ounce sterling silver, 0.925 fine.

Exports of silver from London to the East, Jan. 1 to Sept. 30, as reported by Messrs. Pixley & Abell:

	1908.	1909.	Change.
India	£7,271,193	£14,679,000	D. £7,604,066
China	316,100	1,000,000	D. 1,058,800
Straits	112,383	82,800	D. 29,583
Total	£7,699,676	£15,967,400	D. £8,688,448

Copper, Tin, Lead and Zinc

Oct.	Copper. Lake, Cts. per lb.	Copper. Electrolytic, Cts. per lb.	Copper. London, £ per ton.	Tin. Cts. per lb.	Lead. New York, Cts. per lb.	Lead. St. Louis, Cts. per lb.	Zinc. St. Louis, Cts. per lb.
	13	12½			4.32½	4.20	5.82½
7	@14¼	@12⅞	58	30.45	@4.35	@4.22½	@5.85
	12⅞	12⅜			4.32½	4.20	5.85
8	@14¼	@12⅞	58	30.45	@4.35	@4.22½	@5.87½
	12⅞	12⅜			4.32½	4.20	5.85
9	@14⅛	@12⅞	....	30.40	@4.35	@4.22½	@5.90
	12⅞	12⅜			4.32½	4.20	5.87½
11	@14⅛	@12¼	57⅝	30.35	@4.35	@4.22½	@5.90
						4.20	5.90
12	...	.....	57	.....	.....	@4.22½	@5.92½
	12⅞	12⅜			4.32½	4.20	5.92½
13	@14⅛	@12¼	57⅜	30.35	@4.35	@4.22½	@5.95

London quotations are per long ton (2240 lb.) standard copper. The New York quotations for electrolytic copper are for cakes, ingots and wirebars, and represent the bulk of the transactions made with consumers, basis, New York, cash. The prices of casting copper and of electrolytic cathodes are usually 0.125c. below that of electrolytic. The quotations for lead represent wholesale transactions in the open market. The quotations on spelter are for ordinary Western brands; special brands command a premium.

STATISTICS OF COPPER.

	September.	Nine Months.
Production in U.S.	118,023,139	1,038,290,585
Deliveries, domestic	52,105,155	500,852,602
Deliveries, foreign	50,077,777	508,758,112
Total deliveries	102,182,932	1,009,610,714
Stocks, U.S., Sept. 30	151,037,137	...
Inc. in Sept.	15,840,207	...
Stocks, Europe, Sept. 30	210,226,240	...
Inc. in Sept.	12,617,920	...

Figures are in pounds of fine copper. U. S. production includes all copper refined in this country, both from domestic and imported material.

Copper—The market is in rather an unsettled state. The publication of the monthly statistics with their increase in the domestic stocks of about 10,000,000 lb. did not make a marked impression, as they were not much worse than expectations. However, the tightening in the money rates has had a serious influence on weak speculative accounts, and a good deal of copper emanating from such sources has been thrown on the market and sacrificed at prices far below the ruling quotations. In the absence of a large demand from consumers, the policy of first hands has not developed. The concessions in prices so far have not been sufficient to attract buyers. The market closes weak at 12½@13¼c. for Lake copper, and 12⅜@12¾c. for electrolytic copper in cakes, wirebars or ingots. Casting copper is quoted nominally at 12½@12¾ cents.

Copper sheets are 17@18c., base for large lots. Full extras are charged, and higher prices for small quantities. Copper wire is 14c. base, carload lots at mill. Business continues on a good scale.

The standard market in London has been depressed throughout the week, quotations crumbling away from day to day. The close is somewhat steadier at £57 7s. 6d. for spot, and £58 7s. 6d. for three months.

Refined and manufactured sorts we quote: English tough, £61 10s.; best selected, £60 10s.@£61 10s.; strong sheets, £72 10s.@£73 10s. per ton.

Exports of copper for the week from New York and Philadelphia were 4490 long tons. Our special correspondent gives the exports from Baltimore at 626 tons of copper.

Copper Producers' Association—The report published Oct. 11 gives the following statement for September and the nine months ended Sept. 30, in pounds:

	September.	Nine Months.
Stocks, Sept. and Jan. 1	135,196,950	122,357,266
Refined in U. S.	118,023,139	1,038,290,585
Total supplies	253,220,069	1,160,647,851
Deliveries, domestic	52,105,155	500,852,602
Deliveries for export	50,077,777	508,758,112
Total deliveries	102,182,932	1,009,610,714
Stocks, Oct. 1	151,037,137	151,037,137
Inc. or dec. in stock	I. 15,840,207	I. 28,679,871

Production includes all copper refined or put in marketable form in the United States, whether from domestic or foreign material. The September production was 2,574,095 lb. less than in July, while deliveries were 5,813,979 lb. less.

Tin—Owing to the tightness in the money market, tin was adversely affected. Throughout the week, the market showed heaviness in tone and a declining tendency, and the close is cabled at £137 15s. for spot, and £139 5s. for three months. This market is still characterized by an anxiety on the part of sellers to dispose of tin, in consequence of which sales at below import point are constantly being made. Business, however, is of small proportions only, and at the close the market can be called about 30¼@30⅜ cents.

A British consular report gives the tin production of Bolivia for 1908 at 20,937 long tons of *barilla*, or concentrates; equivalent to 23,062 tons metallic tin.

Arrivals of Bolivian tin ore and concentrates at Hamburg, Germany, in September are reported by Robertson & Bense at 805 long tons.

Lead—The market is quiet and unchanged at 4.32½@4.35c. New York, and 4.20@4.22½c. St. Louis.

The London market has been steady at £13 5s. for Spanish, and £13 7s. 6d. for English.

Spelter—The market is very firm and a good business is doing from day to day at advancing prices. Quotations at the close are 5.97½@5.95c. St. Louis, and 6.07½@6.10c. New York.

Quotations for spelter in New York, Oct. 7, were 5.97½@6c.; Oct. 8, 6.00@6.02½c.; Oct. 9, 6.00@6.05c.; Oct. 11, 6.02½@6.05c.; Oct. 13, 6.07½@6.10 cents.

The London market is unchanged at £23 5s. for good ordinaries, and £23 10s. for specials.

Base price of sheet zinc was advanced ¼c. on Oct. 9, to 7¾c. per lb., f.o.b. La-Salle-Peru, Ill., less 8 per cent. discount.

Other Metals

Antimony—Business is dull and prices unchanged at 8⅝@8¾c. for Cookson's; 8⅜c. for Hallett's; 8@8¼c. for U. S., and 7⅝@7⅞c. for outside brands.

Aluminum—No change can be reported. No. 1 ingots can be had at 20@23c. per lb. in large lots, with the American maker holding to the higher figure.

Quicksilver—Business continues good and prices are a little higher. In New York the quotation is $46@47 per flask of 75 lb. for large lots, while jobbers ask 65@66c. per lb. for small quantities. San Francisco prices are $44@45 for domestic business, and $2 less for export orders. The London price has been advanced 5s. to £8 12s. 6d. per flask, with £8 10s. quoted by jobbers.

Magnesium—The price of pure metal is $1.50 per lb. for 100-lb. lots f.o.b. New York.

Nickel—Large lots, contract business, 40@45c. per lb. Retail spot, from 50c. for 2000-lb. lots, up to 55c. for 500-lb. lots. The price for electrolytic is 5c. higher.

Cadmium—Current quotations are 75c. per lb. in 100-lb. lots at Cleveland, Ohio. In Germany 450@475 marks per 100 kg., at factory in Silesia.

Spanish Metal Exports

Exports of metals and minerals from Spain, six months ended June 30; reported by *Revista Minera,* in metric tons:

Metals.	1908.	1909.	Changes.	
Pig and manuf. iron	18,283	35,838	I.	17,555
Copper	8,508	10,796	I.	2,288
Copper precipitate	10,083	12,598	I.	2,515
Lead	110,055	103,682	D.	6,373
Zinc	812	874	I.	62
Quicksilver	1,491	1,484	D.	7
Minerals.				
Iron ore	4,624,424	4,537,432	D.	86,992
Manganese ore	13,791	7,065	D.	6,726
Copper ore	711,722	655,159	D.	56,563
Lead ore	1,911	2,188	I.	277
Zinc ore	65,087	74,889	I.	9,802
Pyrites	873,883	765,361	D.	108,522
Salt	396,782	390,552	I.	6,230

Imports of phosphate rock, 46,555 tons in 1908, and 40,626 in 1909; decrease, 5929 tons.

Zinc and Lead Ore Markets

Joplin, Mo., Oct. 9—The highest price was $52.50 per ton for one bin of 63 per cent. zinc ore, the general high price being $52. On the assay base one bin sold at $49.50. An increased tonnage sold on a base of $48.50 and $49 per ton of 60 per cent. zinc. Zinc silicate sold on a base price of $23@24.50 per ton of 40 per cent. zinc, the highest price being $29.50 per ton. The average price, all grades, was $44.88. Lead ore sold on a base price of $55 per ton of 80 per cent. lead in the bin, the highest price reported being $56.40, with medium grades selling at $54. The average price, all grades, was $54.72 per ton.

Shipments are curtailed from lack of cars for loading. A large portion of the salable stock in the bins has been sold and will be moved as speedily as transportation facilities will permit.

SHIPMENTS, WEEK ENDED OCT. 9.

	Zinc, lb.	Lead, lb.	Value.
Webb City-Carterville	3,556,560	458,760	$ 96,194
Joplin	1,530,440	226,450	43,282
Prosperity	582,450	203,250	19,276
Galena	551,930	67,700	14,829
Duenweg	534,200	77,070	14,135
Alba-Neck	538,660	.....	13,466
Jackson	270,880	193,120	11,541
Quapaw	324,270	89,040	9,376
Carthage	372,910	.....	9,322
Aurora	584,350	70,840	9,265
Badger	349,170	.....	8,380
Miami	388,610	51,050	8,179
Spurgeon	336,650	43,660	6,778
Sarcoxie	296,900	...	6,576
Granby	282,400	14,000	5,545
Oronogo	199,600	53,820	5,536
Zincite	204,660	.....	5,059
Cave Springs	167,360	.....	3,933
Shoalsburg-Saginaw	171,090	2,710	3,774
Carl Junction	133,910	.....	3,340
Totals	11,376,900	1,551,470	$297,786

41 weeks.....461,933,300 69,589,620 $10,972,392
Zinc value, the week, $255,323; 41 weeks, $9,074,622
Lead value, the week, 42,463; 41 weeks, 1,897,770

MONTHLY AVERAGE PRICES.

Month.	Zinc Ore. Base Price. 1908.	1909.	All Ores. 1908.	1909.	Lead Ore. All Ores. 1908.	1909.
January	$37.60	$41.25	$35.56	$38.46	$46.88	$52.17
February	36.63	36.94	34.92	34.37	49.72	50.50
March	36.19	37.40	34.19	34.71	49.90	50.82
April	35.40	38.63	34.08	37.01	52.47	55.63
May	34.19	40.06	33.39	37.42	56.05	56.59
June	33.06	44.15	32.07	40.35	60.48	57.52
July	34.55	43.06	31.67	41.11	59.90	53.74
August	36.53	48.25	33.42	44.54	60.34	57.60
September	37.63	47.70	34.44	44.87	54.59	56.11
October	35.95	.....	33.28	.....	52.63	.....
November	39.13	.....	35.02	.....	54.53	.....
December	42.75	.....	39.63	.....	49.68	.....
Year	$36.63	.....	$34.31	.....	$53.93	.....

NOTE.—Under zinc ore the first two columns give base prices for 60 per cent. zinc ore; the second two the average for all ores sold. Lead ore prices are the average for all ores sold.

Platteville, Wis., Oct. 9—The highest price paid this week for zinc ore was $49.50 per ton; the base price, 60 per cent. zinc, was $48.50@49. The base price paid for lead ore was $56@57 per ton.

SHIPMENTS, WEEK ENDED OCT. 9.

Camps.	Zinc ore, lb.	Lead ore, lb.	Sulphur ore, lb.
Hazel Green	477,400	.....	38,100
Benton	403,730	.....	.....
Days Siding	400,000	.....	.....
Highland	318,500	78,500	303,900
Platteville	312,190	.....	.....
Linden	216,620	.....	.....
Cuba City	171,765	85,220	.....
Harker	158,350	.....	.....
Shullsburg	140,000	60,000	.....
Galena	84,000	.....	.....
Rewey	51,300	.....	.....
Total	2,737,455	224,720	342,000
Year to Oct. 9	106,324,655	6,773,575	10,187,845

In addition to the above there was shipped to the American Zinc Ore Separating Company, 440,640 lb., and to the Joplin Separator Works, 174,850 lb. zinc concentrates.

Chemicals

New York, Oct. 13—The markets show little or no change since last week's report. Outside of contract business trading was rather light and prices are generally stationary.

Copper Sulphate—Business is not especially active, and prices are a shade lower at $4 per 100 lb. for carload lots and $4.25 per 100 lb. for smaller parcels.

Arsenic—There has been little business during the week. Quotations for white arsenic are 2.70@2.75c. per lb. for spot, while 2⅞c. per lb. is asked for next year's delivery.

Nitrate of Soda—The market is dull, with quotations at 2.10c. per lb. for both spot and futures.

Potash Salts—The remaining members of the Kali-Syndikat, according to Berlin despatches, propose to act aggressively against the mines which are now controlled by American concerns through ownership or contract. One measure suggested is a special tax on the production of mines worked for foreign account, but it seems improbable that such a step will be taken. It is understood that a special committee has been appointed to visit this country and to organize competition here.

Mining Stocks

New York, Oct. 13—This week was broken by a holiday again, the new "Columbus Day" coming in this year for the first time in New York. The market for the whole week was generally confused, with a downward tendency and a good deal of liquidation going on. It was further depressed by advancing rates for money, and the probability that a stiffer money market may be expected for some time.

There was one sale of Homestake, of South Dakota, during the week, at $91.12½ per share.

The Curb market followed the Exchange for the most part and was depressed and irregular. Copper shares were affected by the Producers' report, showing an increase in stocks, though this had been largely discounted. There was some excitement in Cobalts, brought over from the preceding week, but most of the stocks gained. On the whole, it was rather an unprofitable week.

Boston, Oct. 12—Copper shares are in the dumps but at that they are marking time and awaiting a rift in the horizon. The continued accumulation of copper supplies, both in this country and abroad, has taken about all the bullish enthusiasm out of holders of these securities. The only favorable thing of the present time is the disinclination to part with holdings, and as there is little or no demand, prices

do not go off much. The issue of the Copper Producers' report, showing increased supplies for September, brought some selling by traders, but they were timid in their commitments. Money has been an unsettling factor and rates for call loans are practically on a 5 per cent. basis.

The Boston Stock Exchange ran it alone today. Practically all the other stock exchanges throughout the country suspended on account of the observance of Columbus Day in New York. The result was a quiet day with but little price variation. For the week prices are off. Calumet & Hecla is off $25 for the period to $640 and Calumet & Arizona broke $5.25 to $97.75, but offerings were light in both cases. Atlantic is selling plus the $2 assessment called a short time ago and brought $10.75 yesterday.

Lake Copper has had both strong and weak periods, although the net result for the week is a $2.37½ decline to $35.50. Disappointment at the delay in starting the Arizona Commercial Company's smeltery has caused a $3 drop to $43.37½. A sharp demand for Greene-Cananea put the price up to $10.87½. North Butte is lower by $2.87½ at $58, Osceola by $3.50 at $153.50.

Amalgamated is off about $3.50 to $79. North Lake made low at $6.75.

Rhode Island Coal had a break on the Curb from $11.50 to $9.50, but has recovered the greater part of it. First National and Davis-Daly have both held close to $6 per share.

STOCK QUOTATIONS

NEW YORK Oct. 13	
Name of Comp.	Clg.
Alaska Mine	‡.11
Amalgamated	79
Anaconda	46
Balaklala	‡2⅞
British Col. Cop.	6
Buffalo Mines	3⅛
Butte Coalition	25
Colonial Silver	‡⅛
Cum. Ely Mining	6⅝
Davis-Daly	5¾
Dominion Cop.	7
Douglas Copper	1
El Rayo	2⅛
Florence	3
Foster Cobalt	‡.32
Furnace Creek	‡.05
Giroux	9
Gold Hill	⅝
Goldfield Con.	6⅞
Granby	‡95
Greene Gold	‡⅝
Greene G. & S.	‡9
Guanajuato	2
Guggen. Exp.	215
Hanapah	‡15
Kerr Lake	8⅛
McKinley-Dar.	.91
Miami Copper	1[illegible]
Micmac	[illegible]
Mines Co. of Am.	[illegible]
Montgom'y-Sh.	1[illegible]
Mont. Sho. C.	1⅛
Nev. Utah M. & S.	1⅛
Newhouse M. & S.	[illegible]
Nipissing Mines	1[illegible]
Old Hundred	[illegible]
Silver Queen	[illegible]
Stewart	[illegible]
Tennessee Copper	[illegible]
Tri-Bullion	[illegible]
Union Copper	10
Utah Apex	‡1[illegible]
Utah Copper	4[illegible]
Yukon Gold	5[illegible]

‡Last quotation.

BOSTON Oct. 13	
Name of Comp.	Clg.
Adventure	6
Allouez	57
Am. Zinc	‡34¼
Arcadian	4
Arizona Com.	43⅜
Atlantic	8½
Boston Con.	14¾
Calumet & Ariz.	100
Calumet & Hecla	640
Centennial	37½
Copper Range	79⅝
Daly-West	8
East Butte	11½
Franklin	16
Greene—Can.	10⅞
Hancock	12⅞
Isle Royal	23¼
Keweenaw	2¼
La Salle	11½
Mass.	7
Michigan	9
Mohawk	60
Nevada	23½
North Butte	58½
Ojibway	8
Old Colony	60
Old Dominion	52
Osceola	153¼
Parrot	30½
Quincy	87
Rhode Island	‡4¾
Santa Fe	1¾
Shannon	57
Superior & Bost.	14¼
Superior & Pitts.	15½
Tamarack	70
Trinity	10
U. S. Smg. & Ref.	53
U. S. Sm. & Re., pd.	52⅞
Utah Con.	42⅞
Victoria	4¼
Winona	6¼
Wolverine	149
Wyandotte	2

‡Last quotation.

N. Y. INDUSTRIAL	
Am. Agri. Chem.	45¾
Am. Smelt & Ref.	95⅜
Am. Sm. & Ref., pf.	111¾
Colo. Fuel & Iron	44¼
Federal M. & S., pf.	80
National Lead	86½
National Lead, pf.	‡111
Pittsburg Coal	‡18½
Republic I. & S.	‡45½
Republic I. & S., pf.	106¼
Sloss-Sheffield	91
Standard Oil	‡685
U. S. Steel	86⅞
U. S. Steel, pf.	126⅞
Va. Car. Chem.	45¼

BOSTON CURB	Low.
Ahmeek	210
Chemung	16¾
Chino	7½
Gila	8
Indiana	5½
Mason Valley	2
Ray Central	2⅝
Ray Con.	18¾
San Antonio	8
Yuma	1½

Furnished by Hornblower & Weeks, N. Y.

ST. LOUIS Oct. 9		
N. of Com.	High.	Low.
Adams	.40	.30
Am. Nettie	.10	.07
Center Cr'k	1 90	1 60
Cent. C. & C.	84 00	83 00
C. C. & C. pf.	83 00	82 00
Cent. Oil	110 00	100 00
Columbia	9.00	7 00
Con. Coal	18 00	17 00
Doe Run	115.00	105 00
Gra. Bimet.	.30	25
St. Joe	12 50	11.00

LONDON Oct. 13	
Name of Com.	Clg.
Dolores	£1 5s 0d
Stratton'sInd.	0 3 3
Camp Bird	1 10 0
Esperanza	2 18 0
Tomboy	0 19 6
El Oro	1 5 6
Oroville	0 14 0

Cabled through Wm. P. Bonbright & Co., N. Y.

NEVADA STOCKS. Oct. 13.
Furnished by Weir Bros. & Co., New York.

Name of Comp.	Bid.	Name of Comp.	Bid.
COMSTOCK STOCKS		Silver Pick	11
Belcher	1 00	St. Ives	05
Best & Belcher	‡ 59	Triangle	01
Caledonia	‡ 41	BULLFROG STOCKS	
Chollar	38	Gibraltar	.02
Comstock	‡.28	Homestake King	‡.01
Con. Cal. & Va.	1 75	Mont. Shoshone C.	1.50
Crown Point	‡.86	Tramp Cons.	.04
Exchequer	43	MISCELLANEOUS	
Gould & Curry	44	Cumberland Ely.	6.50
Hale & Norcross	76	Giroux	8 62½
Mexican	2.47	Greenwa'r Copper	03
Ophir	2 15	Nevada Con.	23.50
Overman	‡ 75	Nevada Hills	.70
Potosi	83	Navada Smelting.	.75
Savage	75	Nevada Wonder	55
Sierra Nevada	.84	Nevada-Utah	1 62½
Union	1.10	Penn-Wyoming	...
Utah	‡.05	Pittsburgh S. Pk.	65
Yellow Jacket	1 60	Ray Central	2.06¼
TONOPAH STOCKS		Ray Con	18.75
Belmont	75	Round Mt. Sphinx	05
Extension	.50		
Golden Anchor	..		
Jim Butler	11		
MacNamara	29		
Midway	.18		
Montana	90		
North Star	.02		
Tono'h Mine of N.	6 62		
West End Con.	26		
GOLDFI'D STOCKS			
Adams	.01		
Atlanta	.11		
Blue Bell	.02		
Booth	.10		
C.O.D. Con.	.05		
Columbia Mt.	.08		
Comb. Frac.	73		
Cracker Jack	.01½		
Dia'dfield B. B. C.	.01		
Florence	2 87		
Goldfield Belmont	04		
Goldfield Daisy	07		
Great Bend	04		
Jumbo Extension	13		
Kendall	02		
Lone Star	02		
May Queen	04		
Oro	04		
Red Hill	.04		
Sandstorm	05		

COLO. SPRINGS Oct. 8	
Name of Comp.	Clg.
Acacia	‡.07¼
C. C. Con.	‡ 03¼
Doctor	.08½
Elkton	74
El Paso	.60
Findlay	10¾
Gold Dollar	13½
Gold Sovereign	‡.04⅜
Isabella	16½
Jack Pot	‡ 08½
Jennie Sample	07¾
Jerry Johnson	06½
Lexington	‡.01¾
Mary McKinney	‡ 40¼
Old Gold	.04½
Pharmacist	03¾
Portland	83
U. G. M.	08
Vindicator	73
Work	.07

Assessments

Company	Delinq.	Sale	Amt.
[illegible] M. & M., Ida.	Oct. 7	Nov. 4	$0.00[illegible]
Alta Gladstone, Utah	Sept. 15	Oct. 20	0.00[illegible]
[illegible] Copper, Ida.	Sept. 27	Oct. 27	0.005
[illegible], Nev.	Oct. 1	Oct. [illegible]	0 02
[illegible], Nev.	Oct. 7	Oct. 27	0 05
Caledonia, Nev.	Oct. 21	Nov. 11	0 10
Challenge Con., Nev.	Sept. 28	Oct. 18	0 10
[illegible] & C., Ida.	Oct. 1	Oct. 1[illegible]	0 001
Hale & Norcross, Nev.	Sept. 21	Oct. 11	0 10
Hancock Con., Mich.	Oct. 10		1 00
[illegible], Ida.	Oct. 2	Nov. 15	0 01
Julia Con., Nev.	Oct. 11	Nov. 8	0 05
[illegible], Ida.	Oct. 7	Nov. 8	0 001
[illegible] M. &	Dec. 1		1 00
[illegible] & S. Mining, Utah	Sept. 28	Oct. 30	0 05
Sierra Nevada, Nev.	Oct. 12	Nov. 3	0 10
Silver King [illegible], Utah	Oct. 4	Oct. 23	0 10
[illegible], Utah	Sept. 30	Oct. 2[illegible]	0 005
[illegible] M. & M., Ida.	Oct. 14	Nov. 4	0 001
[illegible], Nev.	Oct. 2[illegible]	Nov. 12	0 01
Utah, Nev.	Oct. 26	Nov. 16	0 05

Monthly Average Prices of Metals

SILVER

Month.	New York.		London.	
	1908.	1909.	1908.	1909.
January	55.678	51.750	25.738	23.834
February	56.000	51.472	25.855	23.706
March	55.365	50.468	25.570	23.227
April	55.505	51.428	25.133	23.708
May	52.795	52.905	24.377	24.343
June	53.663	52.538	24.760	24.166
July	53.115	51.043	24.514	23.519
August	51.683	51.125	23.858	23.588
September	51.720	51.440	23.877	23.743
October	51.431	......	23.725	......
November	49.647	......	22.933	......
December	48.766	......	22.493	......
Total	52.864	......	24.402	...

New York, cents per fine ounce; London, pence per standard ounce.

COPPER

	NEW YORK.				LONDON	
	Electrolytic		Lake.			
	1908.	1909.	1908.	1909.	1908.	1909.
January	13.726	13.893	13.901	14.280	62.386	57.688
February	12.905	12.949	13.098	13.295	58.786	61.198
March	12.704	12.387	12.875	12.826	58.761	56.231
April	12.743	12.56¼	12.928	12.93¾	58.331	57.363
May	12.598	12.893	12.788	13.238	57.387	59.338
June	12.675	13.214	12.877	13.548	57.842	59.627
July	12.702	12.880	12.933	13.363	57.989	58.556
August	13.462	13.007	13.639	13.296	60.500	59.393
September	13.388	12.870	13.600	13.210	60.338	59.021
October	13.354	......	13.646	.....	60.139	...
November	14.130	......	14.386	.....	63.417	......
December	14.111	...	14.411	...	62.943	...
Year	13.208	......	13.424	...	59.902	....

New York, cents per pound. Electrolytic is for cakes, ingots or wirebars. London, pounds sterling, per long ton, standard copper.

TIN AT NEW YORK

Month.	1908.	1909.	Month.	1908.	1909.
January	27.380	28.060	July	29.207	29.125
February	28.978	28.290	August	29.942	29.966
March	30.577	28.727	September	28.815	30.293
April	31.702	29.445	October	29.444	...
May	30.015	29.225	November	30.348	....
June	28.024	29.322	December	29.154	...
			Av. year	29.465	...

Prices are in cents per pound.

LEAD

Month.	New York.		St. Louis	London	
	1909.	1909.	1909.	1908.	1909.
January	3.691	4.175	4.025	14.469	13.113
February	3.725	4.018	3.868	14.250	13.313
March	3.838	3.986	3.835	13.975	13.438
April	3.993	4.168	4.061	13.469	13.297
May	4.253	4.287	4.214	12.938	13.226
June	4.466	4.350	4.291	12.600	13.031
July	4.744	4.321	4.188	13.000	12.563
August	4.580	4.363	4.227	13.375	12.475
September	4.515	4.342	4.215	13.125	12.781
October	4.351	...	......	13.375	
November	4.330		......	13.538	.....
December	4.213		......	13.156	....
Year	4.200	.	.....	13.439	...

New York and St. Louis, cents per pound. London, pounds sterling per long ton.

SPELTER

Month.	New York		St. Louis		London	
	1908	1909	1908	1909	1908	1909
January	4.513	5.141	4.363	4.991	20.563	21.425
February	4.788	4.889	4.638	4.739	20.875	21.563
March	4.665	4.757	4.527	4.607	21.075	21.438
April	4.645	4.965	4.495	4.815	21.344	21.531
May	4.608	5.124	4.458	4.974	19.906	21.975
June	4.543	5.402	4.393	5.252	19.000	22.000
July	4.485	5.402	4.338	5.252	19.031	21.969
August	4.702	5.729	4.556	5.579	19.350	22.125
September	4.769	5.796	4.619	5.646	19.563	22.906
October	4.801	.	4.651		19.750	..
November	5.059	....	4.909	....	20.875	..
December	5.137	.	4.987	...	20.626	
Year	4.726	...	4.578	...	20.163	...

New York and St. Louis, cents per pound. London, pounds sterling per long ton.

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Practice of Coal Mining in Great Britain

Under Certain Conditions, Longwall Mining Has So Many Advantages That Its Greater Adoption in America Is Only a Matter of Time

BY FLOYD W. PARSONS

The most unusual sight that greets the American engineer on his first visit to British coal mines, is the spectacle of women and girls working at the mines. Not long ago, female labor was employed underground; this practice, however, was abolished in Great Britain by an act of Parliament. My first impulse was to criticize the present custom of employing female labor in the screening plants and around the tipple, but closer investigation of this problem showed that these colliery lasses were better off than girls who worked in the mills. The wages paid these girls vary from 36 to 72c. per day.

That the character of the work done by these women does not seem to shorten their lives is shown by Fig. 2. The person shown in this photograph is the oldest woman employed on the pit brow of any of the mines in Lancashire. When the photograph was taken, she was 72 years old; her present age is 92, and she still works on the surface as a ganger. This woman worked underground as a miner, previous to the act of Parliament forbidding such practice. The young woman shown in Fig. 3 appears in the regulation costume that has lately been adopted. This dress differs from the one formerly worn, in that the skirt is longer and the trousers are not so much in evidence. Hob-nailed shoes shaped like miniature canal boats are still worn by all of these colliery girls, as well as the mill girls in Lancashire. In the early morning when the laboring classes are on their way to work, these wooden-bottomed shoes make a merry clatter on the stone street. Figs. 4 and 5 show colliery lasses in more ancient costume, with trousers and hob-nailed shoes.

The cheapness of labor in England is the one great drawback to the adoption of mechanical devices for coal picking, etc. In America, the coal operator would find it impracticable to employ so many persons to pick out the slate and bone, and in this way prepare the coal for market. Making a definite comparison of conditions abroad and conditions at home, I may state that at a bituminous mine near Punxsutawney, Penn., 30 men are employed in the tipple house picking slate from the coal; the cost of cleaning the coal this way by hand totals $52.50 per day, or more than 5c. per ton of output. This added cost of production is worrying the mine officials more than they are willing to admit, and if the seam retains its present dirty streak, some cheaper method of cleaning the coal will have to be adopted, or operating profits will be

FIG. 1. VIEW SHOWING INTERIOR OF A SCREENING HOUSE AT AN ENGLISH COLLIERY WHERE GIRLS ARE EMPLOYED TO PICK OUT THE SLATE. ALL BELTS AND MACHINERY ARE ELECTRICALLY DRIVEN

badly curtailed. In England, or on the Continent, the cost of cleaning this same output of coal would not total more than $15 per day, or less than one-third the cost of the same work in this country. The general method of cleaning the coal

FIG. 2 OLDEST WOMAN WORKING ON THE PIT BROW. PRESENT AGE 92 YEARS

FIG. 3 A LANCASHIRE COLLIERY LASS IN REGULATION COSTUME

at an English colliery is shown in Fig. 1. The wire-belt conveyers are all electrically driven, and as the coal is carried along, girls are employed to pick out the slate and bone. At the plant shown in Fig. 1, 20 girls are employed at a total cost of about $10 per day.

The Coal Seams Are Cleaner in America

If the coal seams in America were as dirty, and contained as many partings as is generally the case in European mines, our operators would be up against the proposition of either changing their methods and conditions or of seriously curtailing profits. I realize, of course, that we cannot compare mining in Europe with mining in America because the selling price of coal abroad is from three to five times as much as it is in this country. However, notwithstanding all this, the European operator has the better system, and if labor conditions and other influencing factors were the same as ours, the foreign operator would excel.

Longwall Should Be More Generally Adopted

Coal operators in America have practically set up one standard or system, by which they expect to operate all mines, irrespective of the character of the roof and bottom, thickness of the seam, and all other physical characteristics. There are many coal mines in the United States working seams from 3 to 6 ft. thick, on the room-and-pillar system, when every local condition suggests that a system of longwall would be most satisfac-

FIG. 4 COLLIERY GIRLS EMPLOYED TO PICK SLATE IN SCREENING HOUSE

tory and efficient for the development of the property.

In various States (Illinois, for instance), the longwall system of mining is attempted at a number of places. The plan of mining, however, is not longwall in the true sense, and as shooting from the solid is universally practised at these mines, the benefits from the system are largely destroyed.

A few years ago it was generally believed that the longwall system of mining could only be applied to thin, hard coal seams, lying horizontal, with good roof and floor, and free from water. More recent practice in European mines has removed these narrow limitations, and longwall mining is successfully used in thicker seams where local conditions would formerly have barred this method entirely.

The style of longwall that should be adopted in any special case depends entirely on local conditions. A careful consideration of many factors is essential to a successful outcome. One important factor in determining the direction of the roads is the jointing or cleavage of the coal. There is always one direction along which the coal yields more easily than in any other, and the best plan is to drive the roads at right angles to this line of main cleavage. In very soft seams it is sometimes best to work the roads parallel to the main cleavage. When the joints in the roof coincide with the cleats in the coal, it is dangerous to drive the walls parallel to these cleats, for when this plan is followed, the roof becomes dangerous and bad falls are likely to occur.

The Length of a Longwall Face

The length of wall in a longwall work-

FIG. 5 ROBUST SPECIMEN OF FEMALE LABOR EMPLOYED ON PIT BROW

ing depends principally on the thickness of the seam, and the amount of material that is available for goafing packs. The average length of wall in English mines varies from about 40 to 75 ft. in length. In some mines where the seams are above

4 ft. in thickness, the walls are driven from 100 to 200 ft. in length. The great disadvantage in having the walls too long lies in the fact that the coal is injured by breakage in the process of handling it two or three times along the wall before it reaches the gate road.

In working longwall, the mistake should not be made of having the roads too narrow; much trouble often results from this practice, owing to the packs getting squeezed out and catching on the cars. The size of pack depends largely on the amount of refuse obtained in working the seam. Under no circumstances, however, should a pack be less than 6 ft. along the face. In dirty seams where plenty of refuse is available for gobbing, the whole of the space from which the coal has been extracted may be completely packed.

The problem of timbering a longwall face deserves the most careful consideration. Although the working places should be carefully propped, no more timber should be left in the waste than can be avoided, as it keeps the roof from subsiding properly, and also increases the cost. One of the chief advantages of the longwall system is the large percentage of lump coal that is obtained through this method of development. In order to take full advantage of this factor, it is necessary to carefully sprag the coal face, so as to derive full benefit of the "weight" when it comes on the coal. At some mines where the roof is weak, the top is supported by old rails that are put up between the coal and the nearest row of props, the inner end of the rails being wedged into the coal.

Working a 16-in. Seam

At one mine in England the longwall system is being successfully used to develop a 16-in. seam. The roof overlying the coal at this mine is strong and composed of hard rock; the bed lies flat and but little water is present. This is one of the thinnest seams that is being successfully worked. It is doubtful if any method other than the longwall would produce satisfactory results here. Even in this instance it is probable that success is due to the fact that the roof is very strong and consequently little timber is required.

In America one of the principal arguments against the adoption of the longwall system, is that the coal seams are generally clean, and that but little refuse is available for gobbing purposes. In Europe, even this condition would not be considered a valid excuse for the adoption of the room-and-pillar system. In continental mines, when such conditions exist, the goaf is packed with sand or fine débris run in with water through a series of bore holes from the surface. The refuse and sludge from the coal-washing plants are sluiced with water into the waste workings. In such cases the water, after depositing its load, filters away through a dam placed at the bottom end of the pack, eventually reaching clearing tanks, from which it is pumped to the surface. The cost at various collieries for packing the waste in this way averages about 10c. per ton of coal produced; this cost includes all labor charges connected with the system of flushing, and also includes the cost of pumping, pipes, interest on capital, etc.

Advantages of Longwall

If it is expected to work the longwall system successfully, the line of face should be kept even so that the walls will not get closed, thus hindering ventilation and causing extra trouble and expense to open out the face again. It is also necessary to keep the walls going regularly. If proper precautions are thus taken, the longwall system will insure from 90 to 95 per cent. extraction. In addition to this the coal is easier to work longwall, as the constant weight of the roof is a considerable aid in mining; the working cost per ton is, therefore, cheaper than in room-and-pillar. Another point favoring longwall is that from 5 to 15 per cent. more lump coal is produced by this system. Furthermore, longwall permits the employment of more men in a given area, and consequently a larger output can be obtained. Two other points worth considering in this connection are the ease in ventilating longwall workings and the comparatively short hauls for a given output.

In concluding this argument for the greater adoption of longwall in American mines, I do not wish to be understood as advocating this system for all coal seams under every condition. There is no question but that in many of our thick seams where the roof is bad, and where but little refuse is present in the seam, the room-and-pillar method of development is best adapted. I do claim, however, that many of our mines could be worked longwall more efficiently than by the present room-and-pillar practice. Also that at several mines in this country where longwall has been tried and abandoned, the failure of the system was due largely to ignorance on the part of those in charge of the operation. The time will soon be here when American coal operators will find it as much to their advantage to extract the maximum percentage of their coal acreage, and to produce their output in the best possible condition with regard to size, as it is to produce a great tonnage in a minimum time and in the worst possible shape. The majority of American mines are now producing only from 45 to 65 per cent. lump (the average percentage lump production in this country is about 55 per cent. of the total output). This estimate I base on the use of a standard 1¼ in. screen. The average percentage of lump production in England and on the Continent, estimated on a similar basis, is from 60 to 80 per cent. With the adoption of coal cutting machines and the abolishment of shooting from the solid, it is to be hoped that American operators will soon be producing as good a grade of coal, with respect to size and soundness, as is produced abroad. The adoption of the longwall system where conditions are favorable, will further increase the improvement in the grade of coal produced.

The Park Collieries

Many engineers prefer to study the details of individual practice rather than

FIG. 6. SHOWING SCREENING HOUSE AND RAILROAD SIDINGS AT A MODERN ENGLISH COLLIERY

FIG. 7. INTERIOR OF SCREENING HOUSE SHOWING ROTARY TIPPLE WHICH IS WORKED BY A FRICTION WHEEL

Reference.
1 Recent.
2 Pliocene
3 Oligocene & Eocene
4 Cretaceous
5 Jurassic
6 Liassic
7 Triassic
8 Permian
Coal Measures.
10 Millstone Grit
11 Carboniferous Limestone.
12 Devonian
13 Silurian
14 Cambrian
15 Laurentian.
16 Archean
ARCHEAN
DEVONIAN
SILURIAN
CAR. LIMESTONE
JURASSIC
CRETACEOUS
TRIASSIC
CARBONIFEROUS LIMESTONE
RECENT
GEOLOGICAL MAP
OF
THE BRITISH ISLES.
SCALE OF MILES

read a general description of the methods that prevail in one entire field. The Park collieries located at Garswood, England, are representative of the medium sized mines in their district.

At this property, the roads at the foot of the shaft are supported with 2-ft. brick walls which carry steel girders to hold up the roof. These walls extend 540 ft. from the shaft bottom. In all of the main roadways, arched timbering is used to support the roof. Near the foot of the shaft, and built carefully in the coal seam just off the main roadway, is the mine stable. This room is built with substantial brick walls, and is frequently whitewashed. The gutters in the stable are laid on a proper slope, so that drainage is good. Ventilation is secured by means of two regulators each 1 ft. square. Both of these regulators are located at the end of the stable nearest the intake airway, and one is located near the center of this end so that when the stable is being cleaned, this regulator is opened and all dust and dirt are quickly swept away. The other regulator is the one properly used for ventilation, and is situated at the same end of the stable, but near the side of the end, so that when this regulator is opened, the air passes through the stable at the head of each stall, thus giving the ponies plenty of fresh air directly over their mangers. One extra animal is kept underground, so that every fifth day one pony can rest.

The Men Are Checked In and Out

The men working underground at the Park collieries are carefully checked in and out of the mine each day. Near the bottom of the shaft and on the main roadway are two big check-boards. When the miner descends the shaft, he goes immediately to the lamp room where one man takes his check, delivers him his lamp, and another man records his name; the miner passes on into the mine and the check is hung up on the board. When the miner returns from the face, preparatory to leaving the mine, he takes the check, with his regular number on it, to the lamp room where his return is properly recorded. This system of checking makes is easy for the management to know just which men have been caught underground in case of an accident.

In descending the shaft at the Park mine, the first seam encountered is known as the Wigan, which is a 4-ft. bed lying 63 ft. below the surface. About 18 ft. below this seam is another bed known as the Wigan 9-ft seam. Descending further, the Orrell 5-ft. bed is encountered at a depth of 765 ft., and at a depth of 960 ft. from the surface is the Arley seam, which bed is only about 3 ft. thick. A permitted explosive known as ammonite is used to blast out the coal in the upper seams. In the Arley seam, no powder is used at all, the coal being brought down by the hydraulic mining cartridge. In the seams using explosives, the cost of the powder per ton of coal, over a period of two years, was approximately 4.1c. All of the seams are worked longwall, and everything is undercut, no coal being shot from the solid. A careful record of operations in the Arley seam during the past year shows that 7 per cent. more lump coal was produced by the hydraulic cartridge than was formerly mined with explosives. One other point advanced by the managers of this colliery is that the coal brought down without explosives is better able to stand knocking about and loading. Investigation also showed that during the past year, each cartridge produced 3 tons of coal per thrust.

The underground haulage at the Park collieries is accomplished by endless cable; when it is necessary to extend the haulage system, the cable is spliced. The coal is undercut with the Pickwick electric undercutters.

As is the case at practically all European collieries, safety lamps are used underground exclusively. The dust on the return airway is moistened and rendered harmless by sprinkling with calcium chloride. The superintendent said that this method of dampening the dust has proved safer and eventually cheaper than sprinkling with water.

Double-deck cages covered with substantial sheet-iron hoods are used at this mine and are of the type generally adopted throughout England. Girls are employed to do most of the work about the screening house, and tipples on the surface. These colliery girls are paid from 36 to 72c. per day.

Accompanying this article, I am showing a geological map of the British Isles. This map is practically complete in itself and will prove an interesting study if the numbered reference or legend at the top of the page is consulted. It will be noticed from a study of the map that the coal measures in England rest on the Millstone Grit, which series in the reference is numbered 10. In Lancashire where the Park collieries are located, the Millstone Grit is 5000 ft. thick. In South Wales this series is only from 400 to 1000 ft. thick.

The degree of concentration with which coal mining in Great Britain is carried on is made plain to us when we note that the coalfields of England cover an area of 2821 square miles, and those of Scotland 1547 square miles, making the small total of only 4368 square miles as the available area containing workable coals. From this area the British last year produced 261,500,000 tons of coal. The experts in England estimate that at the present rate of production, the coal of the country will still last about 475 years. It is interesting to compare this with figures relative to our own country. The total area of our coalfields is given as 496,776 square miles, or from an area more than 100 times as great we produce less than twice as much coal. It is also worthy of mention that our experts calculate the exhaustion of our easily available coal as less than 100 years in the future. With our wasteful methods, an occasional good scare is not to be deplored; however, if we base the future on the past the outlook is full of hope, for at home and abroad every new estimate of available fuel supplies has shown an increased total on hand. Old Mother Earth is remarkable in her way, for the more she spends and gives away, the more she seems to have left.

Copper-Clad Steel*

By Wirt Tassin

For many years past attempts have been made to cover steel with a copper coat which could be of any desired thickness, and to so firmly weld the two metals that the combined product could be submitted to any of the usual methods for working metals without destroying the integrity of this weld.

The many methods tried in the past have been more or less successful failures, either from a metallurgical or a commercial standpoint, and it is only recently that a process has been developed for the successful welding of copper to steel in such a manner that it will stand the many methods used for working metals, and be at the same time a commercial metallurgical product.

The weld between the copper and the steel is perfect within the limitations of a metallurgical process. The copper can be separated from the steel only by melting it off. The weld will resist sudden temperature changes such as heating the combined metals red hot and then quenching them in ice water. It will resist both stress and shock.

Details of the Process

The process by which this result is obtained may be described as follows: Steel of any desired composition and shape, which, for the purpose of this description, will be regarded as being a mild basic open-hearth steel, rolled into rounds and cut into 26-in. billets to make wire rods, is sandblasted and pickled to remove scale. The billet, which has previously been drilled and tapped at each end, is hung by means of a rod and bushing screwed into one end, in a pre-heater, and is brought to a red heat. When the desired temperature has been reached, the billet is then drawn into a tube (also previously heated) by means of a rod which is screwed into the top of the bushing. This rod slides up and down in the center hole of a three-jawed chuck, which holds the tube and centers the billet in it. A steel flange is then screwed on the bottom of the billet, thus forming with the tube a mold in which the billet is the core.

*Reprint from *Journ. Ind. and Eng. Chem.*, Sept. 1909.

The mold and billet are now carried to a pot of specially prepared copper which is in a super-molten condition. The billet with its attached flange is now lowered out of the tube and into this copper, and kept there for a length of time sufficient to wet the surface of the steel and to form an alloy film. The billet is then drawn from the copper up into the tube, and the billet and its mold are carried to a second pot containing commercially pure copper, in which the final coat of copper is applied. The mold with its billet as a core is lowered into this pot and the molten copper rushes in through two openings in the top of the tube until the mold is filled. The mold is then withdrawn from the second crucible, and when the copper has frozen, the chuck, rod and flange are unscrewed. The tube and its contents are next placed in a ram and the copper-clad steel billet is pushed out of its mold. The billet is now given a washing heat and is then rolled to the desired size.

The rolling is, in general, similar to that of steel or copper, and it is interesting to note that in spite of the great differences between the physical properties of copper and steel, the two metals when so welded have, under proper conditions, practically the same rate of flow. The proportional areas of the copper and the steel remains practically a constant from the larger to the smaller sizes.

Unusual Tensile Strength

The tensile strength of the copper-clad steel is also remarkable. Regarding the metal as having 40 per cent. of its sectional area made up of copper, its tensile strength after the proper treatment is equal to, and may be greater than that of a steel having a composition similar to that of the steel in the copper-clad, but whose sectional area is equal to that of the clad metal. An illustration of this may be seen in the accompanying table of commercial wires, in which due allowance must be made for the difference between hard and soft drawing:

STRENGTH OF VARIOUS WIRES

Name	Diameter in Inches.	Breaking Weight in Lb.
Galvanized steel	0.162	1106
B. B.	0.162	1250
E. B. B.	0.162	1140
Copper	0.162	1237
Copper-clad	0.162	1874

This table is an illustration of the fact that the tensile strength of the copper-clad steel is not the mean of the strength of copper and steel, for the composition of the steel in the galvanized wire quoted is practically that of the steel in copper-clad, and, making liberal allowance for the difference in the heat treatment of the two, the breaking weight of the copper-clad is equal to, if not greater than, that of the galvanized, and but six-tenths of it is steel.

The above statement is also true of its elastic limit, which will average 90 per cent. of its tensile strength. The elastic limit of copper under the best conditions is 60 per cent. of its ultimate strength. That of steel is a variable, but for comparison take it at 90 per cent. Copper-clad steel, four-tenths of whose sectional area is a metal having a relatively low elastic limit, gives a figure directly comparable with that of a steel treated under like conditions whose sectional area is equal to that of copper-clad, and whose composition is similar to that of the steel composing its core.

Galvanic Action

Copper and steel in the presence of moisture form a galvanic couple, and the corrosion of the steel proceeds with great rapidity. The resistance to corrosion of copper-clad steel, so far as the copper coating is concerned, is, of course, the same as that of copper. But, in view of the marked galvanic action set up between copper and steel, it would be assumed that corrosion would quickly occur at the exposed ends, and be a constant factor so long as an electrolyte was present. This supposition is not so, at least in the presence of fresh or salt water. Test samples placed in water, through which a current of air has been allowed to bubble continuously for three months, demonstrated that after a certain period of time, somewhere between 15 and 40 days, corrosion practically ceases, as shown by taking the loss in weight of the tests at varying periods. It is believed that this stopping of corrosion is a result of the following conditions:

After a certain amount of rust has been formed, it appears that a thin film of copper mixed with some copper oxide is plated out or deposited between the iron oxide and the unattacked steel, and that this film will act as a preservative coat as long as it remains intact. If broken, further oxidation is set up and the process simply repeats itself. While it is true that the corrosion on the end of a wire is not a factor in its life, yet the corrosion of the end of a relatively large diameter may become serious. If the above observations hold true on larger sizes (so far it has not been tried on sizes above ⅛ in.), it will have quite a bearing on material suitable for marine work. Tests along this line are now being carried out, and the evidence to date points to a confirmation of the observations made on the smaller sizes.

Possible Uses

The uses to which copper-clad steel may be put are many. The first and most obvious is a wire to be used for electrical and mechanical purposes. The conductivity requirements for electrical use depend directly upon the amount and kind of copper used in the coat. Thus a copper-clad wire, four-tenths of whose sectional area is copper, will have a conductivity of 40, since both copper and steel wire possess certain disadvantages for electrical work, the one having a low tensile strength and under given conditions a lack of toughness, the other having a low conductivity and being subject to a more or less rapid corrosion.

Copper-clad wire has a strength and toughness equal to that of steel, a conductivity far greater than that of steel, and it will not corrode. For example, in telephone work the life of a line is dependent upon its breaking weight and elastic limit. The breaking weight and elastic limit of a No. 10 copper wire are respectively 530 and 293 lb., while that of a No. 14 copper-clad is 760 and 320 lb. The one weighs 106 lb. per mile and the other 61. Comparing copper-clad with galvanized-iron telephone wire, a much smaller size of copper-clad may be used for the same ohmic resistance.

RESISTANCE OF GALVANIZED AND COPPER-CLAD WIRE.

Wire	Diam., In.	Ohms per Mile.	Weight per Mile, Lb.
E. B. B.	0.144	18.84	250
B. B.	0.144	22.04	250
Copper-clad	0.144	7.50	266

Where a high tensile strength and resistance to corrosion is an essential and an increased conductivity is desirable, as for example in power transmission requiring long spans and in catenaries, its value is apparent.

For mechanical purposes, such as bridge work, derrick guys, rigging, springs, rounds of all sizes suitable for anchor bolts, pump rods, etc., where resistance to corrosion combined with a high tensile strength is an essential, copper-clad steel is admirably adapted since steel having any desired physical qualities may be used as the core. For large structural shapes it is questionable whether this material will ever have a commercial use, but for light shapes suitable for skylight and similar work, its value is obvious. It is non-corrodible and possesses the strength of steel. Copper is weak, and galvanized iron corrodes.

To sum up, the material has a greater strength than copper and under given conditions equal, if not greater, strength than steel. It has a greater conductivity than steel and less than that of copper. Its resistance to corrosion is equal to that of copper and immeasurably greater than that of steel.

According to the U. S. Geological Survey the production of tourmaline in 1908 was 3300 lb., with an estimated value of $20,000. In 1907 the production was 2140 lb., valued at $84,120. The bulk of the 1908 production came from California; at Mesa Grande a perfect tourmaline weighing 55 carats after cutting was obtained

Modern Type of the Barrel Copper Converter

Now in Use at a Number of Copper Smelteries. Suggested Improvements for Increasing Lining Efficiency with Consequent Cost Reductions

BY CHARLES F. SHELBY*

Figs. 1, 2, 3, 4, 5 and 6 in the accompanying illustrations show the general design of the modern type of "barrel converter" that is giving such good satisfaction at quite a number of copper smelteries throughout the United States and other countries. Figs. 7, 8, 9, 10, 11 and 12 illustrate an important modification of the same, which without materially increasing the cost of manufacture, might increase the lining efficiency, or tonnage per shell, as high as 250 per cent.; i.e., that for each time the converter was lined it could turn out 2½ times as much copper from the same grade of matte and with the same character of linings.

The converter shell first considered has for standard dimensions: Diameter of cylinder, 8 ft.; length of cylinder at center, 11 ft. It is equipped with cast-steel heads on which are cast the riding rings as an integral part of the same. These are turned true and are spaced 8 ft. 9⅛ in. centers. The improved design is spherical in shape, and in this instance is so proportioned as to be interchangeable on the same stand with the "barrel shape." This new type is formed on the lines of a sphere 11 ft. in diameter. It is also provided with cast-steel heads on which are also cast integral riding rings, spaced to coincide with those of the cylindrical-shaped shell.

Difference in Capacity

The point at issue between the two shapes consists in the cubical contents of useful lining capacity. By referring to Fig. 6, which is a horizontal section through the center of the cylindrical type, showing the metallic shell, the refractory brick lining used as a protector for the metal, and the regular silicious lining, we notice inscribed within the brick lining the outlines of an ellipse of which the extremities of the major and minor axes extend to the brick lining.

This ellipse represents about the lines of maximum utility of the silicious lining in a converter of this shape; and ignoring the nose of the converter, a calculation in which the cubical contents of an ellipsoid, having axes equal to this ellipse, is determined, will result in the cubical contents of maximum available lining for slag-forming purposes, but from which result the contents of the "form" or "drum" used in lining the converter must be deducted.

The natural tendency of an operating converter in consuming lining is to make a round hole of the rectangular one originally provided as a matte receptacle. This results in the linings being worn away near the center tuyeres first, while the balance of the shell is still provided with an abundance of useful material for slag-forming purposes, were it not for the condition of the center tuyeres necessitating relinings.

It is impossible, in a converter of this type, to utilize all the linings tamped in, except by prolonged "blowing on the bricks," which would mean a short life for the metallic body itself. Even the line shown is generally better than can be obtained in practice.

Fig. 12 shows the same section through the ball type of converter, in which the natural tendency of the lining to wear off or the space to enlarge, is in conformity with the shape of the shell, the result being that the maximum lining efficiency of this shell is 100 per cent. of that contained within the sphere proper.

Of course, this also cannot be maintained in practice, but the factor of error is probably proportional to the ellipsoid considered in the barrel type, and comparisons will be made then on the basis of maximum efficiency in both cases.

Capacity of Barrel Type

We find that the barrel type of converter has a cubical capacity inside of the brick lining of approximately 365 cu.ft., and that the form used in lining this converter has a cubical capacity of 70 cu.ft. This leaves net for silicious lining 295 cu.ft. We find that the ellipsoid considered has a cubical capacity of 242 cu.ft Deducting therefrom the form again, 70 cu.ft., we have for maximum available linings 172 cu.ft., or 58.3 per cent. of the total lining capacity figure; the remaining 41.7 per cent. being inert material, a large portion of which, when originally put in the converter, remains there until the shell is worn out or it has to be dug out for new bricks or repairs

Capacity of Ball Type

With the ball type of converter we find the cubical capacity to approximate 564 cu.ft We allow for a special form better adapted to this shape, 121 cu.ft,

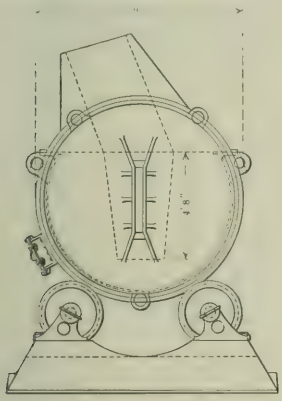


FIG. 1. SIDE VIEW WITH DRIVE CONNECTION, BARREL TYPE

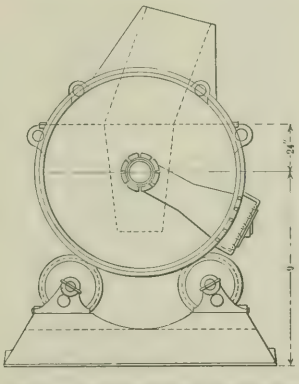


FIG. 2. SIDE VIEW WITH WIND CONNECTION, BARREL TYPE

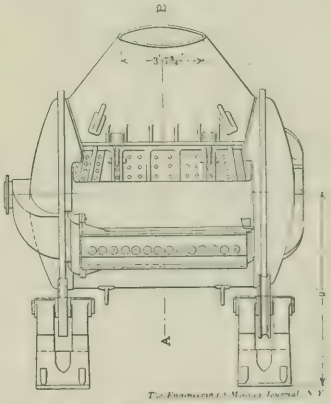


FIG. 3. FRONT VIEW, BARREL TYPE

*Superintendent, reduction division, Cananea Consolidated Copper Company, Cananea, Sonora, Mexico.

leaving a net lining capacity of 443 cu.ft., of which we consider 100 per cent. to be the maximum available figure.

These 443 cu.ft. compare with the 172 of the barrel type as 2½ to 1, indicating that a "ball" type of converter that will correspond in leading dimensions to the present popular "barrel" type would give a lining efficiency nearly 250 per cent. greater.

MINOR ADVANTAGE OF BALL TYPE

There are other minor advantages to be gained with the proposed shape other than an increased lining efficiency. A decreased amount of crane service is necessitated in changing shells. There is practically an entire elimination of the practice of digging out a converter after it has been taken off the stand in order that the form of drum may be put in again. This work will be done on the stand with the ball type by digging the former surface material. This will also result in a lack of the necessity of using so much water to cool off the shell so that men can get at it and dig it out; and this again means that the heat retained in the shell assists in the subsequent drying.

Larger charges, both initial and subsequent, can be blown in the proposed type by means of its greater cubical capacity. The weight of a barrel type converter, lined, and of the size considered, is about 45 tons, whereas the spherical type of the size considered would approximate 63 to 65 tons.

I have had this type of shell in view for a number of years, but have never been so situated as to have the proper opportunity for a demonstration. At Cananea our cranes are not of sufficient strength to carry the increased weight of the loaded shell. Three years ago, when it was decided to remodel the converter plant, this type was strongly considered, but finally abandoned for the above mentioned and other reasons. I hope that someone may be able to use these designs and demonstrate the superiority of the proposed shape. They are not patented.

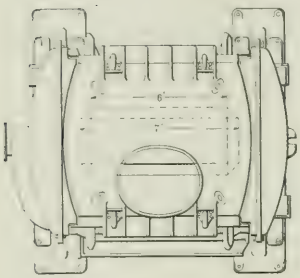


FIG. 4. TOP VIEW BARREL TYPE

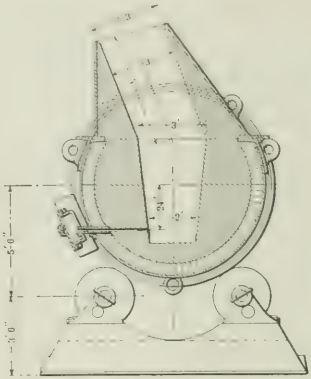


FIG. 5. SECTION A-B BARREL TYPE

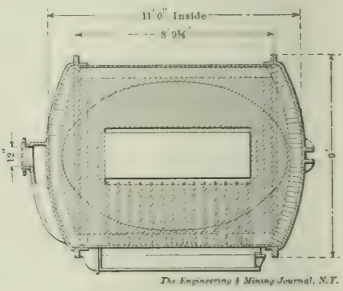


FIG. 6. SECTION C-D BARREL TYPE

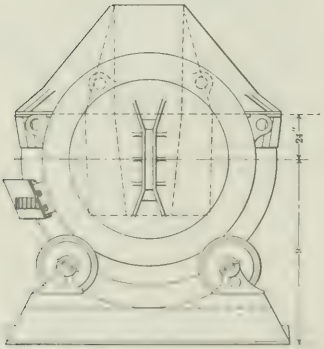


FIG. 7. SIDE VIEW WITH DRIVE CONNECTION BALL CONVERTER

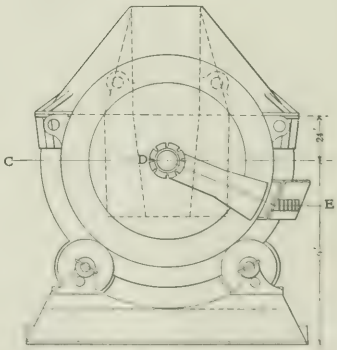


FIG. 8. SIDE VIEW WITH WIND CONNECTION BALL CONVERTER

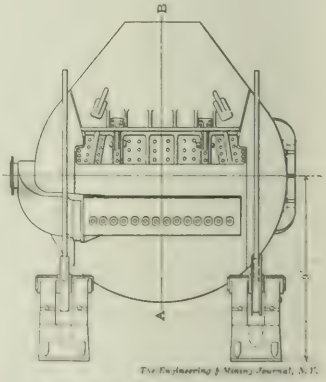


FIG. 9. FRONT VIEW BALL CONVERTER

Lehigh Valley Coal Company

This company owns and controls a large estate in the anthracite-coal region of Pennsylvania. It is controlled by the Lehigh Valley Railroad Company, and its mines are tributary to that road. The report for the year ended June 30, 1909, shows that its capital consists of $1,965,000 capital stock, $13,138,500 bonds, and $10,537,000 certificates of indebtedness, representing advances made by the railroad company.

The report does not give any statement of gross earnings or of coal sold. The income account shows net income for the year of $375,452; deductions for royalty settlements and other adjustments were $97,400, leaving a balance of $269,052. Adding $1,976,846 brought forward from previous year made a total balance of $2,272,898 at the close of the year.

The coal statement for two years is as follows, in long tons:

	1907-'08.	1908-'09.	Changes.
Anthracite mined.....	9,263,899	7,734,078	D. 1,529,821
Bituminous mined.....	276,154	288,457	I. 12,303
Breaker hours worked....	46,891	36,893	D. 9,998
Per cent. domestic sizes made	60.49	62.94	I. 2.45
Per cent. steam sizes.....	39.51	37.06	D. 2.45

The decrease in anthracite mined was 16.5 per cent., but the decrease in breaker hours worked was 21.3 per cent. The bituminous coal was mined in the Snow Shoe region in central Pennsylvania, where the company owns coal lands and mines.

The report says, in substance: "The conditions surrounding the anthracite-coal industry during the year have been far from satisfactory. As a result of two unusually mild winters and the general curtailment of commercial activity, the demand for coal fell off considerably. This occasioned irregular working of the collieries, which necessarily increased the cost of mining. The drought in the coalfields during the summer and fall of 1908 made it exceedingly difficult and expensive to obtain the requisite amount of water to conduct some of the operations and enforced the suspension of mining at certain collieries at a time when they could have been worked most advantageously. Then, too, the uncertainty in the labor situation made it advisable to stock large quantities of coal in order to insure a steady supply to the public in the event of a general suspension of mining. This further increased the expense of operation during the year. The labor situation was finally adjusted by extending the award of the Anthracite Strike Commission for a period of three years from April 1, 1909, upon the same general terms and conditions.

"The expenditures during the year for additions and betterments amounted to $487,178, a decrease of $267,051 as compared with the previous year. It is only by the continuance of the company's policy of concentrating its breaker operations as much as possible, installing improved machinery for the purpose of reducing the labor cost and increasing the percentage of prepared sizes, centralizing power and pumping plants and constructing tunnels for natural drainage wherever opportunity affords, that the cost of mining can be kept within reasonable limits. The cost of producing coal is each year showing a serious increase, owing to the gradual exhaustion of the thicker and more cheaply mined veins near the surface, making it necessary to work thinner veins at greater depths and longer distances from the openings. This increases the cost of the underground operations and of pumping and ventilating, which latter are continuing items of expense, as great when the mines are idle as when in operation. The new breaker plant at Spring Mountain has been completed and is now in operation. The total cost was $374,160. In addition to the preparation of coal from new fields, this breaker is, with but little additional expense, handling the coal from Oneida and Spring Brook collieries, which has enabled the abandonment of the breakers at those two points with the attendant expense of operation. In furtherance of this policy of concentration, the old breaker at Hazleton Shaft colliery is being enlarged and rebuilt on a basis that will permit of preparing not only the tonnage of that colliery, but also of Stockton and Deringer, with practically no increase in the operating cost. The expenditures for this work were $102,451 during the year.

"Other improvements included a tunnel at Blackwood to provide water supply; concentrating the pumping plant and installing electric haulage at Packer No. 5; improved ventilating system; a new washery at Leviston to work the Beaver Meadow culm banks.

"Notwithstanding the restricted operations, mining was so conducted from those lands held under lease as to cause no increase in the advance royalty account, the same showing a slight reduction at the close of the year. Current assets are $4,948,150 in excess of current liabilities."

The Lehigh Valley railroad carried during the year 13,273,136 tons of coal and coke, the ton miles being 2,017,613,649; an average haul of 152 miles. The total The total revenue from coal and coke was $14,831,671, being 44.8 per cent. of the total earnings of the road. The average rate per ton mile was 0.735c. There was a decrease of 8.6 per cent. in coal carried, and of 8.3 per cent. in coal earnings, as compared with the previous year.

The Empire District Electric Power Company has been chartered to erect a plant two miles west of Galena, Kan., of 20,000 h.p., using steam. The power is to be used for commercial and mining purposes throughout the zinc and lead district. The company is successor to Henry L. Doherty Company, of New York, which recently absorbed the Spring River Power Company, already having plants of the combined capacity of 20,000 h.p. It is stated that this is the initial installation of a much larger project which has in view the development of ample power for all of the large tributary districts. The capacity of the Spring River company has been under contract from the outset, and there is an increasing demand for electrical power for the mining industry of this section.

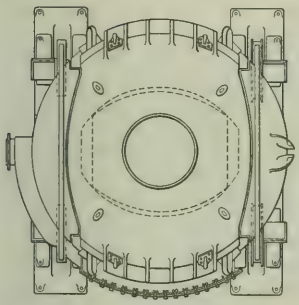


FIG. 10. TOP VIEW BALL CONVERTER

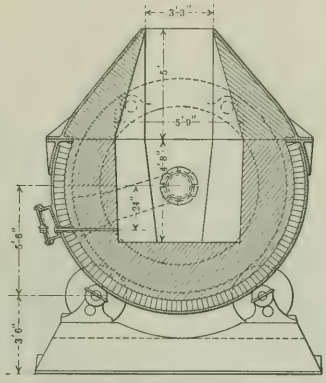


FIG. 11. SECTION A-B BALL CONVERTER

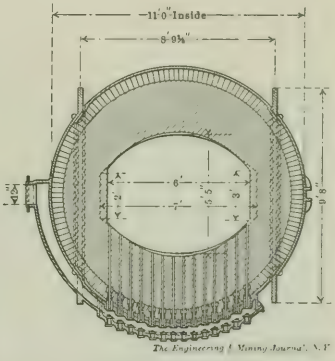


FIG. 12. SECTION C-D-E BALL CONVERTER

If all the protective coverings and casings in an underground electrical system are carefully earthed, the danger of shock is practically eliminated. It is also advisable, on the part of safety, to provide for a daily test of the operation of all automatically opened circuits.

During the year ended May 31, 1909, there were on an average 31.30 machine drills at work per day at the Alaska Treadwell. The average number of tons broken was 20.28, feet drilled 28.47 at a cost of $7.23 for labor and $2.85 for explosives, all per machine shift of 10 hours.

The Presidio Silver Mines, Shafter, Texas

Situated in Semi-arid Belt. Orebodies Occur in Cretaceous Limestone. Mill in Operation for 25 Years; 15 Miles of Underground Workings

BY MORRIS P. KIRK*

Texas is generally looked upon as a land of plains, cattle and cotton, but nevertheless southwestern Texas, beginning at El Paso and extending 300 miles in a southeasterly direction along the Rio Grande river and south of the Southern Pacific railroad is a highly mineralized country and contains several good producing mines and many promising prospects.

Situation and Climate

Of these the silver mines at Shafter, the property of the Presidio Mining Company, in the southern part of Presidio county, 15 miles from the Mexican border, are the most important. Shafter is reached from Marfa, a point on the Southern Pacific railroad, 200 miles east of El Paso and 130 miles west of San Antonio, from which place the stage leaves daily, covering the distance of 15 miles in seven hours. Upon the completion of the Kansas City, Mexico & Orient railway to Presidio, at which point it crosses the Rio Grande river and enters Mexico, the mines will be within 12 miles of the railroad.

In the immediate vicinity of Shafter the country is rugged and has been the scene of great volcanic activity, but beginning a few miles south of the camp and extending to the railroad it is characterized by rolling hills and plain.

While it is in the semi-arid belt, it has a delightful climate except for a few months in summer, and even then the nights are cool, the mine being situated at an elevation of 3850 ft. above sea level. The rainfall is light, but sufficient for stock-grazing purposes.

History of the Mine

The Presidio mine was discovered in 1881 by Mexicans in the employ of John Spencer, an old pioneer who resided near Presidio on the Rio Grande river. He interested William R. Shafter, of Santiago renown, then a young captain stationed at Fort Davis, a military post 65 miles north of Shafter. Mr. Shafter in turn secured the support of some California people, and operations were commenced in 1882, the mill being built the following year. This mill has been in continuous operation ever since, and has treated about 371,000 tons of ore, from which were recovered in the neighborhood of 9,761,000 oz. of silver.

The Presidio Property

The property consists of a rectangle one mile square upon which the mine is located. In addition to this the company owns 37 acres on Cibolo creek, 6000 ft. distant, where the mill and town are situated.

The orebodies occur in the same Cretaceous limestone in which are found the Sierra Mojada, Santa Eulalia, Sierra del Carmen and other great silver mines of northern Mexico. The mine was first worked as an opencut, but there are now five shafts on the property, ranging in depth from 200 to 700 ft.; one of these, the East shaft and the present main working shaft, is of two compartments, equipped with a double-drum hoist, is 700 ft. deep, and was sunk by Mexican labor by hand drilling in 11 months. The mine contains over 15 miles of underground workings. The levels are usually 100 ft. apart, and many of them are run in the soft porphyry of the dikes; they are well ventilated and perfectly dry and require no timber. The large stopes from 40 to 70 ft. square and 20 to 40 ft. high, containing no timber or any other support for the roof, are interesting sights.

EAST SHAFT OF THE PRESIDIO MINING COMPANY, SHAFTER, TEX.

Occurrence and Nature of the Ore

The ore occurs as a replacement deposit in limestone and where first discovered outcropped on the surface. It has been followed along the dip of the formation, which is 15 deg., and in a southeast course for a distance of 2500 ft., and to a depth of 600 ft. The orebodies are irregular, ranging from 40 to 550 ft. in breadth and from 6 to 40 ft. in thickness. The limestone is cut by several well defined faults and porphyry dikes and one of the former on the west marks the western extent of the orebody. The porphyry

*Mining engineer, Dallas, Texas, Box 1000, Tel. 1260.

dikes intersect each other at right angles near the center of the deposit and have probably had some connection with the formation of the ore.

The ore occurs as a brown, iron-stained quartz carrying silver as chloride and sulphide. Bunches of high-grade silver-lead ore are sometimes encountered; this is shipped directly to the smeltery at El Paso for treatment. An analysis of the ore is as follows: Lime, 12 per cent.; zinc, 2.5; iron, 4.5; lead, 0.5; magnesium, 2.4; silica, 62; carbonic acid, 13.2.

Mining Operations

Underhand stoping by hand drilling is the method employed in mining the ore. All employees work by the day. Stoping and hoisting is done on the day shift only, but development work, of which there is about 200 ft. done each month, is carried on by two shifts.

It is impossible to state with any degree of accuracy the amount of ore developed in these irregular limestone deposits, but the mine has been operated continuously for 25 years, and is in as good a condition today as regards ore reserves as at any time in its history.

Milling Equipment and Operations

The ore is hauled 2½ miles by the road from the mine to the mill in 12- and 14-mule ore teams, the wagons holding 14,000 to 22,000 lb. Three teams are employed and make three trips daily with the exception of Sunday.

The pan-amalgamation process is used in the treatment of the ore. The mill contains 15 stamps, 12 pans, 6 settlers and large storage pulp tanks. When running at normal capacity, 4 tons of ore are crushed per stamp per day, through a 20 mesh screen, and a recovery of 85 per cent. made. The silver bullion which is about 900 fine is shipped to San Francisco. The mill is a frame structure, as shown by the accompanying illustration, and has been running for 25 years, but practically reconstructed during that time.

The power plant consists of three 60-h.p. return-tubular boilers and a 120-h.p. Reynolds Corliss engine. Wood was formerly used for fuel but the supply within a radius of 25 miles has been practically exhausted and crude oil from the Texas-Louisiana field is now used. It is hauled from Marfa in tank wagons holding 16 bbl. and built especially for the purpose. At the mill there is a well equipped blacksmith shop, carpenter shop, warehouses, etc.

Labor and General Conditions

Mexican labor is employed chiefly, and is far superior to the average labor encountered in Mexico. The supply is plentiful. The white labor employed, foreman, mechanics, etc., receive the usual western wage.

Freighting from the railroad at Marfa to the mines is done entirely by Mexicans who receive from 20 to 40c. per 100 lb., according to the class of freight hauled This, considering the distance (45 miles), is very cheap.

The population of Shafter is about 1000, nearly all of whom are dependent upon the mines for a living. The town has two stores which carry an immense stock for such a small place. The company has large boarding houses at the mine, and mill, assay office and drafting rooms are all of a high-class character. Good comfortable houses are provided, rent free, for the married white employees. The Mexicans construct their own houses or shacks, a number of which are shown in the illustration of the mill. The town is connected with Marfa by telephone. The Presidio Mining Company is a close corporation with offices in San Francisco, California.

OLD MAIN SHAFT AND OPEN CUTS, PRESIDIO MINE

PRESIDIO MILL AT SHAFTER, TEX.

Allentown Portland Cement Company

The Allentown Portland Cement Company recently completed one unit of a cement plant at Evansville, Penn., having a daily capacity of 2500 bbl. The company owns 452 acres of land, which contains a good quality of cement rock. This plant is the second one that has been built on the Reading system in this vicinity, and is so situated that it is able to supply a large local trade. The plant was designed and built by the Fuller Engineering Company.

The power house is 1000 ft. from the crushing and grinding plant and is equipped with three Wetherill cross-compound condensing engines, direct connected with alternating-current generators. The boiler plant has five 400-h.p. Babcock & Wilcox vertical boilers, fired by Lehigh stokers.

Operation and Equipment

The rock is mined at the quarry and loaded into cars with steam shovels and taken direct to a No. 10 McCully crusher by an electrically operated hoisting engine The crushed material is distributed by elevators to three No. 6½ Lehigh gyratory crushers. From here the crushed product passes to storage bins. The bottom of the bins is equipped with automatic shaking feed which gives a constant flow of material to the driers. There are three driers 7 ft. in diameter and 50 ft. long. These are heated by waste gases from the kilns. The dried rock is taken to a second set of storage bins having a capacity of 5000 tons. From here it goes to two No. 8 Krupp ball mills, which prepare it for the Fuller mill. After the pulverized rock leaves the Krupp mill it is again distributed by elevators to storage bins above the Fuller mills. From the Fuller mills the fine product is conveyed to the four rotary kilns. The kilns are 8 ft. in diameter and 120 ft. long. Each kiln has a capacity of 700 to 800 bbl. per day. Two kilns discharge into a common elevator, which carries the clinker to rotary coolers. The clinker is crushed to ¾ in. and sent direct to 11 Fuller mills and ground to an impalpable powder. The finished product is sacked by the Bates valve-bag machine.

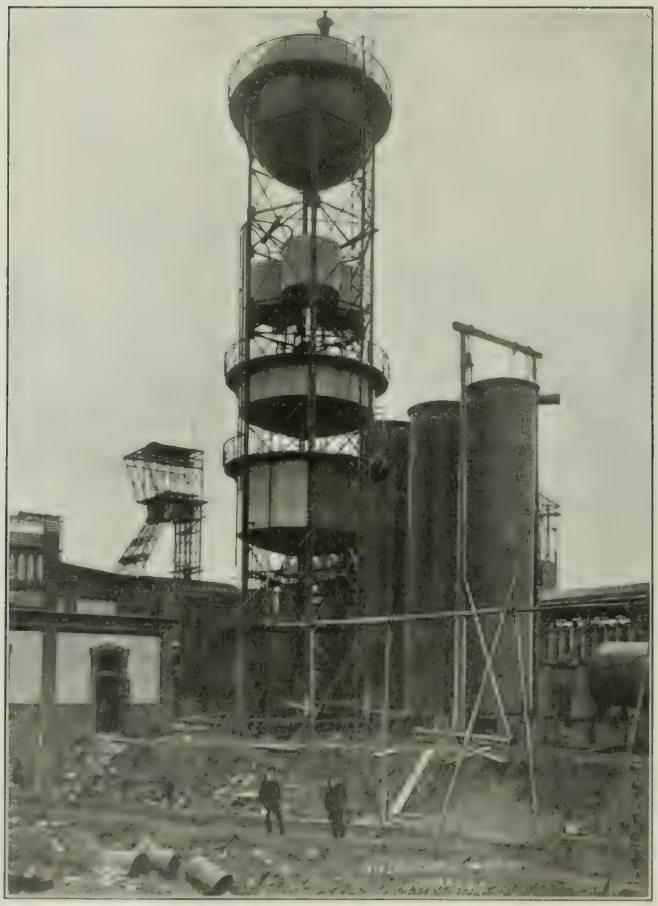
The plant will be driven by electricity throughout and will furnish one of the best examples of electrically driven cement plants so far produced. Each machine is driven by its own motor. The coal for the kiln is crushed by gravity rolls and taken to two driers, each 4' x 30 ft. The driers are heated by waste gases from the kilns. The coal is then pulverized by two Fuller mills and passed over magnets

The Klonne Type of High-level Storage Tank

Affords Advantageous Ratio between Useful Capacity and Weight of Structure; Whole Outside Surface Exposed; Construction Cost Is Low

BY A. GRADENWITZ*

Although a number of different types of high-level tanks have been suggested, none of these various designs have fulfilled all the requirements. While only few of them proved satisfactory from a technical point of view, even those were [illegible] and instal[illegible]



[illegible]

stage of perfection possible in the construction of storage tanks. While constituting an important advance, this type, however, did not come up to the requirements in the long run, as the abutment ring was of difficult and expensive construction and attended by a number of defects.

The Klonne Tank

A [illegible] high-level tank devel[illegible] plans by Prof. G. Barkhausen, may be said to avoid the bad points of its predecessors. While being practically perfect from a technical point of view, it is of cheap construction and affords the most advantageous ratio between the useful capacity and weight of the structure. The underframe is of great lightness and the whole outside surface is constantly exposed to daylight, thus allowing even the smallest leakage to be immediately noted and repaired.

The bottom of the tank is free from any rings, and accordingly does not contain any angle; the transition between the bottom and the cylinder wall likewise contains no break. The bottom and wall are exposed in all their parts only to traction strains due to hydrostatic pressure (both radial and annular) so that the wall can be made relatively thin without reinforcement. The bottom consists of as simple-shaped metal sheets as possible.

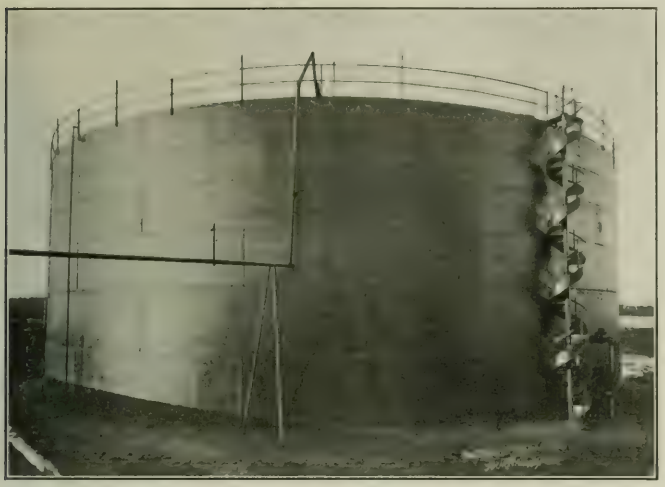
A supporting member for vertical loads (also between individual struts) is used in the place of a special annular support; the vertical cylinder wall is provided with girder ties and vertical props. Deformations due to the load or to fluctuations in

[illegible] TANK OF THE KONIG LUDWIG MINES

temperature entail no sliding on the support, and the bottom is accessible from all sides. The tanks consist of a cylindrical wall and the bottom, which is connected without any break of continuity with a vertical tangent. While any shape desired can be adopted the hemispherical

*[illegible]

form is generally preferred. In the case of tanks intended for coal-washing plants, steep sliding surfaces are the most advantageous. The vertical cylinder wall obviously can be provided also on the top with a similar cap to the bottom, which at the same time forms the roof of the structure, allowing the upper portion to be conveniently utilized. In order to eliminate any compression stresses the ratio between the cylinder sleeve and the bottom should be chosen conveniently.



OIL TANK 28 M. IN DIAMETER AND 10 M. HIGH RECENTLY ERECTED AT SCHULAN

The wall is provided with substantial vertical struts above the points of support where the whole of the load has to be transmitted. As, however, the whole load of the tank is concentrated on the inside of these struts (which must not project inwardly) the radial sections of the struts are chosen as flat as possible.

The cylinder wall is utilized as a girder between the points of support, although the tank has a complete masonry base, the vertical ties inserted into the wall being prolonged beyond the lower edge of the cylinder wall to an extent agreeing with their rigidity, thus increasing the hight of pressure and disengaging the tank from all sides.

Installations

The accompanying illustrations represent some typical instances of this type of high level tank. The tank tower of the Rhein-Preussen coal mines is intended for a coking plant. The uppermost tank contains clear water, the middle tank, ammonia water, and the lowermost tank, tar. The tank tower of the Friedrich der Grosse mine is likewise intended for a coking plant, its various tanks containing the different by-products yielded by coal distillation.

The sulphuric-acid tank of the König Ludwig mines is free from any discharge pipe on the bottom, so as to avoid corrosion, the discharge pipe being arranged on the top. The concentrated sulphuric acid is discharged from the top by atmospheric pressure through a tube immersed in the liquid. There is also shown an oil tank 28 m. in diameter and 10 m. in hight recently erected at Schulan.

TANK TOWER OF THE RHEIN-PREUSSEN COAL MINES

Boston & Corbin Copper and Silver Mining Company

The annual report for the year ending July 31, 1909, states that during the year 3236 ft. of crosscuts and drifts were run on the various levels. The main working shaft was extended 174 ft. as a double-compartment shaft. Later in the year the entire shaft, 700 ft. deep, was enlarged to three compartments by raising from the bottom to the surface. Electrical machinery has been installed and will be operated by power from the Missouri River Power Company. The company has about $185,000 cash in the treasury with no liability except its 90,000 shares of capital stock and a small amount of outstanding bills. It is expected that ore shipments of 300 tons per day will be made within the next few months. In addition to copper the ore carries some gold and silver.

It is reported by Consul Lester Maynard, of Vladivostok, that the German firm of Schultz & Co. has decided to work the oilfields of Sakhalin island. It intends erecting a plant with a capacity of 1,000,000 cases of kerosene and 1,000,000 cases of crude oil per annum. Three wells will be bored and two large pumping stations erected. In addition, there will be a tin-can factory, boiler and repair shops, and a box factory.

Examples of Modern, Sanitary Dry Houses

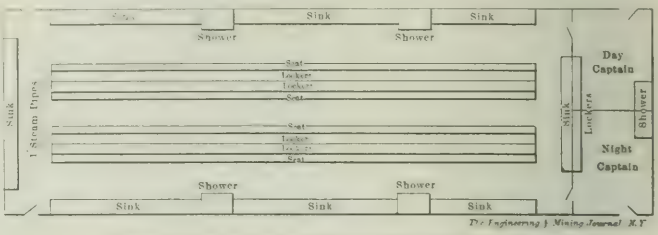
Constructed of Brick, Sheet Iron and Concrete; Equipped with Steel Lockers, Shower Baths, Emergency Hospital and other Appliances

BY ALBERT H. FAY

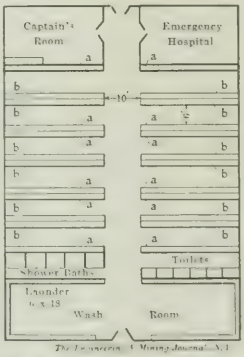
In too many instances the personal or human side of mining is overlooked. The health and comfort of the miners is a point that it is well for every mine manager to bear in mind. The sanitary conditions of the change room is something that can be improved, in many instances, at a nominal cost. Unless these rooms are kept perfectly clean, good opportunities are presented for germs to breed and thus spread contagious diseases. Vermin are found in many of these buildings where the men are compelled to change their clothes when on their way to and from work. The buildings shown in this article are in the Minnesota and Michigan iron districts, and more attention is given to heating than would be necessary in a warmer climate.

Oliver Iron Mining Company

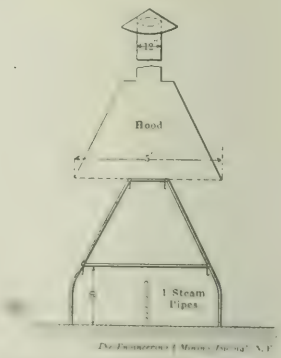
The accompanying illustration in an example of a modern and uptodate change room now used by the Oliver Iron Mining Company, at all its new properties; it is also being built at the older mines as soon as the old buildings are beyond redemption. The building is 40x125 ft., one story high. The outside of the structure is sheet iron, veneered with brick on the inside, making the wall about 5 in. thick. The floor is concrete with ample drainage provision. The building is heated with exhaust steam and lighted by electricity. There are two double rows of steel lockers, 250 in all. Each man is assigned a locker which he uses as long as employed at the mine. There are four shower baths, each one inclosed in a sheet-iron room. Hot and cold water are supplied. Around the walls of the building are 8 porcelain sinks composed of sections about [illegible] ft. long when contain 2 porcelain [illegible] per section. In this way each man has [illegible] clean water in which to wash and there is almost no possibility of spreading disease, as no two men will use the same water. Just above the sink are the hot- and cold-water pipes with faucets for each section of the sink. The lockers are placed back to back and beneath each row are four 1-in. steam pipes. The heat rising through the grating in the bottom of the locker soon dries the wet clothes. There are also two steam pipes along the side of the building. These are placed in the floor in a concrete trough under the sinks and are covered with sheet iron. A bench extends the entire length of each row of lockers, which gives the men a comfortable place to sit while dressing, or eating their lunch. The room is well supplied with windows above the sinks. Clean empty powder boxes are placed in front of each row of lockers for



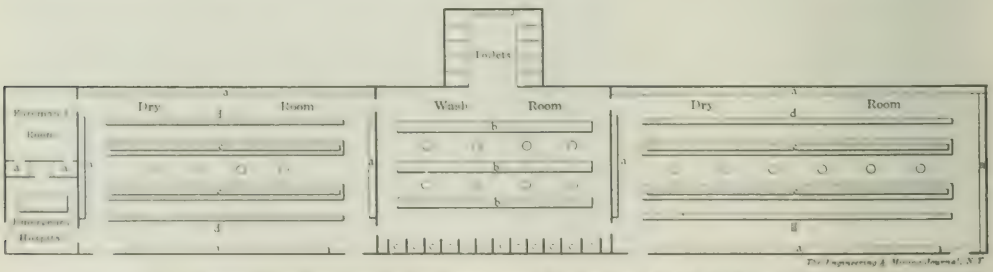
GENERAL PLAN OF CHANGE ROOM, OLIVER IRON MINING COMPANY



REPUBLIC IRON COMPANY'S DRY HOUSE



CLEVELAND CLIFFS DRY RACK AND HOOD



GENERAL ARRANGEMENT OF DRY HOUSE USED BY CLEVELAND CLIFFS COMPANY

the men to throw scraps from their lunch. Ventilators pass out through the roof, but no hoods are used. A caretaker is in attendance both day and night and keeps everything clean. In case any locker becomes infested with vermin, the caretaker opens it, removes the man's clothes and washes the locker out with hot water.

REPUBLIC DRY HOUSE

In addition to this change room for the men are two other rooms, one for the night captain and the other for the day captain. Each is fitted with lockers, shower bath, desk and chair. The accompanying sketch shows in general the details of construction. No provision is made in this building for an emergency hospital.

Cleveland Cliffs Iron Company

The dry house of the Cleveland Cliffs Iron Company is 34x200 ft., and is built of brick. The walls are 9 in. thick and the floor is concrete. At the end nearest the mine is a small room used as an emergency hospital, in which is an operating table, and at one side is a medicine closet containing emergency supplies. The door to this room is 5 ft. wide so as to give ample room to enter with a stretcher. By the side of this is the mine captain's room, in which are two closets, one for him and one for the man who takes care of the building. Along the side of the walls are steel lockers *a*, in which the miner puts his street clothes. His working clothes are not placed in these; therefore he always has a clean place for his other clothes. In the dry room are two rows of racks *e*, made of 1-in. pipe. The upper bar is about 6 ft. from the floor, while the lower one is 30 in. The lower bar is used for boots and shoes, while the upper bar is for clothes. Between the rack and the locker is a seat *d*. Just beneath the dry rack and in the center are eight 1-in. steam pipes placed one above the other. Above the dry rack are a number of hoods 5x15 ft., to take away all the odors arising from the dirty clothes. The hood terminates in a 12-in. pipe

DRY HOUSE AT CLEVELAND CLIFFS PROPERTY

OLIVER DRY HOUSE

There are three launders *b* the full length of the wash room. These slope toward the center of the room, with a discharge pipe at *b*. The launders are 27 in. wide, 12 in. deep, semi-circular in form. They are made of ¼-in. sheet iron. On the top and in the center of the launders are the hot- and cold-water pipes with faucets every 5 ft. The space between the pipes and the edge of the launder is such that there is just room for the wash basin to be set on top. Steam pipes are placed underneath for heating purposes. Twelve shower baths *c* occupy one side of the wash room. On the other side of the room is an annex in which are 8 toilets. Six of these are for the miners and are left open all the time. The other two are for the machine-shop men, each of whom has a key.

In front of the building is a well kept lawn in which young trees have been planted. As in all other departments, the management takes pride in making this an attractive and comfortable place for the employees. This building is equipped for 500 men.

Republic Iron Company

The building, which has been equipped as a dry house, was originally an engine house. It is built of brick, and is 64x90 ft. The floor is cemented, and there is a hall 10 ft. wide running through the center of the building. At the front is a room for the foreman or mine captain. Just across the hall is a room fitted up as an emergency hospital, in which is an operating table, medicine chest, and chairs, together with hot and cold water connections. There are 150 expanded-metal lockers *a* and 150 sheet-steel lockers *b*. The expanded-metal lockers are 18x18 in. x 5 ft. and used for the miners' street clothes. The sheet-metal lockers are 18x18 in. x 6 ft. and are the ones in which the working clothes are placed to dry. The sheet-metal lockers are as nearly air tight as it is possible to make them. Steam pipes are placed beneath the lockers. The top of the locker is connected direct with a ventilator so that no odor escapes in the room. Two men are assigned a pair of these lockers, each man, of course, working on the opposite shift. There are five

shower baths and five toilets. One end of the room is provided with launders, as shown in the drawing. These are 18 in. wide by 6 in. deep. Each locker is provided with a bucket which is used as a wash basin. In this way only two men use the same bucket. The building is well ventilated, has plenty of windows and is lighted by electricity. As the building is too far from the engine house to be heated by exhaust steam, a small boiler has been installed in the basement for heating the building and supplying hot water. An attendant is in charge of the building at all times.

Concentration of Flake Graphite

By Frederick D. Chester*

A number of graphite ventures have been a financial failure because of the low percentage of extraction. Occasionally this loss amounts to as much as 50 per cent., which is equivalent to handling an ore of half value, and as the expense is the same and the output one-half its theoretical amount, the yields may be insufficient to give a profit. Besides an efficient extraction, it is important that the resulting concentrates be as clean as possible, and in this respect some mills have failed.

Concentration of the Ore

Flake graphite as it occurs in nature, freed from every trace of associated gangue matter, is not a pure mineral, but one made up of a series of laminations between which are lodged variable amounts of mineral impurities varying from 10 to 25 per cent. To remove the latter, so as to bring the flake to a state of maximum purity and high carbon, these thicker flakes have to be split up, and the resulting thinner flakes rubbed clean of adherent impurities. This has so far been done on stone mills. By the grinding not only are the flakes delaminated, but the more brittle mineral impurities are ground to dust, which is subsequently bolted out from the larger more precious flake. This process is repeated as many times as is necessary to get rid of flake of the necessary thinness, and still to be essentially clean of foreign matter. The process of refining is applied to the dried concentrates, and the losses in the milling are largely dependent on purity of the concentrates.

I have been in mills which have made it a practice to grind concentrates which would not run over 35 per cent. of carbon, and there are few instances where these concentrates will run over 50 per cent. The milling of a sandy concentrate is ruinous, since it cuts the flake or grinds it to dust, and carbon in the form of dust is not worth over 3c. per lb. while as flake it is worth from 7 to 7.5 cents.

*Manager and Engineer, Chester Graphite Company, Chester Springs, Penn.

Losses Current in Milling

In order to give the losses current to milling a definite expression, the following formula has been derived, which gives results which I have found agree quite closely with the practice. In this a pure flake is assumed to contain 90 per cent. of graphitic carbon. If, then, a concentrate assays 60 per cent. of carbon it means that 30 per cent. of foreign matter has to be ground out of this concentrate, which gangue matter in the form of dust is mixed with more or less reduced flake.

It has been found that in the operation of grinding a concentrate twice, the average percentage of carbon in the resulting dust will vary from 30 to 40 per cent., depending upon the character of the concentrate, so that from these data it is easy to determine the theoretical proportions of pure flake to dust from a given concentrate.

Thus, let

x = Weight of the concentrate in pounds,

F = Weight in pounds of pure flake recovered,

c = Percentage of carbon in the concentrates.

Then

$100 - c$ = Percentage of impurities to be removed = s,

and

$x\,s$ = Weight of impurities in x.

Let

p = Average percentage of carbon in the total dust produced,

and

y = Total weight of dust produced,

then

$$x = x\,s + p\,y = \frac{x\,s}{1-p}$$

Then

$$F = (x - x\,s) = \left(\frac{x\,s}{1-p} - x\,s\right) = x\,\frac{p\,s}{1-p}$$

On the basis of the latter formula, we would get the results shown in the accompanying table from lots of 2000 lb. of concentrates of different percentages of carbon.

From this it is seen that the money value of the product of a mill is largely dependent on the character of the concentrate, and how important it is to bring these concentrates to the highest attainable degree of purity before they are ground. Of course, a mill handling a given tonnage of ore per day will produce a larger quantity of a low-grade concentrate than of a higher, and the output of a mill can be run up by grinding a lot of sandy concentrates, and making an equivalent amount of low-priced dust at the expense of flake, but, as has been shown, this is not profitable.

To get at the matter more exactly we will consider 1000 lb. of an 80 per cent. carbon concentrate as the highest ideal standard, then with lower percentages of carbon in the concentrates the quantities and values will be somewhat as appear in the second table. From this it is seen that between a concentrate of only fair value as usually encountered, and running 40 per cent. of carbon, and one of maximum purity, there is a loss of value from milling of nearly 44 per cent. If, then, a mill is capable of producing 2000 lb. of an 80 per cent. concentrate, or 4000 lb. of one averaging 40 per cent., it makes considerable difference in the profits whether the output from these two grades of concentrates be $109 or $60, possibly the difference between a profit and a loss.

RESULTS FROM 2000 LB. LOTS ACCORDING TO FORMULA.

Percentage Carbon in Concentrates	Refined Flake Produced, Lb.	Total Dust Produced, Lb.	Pure Carbon in Dust, Lb.	Value of Flake Produced at 65c. Net	Value of Dust Produced at 3c. per Lb. for Carbon.	Total Value of Flake and Dust.	Average Value per Pound of Product.
40	334	1666	666	$20.87	$19.98	$30.85	1.54c.
50	667	1333	533	41.69	13.39	55.68	2.71
60	1000	1000	400	62.50	12.00	74.50	3.70
70	1429	571	171	89.31	5.13	94.44	4.70
80	1715	285	85	107.18	2.55	109.73	5.48

It is also seen from the accompanying table that the difference between an 80 and a 70 per cent. concentrate is not great enough to pay for the extra cost of refining above the 70 per cent. limit. But that below 70, while the percentages of carbon in the concentrate decrease in arithmetical ratio, the values of the product decrease in something like geometrical ratio.

Summary of Commercial Consideration

It may now be asked, is there any set of conditions which will determine the profitable production of graphite, and which may be applied to any enterprise. An attempt might be made to answer the question as follows: (1) A cost of mining not to exceed 50c. a ton, and of milling not to exceed 75c., (2) a yield of marketable graphite, calculated as graphitic carbon, of not less than 40 lb. to the ton of ore handled; (3) the production of a concentrate to contain not less than 65 per cent. of carbon; (4) a return from the sale of the product of not less than 7c. per lb. for the actual carbon in the refined flake, and of 3c. per lb. for the actual carbon in the dust. Under these conditions an ore yielding 40 lb. of actual carbon will be worth approximately $2 a ton,

and a mining and milling cost of $1.25 a ton, will leave a profit of 75c. a ton.

Thus it appears that a mill must have a rather large tonnage capacity to realize much of an interest on the investment, cover repairs, renewals, and provide a sinking fund to redeem the investment within the productive life of the mine.

It must be understood that a low-grade graphite ore at the existing prices of the product will not pay for deep mining at any greater cost than enumerated. From what has been written it will not be difficult for the officers of a company, not satisfied with results, to institute an inquiry, and to determine the real condition of affairs existing. Very often officials and stockholders realize that something is wrong in their company without knowing the cause, and the employees, anxious to retain their positions as long as possible, make plausible showings of total output; the financial balance, however, is always on the wrong side.

QUANTITIES AND VALUES OF VARIOUS CONCENTRATES.

Percentage of Carbon in Concentrates.	Proportionate Weights of Concentrates in Lb.	Average Value of Flake and Dust Produced.		Percentage of Loss in Value.
80	1000	@ 5.48c.	$54.80	0
70	1143	@ 4.70	53.72	1.97
60	1333	@ 3.70	49.32	10.00
50	1600	@ 2.70	43.20	21.20
40	2000	@ 1.54	30.80	43.90

Causes of Variations in Ore Sampling

By Thomas Kiddie*

There are a number of approved mechanical ore samplers in use, each kind having its own advocates, but so far as I know there is not any regular nor standard method of determining the accuracy or inaccuracy of these machines.

Ordinarily in sampling the personal element enters to some extent. A certain make of sampler is recommended and installed, and, there being no other sampling machine in use in the same establishment, those using it generally have no effective means of checking it against one of another style or make. As a consequence, the interests of both buyer and seller of the ores sampled are affected either adversely or favorably as the case may be, by the results obtained by such sampling through possible inaccuracy.

In my opinion tests to determine the accuracy of all samplers and sampling methods should include sizing tests as well as chemical tests, instead of, as by present method, chemical tests only, and if the value of the different portions of an ore increase or decrease more or less consistently with the size of the particles in the portions tested, as I believe it can be proved they do, then it follows that the machine or method of sampling which shows the least variation on analysis by sizing, gives the most accurate sample.

In the course of experiments made on the separation of metallic sulphides from silicates (or quartz) by the gradual crushing of sulphide ores having a hard gangue, it was found that the portions of certain constituents in those ores always increased and certain other constituents always decreased as the size of the portion tested increased, as shown by the accompanying tables of analyses and sizing tests.

From the above it will be seen that the percentage of silica and alumina increases with the size of the ore, although not apparently in accordance with any definite mathematical law, and that the gold, silver, copper, iron and sulphur decrease as the lumps are larger. These facts have been confirmed by tests of various lots of ores and will be found to conform to the experience of many metallurgists.

Applying this principle to the sampling of ores it would appear that analyses by sizing should prove the accuracy, or otherwise, of any sampling device. With this purpose in view, a Jones ore sampler, 10-in. size, fed with an ordinary mill sample, was tested, with the result that the proportions of the respective sizes, shown in an accompanying table, were discharged from opposite sides of the sampler, the total quantity of ore passed through the machine during this test having been 3016.5 ounces.

This shows a variation between the two sides of the sampler of 88 oz., or 2.932 per cent., and between the respective sizes, as follows: On ⅜-in. screen, 31 oz.; on ¼-in. screen, 32.75 oz.; on 1/16-in. screen, 7 oz., and through 1/16-in. screen, 17.75 oz. The results of this test indicate one serious source of error which may occur in determining the actual value of ores sampled by a riffle sampler. As further showing the variation in sampling, the accompanying table shows the result of a test to determine the difference between a sampling by riffle and cone methods, respectively, with 300 lb. of ore riffled down to 50 pounds.

From the chemical analyses of the ore and from the sizing tests contained in the foregoing tables it is clearly shown that there are great differences in the metallic contents of the various-sized particles, and results obtained vary considerably with the present methods of sampling. It is, therefore, necessary that a sampler, or method of sampling, shall deliver a sample containing the exact proportion of the different sizes contained in the ore sampled, and that in order to do this the personal element must be eliminated.

TEST OF JONES SAMPLER.*

Screens.	Side A. Weight in Oz.	Side A. Percentage.	Side B. Weight in Oz.	Side B. Percentage.
Through ½- on ¾-in.	824.50	56.319	855.50	55.105
Through ¾- on ½-in.	247.75	16.923	280.50	18.068
Through ½- on ⅛-in.	198.25	13.541	205.25	13.221
Through ⅛-in.	193.50	13.217	211.25	13.606
Total	1464.00	100.00	1552.50	100.00
	48.53%	.....	51.46%	.....

To prove the accuracy of a sampling machine, or of any method of sampling, it would be necessary to make up a synthetic or artificial ore, by taking several weighed and previously assayed quantities of different-sized particles, and then mixing them so as to make up an ore, the composition of which, as regards the sizes and contents of its component particles, is shown. The whole of this artificial ore would be passed repeatedly through the sampling machine, and each sample thus obtained would then be passed through the same screens as were used in making up the ore, and the proportions of its several sizes be determined and compared with that of the original.

ANALYSES OF SIZES.

	Original Ore.	On ¾-inch Screen.	On ½-inch Screen.	On 30 Mesh.	On 80 Mesh.	On 120 Mesh	Through 120 Mesh.
Au, oz	0.22	0.22	0.20	0.18	0.38	0.43	0.24
Ag, oz	0.50	0.50	0.50	0.50	0.70	0.80	1.00
Cu, per cent	1.12	0.81	1.09	1.39	1.66	2.19	2.13
Fe, per cent	15.50	16.40	18.00	17.60	20.10	24.80	23.60
SiO, per cent	44.70	45.90	45.50	45.00	39.60	34.20	34.40
S, per cent	4.80	5.00	3.60	5.20	8.20	11.20	9.30
CaO, per cent	7.20	7.10	6.20	8.40	7.70	7.10	7.40
Al_2O_3, per cent	16.80	19.60	18.10	15.80	13.40	13.10	14.20
Sizing test: Percentage by weight.	100.00	78.25	11.00	7.68	1.25	0.34	1.48

It would seem to be advisable that these determinations should be undertaken by a commission, or, as a preliminary step to that end, by the faculty of some school of mines or other like institution. If this were done and similar tests applied to all well known makes of sampling machines, we would then have absolute data obtained from a competent and independent source; whereas the results already published are usually those from one class of machine only.

It must be remembered that this investigation applies to one class of ore only, and that a wide field for investigation along these lines is open to anyone sufficiently interested in the matter to enter upon it. The application of this principle

*Metallurgist, Northport, Washington.

of separation of metallic sulphides by crushing has already produced satisfactory results in smelting by the adoption of such means as was found necessary to prevent such separation taking place, whereby a uniform ore charge was delivered to the furnace, resulting in an increased output and a general betterment in furnace conditions.

COMPARISON OF RIFFLE AND CONE SAMPLES.

Sample No. 1.	Riffle. Per Cent.	Cone. Per Cent.	Difference.
Through ½- on ¾-in. screen	29.84	26.32	3.52
Through ¾- on ¼-in screen	36.62	32.61	4.01
Through ¼- on 1/16-in. screen	17.42	26.18	8.76
Through screen 1/16-in.	16.12	14.89	1.23
Sample No. 2.			
Through ½- on ¾-in. screen	7.9	8.23	0.4
Through ¾- on ¼-in screen	18.7	19.1	0.4
Through ¼- on 1/16-in. screen	40.9	40.8	0.1
Through 1/16-in. on 20-mesh screen	15.8	15.6	0.2
Through 20- on 40-mesh screen	9.1	8.5	0.6
Through screen 40-mesh	7.6	7.7	0.1

Since writing the above, Dr. J. Bonsall Porter, of McGill University, has kindly undertaken certain work in this investigation, which will be made the subject of a future joint paper.

VARIATIONS IN CONE SAMPLES.

Sizes.	A. Per Cent.	B. Per Cent.	Difference.	C. Per Cent.	D. Per Cent.	Difference.
Through ½- on ¾-inch screen	2.1	3.4	1.3	4.8	5.4	0.6
Through ¾- on ¼-inch screen	11.8	16.0	4.2	17.2	21.4	4.2
Through ¼- on 1/16-inch screen	43.8	44.3	0.5	44.0	42.2	1.8
Through 1/16-inch on 20-mesh screen	17.5	16.0	1.5	15.5	14.0	1.5
Through 20- on 40-mesh screen	12.4	10.2	2.2	10.1	8.9	1.2
Through 40-mesh screen	12.4	10.1	2.3	8.4	8.1	0.3

Labor is reported as having been scarce at the Alaska Treadwell during the year ended May 31, 1909. Wages paid are as follows: Machine drillers, $3.50 per day (in pits $4.50); machine helpers, $3.25; mine laborers, $3; amalgamators, $120 per month; feeders, $100; vannermen, $95 to $130; machinists and helpers, $3 to $7 per day; blacksmiths, $5 to $6; tool sharpeners, $4.50 and blacksmith's helpers $3. Board at the company's boarding house costs $25 and room $2 per month. The average number of men employed was 676.

The report of the British Alkali Commissioner gives the production of sulphate of ammonia in Great Britain for two years as follows, in long tons: 1908, 313,281 tons; 1909, [illegible] tons. While the gas works continue the largest source of supply there was a considerable increase last year from the coke ovens, owing to the greater number of the product ovens in use.

American Borax Deposits

By Charles R. Keyes*

For years the principal supply of borax in the United States was the product of industrial chemistry. Suddenly, as over night, the entire borax industry has changed its methods and started out along new lines. Instead of laboriously obtaining various salts of boron by evaporating the waters of bitter lakes, by extracting them from the bottom crusts of desiccated ponds, by leaching them from boraciferous lake-muds, or by obtaining them through the heating of certain clays with sulphur in great retorts, it is now mined in the same way as are the metals or coal. From an industrial viewpoint the most important result is that it should now be possible to produce borax at a figure that is less than one-third of the price current a few years ago, and that it should enable the American product easily to command the markets of the world.

The recent discovery of enormous deposits of almost pure, crystallized borate minerals in the Tertiary clays of southern California promises an ample supply for the entire world for many years to come. Some of the localities have been long out of the beaten path of travel and without transportation facilities. At this time the geologic occurrence of the borate minerals is of more than usual interest and some of the facts lately observed seem worthy of more than passing notice.

Extent of Boraciferous Formations

The borate minerals occur in definite geologic formations. These terranes consist mainly of Tertiary clays of great thickness. They extend in a broad, semicircular belt around the southern end of the Sierra Nevada. From Death Valley and the Nevada line, they are exposed at short intervals for a distance of more than 300 miles to Santa Barbara, 60 miles north of Los Angeles. Along Furnace cañon on the east side of Death Valley and in the Amargosa desert, in the low mountains north of Daggett in the Mojave desert, in the Cajon cañon, and in the Santa Paula valley which opens out to the eastward from Santa Barbara, fine exposures give insight to the great extent of the Tertiary clays.

For a decade or more, Daggett has been the chief source of supply of American borax. Within the year, the Furnace cañon and Santa Paula localities have been so extensively developed that the poorer deposits of Daggett are not worked so extensively as they once were. Better borax deposits than any of those now operated and even more accessible to market are also ready for mining. Whether or not all of the borate deposits are on the same stratigraphic horizon is not as yet determined. Nor is it known with certainty that the several localities belong to the same geologic province. Presumably the clay beds are continuous throughout the entire belt mentioned.

Lithology of the Tertiary Terranes

Of the three major classes of geologic formations comprising the Tertiary of the region, only the great clay deposits need be especially considered in the present connection. The early acidic volcanics and the interbedded basic lavas require no further mention. Of the soft stratified deposits there are three rather distinct phases. At the base is a coarse conglomerate, which in the Death valley district appears to be confined to the eastern margin of the belt of finer deposits. It has a thickness at the south end of the Grapevine mountains of more than 3000 feet.

The second, marked phase of the Tertiary stratified deposits is called the older sand series. The entire section is composed of yellow to reddish, friable sandstones, rather massively bedded. These sandstones, so far as observable, nowhere merge into the conglomerates below; neither have they any conglomeratic facies. They have interstratified several layers of clays. The upper surface of the sandstones is very uneven; and apparently it was sub-aërially eroded before the overlying clays were deposited. Neither in the sandstones nor in the conglomerates below are there any evidences of the existence of borate deposits.

The third and uppermost lithologic phase consists of fine, alkaline, blue and olive-green clays, which weather to pale yellow or white. Numerous olivine-basalt sheets, 10 to 200 ft. in thickness, are interbedded. In the upper part of the succession occurs much crystalline gypsum (selenite), thick beds of crystallized borate of lime (colemanite), and thin strata of limestone, presumably of chemical origin. Thick beds of rock-salt are also reported to occur in several localities. So far as known no fossils are found in any of the formations.

The Borate Beds

The richer borate-bearing beds have a thickness of from a few inches to 40 or 50 ft. In the unweathered portions they consist of bluish clays thickly interspersed with milk-white, crystallized colemanite in thin layers, nodular bands and scattered nodules of all sizes up to a foot or more in diameter. This is termed locally the high grade ore.

*Mining engineer, Des Moines, Iowa.

Throughout the beds carrying the coarsely crystallized mineral, the clays are more or less strongly impregnated with fine particles of borate minerals, which yield upon leaching 10 to 12 per cent. of anhydrous boracic acid. This is called by the miners the low-grade ore. While there are large quantities of this low-grade mineral in the several districts it cannot be utilized now to advantage in competition with the richer ores alongside of it. At Daggett, however, similar clays carrying as low as 6 per cent. of the borate in a finely divided condition is exclusively mined on a large scale by two of the principal borax producers.

Mingled with the coarse colemanite is often considerable amounts of crystallized gypsum in large plates. In places the gypsum becomes so abundant as to all but completely obscure the borate minerals. In the Furnace cañon there appear to be several distinct horizons at which the colemanite was deposited; but so far as is now known there is only a single level at which the mineral was formed in large quantities. This horizon is exposed on both sides of the Furnace valley. A very large amount of the mineral has been removed through the excavation of the cañon.

The clays associated with the borate beds are all very fine and entirely free from coarse materials, the colemanite crystallizations excepted. These clays when freshly exposed are blue in color, but soon change to olive-green, then to yellowish and finally nearly to white. As to their origin it has been thought that they are typical playa deposits, similar to those which are at the present time being formed extensively in many inclosed basins of the arid regions. It is more probable that the California borate-bearing deposits are mainly wind-blown desert dusts carried into shallow seas, arms of the latter becoming desiccated from time to time.

Methods of Mining

Depending upon the steepness of inclination of the borate-bearing beds and their associated strata, two distinct methods of mining are followed. When the beds are nearly horizontal in position and their main outcrops are in the sides of deep cañons, as in the Death Valley region particularly, the mineral band is simply drifted upon. A main entry is driven into the hill-side. From this, on either side, lateral passages are made and chambers opened up. In all respects the plan is that of the ordinary room-and-pillar method of mining coal. The mineral is loaded into small cars which a man pushes out to the mouth of the adit. Owing to the high cost of fuel and particularly to the especially favorable conditions for this sort of mine transportation it is not probable that power will be soon substituted.

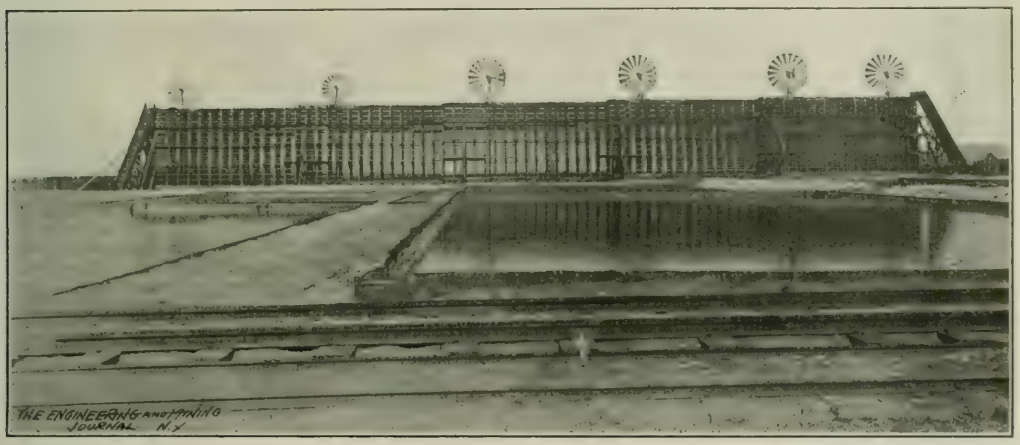
In the Santa Paula valley, where the borate beds stand nearly vertically, drifts are run in on the outcrop of the mineral near the bottom of a cañon and the mineral is stoped down in the several levels much as are metalliferous ores in fissure veins. In the present workings there are several hundred feet of mineral above the lowest level so that it is likely to be some time before it will be necessary to sink shafts or operate by inclines.

In the Mojave desert, the borate beds are also highly inclined. Shafts have been sunk to depths of 300 to 500 ft.; levels are opened every 50 ft. and the mineral stoped in the usual way. The hoists are run by gasolene engines. The low-grade mineral is hauled by steam to the extraction works situated on the main line of the Santa Fe railway, a distance of 8 miles. A view of the huge evaporating racks and concentrating vats is shown in the accompanying engraving.

Available Supply of Borates

Since the recent discoveries of the rich and extensive beds of colemanite, the low-grade mineral which has been so profitably worked in the past will no longer be taken out, and the few small mines which have been operating in such deposits have been already closed. While the new mineral bodies lately opened up are of sufficient size to supply the world with borax for many years to come, the operating companies have endeavored to control the entire visible supply by locating hundreds of mining claims covering all deposits known to them. That any person or company is permitted to do such wholesale locating of mineral lands indicates only too clearly some of the graver defects in our mining laws. In the particular instance just mentioned the seriousness of the situation happens to be largely mitigated by the fact that a large majority of the claims have been located with little regard to their real merit, and as a result they have little value.

Some of the best deposits are still unlocated and in these so far as now known there is an estimated available tonnage ample to supply the world for many years. One deposit alone which has not yet been touched is over 50 ft. in thickness composed entirely of the high-grade crystallized colemanite. It occupies an area of several square miles, at least. A single claim of standard size, 600 by 1500 ft., would contain about 3,000,000 tons, and a square mile upward of 100,000,000 tons. Yet before the recent general slump in mine products, commercial borax sold for 7c. per pound!



EVAPORATING RACKS AND CONCENTRATING VATS OF BORAX WORKS AT DAGGETT, CAL.

The only export tax in Mexico on minerals or mineral products is on gold or silver. All other products of the mines are exported free except for a nominal customs charge at the port of export.

The Boston Consolidated Mining Company

SPECIAL CORRESPONDENCE

On Oct. 7 and 8, 1909, members of the American Institute of Mining Engineers, returning from the Spokane meeting, visited the mines, mills and smelteries around Salt Lake City. The Boston Consolidated Mining Company prepared especially for these visitors attractive little booklets giving in concise form, data of the equipment and the operating costs, both at the company's mines in Bingham cañon and at the mill at Garfield. The "tabloid" form in which these data are presented readily appeals to the busy engineer, and they are presented below for the benefit of those who were not able to take this trip:

MINES AT BINGHAM CAÑON

Mines Area:
378.8 acres covering both sulphide and porphyry mines, which are separate mines.
Porphyry Mine:
Development—101,914 ft. underground workings.
Tonnage 37,439,000 tons porphyry ore above 1.5 per cent. copper content.
Mining Method Present output obtained by caving methods, but mine is equipped for steam shoveling.
Sulphide Mine:
Development—47,536 ft. underground workings.
Mining Method Square sets in stopes.
Equipment—Both Mines:
Tramway—4 track gravity tram—Stine.
Drums—Air controlled; lower 12 tons in car.
Length of tram, 2000 feet.
Elevation overcome, 737 feet.
Gradient, 24 to 55 per cent.
3000-ton cylindrical steel receiving bin.
Tramway, daily capacity, 6000 tons.
Four 90-ton steam shovels.
12 locomotives.
146 cars.
6 miles narrow-gage track.
3 electric-driven air compressors, 70 drills capacity.
80 rock drills.
Usual shops, warehouse, boarding houses.
Number of Employees:

Sulphide mine	102
Porphyry mine	427
Shops	19
Total at Bingham	548

SEPTEMBER MINING COSTS

Sulphide Mine:
Production—7178 (dry) tons ore. 310,000 lb copper contents.
Square set method—Stoping ore.
Cost of Mining in Cents per Ton:

Breaking ore	29.1	
Mucking	35.2	
Timbering	50.1	
Electric haulage	9.6	
General expense	4.1	
Sulphide mine expense	12.0	
Cost of mining		$1.401
Development in waste		0.287
Total cost		$1.688

Porphyry Mine:
Caving method
Production—71,880 (dry) tons ore.
Cost of Mining in Cents per Ton:

Breaking ore	18.8
Mucking	16.5
Timbering	7.7
Electric haulage	4.0
Gravity tram	2.5
Mine expense	5.0
General expense	2.2
Development expense	10.0
Total cost	66.7

GARFIELD MILL

Mill Site
Area 910 acres.
Buildings:
Foundry—Steel building, 60x80 feet.
Equipment—Motor Driven:
No. 3 Whiting cupola.
No. 3 brass furnace.
No. 4 Root blower.
12,000-lb. jib crane.
Machine shop—Frame building, 44x178 feet.
Equipment—Motor Driven:
1—10 ton traveling crane.
1—36x24 triple engine lathe.
1—20x20 lathe.
1—No. 6 Barnes' vertical drill.
1—24-in. shaper.
1—No. 55 bolt and pipe cutter.
1—power pipe cutter.
1—No. 21 plate shear.
1—8-ft. Poole boring mill.
1—18 in. keyseater.
1—5-ft. Niles' radial drill.
1—1100-lb. Bement steam hammer.
Electric Substation:
Transformer building—Concrete and brick, 60x72 feet.
Equipment:
4—1000-kw. 80,000-460 volts Westinghouse transformers.
3—250-kw. 460-2300 volts Westinghouse transformers.
3—75-kw. 460-115 volts Westinghouse transformers (lighting).
1—Set 80,000-volt choke coils.
1—Set 80,000-volt arresters.
1—9-panel distributing switchboard.
Power transmission at 40,000 volts.
Distance 144 miles from Telluride Power Company's, Grace, Ida., station.
Crude Ore Bin:
Steel building, 300x36 feet.
Capacity, 12,000 tons.
Crusher House:
Steel building, 66x78 feet.
Equipment—Motor Driven:
2—No. 6 Gates' gyratory crushers.
2—No. 5 Gates' gyratory short head crushers.
Screens and conveyers.
Mill:
Steel building, 326x590 feet.
Crushed ore bin, 21x570 feet.
Equipment—Motor Driven:
312—1500-pound Nissen stamps.
Duty, 114 drops per min.; 6½-in. drop.
Capacity, 5.73 tons per stamp day.
299 Wilfley tables.
221 Johnston vanners.
312 Callow tanks.
Classifiers, launders, etc.
Flow from stamps by gravity throughout.
Tailings and concentrates flow from mill through one central tunnel, having 13 branches beneath mill.
Heating Plant:
Frame and iron building.
Equipment—Three 80-h.p. boilers.
Main Pumping Plant:
Brick building, 30x50 feet.
Equipment—Motor Driven:
1—3 stage Byron Jackson centrifugal pump; capacity, 3000 gal. per minute.
2—4-stage Wood centrifugal pumps; capacity, each, 1500 gal. per min. against static head of 380 ft. through 4316 ft., 20-in. wood pipe line.
Concentrate Bins:
Concrete.
Nine bins, capacity, 200 tons each.
Concentrates loaded by Browning crane into railway cars.
Assay Office:
Brick building.
Store Room:
Frame, covered with iron.

MEN EMPLOYED AT GARFIELD

Shops:		
Foundry	15	
Shops	21	
Electrical department	6	42
Mill:		
Unloading ore	10	
Crusher house	18	
Mill	114	
Loading concentrates	3	145
Clerical force	5	
Assay office	2	
Other outside labor	34	41
		228

September Operation:
Received 77,003 tons
Milled 72,000 tons (dry).
Produced 3550 tons (dry) concentrates, containing 1,569,000 lb. copper.
Recovered 21.8 lb. copper per ton crude ore.
Average heads 1.58 per cent.
Power required—Pumping 469,280 kilowatt-hours; milling, 989,265 kilowatt-hours; total 1,458,545 kilowatt-hours.
Possible stamp hours, 224,630
Actual stamp hours, 244,145.
Percentage run 95.3.
Milling Costs

	Cents per Ton.
Crude ore bin	1.09
Crushers	4.49
Stamps	21.97
Wilfley tables	2.45
Vanners	3.35
Launders	0.51
Callow tanks	1.01
Loading concentrates	0.44
Tailings dump	0.74
Water Supply	7.50
Heating plant	0.04
Mill expense	3.41
General expense	3.11
Total	50.11

OUTPUT PER MAN

From these figures can be deduced some interesting information as to tons of ore mined and milled per man:

Mining:

Tons of ore mined per day per man underground:	
Sulphide mine, square-set system	2.34
Porphyry mine, caving system	5.61
Tons of ore mined per day per man, all hands	4.81
Milling:	
Tons of ore milled per day per millman	21.0
Tons of ore milled per day per man, all hands	10.5
Tons of concentrates loaded per day per man loading	39.4
Mining and Milling:	
Tons of ore mined and milled per day per man, all hands	3.3

Credit for these unusually efficient operations is due to Lafayette Hanchett, general manager; L. S. Cates, mine superintendent; and A. J. Bettles, mill superintendent.

Tin Mining in South Dakota

The Tinton Milling Company, of Tinton, South Dakota, has brought its mill through the experimental stage, and is about to start running two regular shifts. As the only tin mill in the United States its progress will be watched with interest. The mill is designed for 150 tons, and is connected to the mine by an aërial tram about half a mile long. The ore from the receiving bin goes to a No. 3 Gates crusher, is elevated to a 100-ton bin, fed to two smaller Gates crushers and is elevated to the 100-ton crushed-ore bin. Thence it is fed by a challenge feeder to the dry elevator, to coarse shaking screens ⅝-in. aperture, oversize to No. 1 roll, undersize to fine screen 3/16-in. aperture, oversize to No. 2 roll, undersize to wet elevator to a Woodbury jig. Material for No. 1 and No. 2 rolls goes to the dry elevator and is returned to the screens. The first jig compartment gives shipping concentrate, the heads from the second and third go to Wilfley tables. The middlings from all three compartments is reground in rigid rolls and returned to wet elevator to jig. The slime overflow from the first compartment is thickened in a Callow cone and concentrated on a Wilfley slime table. The tailings from all three jig compartments and the tables go to waste. The middlings from the first tables are at present being run over the slime table. The heads from all the tables and the middlings from the slime table are shipped. It is estimated that a profit can be made from 1 per cent ore.

Granby Consolidated Mining, Smelting and Power Company

This company owns large low-grade copper deposits in the Boundary district of British Columbia, and a large smelting plant. The report for the year ended June 30, 1909, shows that the capital stock is $15,000,000 in shares of $100 each; of these 15,000 are held in the treasury.

The ore mined and shipped to the smeltery during the year was 963,510 dry tons. The ore smelted, including 19,944 tons foreign ore, was 984,733 dry tons. The metals produced were 21,901,528 lb. copper, 335,521 oz. silver and 45,761 oz. gold; averages of 22.24 lb. copper, 0.342 oz. silver and 0.046 oz. gold per ton. The average price realized for copper was 13.22c.; for silver, 51.25c. The total mine development during the year was 9707 ft.; diamond-drill development, 8329 ft. The report of Manager A. B. W. Hodges says:

"At the mine during the past year little or no new construction work was undertaken, as all of that had been completed the year before and work was confined to developing the known orebodies and finding new ones with the diamond drill, which drilled over 8000 ft. of holes during the year, and our ore reserves are largely increased and we have ore in sight for many years to come.

"The grade of the ore last year was not as good as the year previous. This was for the reason that in some places on the 400- and 300-ft. levels and near the surface we have had to take out a lot of pillars and cave down a lot of ore, and in doing this everything comes down between the walls and consequently the grade is lower, but this is offset by the reduced cost of mining. In stoping in comparatively new orebodies, the higher and lower grades can be mined and selected at will, but when the workings have been worked for eight or nine years, a time comes when it is advisable to take everything out, consequently the ore cannot be kept as clean.

"Our three main tunnels and our large shaft are all equipped with electric locomotives, cars, crushers, etc., and can take out and crush from 4000 to 5000 tons per day, and all are kept in the best state of efficiency and all repairs and mine improvements are charged to daily operating expenses.

"At the smeltery a large amount of money has been expended in machinery and new construction. Two years ago it was decided to enlarge still further all the furnaces and converter plant so that we would have a smelting capacity of from 3500 to 4500 tons per day, and all this work has gone on during the past year and we have everything finished with the exception of two blast furnaces, which are now undergoing alteration and which will be completed by October next.

"The blast furnaces were lengthened from 17 ft. 10 in. to 22 ft. 2 in., and made 4 ft. deeper. This was done by lowering the furnace floor and slag tracks 4 ft. These larger furnaces have shown a marked reduction in smelting cost, especially in the lesser slag losses, reduction in amount of coke used, and also in labor due to large capacity and bigger units.

"The converter plant was enlarged and modernized. Two of the old small converters were replaced by three electrically operated shells 84 in. diameter by 126 in. long, giving us one small stand and three large ones. A new 40x40x42-in. two-cylinder electrically operated blowing engine of 10,000 cu.ft. capacity per minute was also added. The converter plant now has a capacity of about 40,000,000 lb. per year. Also two large rotary blowers for the blast furnaces were added, each having a capacity of 100,000 cu.ft. per minute. All of our engine rooms containing blowing engines, electrical motors and generators are housed in steel and brick fireproof buildings."

The income account for the year is as follows, averages being calculated on the total tons smelted:

	Amount.	Per Ton.
Realized for metals	$3,983,537	$4.05
Working expenses	$3,136,122	$3.19
Foreign ores purchased	166,280	0.17
Total expenses	$3,302,402	$3.36
Net profit	$ 681,135	$0.69
Mine explorations	$ 74,841	.....
Depreciation	10,000	.....
Interest	82,787	.....
Dividends, 2 per cent	270,000	.....
Total	$ 437,628	.....
Surplus for the year	$ 243,507	.....
Carried over from previous yr.	2,455,180	.....
Total surplus	$2,698,687	.....

Working expenses include all development and repairs; also freight, refining, selling and general expenses. There was expended on new construction and equipment $233,994; additional mining property, $11,952; a total of $245,946 for additions to property.

President J. Langeloth's report says: "In consequence of the enormous damage done by the great forest fires in August, 1908, which devastated a very considerable area in British Columbia, whence our coke supplies are received, and destroyed railroad bridges and trestles, no fuel could be had for several weeks and over one-half of the works had to be closed down.

"It is very satisfactory to report a material reduction in the cost of mining and smelting per ton of ore; these lower costs established during the last few months should be maintained during the current business year, and consequently the cost price per pound of copper reduced. Last year, this cost, after deducting the value of gold and silver, amounted to 10c., against 10.24, 10.14 and 8.35, respectively, the three previous years.

"The expected improvement in the price of copper did not materialize, mainly on account of the very large production, which for a considerable part of the fiscal year exceeded consumption, and this, up to a few months ago, was still considerably below what it was during the period prior to the panic. Of late these conditions have changed materially for the better."

Foreign Trade in Iron and Steel

Iron and Steel Exports—Exports of iron and steel, including machinery, from the United States for the eight months ended Aug. 31 are valued by the Bureau of Statistics of the Department of Commerce and Labor at $105,258,962 in 1908, and $100,955,684 in 1909; a decrease of $4,303,278, or 4.3 per cent. The leading items of export were, in long tons:

	1908.	1909.	Changes.
Pig Iron	26,452	37,805	I. 11,353
Billets, ingots & blooms	79,015	84,119	I. 5,104
Bars	33,440	53,614	I. 20,174
Rails	138,787	166,306	I. 27,519
Sheets and plates	67,162	107,735	I. 40,573
Structural steel	81,910	60,960	D. 20,950
Wire	90,081	101,221	I. 11,140
Nails and spikes	26,730	30,346	I. 3,616
Pipe and fittings	76,554	99,124	I. 22,570

The exports of mining machinery were valued at $2,619,005 in 1908, and $2,900,269 this year.

Iron and Steel Imports—Imports of iron and steel and of machinery into the United States eight months ended Aug. 31 were valued at $13,407,611 in 1908, and $18,174,492 in 1909; an increase of $4,766,881, or 35.6 per cent. Leading articles of import were, in long tons:

	1908.	1909.	Changes.
Pig iron	56,941	87,222	I. 30,281
Scrap	3,262	4,377	I. 1,115
Ingots, blooms, etc.	6,610	10,419	I. 3,809
Bars	14,316	9,244	D. 4,972
Wirerods	7,796	7,606	D. 190
Tin plates	42,828	40,042	D. 2,786
Sheets and plates	1,524	2,225	I. 701

The only considerable changes were the decreases in tin plates and bars.

Iron Ore Movement—Imports and exports of iron ore in the United States, eight months ended Aug. 30, long tons:

	1908.	1909.	Changes.
Imports	424,963	954,718	I. 529,755
Exports	140,562	302,766	I. 162,204

Of the imports this year 550,672 tons were from Cuba, 275,943 tons from Europe and 106,044 from Canada and Newfoundland.

Imports of manganese ore were 119,255 tons in 1908, and 135,603 in 1909; increase, 16,348 tons.

At the Tennessee Copper Company's smeltery at Copperhill there was used for a time a jacket of chilled slag surrounding the junction of the breast jacket and the spout, with a view to preventing or minimizing the effect of breakouts at that point. This, however, has been discontinued. More careful calking of the joint, supplemented by a spray pipe, is giving better results and with less trouble.

Nevada Consolidated - Cumberland Ely

The approaching absorption of Cumberland Ely by Nevada Consolidated lends interest to the affairs of these companies, together with their subsidiary concerns, viz., the Nevada Northern Railway Company and the Steptoe Valley Smelting and Mining Company. The official reports of these companies are characterized by absence of frankness toward their stockholders; indeed, it may be more properly said by concealment of all essential details. It might be possible to unravel some things with the aid of collateral evidence, but it would be no simple job.

As to the entrance of Cumberland Ely into the affairs of Nevada Consolidated in the first place, we quote from the JOURNAL of Oct. 19, 1907, as follows:

"Early in the Ely boom the Guggenheims acquired the controlling interest in the Cumberland Ely Copper Company, which had some property of good prospective value in the district, together with some valuable water rights in the Steptoe valley. Having thus become engaged in the district, they began quietly in 1906 to buy stock in the Nevada Consolidated, and by the middle of the year secured control of the latter company through the ownership of 51 per cent. of its stock, for large blocks of which it is understood that $12.50 per share was paid. Since then the Nevada Consolidated has been a Guggenheim company, the old management having retired and all subsequent operations being conducted by Guggenheim engineers.

"It appears that the Cumberland Ely Copper Company profited more from this transaction than did the Nevada Consolidated. The latter was already far along with the construction of the railway and was going to have its own smelting works, which in the natural course of events would probably develop an important custom business. The company also owned the Georgetown ranch, about 2800 acres, north of Ely, which carried with it the right to the water of Murry creek—a continuous flow of 4,000,000 gal. per 24 hours, which Mr. Channing considered one of the most valuable assets of the company, inasmuch as it assured a supply of water capable of treating many times the amount of ore which the mines could produce. The Cumberland Ely Copper Company at this time had no mining development of great consequence, but owned valuable water rights on the other side of Steptoe valley.

However, under the new management, the Nevada Consolidated relinquished its great advantages to the Cumberland Ely company, the two companies becoming equal partners in what the Nevada Consolidated might have had alone. The Cumberland Ely company was allowed to [illegible] in the Nevada Northern railway, and the Steptoe Valley Smelting and Mining Company was organized to build the mill and smelting works, the Nevada Consolidated and Cumberland Ely each owning a half of this company. On the other hand, the Cumberland Ely company transferred its water rights to the Steptoe company. The location of the works was finally made at a place where the latter could be utilized, instead of just north of Ely as originally contemplated. Of course, this deal was not entirely disadvantageous to the Nevada Consolidated. It was provided with smelting capacity considerably greater than it had contemplated, at least to begin with, but certainly it lost the controlling position in the Ely district, which it would doubtless have retained if the Guggenheims had not acquired 51 per cent. of its stock."

In addition to the above statement it may be remarked that the consideration to the Nevada Consolidated, aside from the water rights, was 200,000 shares of Cumberland Ely stock at the valuation of $10 per share, or twice par. The management of the Nevada Consolidated had previously selected the site for its smelting works and was ready to go ahead with construction. A great deal of valuable time was frittered away in the process of allowing the Cumberland Ely company to butt in.

Nevada Northern Railway

This company owns and operates a railway extending from Cobre to Ely, Nevada, a distance of 140.4 miles, together with branches amounting to 22 miles, making a total of 162.4 miles, besides which there are five miles of sidings. The line is laid with 60-, 70- and 75-lb. rails. It was opened June 2, 1906. The company has seven locomotives, eight passenger cars, nine box freight cars, five cabooses, 16 flat cars and 50 ore cars. The capital stock of the company is $2,000,000, divided into shares of $100 each ("Poor's Manual of Railroads," for 1908).

Beside the capital stock of the Nevada Northern railway, there is a bond issue of $1,000,000, for the conversion of which 200,000 shares of the stock of the Nevada Consolidated Copper Company, or $1,000,000, is held in trust.

The Nevada Northern railway was very easy construction. It runs due south through the broad and gently sloping Steptoe valley. The curves are few, there is not a bridge on the line, only one or two cuts worthy of the name and scarcely any grading. In all respects the physical conditions were exceptionally favorable. The rise in elevation from Cobre to Ely is less than 1000 ft. The construction and equipment of the line ought not to have cost any more than the amount of the capital stock and bonds of the company. The last balance sheet of the company (June 30, 1909) shows property and equipment at $3,708,482. The amount received from Cumberland Ely by Nevada Consolidated was nominally $2,000,000 in stock of the former company. This stock was subsequently sold, to a large extent, in the market, and probably realized less than $10 per share. The official statements of the Nevada Consolidated indicate nothing specific as to these transactions.

Steptoe Valley Smelting and Mining Company

These works were built jointly by Cumberland Ely and Nevada Consolidated. Presumably each company supplied funds for it as required and received capital stock of the subsidiary in consideration therefor. As originally constructed, the works comprised a concentrating mill of 4000 tons daily capacity, and a smeltery of about 700 tons daily capacity. A power plant of 6500 h.p. was also provided.

Extravagant figures representing the cost of these works have been published, such as $7,000,000 for example. If such estimates have any basis, it is probably the figure at which the works are carried in the capital accounts of the two mining companies, rather than their actual cost.

A concentrating mill of 1,200,000 tons annual capacity ought not to cost more than $1,800,000. A smeltery of 250,000 tons annual capacity ought not to cost more than $1,250,000. A power plant of 6500 h.p. ought not to cost more than $700,000. These estimates, which foot up to $3,750,000, would allow for a good deal of extravagance. In its fiscal year ending Nov. 30, 1908, which covers the period of most active construction, the Cumberland Ely company reported that it had expended $1,190,522 "in development work at the mine and this company's proportion of the cost of construction of the Steptoe Valley Smelting and Mining Company's plant."

Nevada Consolidated

According to the report of this company for the year ending Sept. 30, 1908, five of the six sections of the concentrating mill were then in operation, two being on Cumberland Ely ore and three on Nevada Consolidated ore. The sixth section, expected to go into commission in December, was to be used for Nevada Consolidated ore, when the production of this company was expected to be at the rate of 35,000,000 lb. of refined copper per annum. By April, 1909, with additions to the concentrating and smelting plant, the rate of output was expected to be 50,000,000 to 55,000,000 lb. per annum. The additions to plant were made as contemplated, but the Cumberland Ely management not desiring to make any addition for its account, Nevada Consolidated thereby obtained a five-eighths interest in the Steptoe Valley company, although Cumberland Ely had the right to balance it at any time desired.

The cost of producing copper by the Nevada Consolidated was estimated by

Mr. Channing and by other engineers at 7c. per lb. In the quarter ending June 30, 1909, the company reported a production of 9,721,873 lb., which apparently cost 8.08c. per lb., or 6.8 per lb. if the profits of $124,299 from its share of the Steptoe Valley works and the Nevada Northern railway were deducted. The ore reserves at the end of 1908 were estimated at 20,000,000 tons, while in the opinion of Pope Yeatman, the consulting engineer, the possibilities for a large increase of tonnage were very great.

Cumberland Ely

In the Veteran mine this company has an orebody that is believed to amount to about 4,000,000 tons. Up to Feb. 1, 1909, it had milled 177,589 tons which averaged 3.1 per cent. copper, yielding a total of 7,332,118 lb. of copper. In the quarter ending June 30, 1909, the company produced 5,332,701 lb. of copper from which the net earnings were $121,749, besides which $114,000 were received as profit from the smeltery and railway. On the same basis that the cost of the Nevada Consolidated copper in the same quarter was reckoned at 8.08c. per lb., the cost of the Cumberland Ely copper was 11.28c. per pound.

Oroville Dredging, Limited

The statutory general meeting of this company was held in London on Sept. 17, when a statement was made by the chairman, Frederick W. Baker, explanatory of the formation of the company and of the operations for the year ended July 31.

The company was originally an American company, governed by a board of directors in New York, but owing to the greater part of the stock being held in London, it was decided to organize an English company, the nominal capital of the new company being made equal to that of the capital of the American company on the basis of one share of £1 in the English company for each $5 share in the American company. The number of shares that had been exchanged up to Sept. 6, was 505,369 shares and a further number of 134,846 are about to be exchanged, making a total number of those who have joined or agreed to join the English company, 640,215 shares out of a total capital of 700,000 shares.

The accounts of the American company which are late in appearing, being only for the year ending July 31, 1908, instead of 1909, show a net income of $271,199. Dividends to the amount of $348,884 were paid, the balance being partly covered by the surplus account and the net debit being carried to balance. The report for the year ending July 31, 1908, contains a statement by W. P. Hammon, the general manager, describing the operations of the constituent companies of Oroville Dredging. These companies are the Boston & California Dredging Company, the Boston & Oroville Mining Company, the Oroville Gold Dredging and Exploration Company, the Bear River Mining Company and the Boston Machine Shop Company. During the year the dredging equipment of the company was reduced from twelve machines to three by the abandonment of the three old 3-cu.ft. bucket capacity Risdon machines. The other machines were improved at an expenditure of $122,131, equal to an average of 1.68c. for each cu.yd. of material handled. The profits of the companies, when compared with the previous year, have been reduced by reason of the extraordinary expenditure of $77,521. The operating expenses and the yield of the different dredges are given in tabular form, from which it appears that dredges, like battleships, become rapidly out of date and obsolete. The tendency is for the size of the buckets to increase, the larger machines being operated at considerably less cost. The larger type used at Oroville are 7-ft. buckets, while on properties neighboring to Oroville, 14-ft. buckets are used, operating at a cost of 3c. per cu.yd., as against a cost of nearly 7c. for the 7-ft. bucket machines at Oroville. So great is the saving in cost from the use of the larger machines that the company is considering the building of two 14-ft. bucket dredges at an estimated cost of £80,000, and the scrapping of most of the old machines. A general summary of the four dredging companies, forming Oroville Dredging, Ltd., is given in the accompanying table.

SUMMARY OF OROVILLE DREDGING COMPANIES

	Cu.Yd. Excavated.	Total Cost per Cu.Yd. Cents.	Returns Cu. Yd., Cents.	Net Revenue Cu. Yd., Cents.
Boston & California...	2,133,921	6.33	13.72	7.39
Boston & Oroville...	1,808,810	7.97	9.02	1.05
Oroville Exploration..	2,542,694	5.15	11.64	6.49
Bear River Mining....	835,799	9.82	7.73	2.09 (loss)
Averages..	....	6.72	11.16	4.44

* Ore depth from 27.6 ft. to 31.7 ft.

Average Expenditure.

	Cents	Per Cent. of Total Cost.
Labor and material } current exp..	1.48	22.0
Electric power.... } current exp..	0.77	11.4
Water..... } current exp..	0.11	1.7
Repairs.....	3.61	53.6
General expenditure	0.43	6.5
Taxes and insurance.	0.32	4.8
Total.....	6.72	100.0

Further average figures are:

Cu.yd. per acre.	48,271
Yield per acre	$5,386
Expense per acre	3,244
Profit per acre	2,141

In consequence of the limited area that still remains at Oroville, estimated by Mr. Hammon last January at 10 years or 14 years, if the Bear River ground is included, the directors have been looking out for a new dredging area and have taken up a property in Colombia situated on the west bank of the Nichi river, about six miles above the town of Zaragoza, Antioquia. The nearest seaport is Puerto Colombia, which is about ten days by steamer from New York. The concession covers 22,000 acres, of which 310 acres have been proved by Keystone drills. The engineers have estimated the total yardage of this area at over 13,000,000 cu.yd., of an average gross value of 31.31c. per cu.yd. The working expenses are estimated at 8c. per cu.yd. The property has been taken over on the recommendation of W. P. Hammon and the purchase money has been paid. The titles are held by the Pato Mines Company, registered under the laws of West Virginia and 75 per cent. of the stock will be issued to the Oroville company and 25 per cent. will go to the vendors in addition to $35,000 purchase money paid in cash. Oroville Dredging, Ltd., propose to make a debenture issue of $62,500, carrying 8 per cent. interest in order to provide the funds for paying for and equipping the property. A dredge of the most modern type has already been ordered and it is expected to commence work early next year.

The Bradley Process

The Bradley process for treating copper ore, which has been repeatedly referred to by the daily press and T. W. Lawson, in connection with the Process Copper Company, is the invention of Charles S. Bradley. He is conducting experiments at the plant of the International Tin Company, Bayonne, N. J., a portion of which he has been using as a laboratory and testing plant for nearly three years. Mr. Bradley and his two sons are in control of the work, and the utmost secrecy is maintained. No information is given out at their office. The plant is equipped for testing ore in quantities that will approximate mill tests. The Bradleys are technical men and are spending all their time at the plant, in an endeavor to perfect a hydrometallurgical process for the extraction of copper from low-grade ore.

Graphite mining is becoming one of Utah's important industries. The Homber Mining Company, which recently opened large deposits of high-grade graphite near Brigham City, is receiving more orders for its product than it can supply. The company is arranging for the use of grinding machinery at one of the local brick plants until its own mill can be built.

Mine Explosion in British Columbia

SPECIAL CORRESPONDENCE

An explosion at the No. 2 mine of the Wellington Colliery Company, at Extension, Vancouver island, B. C., caused the death of 32 miners on Tuesday morning, Oct. 5. This is one of the island collieries known as the Dunsmuir coal mines, the largest holder in which is the Hon. James Dunsmuir, lieutenant-governor of British Columbia. The cause of the explosion has not yet been ascertained, but the general opinion of officials and miners familiar with the mine is that a blown-out shot ignited the coal dust within the comparatively small area affected. The damage to the mine is inconsiderable so work in it will be resumed in the course of a few days, after the provincial government inspectors shall have examined it and made a strict inquiry into the circumstances attending the disaster.

Chief Inspector F. H. Shepherd and District Inspector Alexander Dick have been at the mine assisting in the recovery of the bodies of the dead miners. The provincial mineralogist and James Ashworth (the latter a well known English writer on coal-dust explosions who has for some time past been engaged in solving some difficulties encountered at the mines of the Crow's Nest Pass Coal Company, southeast Kootenay, B. C.) have also been authorized by the provincial government to endeavor to discover the cause of the explosion.

Five or six years ago a fire in this mine caused the death of between 20 and 30 miners, but since then there has been no serious trouble at the property. Two experienced and thoroughly reliable firebosses examined the mine two hours before the recent explosion and reported all working places in good condition.

An Interesting Coal Case in Indiana

SPECIAL CORRESPONDENCE

A case that is attracting much attention, and one which will try locally a point never before decided in this manner in the coal field of Indiana, is soon to be tried in the Clay county circuit court at Brazil, Indiana. It is the case of Abe Park and four others. They are suing President Lewis, of the United Mine Workers, Mr. Hargrove, national board member, and the [illegible] Local No. 31. The men are suing [illegible] the ground that they had the [illegible] and [illegible] of Mine Workers' Union of those of their [illegible] [illegible] possible to [illegible] per-

vented from earning a living for themselves and their families.

The trouble arose in March, 1908, in the Rosebud mine of the Vandalia Coal Company at Seeleyville. The men allege that one morning when they went to work they found notices posted at the mine by the State mine inspector, stating that the air in the mine had been found to be bad.

MINERS REFUSED TO WORK

The men refused to go to work and the mine was closed for two days. The company, then, it is charged, exercised a right they claimed to hold under the contract, that of deducting $2 from each envelop of the two hundred or more employees. The men threatened suit, and the matter was brought before the attention of the miners' officials of the district. The complaint recites that these officials made a proposition that if the men would withdraw their suits they could return to work. Twenty-nine of the men refused to do this, but got judgment for the $2 each and collected the same. This angered the officials of the mine workers who refused to take dues from these miners, for a period of 90 days, and at the expiration of that time, they were expelled and denied working cards. They also charge that all of the 29 men found work in the block coalfield by paying a membership fee of $10, but these five refused to do so, and brought this suit.

The officials of the miners against whom the suit is directed insisted that under the yearly contract, the operators had a right to deduct the $2 or a dollar for each day the men refused to work pending the investigation and consideration of any grievance, and they sought to enforce the rule or provision in this case.

Colliery Notes

When the insulation of a motor has become damp during a stoppage, suitable steps should be taken to insure that the insulation shall be dry before the working of the motor is resumed, in order that its base may not become alive.

Cables carrying electric current underground, when suspended, should be supported by leather or other flexible material, in such a manner as to allow of their readily breaking away when struck, before the cables themselves can be seriously damaged.

A recent attempt was made at a colliery to get cement behind the tubbing in a shaft, where a large quantity of water was coming in. A crib was made with wood at the bottom edge of the lowest casting, between it and the rock, the wood being bolted to the casting, and the joint made water-tight with [illegible]. The cement was then poured into the space between the tubbing and the rock, [illegible] in the casting about 10 ft. above the bottom. The cement was put in under pressure, being sent down through a pipe in the proportion of 1 of cement to 2 of sand; by the time that the mixture got to the bottom, the cement had usually separated from the sand and was useless. When the cement was put in through a tundish by hand, without pressure, the concrete was good.

The reversing feature in mine fans is becoming more popular and is now regarded by many engineers as essential to the safe and efficient ventilation of a mine. The principal arguments favoring the reversing feature in mine fans are, (1) in case of a mine fire or explosion, the reversal of the air current will often retard the progress of flames or gases; (2) by reversing the current and using the hoisting shaft as an upcast each night during the winter months, ice will be prevented from forming on the hoisting guides. In compliance with the demand for a reversible fan, the Sullivan Machinery Company is building a ventilator with a steel hood, which latter is given a quarter turn when it is desired to alter the direction of the air. For this purpose the hood is suspended on circular steel plates or rings, and runs on roller bearings. Rotation is secured by a rack on the circumference of the bearing ring, which is engaged by a pinion, turned by a large handwheel in the engine room. Anyone about the mine can reverse the current instantly without stopping the fan. One of these ventilators has been installed at the Crown Hill mine of the Clinton Coal Company, at Clinton, Indiana.

In many mines, occasions often arise where the work can be done most safely and to best advantage with compressed air. Among such instances is the operation of coal-pick machines in driving headings, or entries. If the mine in question is equipped with electric energy, the electric wires can be brought quickly up to the working face or point of application. For just such cases where it is inconvenient to carry pipe lines to the face, and still where electric energy cannot be used advantageously, a portable air compressor has been designed by the Sullivan Machinery Company. This machine consists of a standard single-phase compressor, driven by a silent chain from an electric motor, both motor and compressor being mounted on a truck, with wheels to fit the gage of the mine track. One compressor of this type which was recently supplied to a coal-mining company, has a 10x12 in. air cylinder, furnishing about 175 ft. of free air per minute, at 150 r.p.m. The horsepower of the motor is 25, which easily maintains an air pressure of 80 lb. in the receiver. This capacity is sufficient to operate a coal-pick machine. In case mine track is not available in the underground workings, which with wide tires may be [illegible] in place with changes, and the [illegible] can be moved from place to place on the ground.

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*Illustrated.

Nevada Consolidated Buys Cumberland-Ely

Assuming that the stockholders of the respective companies ratify the action of their directors, Nevada Consolidated is going to purchase Cumberland-Ely, increasing its capital stock by 400,000 shares, and giving that for the 1,300,000 shares of Cumberland-Ely. If this program be consummated without hitch, it will conclude a curious record of mining finance.

Some years ago the Guggenheims having become interested in Cumberland-Ely, without much to show in that property, acquired a majority interest in Nevada Consolidated. Cumberland-Ely subsequently, by great good luck, developed an orebody in the Veteran mine. Then affairs were arranged, to the disgust of many shareholders of Nevada Consolidated, whereby Cumberland-Ely was allowed to join Nevada Consolidated in the construction of the Steptoe Valley smelting works, Nevada Consolidated receiving 200,000 shares of Cumberland-Ely stock.

Later on, strenuous efforts were made to effect a consolidation of Cumberland-Ely with Nevada Consolidated, but such resistance was offered by stockholders of the latter, that the scheme was given up. Recently, by the strange whirligig of time it was Nevada Consolidated that made overtures to Cumberland-Ely, and it was stockholders of the latter who offered the resistance, considering the terms to be not good enough. We have no doubt that there will be some stockholders of Nevada Consolidated who will think the terms too high.

However, the outcome is that Nevada Consolidated for 400,000 shares, which at the present market price—about $25 a share—would be worth $10,000,000, repurchases the half interest in the Nevada Northern railway, and secures in addition the outside interest in the Steptoe Valley smelting works, the Veteran mine, about $500,000 in cash assets (as of June 30, 1909), and a certain area of unprospected ground. Against the present purchase price is to be set the consideration received from the previous sale, its acquisition of Cumberland-Ely stock having been to a large extent marketed. Making this deduction, the present purchase probably stands equivalent to $8,000,000@8,500,000. For this Nevada Consolidated obtains interests in a reduction works and railway for which $2,000,000 and $1,500,000, respectively, would probably be liberal estimates, leaving something like $4,000,000@4,500,000 to represent the mining property. The Nevada Northern railway is making handsome earnings, and on the basis of its earning capacity, its value is doubtless much more than $3,000,000. Its earnings, however, are chiefly derived from the Nevada Consolidated business, and the present price may be considered partly as a premium for the recovery of what never ought to have been disposed of.

It is not worth while to undertake to go too minutely into calculations of value, for in this case the matter of present and prospective earning capacity on the part of Cumberland-Ely may be dwarfed by strategic or other considerations. Cumberland-Ely was admitted to the railway and smelting enterprises on the basis of equal partnership. It has preserved its footing in the railway, but in the smeltery Nevada Consolidated was permitted to increase its share by making an addition to the plant, so that it now holds a five-eighths interest, although Cumberland-Ely has the right to match the additions of the other partner and thus restore the balance. The management of these works for the joint account has been a highly complicated affair, and practically bound to lead to friction if the partners should become hostile. Heretofore they have been friendly, but it requires no great stretch of the imagination to conceive conditions under which the situation might be altered, as for example, the purchase of the control of Cumberland-Ely by some other interest. Possibly this is the real inspiration for the present consolidation, Nevada Consolidated having been led to part with its fine strategic position, the present procedure is probably the best way of regaining it and avoiding a mess in the future.

Undercurrents in the Copper Trade

The animosity between the "Guggenheims" and the management of the United Metals Selling Company, which is an old story, is now being ventilated publicly. The particular grievance is that the "Guggenheims" persist in selling their copper for what it will fetch in the market as fast as produced, whereas their opponents would like to manipulate the market by withholding supplies until consumers would be compelled to pay the price demanded.

[illegible] is reminiscent of the abandoned policy of the Steel Corporation in its branch of trade. There is, however, the difference that the steel producer tried to bring the consumers to terms by restricting its output, while the copper producers want to keep up their output at the highest rate on record and finance the surplus with the bankers up to the day when the consumers will take it off their hands.

Undoubtedly, there are interests that would like to bring about a combination or an agreement for "the betterment of the industry," rumors of which are continually cropping up. Two big stumbling blocks are the Calumet & Hecla and the "Guggenheims," besides which there are others. The present Calumet & Hecla management might be removed by the purchase of that company, but the price required seems to be regarded as too high.

With regard to the "Guggenheims," their name has come to be more or less a figure of speech insofar as the Smelting company is concerned. There are now but few of the family in the American Smelting and Refining Company, and the management of that concern is chiefly in the hands of their former lieutenants, while the actual ownership of the company is believed to be divided among the general public. Some strong interest could doubtless secure control by buying the stock in the market, but here again the price required is deemed to be too high, while moreover even if control were secured, it is possible that a large portion of its present accredited copper output might be diverted, so complicated are the wheels within wheels. History does actually record a happening of somewhat that character.

The irritation that is now manifested among the copper producers indicates that the situation is getting on their nerves. Publication of the monthly statistics of the association is even deplored in an unobtrusive way. Yet, these statistics have been the best possible thing for the copper trade on both sides, during the current year. Even if the consumers could be kept in the dark as to the situation, while the producers possessed an illumination for their own benefit, the condition would not inure to their steady welfare. As a matter of fact, under the old regime, the producers were often as hopelessly in the dark as the consumers, e.g., in the spring and early summer of 1907. Again toward the end of 1908 the producers practically without exception were of the opinion that the previous accumulation of copper had been absorbed and they were able to lift the price to 14⅜c. When at the beginning of 1909 certain producers awoke to the fact that not only was the accumulation unabsorbed, but also that production was enormously increasing, they became persistent sellers, and the price was speedily depressed to 12⅛c. The effect of statistics as to the situation of the industry is to eliminate the tendency toward sharp rises and falls; and steady the market. During the last six months the range of price has been comprised within 1c. per lb. In 1908, before we had the statistics, the extremes were 2¼c. apart.

The Lead Control in Europe

The agreement among a large number of the foreign lead producers has now been in effect for about six months, and the result is said to have been satisfactory. The purpose of this agreement was to bring out a healthier state of affairs in the lead market, the chief aim being to prevent violent fluctuations of price and to establish a level of price that will permit of steady continuous production. It was proposed to attain this end by arranging for a control over sales.

The organization of the producers was effected as stated in the last semi-annual report of the directors of the Broken Hill Proprietary Company, as follows: "In order to endeavor in some way to control the disposition of the world's supply of lead, an influential conference of the chief producers was held in Paris for the purpose of formulating an agreement by which more even prices could be maintained for the metal and less variation in the selling price than has appertained hitherto. The Proprietary company was invited to join in the conference, and the chairman of the London board (Mr. Dutton) was appointed to represent it. After several meetings an agreement was finally come to for the regularization of lead prices, but not to inflate prices further than the law of supply and demand allows. An influential committee was formed in Paris, of which Mr. Dutton was elected president."

The parties to the agreement comprise all of the Australian, Spanish and Mexican producers (including the American refiners who export Mexican lead), together with many of the producers in Belgium, France, Germany and Great Britain. In the aggregate about 75 per cent. of the foreign production is represented. All of this production is by the agreement sold by the Metallgesellschaft, Frankfurt-am-Main, and Henry R. Merton & Co., Ltd., of London, who dispose of the product pro rata for the account of the various members. There is no agreement for the curtailment of the production, but the members, or their representatives, hold occasional meetings, at which they compare notes, and presumably govern themselves according to the information obtained as to the state of the industry.

The tariff that surrounds the United States, of course, prevents any influence upon the American price for lead during most of the time. In so far as the foreign market is concerned the association appears wisely to have refrained from any attempt to strangle consumption. In fact since its organization the price for lead has rather steadily declined, the average for April having been £13.297 and for August only £12.475, though lately it has risen a little. This result has been characterized in some quarters as a fiasco on the part of the association, but that hardly seems to be the case. There is no doubt that the consumption of lead in Europe this year has been relatively small, which has resulted in the accumulation of a considerable stock, and the selling agents for the associated producers have showed their wisdom in bowing to the situation.

The Situation in the Zinc Industry

We are at last becoming able to see somewhat of how conditions are going to adjust themselves under the new tariff. The latter acted promptly to raise the price for spelter which is now at about 6.2c., St. Louis, against a range of 4.6 to 5.25c. during the first half of the year. Coincidently the price for ore has risen and the smelting margin has continued narrow, having been only about $11 per ton so far this year. During the first half of the year the ore production of the Joplin district was about 146,000 tons, and of Wisconsin about 29,000 tons, compared to 260,000 and 58,000 respectively for the two halves of 1908, demonstrating rather conclusively that a price for spelter of less

than 5c. did not check production in those districts. In the third quarter of 1909, Joplin produced about 74,000 tons (about the same rate as in the first and second) while Wisconsin turned out about 21,000 tons, a noteworthy increase. During this period the price at London was rather steady at 4.60 to 5c., or at substantially the usual difference below the American price, until lately; at present the price at London is about 5.05c. against 6.35c. at New York. The tariff on spelter is now 1⅜c. and a difference of 1½ to 1⅝c. would probably permit importation for consumption on the Atlantic seaboard. Consequently there is still room for a further rise in spelter before the danger of importations will impend, but obviously we shall need to keep our eyes more closely on the European market than formerly. If for any reason the price at London should fall to £19 = 4.13c. which is the minimum contemplated by the convention, the price at New York would have to come down to something like 5⅝ cents.

Anyway, we shall now become accustomed to seeing the American price for spelter far above the foreign. The difference will be determined by the demand for consumption, and by the supply of ore. The new scale of price has not yet been in effect long enough to determine its effect upon consumption. Nor can we yet forecast clearly the matter of ore supply. At present the smelters are well provided, having laid in large stores in advance upon which, of course, they are now realizing a fine profit. The miners who are furnishing the current supply of ore are also enjoying a greatly increased profit. The consumers are paying the bills. The tariff had an instant effect in raising prices, which was expected and for which it was wanted, but the action of the tariff would have been far less spectacular if its imposition had not been coincident with a great awakening of demand for spelter, the result of which has already been to remove the surplus stock and at the same time absorb the current production that is going on at a substantial increase over the rate of 1908.

The increase in the price for spelter is stimulating the production of ore in the country west of the Rocky mountains, where there is a keen demand for almost any zinkiferous material of a reasonable kind. This is, of course, a perfectly natural result. Given a price sufficiently high a production would be stimulated from the ore resources of Tennessee that may yield from 1 to 2 per cent. of zinc. There is, however, a limit to the price in the difference that will permit imports of spelter from Europe or of zinc ore from Canada and Mexico. We are likely to see again the importation of ore; indeed certain kinds for special purposes are now being imported; but present conditions do not permit a general importation.

Foreign ore will have to pay a duty of 1c. per lb. on 100 per cent. of its zinc content and 1½c. per lb. on its lead content if entered for domestic consumption. But if to be smelted in bond the smelter may liquidate by delivery of 90 per cent. of the metals. Undoubtedly there will be more or less smelting in bond for a spelter product that may be marketed in Mexico and Canada and in this country with galvanizers and others who will export it in the form of manufactures upon which drawback may be collected. All of the waste material, such as galvanizer's dross, will, of course, remain in this country for smelting and will eke out the domestic supply

It is scarcely time yet to see how the smelters will work out of the slough of absurdly narrow margin that for a long time has been destructive of profit. As for the miners the new tariff went into effect along with a natural revival of good business in this country and moreover with very favorable conditions in Europe, where spelter is the brightest feature of the metal market, and they can make hay while the sun shines. The chances are that the price for spelter in our markets will go still higher as there remains a margin before the import point will be reached and the demand from galvanizers and brass-makers is strong. The extra price that they have to pay is, of course, passed on to the ultimate consumer.

Commendable Publicity

When the members of the American Institute of Mining Engineers visited the plant of the Boston Consolidated Mining Company near Salt Lake City on Oct. 8, the management of that company distributed a pamphlet giving full technical data about the mines and mills, cost of operation, etc., summary of which is published elsewhere in this issue of the JOURNAL. These data cannot fail to be of interest to all engineers.

The policy of a corporation which does not hesitate to take the public into its confidence is highly commendable, and the frankness on the part of the management of the Boston Consolidated should afford satisfaction to the holders of securities of that company, because it is the best possible evidence that the management is not afraid of intelligent criticism. The data that are given enable any shareholder to see for himself what is being done and thereby inspire his confidence The Boston Consolidated has always rendered full and satisfactory reports even when its directors have been obliged to admit errors of judgment.

"What's in a name?" is an old question asked ironically. Some years ago when some of the zinc smelters consolidated, the consumers who used to appreciate and admire the "Choctaw" brand (we use imaginary names), were quite dissatisfied with the same spelter when branded "Silver Star." The mere shifting of a certain number of cast-iron molds from one works to another rectified all complaints. In Great Britain, now, English tin is said to be a drug on the market, for the simple reason that the grade so-called is produced from ever-increasing importation of foreign ores mixed with the Cornish production in ever-decreasing proportion.

Whether Doctor Cook did or did not precede Commander Peary to the North Pole is a controversy that we have no intention to enter. But anyway it seems certain that the polar region is an unfathomed sea and, therefore, are dispelled our hopes of a new continent with mineral resources to exploit. If only there had been land at the pole and indications of gold, we could have trusted the prospectors to get there without making much ado about it. But now comes W. J. Bower, an Arctic explorer, with a story of immense copper deposits in Prince Albert Land (far, far north), and the South Pole still remains.

The rise in the price of Ely Central on the New York curb to $2.50 will relieve the minds of some engineers who bought this stock at the time of its original promotion, three or four years ago, and since then have been holding it as a "dead one." Undoubtedly they will now take advantage of the unexpected market.

Views, Suggestions and Experiences of Readers

Comments on Questions Arising in Technical Practice and Debatable Points Suggested by Articles in the Journal

CORRESPONDENCE AND DISCUSSION

Applying for a Position

The accompanying advertisement in a London journal started a train of thought which resulted in these notes. Judging from some applications which I have examined the following should be of value to at least a few readers of the JOURNAL.

APPLICATIONS FOR APPOINTMENTS

Expert advice without onerous conditions.
Highest credentials.
All communications treated in strictest confidence.
Abundant testimony to helpfulness of ideas from all classes of professional clients.
Applications furnished ready for signature.
Advertisements drafted in pulling form.

The problem of attracting the attention of the officer who has the selection of the incumbent for the position sought is deserving of more attention than is usually given it. Ability to write attractively to this end seems to have attained the dignity of a means of livelihood. A recent application, written with pencil on a postcard reads as follows: "I am an experienced, practical mill-man and want a job." This man apparently knows his own worth, but upon what could a prospective employer base a judgment?

Many men secure positions by application in person, and such is a good method when feasible. But take as an example a cyanide shiftman accustomed to a salary of $200 per month. Let us say he is out of a position and wants to lose no time in getting a new place. On the personal application system his funds might not suffice to place his merits and claims before 20 superintendents. By doing as I propose in this communication, he can reach hundreds of plant operators.

First, get a list of such operators. Back files of the prominent technical journals if carefully scanned, will afford a large, live, valuable list which can be abstracted from the news items and professional cards. The applicant should then carefully prepare a systematized history of his employment, their lengths, the names of the companies and superintendents and of [illegible] the reason for leaving. [illegible]

attention in each case to points in the record which would seem to be of greatest interest. Where possible, reference to probable mutual acquaintances is often of service. The letter may close with an offer of copies of testimonials, a request for the privilege of competing for any position which may be vacant and finally a graceful admission of the apparently unavoidable egotism of the letter. If the list includes numerous short engagements it is well to lay stress in the letter upon the varied and therefore valuable experience attained. If the engagements have been few in number, boast quietly of the steadiness and "stick-at-it-ness" demonstrated.

The manufacturer of mining machinery, the manager of the mine, the consulting engineer, all have files for just such applications. Could one see such a file, he would realize the value of these hints. Each application creates its own impression and the idea back of the application should be to give all desired information in the most attractive way. While American managers depend little upon written testimonials, Englishmen, Germans and other Europeans value them highly. If one bears in mind that a recommendation from each employer, either verbal or written, may be needed at some future period, such a thought will greatly influence one's conduct when about to surrender a position, even though relations are strained.

Of course, none of the above applies to the recently graduated mining student. He does not seek a position—is really unfortunate if he obtains one. What he needs is a series of jobs, a few months underground, in the mill, in the smeltery, in the laboratory, shifting from one camp to another until he learns something. To secure such jobs, all that is needed is a suit of partly worn overalls (not merely old clothes or even new overalls) together with the ability to keep his soft hands out of sight as he asks the foreman, "What's the chance for a job?"

STANLEY S. ROBERTS.

Chicago, Ill., Oct. 12, 1909.

Spurious Potassium Cyanide

Certain information, consequent upon a [illegible] trouble in the cyanide department of the Daly Reduction Company, Ltd., of Hedley, B. C., would seem to [illegible] between metallurgists as to the comparative merits of KCN and NaCN in the treatment of gold ores. What follows is offered for consideration as to its commercial importance only.

The present management of the above company entered into its metallurgical problems with a distinct prejudice in favor of KCN. However, the works had been using NaCN and there was a large stock thereof on hand. Moreover, the retiring management had claimed to have found the proper solvent for these ores so that a series of tests was made which resulted in the employment of KCN thenceforth, with equally satisfactory results and with an important and satisfactory reduction in costs. Yet here, as elsewhere, there remained much that was unsatisfactory to the metallurgist in the way of extraction and, particularly, in the values of the zinc-box tails. Therefore, a vigilant hunt for the mysterious cause of irregularity was kept up but until recently no suspicion rested upon the honesty of the KCN itself.

In May, 1909, the zinc tails were running much too high and certain extraction percentages were too low. A new shipment of KCN arrived and, being the nearest at hand in the warehouse, was sent to the mill. The effect was immediate, tails dropping and percentages rising. The old and the new lots were then alternated without the knowledge of the cyanide men and the invariable results obtained seemed to point conclusively to a difference in the KCN.

RESULTS OF INVESTIGATION

Analyses were started, a protest was lodged with the importer and the real puzzle began. Samples of both lots were sent as controls to a well-known public analyst, the old lot marked No. 1 and the new No. 2. They ran as follows: No. 1—KCN, 15.83 per cent.; NaCN, 82.24; SO_3, 0.13; total, 98.20. No. 2—KCN, 15.68 per cent.; NaCN, 82.35; SO_3, 0.17; total, 98.20. In view of these identical results and because investigation is still in progress, no attempt at any explanation will be made here but the following queries are propounded instead: (1) When KCN is ordered and paid for at market rates, why is 82 per cent. NaCN shipped? (2) If a weighed portion of this mixed salt, titrated with solution standardized for KCN, shows a value of 100 per cent. KCN then what sort of a mixture is it? Why not [illegible] 100 per cent. KCN? (3) If 1.53 cents less per pound is paid for this mixed salt with 82 per cent. NaCN than for 100 per cent. NaCN, is not the user the [illegible]? (4) But if the user wishes the [illegible] KCN, then is he not a [illegible]? (5) And if he wishes NaCN, is

he not a loser at the higher price for this salt?

As far as we know, most metallurgists have assumed with us that a salt bought of reputable dealers as potassium cyanide, marked and billed and paid for as 98-99 per cent. KCN, actually was potassium cyanide of that standard. But it will now be noted that the usual certificates of purity furnished with each shipment are equivocal. Nor is this all that our inquiries have developed. We are advised that the so-called cyanide trust, operating in the United States under a selling agreement, has for years put out a mixture of KCN and NaCN; that there is very little of the pure, or commercial, KCN in the market. Almost all that is sold as KCN is mixed with 8 to 40 per cent. NaCN or more, as is evident in our case.

Again, the chemists in the appraisers department of the U. S. Custom House appear to have been the first to discover this adulteration and they now assay every lot imported. The reason for this adulteration is obvious. In the first place, NaCN is much cheaper to make than KCN, which requires the use of kali salts from Stassfurt, Germany, while the sodium is readily obtained from rocksalt or seasalt. Besides, the United States tariff imposes a higher duty on NaCN than on KCN.

Considering the difficulty of a sodium and potassium quantitative analysis it is not so surprising that metallurgists should have overlooked what the Government chemists have long known. The only surprising thing about the whole question is, perhaps, that anyone should take anything for granted, especially when that anything is a manufactured article. F. A. Ross.

Manager, Daly Reduction Company, Ltd.
Hedley, B. S., Sept. 27, 1909.

Electrical Wiring for Deep Mining Work

I read with great interest the account of the fixing of the power cables in the shaft at one of the Calumet & Hecla company's mines, as described in the JOURNAL of Sept. 11, 1909. The arrangement appears to me to have been carefully thought out, and carefully carried out, as shown by the fact that the wires were good after being in position about 13 years. I notice that three separate wires were used for three-phase work, the close proximity necessary with wires carried in a pipe, and the twisting that takes place, when one wire is drawn in after the other, being quite sufficient to neutralize the induction. I think that the engineer exercised discretion in adopting this plan. One of the greatest difficulties the electrical engineer has to deal with, when providing cables for use in mines, and particularly for fixing in shafts, is the great weight, and usually the want of flexibility of the cable in consequence.

The common plan adopted in the United Kingdom is to have the three wires laid up into one cable and armored outside. With small wires, providing for a small amount of power, this arrangement answers very well. It makes a compact cable. But, where a large amount of power has to be provided, and therefore the cable has to be large, to my mind it is wiser to handle each of the wires separately. As arranged, of course, the individual cables would not be armored, the inclosing pipe answering all the purpose of the armor where the three wires are stranded together.

I note also that india-rubber insulation was employed. Good work has been done in mines in the United Kingdom with bitumen and paper insulation, but I much prefer rubber, and plenty of it. One of the troubles in connection with rubber insulation is the difficulty of insuring that one is getting good rubber. A few years ago West African rubber, which had been put upon the market in fairly large quantities, and which was worth about one-fifth the value of Brazilian rubber, was largely used by some firms, and there was nothing to show when the cable was made up, what quality of rubber had been employed. The protection is of course the old one—buy from a good firm which will not play tricks of this kind, and I observe that this was done by the Calumet & Hecla company. In too many instances in the United Kingdom, clerks who have the ordering of stores, have been allowed to buy cheap cables, under the impression that they were saving their company money, when in reality they were wasting many times the amount they apparently saved. Good rubber is expensive, but it is by far the cheapest in the long run, as the experience at the Calumet & Hecla shows.

I think also that the experience at Calumet & Hecla shows how much may be done in the matter of insulation, by the use of pure rubber tape. The experience there confirms my own in coal mines in the United Kingdom. I note that the connecting pieces were insulated with numerous layers of pure rubber tape, and that the insulation lasted. A good many years ago I had a troublesome case in a mine shaft, where there was a large quantity of water, and where we were obliged to joint in the shaft. I covered the joint with a number of layers of pure rubber tape, putting the tape on with considerable tension, and carrying it back well beyond the joint on each side, covering the rubber tape with two or three layers of primed tape. I was exceedingly anxious about these joints, but they stood well, and when I opened some of them a long time afterward, I found them quite good, the water not having penetrated through them.

The method of supporting the cables in the shaft strikes me as being remarkably good. It will be noticed from the description given in the article, that the individual cables were quite loose in the pipes, but were held by what Mr. Fichtel calls anchor blocks, at intervals of 100 yd. On this side we call them cleats. I observe that they were 12 in. long, and that the grooves were slightly tapered, leading the ends of the cables into the next pipe. My own preference is for grooved boarding right through the length of the shaft, the boarding having been prepared either by creosoting or by one of the other methods of preserving timber. I like to have the grooves slightly smaller than the cables they are to hold, and I observe that this method was followed with the anchor blocks. Cables are then tapped gently into the grooves, the cover put on, and the cables are supported throughout the whole of their length. The method adopted at Calumet & Hecla evidently gave the equivalent of this, as they would be supported to a certain extent between the pipes on the anchor boxes, and firmly supported on the anchor boxes themselves. One objection that has always been raised to my method of employing groove boarding, is the great expense. Unless the boarding is rendered waterproof, the method is bad, because the porous wood holds the water, and delivers it to the cables, which it is clasping, all the way down, and there is the best chance of some trifling weakness in the cable being discovered. The pipe system adopted by the Calumet & Hecla Company would cost more I think, than the grooved boarding, but it has the distinct advantage that the pipes protect the cables very much better than boarding, particularly in the shafts of metalliferous mines, and the anchor boxes and station-connecting boxes gave full facilities for examining the cables at frequent intervals.

The pipes appear to have been carefully prepared, by drawing chains through them, to get rid of any burs that might be present, and the whole thing to my mind appears to have been designed and executed in a practical and scientific manner.

SYDNEY F. WALKER.

Bloomfield Crescent,
Bath, Eng., Sept. 24, 1909.

According to the U. S. Geological Survey, the production of sapphire in the United States in 1908 was of an estimated value of $58,397, as against $229,800 in 1907. The greater part of the 1908 output came from a single mine in Fergus county, Mont., but a small quantity was obtained in Morgan county, Mo.

The exportation of tin from Malaya in the first six months of 1909 was 385,211 pikuls, against 414,084 pikuls in the first six months of 1908.

Details of Practical Mining

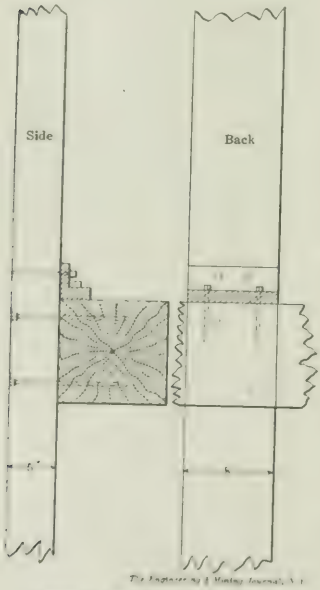
Notes of Interest to the Operators of Small Mines as Well as of Large Mines. The Things That Have to Be Done in Everyday Mining

REPORTS FROM EXPERIENCE

Readers of the JOURNAL are invited to contribute to this department. Articles should be brief, thoroughly practical, and preferably illustrated by drawings or sketches. Our draftsmen will prepare properly any kind of a pencil sketch that is intelligible. Something that is an old story in one district may be quite unknown in another. Articles accepted and published are suitably paid for

Supporting Guides or Runners in Shaft

The scheme shown in the accompanying illustration for the support of shaft guides is used at the Tobin and Dunn mines at Crystal Falls, Mich. The guide itself is 5x8 in., and is fastened to the shaft timbers by two ¾-in. lag screws. In addition to this a 2x2-in. angle iron is used [illegible] as it is fit in the shaft. This angle iron is bolted to the corner [illegible] bolts and fastened to the [illegible] with two ¾-in. lag screws. The original method was to use only one lag screw in the center of a 5x6-in. runner. This was found to be entirely too weak, and the screws almost invariably broke at a point where the thread begins. With the present arrangement the runners do not work loose, except as the acid waters may corrode the bolts.



METHOD OF SUPPORTING GUIDES

Gates for Ore Chutes Used in the Iron Mines of Michigan and Minnesota

Four types of gates are used in the iron-mining districts of Minnesota and Michigan, each of which is shown in the accompanying illustrations. Fig. 1 is used almost exclusively in the Mesabi district. It is 30 in. wide, made of ¼-in sheet steel bent to the arc of a circle. It is operated by a lever attached to a 1½-in. square bar, shown in the upper part of Fig. 1.

Fig. 2 is used at the Pioneer furnace, Marquette, Mich. It is 3 ft. by 18 in. and is 24 in. from the pivot to the face of the gate. It closes easily and works well with fine ore. Fig. 3 is used at Iron Mountain, at both the Oliver and Pewabic mines. This one has the advantage in that it is in the bottom of the chute and closes from the bottom. As soon as the edge of the gate rises the least amount it forms an obstacle for the ore and the ore thus blocked assists in holding the remainder in check. It operates easily and without any trouble whatever. It has been used in this district for many years.

Fig. 4 is a gate which is used at the Traders' mine. It consists simply of a sheet of [illegible]-in. plate steel 30 in. wide by

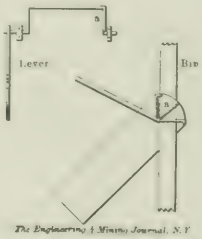


FIG. 1. TYPE OF GATE USED IN THE MESABI DISTRICT, MINNESOTA

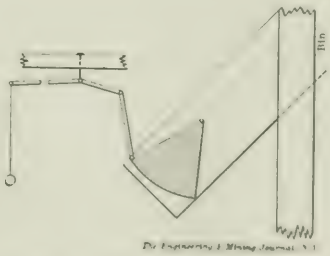


FIG. 2. ORE GATE USED AT THE PIONEER FURNACE

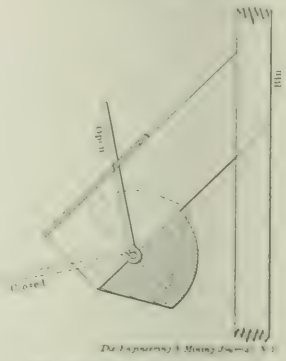


FIG. 3. GATE USED BY THE OLIVER AND PEWABIC COMPANIES, IRON MOUNTAIN, MICH

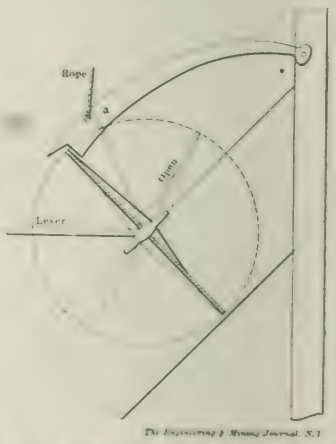


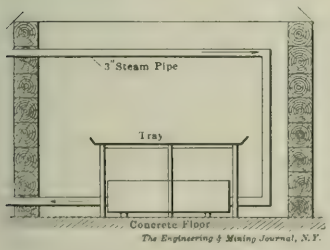
FIG. 4. GATE USED AT THE TRADERS' MINE, IRON MOUNTAIN, MICH

48 in. long. Across the center is placed a bar 1¼ in. square, which is used as an axle upon which it revolves. To this is attached a crank or lever by which it is possible to revolve the gate. The gate is held in place by a catch *a*. When it is desired to draw ore, the catch is lifted by a rope, and the bottom of the door swings out. In order to shut the gate, the crank is turned until the top end of the gate engages the ore when the weight of the ore closes it. Another gate similar to this is used in the Crystal Falls district. This gate is only one-half as long, and each time it is opened, it makes one complete revolution instead of one-half, as shown in Fig. 4.

A gate that is used for coarse lump ore is made of finger bars, about 2 in. square, which slide up and down through slots. The top of the bar is attached to 4 ft. of chain, and connected with an axle and crank. As the crank is turned the chain winds up and lifts the fingers. Sometimes these are operated by an air lift. Each bar is independent as it drops and a hard lump will likely not interfere with more than one bar at a time. The bars for this purpose should be about 6 ft. long, and have a 2-ft. lift. Eight or ten bars will be enough for any ordinary gate.

A Powder Thawer Used at the Traders' Mine

At the Traders' mine, Iron Mountain, Mich., a small house has been constructed in which to thaw all the powder used in the mine. The building is 10x12 ft., built of 12x12-in. timbers placed close together and is on a low piece of ground sheltered by a high bank. Exhaust steam from the boiler house is used for heating the building. It enters through a 3-in. pipe above the tray upon which the powder is placed, and then passes down and into a cylinder 12 in. in diameter and 5 ft. long which is beneath the tray. The tray itself is made of ½-in. iron bars placed about ½ in. apart. It is 3x6 ft. and affords ample room for four or five boxes of powder. This has been in use 14 years. Only one day's supply of powder is kept in this building. The fuse and caps are in another building 50 ft. away. The main powder storage house, where carload shipments are kept; is ¼ mile distant.



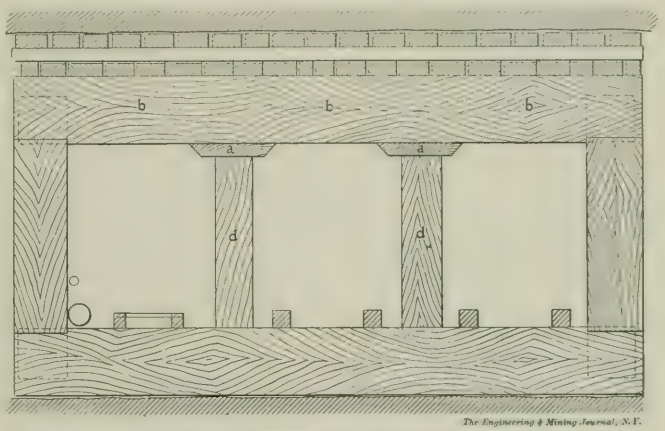
POWDER HOUSE AT TRADERS' MINE

Shaft Timbering at the Keystone Mine

By William H. Storms*

The Keystone mine at Amador City, Cal., is one of the largest mines on the famous Mother Lode. It has been extensively developed by a number of incline shafts of varying depth, the deepest being the Patton shaft near the north end of the property, which was started by W. H. Patton over 40 years ago, and now has a depth of 1573 ft. This shaft, beginning in the slate country rock, at a depth of about 400 ft., is approached by a fissure which occurs in the hanging-wall side of the shaft and continues in or near it down to about the 800-ft. level. The ground is very heavy, and has for years been a source of annoyance and expense in keeping the shaft open. Time and again the timbers have been reinforced and renewed until, in some of the worst places the shaft is supported by a solid crib work of great timbers. One effect of the heavy downward pressure of the swelling ground on the hanging-wall side of the shaft has been to force the caps down upon the ends of the dividers, causing the latter to cut deeply into the caps, thereby weakening the timbers and reducing the size of the shaft, hence necessitating frequent repairs.

A few months ago a scheme was introduced in the retimbering of the Patton shaft which has been found to give complete satisfaction and which is evidently going to result in the saving of much time and timber in repairing this shaft. The idea is illustrated in the accompanying sketch. It is simply the insertion of a heavy head block *a* between plate *b* and divider *d*, as shown. No mortise or dap is cut in the wall plate, and the divider is sawed off square. The plate timbers are 18 in. square, the dividers 12x18 in., and the head block is 18 in. wide, 24 in. long and 4 in. thick. It is cut as shown, and is slipped in between the wall plate and the top of the divider and held in place by driving in shingle wedges. The pressure soon exerts itself, however, and wedges then become superfluous.



METHOD OF TIMBERING THE KEYSTONE SHAFT

*Mining engineer, Sutter Creek, Cal.

Uses for Old Cables

At the Chapin mine an old 5-in. flat cable is now being used as a tail-rope balance in the Ludington shaft. The cable with which the skips are hoisted vibrated considerably, and the old cable was attached to the bottom of each skip and they are now run in balance. This stops a large amount of the vibration. The scheme is used in hoisting from the 14th level.

Another use for round cables is for fences around offices, or places where it is desired to have something in the artistic line. This is now being done by the Corrigan & McKinney Company around its general office at the Great Western mine. Cast-iron posts were especially designed with three holes in them 16 in. apart, just large enough for the cable to pass through. These posts are set in concrete blocks and in this way make a very substantial and neat fence. The cable is much better than ordinary gas pipe, inasmuch as it is flexible and does not get out of shape. Again, the twist adds to its beauty. Another company uses a large amount of old cable for reinforcing concrete.

New Publications

DIE WARMETECHNICK DES SIEMENS-MARTINOFENS. Von Dr. Ing. F. Mayer. Pp. 123, illustrated, 6½x9¾ in., paper, M.5.40. Halle, a.d.C., 1909: Wilhelm Knapp.

A STUDY OF THE OPEN HEARTH FURNACE AND THE MANUFACTURE OF OPEN HEARTH STEEL. Pp. 91, illustrated, 4¾x6¾ in., leather. Pittsburg, 1909: Harbison-Walker Refractories Company.

REPORT ON THE CHROME IRON ORE DEPOSITS IN THE EASTERN TOWNSHIPS, PROVINCE OF QUEBEC. By Fritz Cirkel. Pp. 141, illustrated, 6½x10 in., paper. Ottawa, 1909: Government Printing Bureau.

GEOLOGIA, INDUSTRIA MINERAL, CLIMA, VEGETACAO, SOLO AGRICOLA, INDUSTRIA PASTORIL. Por Miguel Arrojado Ribeiro Lisboa. Pp. 172, illustrated, 7½x10½ in., paper. Rio de Janeiro, 1909: De Rodrigues & Co.

DIE ELEKTROCHEMISCHEN VERFAHREN DER CHEMISCHEN GROSS-INDUSTRIE. By Dr. Jean Billiter. Mit 117 Figuren und vielen Tabellen im Text. Pp. 284, illustrated 6½x9½ in., paper, M. 12. Halle a. d.S., 1909: Wilhelm Knapp.

GEOLOGY OF THE DISSEMINATED LEAD DEPOSITS OF ST. FRANCOIS AND WASHINGTON COUNTIES. Vol. IX, Part I and II. By Ernest Robertson Buckley. Pp. 259 + 82 plates. Jefferson City, Mo., 1909: Missouri Bureau of Geology and Mines.

JAHRBUCH DER ELEKTROCHEMIE UND ANGEWANDTEN PHYSIKALISCHEN CHEMIE. XII Jahrgang. Berichte uber die Fortschritte des Jahres 1905. Pp. 1049, illustrated, 6½x9¾ in., paper, M. 30. Halle a. d. S., 1909: Wilhelm Knapp.

STRENGTH OF MATERIAL: AN ELEMENTARY STUDY PREPARED FOR THE USE OF MIDSHIPMEN AT THE U. S. NAVAL ACADEMY. Second Edition, Revised. By H. E. Smith. Pp. 170, illustrated, 5x7½ in., cloth. New York, 1909: John Wiley & Sons.

TRANSACTIONS OF THE INSTITUTION OF MINING AND METALLURGY. Eighteenth Session (1908-1909). Volume XVIII. Edited by Arthur C. Claudet, S. H. Cox, Wm. Gowland and C. McDermid. Pp. 317, illustrated, 5½x8½ in., paper. London, 1909: E. & F. N. Spon and The Institution of Mining and Metallurgy. New York, 1909.

ANNUAL REPORT OF THE UNDER SECRETARY FOR MINES, INCLUDING THE REPORT OF THE WORKING [illegible] OF MINES, [illegible] AND OTHER [illegible] FOR THE YEAR 1909. Pp. 175, illustrated, 8½x13 in., paper. Brisbane, 1909: A. J. Cumming, Government Printer.

CONTRIBUTIONS TO ECONOMIC GEOLOGY, 1908. Part I, Metals and Non-metals, except Fuels. U. S. Geological Survey, Bulletin No. 380. By C. W. Hayes and Waldemar Lindegren. Washington, 1909: Government Print- Pp. 406, illustrated, 6x9 in., paper. Government Printing Office.

THE RECOGNITION OF MINERALS: BEING A COLLECTION OF NOTES AND SIMPLE TESTS FOR THE USE OF TRAVELLERS AND PROSPECTORS. By C. G. Moor. MONOGRAPHS ON GEOLOGY, ORE DEPOSITS, ETC. By Donald A. MacAlister. Pp. 247, 5½x8½ in., cloth, 7s. 6d. London, 1909: THE MINING JOURNAL.

KUTTER'S FORMULA. By L. I. Hewes and J. W. Roe, Sheffield Scientific School, Yale University, New Haven, Conn. 14x14 in., printed on cloth-backed paper, 50c. New York, 1909: American Institute of Mining Engineers.

A graphic solution of Kutter's formula for the flow of water has been worked out by Dr. L. I. Hewes, which may be of interest to those who deal with canals, flumes and streams. The formula itself is extremely cumbersome, and the purpose of this chart is to furnish a rapid solution, sufficiently accurate to be within the limits of the observed data.

SUMMARY REPORT OF THE MINES BRANCH OF THE CANADIAN DEPARTMENT OF MINES FOR THE NINE MONTHS ENDING DEC. 31, 1908. Pp. 96; 6½x9½ in. Paper. Ottawa, 1909: Government Printing Office.

This report covers a period of nine months, instead of a year, owing to a change adopted by the department under which the summary branches will henceforth be issued simultaneously at the close of the calendar year. The contents include a review by Director Eugene Haanel of the work undertaken by the the branch, comprising an investigation by him of electric smelting in Sweden and producer-gas plants in Germany; the establishment of an experimental peat-fuel plant at Ottawa now under construction, the testing of coals and lignites at McGill University, Montreal, and the operations of the chemical laboratories and the Vancouver assay office. The general fieldwork covered an extensive area, among its more important features being the investigation of iron ore deposits in Nova Scotia, New Brunswick and Ontario; examinations into the occurrence of tungsten ores and the gypsum deposits of the Maritime provinces, and additional work in the asbestos region of Quebec. Dr. R. W. Ells furnishes a preliminary report on tests made in Scotland of New Brunswick oil shale, the results of which were satisfactory, the yield of crude oil and sulphate of ammonia exceeding most of the Scotch shales. The report of J. McLeish, chief of the Division of Mineral Resources and Statistics, calls attention to the greatly increased volume of work imposed on the division by the additional duties assigned it and the reductions in its staff; also to the difficulties in the way of a satisfactory presentation of mining statistics. Some of these are caused by the differences in the methods of collecting statistics pursued by the different provinces, especially as regards the valuation of the production. Owing to the want of a uniform basis there is often an apparent discrepancy between the Dominion and the provincial statistics.

INDEX OF MINING ENGINEERING LITERATURE. By W. R. Crane. Pp. 803, 6x9 in., cloth, First Edition, $5. New York, 1909: John Wiley & Sons.

Contents: Accidents in Mining. Animals in Mines. Blasting in Mines: Methods and Conditions. Chemistry: Methods and Practice. Compressed Air in Mining. Clays and Their Uses. Concentration. Concrete, Mortars and Plasters. Conveyers for Minerals and Coal. Dams for Mining Purposes. Mining Districts. Mine Drainage. Drilling and Boring. The Industrial Development of Mining and Production. Dumping Devices. Technical Education. Explosives for Mining Purposes. Fuels: Coal, Coke, Gas, Oil, etc., and Fuel Testing. Geology: Mineral and Fossil Fuel Deposits. Handling and Storage of Mineral. Haulage in Mining. Hoisting in Mining. Labor in Mines. Ladders in Mines. Life in Mines. Management of Mines. Maps. Metallurgical Methods and Processes. Metal Minerals. Mine and Mill Constructions. Mine Gases. Mining Law. Mine Lighting. Mining. Mine and Mill Machinery. Mine Support. Photography for Mines and Technical Work. Power: Steam, Water Electricity and Gas. Reduction. Hopes for Mine Use. Sampling of Mines. Sizing of Mineral. Signaling in Mines. Surveying. Transportation. Tunneling. Mine Ventilation. Water.

IGNEOUS ROCKS. Volume I, $5. By Joseph P. Iddings. Pp. 464 6x9 in.; cloth, New York, 1909: John Wiley & Sons.

Contents: Chemical and mineral composition and constitution of igneous rock. Chemical composition of the pyrogenetic minerals. Principles of physics and chemistry applicable to rock magmas. Chemical reactions in rock magmas. Crystallization and texture of igneous rocks. Separation of substances from solution. Differentiation of rock magmas. Modes of occurrence of igneous rocks. Nomenclature and classification of igneous rocks.

This first of the two volumes of Professor Iddings' treatise is for many reasons welcome to students, post-graduates and field workers in geology. No other department of that science has waited so

long for clear analysis and classification. We can all remember the time when such comprehensive terms as "trap" covered the ignorance, not only of practical explorers, but also of scientific observers; and we can remember still more clearly the period during which the differentiation of igneous rock species gave rise to a multitude of separate names, the ambitious employment of which by unskilled local observers, and even by practical miners and prospectors, well nigh destroyed the value of their testimony as first-hand observers. Such a stage of excessive emphasis upon specific differences always precedes in science the simplification based upon resemblances and common features of character or origin. The geology, lithology, genesis and age of the igneous rocks had been brought by the researches of many keen observers into a manifold confusion of this kind, when a few leading investigators undertook to bring order out of the pregnant chaos. Of these Professor Iddings is admittedly in the front rank; and this treatise from his hand is a timely and much needed aid to both students and practitioner. The work is to comprise two volumes, of which the first, now before me, treats of the composition, texture and classification, while the second will be devoted to the description and local occurrences of the igneous rocks.

The terms "genesis" and "origin" do not appear in any titles or subtitles; but the subject itself receives much illumination in the chapters of this volume, though the author apparently avoids the promulgation of any genetic theory. The reason may lie in his disinclination to discuss the source of the heat of rock fusion. This omission is, on the whole, advantageous, as leaving him free to fill his available space with material less speculative and more useful. Even those who would build genetic hypotheses must use the facts here carefully stated and arranged.

Another advantageous omission is that of the ordinary rudiments of descriptive geology. The author assumes on the part of the student such an elementary acquaintance with rocks as may be acquired from standard general textbooks or courses of college instruction, and thus saves room for his special subject, unencumbered by a rudimentary introduction, not complete enough for thorough instruction, and not needed by those who are competent to appreciate the rest of the book.

In the matter of classification, Professor Iddings recognizes the principle already established in other departments of science—for instance in that of ore deposits—that no one general classification will serve conveniently at once all uses and purposes. The economic geologist, like the practical miner, and the intelligent but non-expert traveling observer, will always use for the first record, at least, a classification not dependent upon the subtle distinctions of the microscope or the chemical laboratory. Indeed, it is well that this is the case. Nothing is more annoying or, sometimes, more misleading, than the loose employment by the ignorant of modern terms, picked up from the treatises of specialists. Nevertheless, scientific investigation requires scientific nomenclature; and in this book Professor Iddings, without superseding accepted nomenclatures, bases his discussion of the igneous rocks upon their chemical composition, which he declares to be their most fundamental and essential character, an assertion which may be granted with the addition of the qualifying phrase, "for the purpose of such a study of them as is here contemplated." It is conceivable that, from some other standpoint, the physical characters, or the age, or the position, or the dynamic history, of igneous rocks might be a more important feature.

Before reaching in Part II the questions of nomenclature and classification, the author discusses in Part I the chemical composition of igneous rocks and of the pyrogenetic minerals found in them; the principles of physics and chemistry applicable to rock magmas (including the kinetic theory of gases, liquids and solids, the facts and laws of fusion, polymorphism, solution in liquids and solids, and chemical reactions in solutions); the chemical reactions in rock magmas; the separation of substances from solution; the crystallization and texture of igneous rocks (an admirable chapter, explaining crystallinity and granularity, and the effects of viscosity, dissolved gases, rate of cooling, molecular concentration, etc., as well as the shapes assumed by specific minerals, the arrangement of crystals and other features of homogeneous and heterogeneous textures); the differentiation of rock magmas and its results, and the modes of occurrences (extrusive, intrusive and structural) of igneous rocks.

This brings us back to nomenclature and classification, under which head we have, in Part II, three chapters. The first is a historical sketch, of intense interest and great value, in which the work of Haidinger, Werner, Brongniart, Cordier, Leonhard, De la Beche, Bunsen, Scheerer, Rose, Roth, Bischof, Naumann, Cotter and others is recognized and critically weighed. Most of these authors, however, did comparatively little for the igneous rocks. An exception was Roth, whose classification (1861) is here published in full. The publications of Zirkel (1866) and Richthofen (1868) are recognized as laying the foundation of modern petrography, and Zirkel's work (1873), together with the first volume of Rosenbusch (1873) and his second volume, on the igneous rocks (1877), are cited as classics with respect to microscopic investigation. The controversies which followed these publications are critically summarized; but the author adheres in the main to the qualitative mineralogical classification which they proposed.

In Chapter II of this part, we have this qualitative classification, based on predominant minerals, and comprising rocks (1) consisting chiefly of quartz; (2) characterized by quartz and feldspar; (3) characterized by feldspar; (4) characterized by feldspar and feldspathoids; and (5) characterized by feldspathoids.

But the most important classification is the quantitative one set forth in the final chapter. This is the system proposed by Cross, Iddings, Pirsson and Washington, and set forth in the *Journal of Geology*, Vol. X (1902), pp. 555-690, and in "Quantitative Classification of Igneous Rocks," published in 1903 by the University of Chicago press. It is, as Mr. Iddings says, "a quantitative chemico-mineralogical classification;" that is to say, it is based, not on a quantitative determination of the elementary rock constituents alone, but on the chemical composition stated in terms of the standard minerals, in which it is to be regarded as expressed. The system has a nomenclature of its own; and any exposition of it here would require far more space than is available. Indeed, I do not see how it could be adequately set forth in less than the 60 pages which Professor Iddings gives to it. These pages, however, with the illustrative tables, seem to me to present a statement sufficient to enable a competent student both to comprehend and to employ the system. I will only add, concerning it, these general observations:

It is admittedly in some respects arbitrary and artificial, yet it seems to approach more nearly, on the whole, to the character of a practicable formula for the interpretation of nature than any other yet propounded. It is self-consistent and logical, as well as ingenious; it constitutes a step in advance, taken by a group of competent American investigators, thoroughly acquainted with what had been done before in the same field, at home or abroad; and it reflects, as such, the highest credit upon its associated authors. Whether it will ultimately win a general acceptance will depend, in my humble judgment, upon the degree in which it shall prove useful as a tool for investigation and a key to generalization in its field. Meanwhile, I do not think any student in that field can afford to be ignorant of its principles, and the arguments by which they are supported.

This volume is published in excellent typographical style, and with satisfactory illustrations and tables. I notice some trivial errors, indicating an ignorance of the German language on the part of the proofreader. Thus, on page 296, the German equivalent of (lava) "streams" is given as "stromen," whereas it should be "ströme;" and on page 300 the German equivalent for "dikes and veins" is given as "gangen," whereas it should be "gange."

R. W. Raymond.

Personal

Mining and metallurgical engineers are invited to keep THE ENGINEERING AND MINING JOURNAL informed of their movements and appointments.

Victor M. Braschi, of the City of Mexico, is in New York.

John B. Farish leaves this week for Mexico on professional business.

Arthur L. Pearse sailed from London, Oct. 6, for an inspection tour in the United States.

Alexander Sharp, of Orient, Wash., has been examining coal lands in Alberta, Canada.

E. G. Woodford sailed for London last week. From there he plans to go to Venezuela.

Edwin J. Collins, of Duluth, Minn., is examining some copper mines near Globe, Ariz., for clients.

Prof. Willet G. Miller, provincial geologist of Ontario, is examining the Gowganda silver district.

J. R. Finlay has gone to the West on professional business, intending to be absent about six weeks.

E. A. Shannon, of Detroit, Mich., has been elected secretary of El Triuñfo Mining Company of Mexico.

S. M. Stone, manager of the Butters plant at Virginia City, Nev., has returned there from a trip to the East.

F. A. Thomson, professor of mining engineering at the State College, Pullman, Wash., was at Butte, Mont., recently.

R. B. Lamb, of the C. L. Constant Company, New York, is leaving on a prolonged professional tour of the Western mining sections.

Herbert C. Enos, of Johnson & Enos, mining engineers, of the City of Mexico, is making a trip through the State of Guerrero, Mexico.

O. B. Perry has returned from Yukon Territory, where he has been directing the placer gold-mining operations of the Yukon Gold Company.

C. L. Constant, Jr., of the C. L. Constant Company, New York, is making an extended professional visit to the mining sections of Ontario.

John Markle, of Philadelphia, well known as an anthracite operator, has recovered his health, temporarily lost, under the care of a German physician.

A. B. Hodges, of Grand Forks, B. C., manager of the Granby Consolidated Mining, Smelting and Power Company, has been in New York on business.

[illegible] Kaffer, of Greenwood, B. C., [illegible] for the British Columbia Copper Company, lately paid a visit to the Exposition at Seattle.

[illegible] has resigned as superintendent of the [illegible] Mining Company, near Nacozari, Mexico. Dr. O. B. Dawson, of El Paso, has taken charge of the mines.

Professor Newsom, of Stanford University, Cal., has returned from the Canadian Yukon, where he has been doing professional work on some Klondike claims.

Albert L. Waters, of Los Angeles, Cal., who left Mexico in August because of illness, has been in Tucson, Ariz., recently and is now in Denver on professional business.

Ex-Governor Mackintosh, of British Columbia, has been examing the Cobalt, Gowganda and Elk Lake silver areas with the object of preparing a report on smelter facilities.

R. H. Chapman, of the United States Geological Survey, is this season in charge of a Canadian Geological Survey party engaged in making a topographical survey of Vancouver island, B. C.

Edward V. d'Invilliers, of Philadelphia, was on Oct. 4 appointed by the governor of the State a member of the Contour Topographic and Geological Survey Commission of Pennsylvania, and has accepted the position.

Dr. R. W. Brock, director of the Canadian Geological Survey, has returned to Ottawa after a three-months trip to British Columbia, the Yukon and Alaska. He expects an increase in the gold output this year.

Frank Holman Probert and Walter Harvey Weed, announce their association as Weed & Probert, geological and mining engineers, with offices at 42 Broadway, New York, and Central building, Los Angeles, California.

S. B. Tyler, recently general manager of the Homestake-King Consolidated Mining Company, at Rhyolite, Nev., has taken the position of general superintendent of the Frontenac, Topeka and Aduddell mines, near Central City, Colorado.

W. M. Brewer has resigned as ore buyer for the Tyee Copper Company, to engage actively in the work of a mining-development company, recently organized by himself and associates at Victoria, British Columbia. Mr. Brewer is now in New York.

Edwin Higgins has resigned his position as assistant editor of the ENGINEERING AND MINING JOURNAL. After visiting several mining districts in the West and Southwest, Mr. Higgins will, on Dec. 1, open an office as consulting mining engineer in the Central building, Los Angeles, California.

Mason T. Adams, of Britannia Beach, near Vancouver, B. C., has resigned as general manager of the Britannia Mining and Smelting Company, and has been succeeded by R. H. Leach, formerly general superintendent at the Britannia. Mr. Adams will open an office, as mining engineer, at Denver, Colorado.

Obituary

Charles Beebe, agent at Rosario; Mexico for the Lustre Mining Company, died Oct. 7 at El Paso, Texas.

David Ingle died at Oakland City, Ind., Oct. 15. He had been prominent among Indiana coal operators for a number of years, and was president of the Ayrshire Coal Company.

Robert Aitchison, president of the Aitchison Metal Perforating Company, of Chicago, died there Oct. 8, aged 79 years. With his brother he went to Chicago in 1858 and organized the company of which he was the head.

H. W. Anderson, president of the Cedar Hill Coal and Coke Company, of Denver, Colo., died suddenly, Oct. 6, while on a visit to Overbrook, Penn. He had been interested in coal mining in Colorado for a number of years.

James Cherry, who died at Granville, Ill., recently, aged 69 years, was for a long time in charge of the Seatonville mine for the Spring Valley Coal Company, and later engaged with the Chicago, Milwaukee & St. Paul Coal Company and sunk a mine at Cherry, the village being named after him. He was also in charge of the shafts at Granville, Standard and other places. He had been in poor health for about a year and notified the company of his desire to resign, but the company declined to accept it.

Societies and Technical Schools

Appalachian Engineering Association—The next meeting will be held at Washington, Nov. 5 and 6, at the New Willard hotel. Addresses will be made by W. N. Page, Dr. Thomas L. Watson, D. C. Weller, Prof. R. L. Morris, E. V. N. Heermauce and others. Visits will be made to the terminal plant and to the new concrete bridge over Rock creek.

Scranton Mining Institute—The first meeting of the season was held at Scranton, Penn., Oct. 11. After an opening address by the president, John Hale, an address on the "Education of the Miner" was made by R. D. Towne. J. H. Dague, Jr., described a recent visit to several European coal mines. Capt. W. A. May, general manager of the Pennsylvania Coal Company, made an address on "Waste in Mining," and told of many cases of life and property loss, due to carelessness of employer and employee. Mine Inspector Hubert D. Johnson made a plea for education of the foreign miner, saying that it was one of the only means by which accidents could be avoided. He also scored many of the older miners for their carelessness.

Special Correspondence from Mining Centers

News of the Industry Reported by Special Representatives at Butte, Denver, Salt Lake City, Goldfield, Cobalt and Toronto

REVIEWS OF IMPORTANT EVENTS

San Francisco

Oct. 13—The Calaveras Copper Company has been organized in Boston under the laws of Delaware to take over the Union mines at Copperopolis, Calaveras county, owned by the Ames estate of Boston, and to commence active operations at once. This was the first mine in California to be productively developed on a large scale. As early as 1861 the mine produced about all the copper ores mined in the State. The mine paid dividends about that time and later on. Some of the ores shipped in early days ran as high as 15 per cent. copper. The Keystone, now a part of the Union, was a producer at the same period. About 1868 both mines were closed although there was good ore exposed at the time of the shutdown. Nineteen years later the mine was unwatered and the main shaft sunk to 600 ft. Operations were continued for a time and a smeltery built, but in 1892 active operations ceased as far as mining was concerned, though leaching of mine waters has since been continued and more or less cement copper produced. There is on the property a 100-ton smelter and a 400-ton concentrator. The vertical shaft is 400 ft. deep, and it was then inclined 67½ deg. east for an additional 240 ft. Joseph G. Hadley has been the superintendent for the past few years. The Union property comprises not only the Union and Keystone claims, but the Empire as well. The vein, which in these claims exhibits a maximum width of about 40 ft. with an average width of 15 ft., carries a succession of orebodies which are lenticular masses of sulphide copper ore (chalcopyrite) connected by stringers of ore. The water level is here very close to the surface, and the alteration of the sulphides has extended to a depth of only 30 ft. Three orebodies have been opened and worked. Two of these outcrop in the Union and one near the south end of the Keystone claim. These oreshoots dip eastward with the vein and also longitudinally to the north. The largest one, in the Union claim, is about 300 ft. long, from 20 to 40 ft. wide, and has been followed to a depth of 600 ft. One ore stope in this body from which ore was extracted in the '60s was 40 ft. wide, 80 ft. high and 100 ft. long. The underground openings of the Union and Keystone claims are connected and consist of several thousand feet of drifts, shafts, stopes, etc. Nine levels have been run and six shafts sunk on both properties. Only one shaft is equipped with hoist, etc. Within the limits of these two claims, and outside of them along the lode through the company's property, prospecting has showed the existence of a number of other orebodies similar to the three developed orebodies at the surface. The Union orebodies carry no gold or silver. Since the mine was unwatered the last time two grades of ore were found, one a smelting ore averaging 11 per cent. copper, and the other a leaching ore averaging 5 per cent. The surface plant is extensive and includes hoisting and pumping plant, leaching plant, buildings, smelter, concentrating plant, etc. Accurate maps and records of the workings have been kept and it is estimated that there are several hundred thousand tons of ore blocked out above the depth of 900 ft. A large amount of ore has been hoisted to the surface which has never been treated. It has always been a matter of surprise that this mine, carrying ore of such high grade, should have been allowed to remain idle for so long a period when other copper properties not half so well equipped and with lower grade of ores have continued working. In the year 1866 the mine shipped over 56,000 tons of 15 per cent. ore and mined a large quantity of lower-grade ore which was not utilized. During the past year the production has been confined to what copper was obtained from the mine waters.

The old Plumas-Eureka property at Johnsville, Plumas county, formerly owned by the Sierra Buttes company, and later by the Johnston-Graham company, will, it is expected, soon be taken over by Nevada and Eastern capitalists. The last named company has expended large sums in building tramways, rebuilding the mills and putting in new machinery. When the old company closed down 400 men were employed, for the property had been a very large producer for years, but the grade of ore declined so it was necessary to quit work unless deeper sinking and greater expense were undertaken. It is thought that the old mine has a large amount of good ore left, and that more extensive development at greater depths will show up orebodies from which profit may be made.

At the northern end of Mono county at the head of Desert creek, there has been discovered a wide lode of good ore and many claims have been filed in the section. It is 15 miles north of Bridgeport and within four miles of the West Walker river. There is a wagon road from Bridgeport to within five miles of the camp, and a good trail from the road. There is plenty of wood and water and it is within four miles of the place where the California-Nevada Power Company has its power site. A town called Elm City has been laid out.

Denver

Oct. 15—In the Rangely oilfield, from five to 10 miles south of the survey line of the Moffat road near the Utah line, the operators are very busy exploring their ground in advance of the advent of the railway. The Emerald Oil Company, of Vernal, Utah, has 3200 acres which is being patented. Eleven derricks have already been erected, and the company has one pumping well at 820 ft. Enos Bennion is manager. This is a close corporation, with no stock for sale. Another close corporation with property adjoining the former, also with no stock for sale, is a St. Louis concern of which C. O. Baxter is manager. It is composed chiefly of St. Louis men, and owns 3000 acres. A machine capable of sinking 6000 ft. is already on the ground. Another large tract is owned by San Francisco people, who put down some wells five or six years ago, and had 200 ft. of oil in six of them. Loss of money in the San Francisco earthquake is said to be the cause of stoppage of work, but they have now reorganized. This property is southwest of Rangely.

The Modern smeltery at Utah Junction, on the Moffat road, three miles from Denver, is said to have accumulated several thousand tons of Clear Creek and Gilpin county ores, and has blown in. The manager states that they will now treat ore steadily and in spite of all opposition, though what the expected opposition is, is not stated. If this pyritic smeltery should prove successful, it will certainly be a great boon to the districts named.

In the Cripple Creek district, the breast of the deep drainage tunnel is now under Requa gulch, between Grouse mountain and Beacon hill, a distance from the portal of about 11,125 ft. The $160,000 which was needed to complete the work is now said to be available, and a letter has been issued to the various mining companies which subscribed the above amount, by the executive committee of the Tunnel company, asking for a remittance of the first instalment of 10 per cent. It is expected to complete the work in about one year. With the drainage problem solved, this wonderful mining district, which is credited with an output of one hundred and fifty million dollars in gold, may yet give up another hundred

millions, and all this from an area of four miles square.

A long drawn out case at law has just been decided, in which over 20 companies won their suit against Teller county for unjust taxation of their properties, claiming that these should not be taxed at a higher rate per acre than the lowest rate on producing property. They paid their taxes under protest, and this money, amounting to about $10,000, will have to be refunded by the county. Twenty other companies will benefit indirectly by the decision, from which there is no appeal.

Another vexatious and bitterly fought lawsuit, which has been in the courts for 17 years, is now said to be in a fair way to be settled out of court. This is the suit of James Doyle against James F. Burns, for half of the latter's share of the Portland mine, Doyle claiming that he "grub staked" Burns. Doyle once secured a judgment against Burns for $650,000, and on appeal by the latter, the case was sent back to the district court. In a lower court, Burns won, and the case was again going to the supreme court, when the litigants, it is now stated, "got together."

In the San Juan region, especially in the neighborhood of Telluride, the recent washout of tracks of the Rio Grande Southern, and the shortage of cars which exists throughout southern Colorado, is working great hardships to the mines, which cannot get the ore out or coal in, and as freezing weather has set in, the trouble is serious.

Butte

Oct. 13—The Butte Central Copper Company, owner of the Ophir mine, expects to resume, arrangements having been made for the financing of the company. While everything at the mine is ready for work, the trouble thus far has been that the new company has not been able to pay off the indebtedness of the old Butte Central and Boston Copper Corporation, its predecessors. The latter corporation was forced into bankruptcy some time ago and [illegible] allowed the mine to be purchased by one of their [illegible] who are to hold it until the [illegible] been paid off in full, [illegible] company was to be delivered to the [illegible] formed Butte Central Copper Company.

The management of the Butte & Superior Copper Company says that a contract has [illegible] part the American Metal Company [illegible] all the zinc ore mined by the latter will be purchased by the latter during a period of [illegible] years. The American Metal Company also agrees to advance funds for the construction of a mill. The ore from the mine has been shipped to the Butte Reduction Works for several months, [illegible] the production of Butte & Superior Copper. The [illegible] mine has [illegible] such that it is [illegible] to demand the entire capacity of the Butte Reduction Works zinc mill, the reduction works refused to treat the Butte & Superior's ore. The Metal company will also furnish funds for the improvement of the surface plant of the Butte & Superior property with a view to enlarging the mine's production. Among the improvements will be a large, electrically driven compressor plant, and skips will be installed.

At a meeting of stockholders of the Keating Gold Mining Company in Butte the capital stock was increased from 250,000 to 400,000 shares of the par value of $5. The additional 150,000 shares authorized will be offered to the present stockholders in proportion to their holdings, until Oct. 15, and those shares not taken by that time will be underwritten by Gay & Sturgis, of Boston.

The Amalgamated mines are now producing their usual tonnage. At the Leonard new precipitating tanks, larger and of modern construction, are being installed. From the boiler plant to the compressor room a tunnel is being run, in which will be placed the steam pipes for the operation of the compressor plant. At the Badger State, at the foot of a steep mountain north of Butte, a draining ditch has been run for the purpose of keeping the rain water from running down onto the mine workings. An excavation for the boiler plant has been cut into the side of the hill and the stone retaining wall has been completed. At the Pennsylvania an additional pump station is being cut on the 1800-ft. level, and when completed a new electrical pump of large capacity will be installed. This has been rendered necessary owing to the fact that the crosscut south on the 1800-ft. level of the mine ran into what is supposed to be an old crevasse, which was filled with water, and the outflow has materially increased the amount of water which finds its way into the shaft. B. B. Thayer, president of the Anaconda Copper Company, has recently made an inspection of the Amalgamated company's smelter at Great Falls, and has announced that the plant will be enlarged by increasing the capacity of the concentrating plant 1000 tons per day, giving it a total capacity of 5000 tons daily. The other departments will be enlarged on a corresponding scale. Mr. Thayer states that the enlargement will be made just as soon as the experiments now being made with various concentrating jigs and classifiers are finished. The company wishes to determine the capabilities of each make of jigs and classifiers, so that plans may be made accordingly when the enlargements are made.

Salt Lake City

Oct. 15—The department of the interior has instructed the register and receiver of the land office to withdraw from entry 46 townships in San Juan, Kane, Garfield, Iron and Washington counties. The existence of petroleum in these counties has been investigated by United States Geological Survey and the discoveries were considered so important that the reports were telegraphed to Washington and the acting secretary telegraphed instructions to the land office. Prospecting for oil and drilling has been going on for several years in Utah, and in some instance the holes have been capped so that the operators could increase their holdings. A tract of phosphate land in the northwestern corner of Weber county was also withdrawn.

Labor troubles at the Utah Copper mine at Bingham made it necessary to suspend mining operations for almost a week and to call out a force of a hundred deputy sheriffs. The strikers, mostly foreigners, were given an increase in wages from $1.75 to $2 a day. As this company is mining and milling 8000 tons of ore a day, the output of copper for the month of October will be materially affected.

A number of high officials of the United States Smelting, Refining and Mining Company have recently visited the Bingham Junction smeltery. They are on a tour of inspection of the company's holdings in Utah, California and Mexico. The party included W. G. Sharp, president; A. F. Holden, managing director; Frederick Lyon, assistant managing director; and Sidney Winslow, director.

It is expected that the copper output for the month of September will be the greatest in the history of Utah. The reports from the four big producers, the Utah Copper, Boston Consolidated, Utah Consolidated and Yampa show a material increase over August. The Utah Copper produces nearly half of the State's copper output and this company shows the best record for several months. The Utah Consolidated is reported to be getting copper at a little more than 5c. a pound, while the Utah Copper is said to be getting near the 8c. mark.

The smelter of the Utah Consolidated company which operated in Salt Lake valley for years and which was closed by the United States court in the smelter smoke decision, has been razed after lying idle for two years. Most of the structural steel will be used in the Tooele plant.

Cobalt

Oct. 15—The department of lands, forests and mines announces that a strip of land on the Gillies Limit, south of the Cobalt area and immediately to the south of the lots already disposed of, will be offered for sale by tender. It is 1200 acres in extent and will be sold in 20-acre lots, tenders for which will be received until Nov. 15. The conditions will be similar to those of the previous sales, viz., a 10 per cent royalty on the output and a fixed sum to be expended in development. So far 900 acres of the limit have been disposed of, and after the land now offered

is alienated there will still remain 61,900 acres in the hands of the government. During the season the officials of the department have made considerable progress in the exploration of this area, and while no actual discoveries have been announced, it has been ascertained that the geological formation of the greater portion of the limit bears a general similarity to the rocks of the Cobalt area. This, though not a conclusive indication of the value of the area, encourages the expectation that it may be rich in silver and other minerals.

Several properties in the North Cobalt district will shortly resume operations. This is largely due to the discovery of high-grade ore made at the North Cobalt mine. A short time ago another new vein was discovered on this property, which shows about 30 in. of calcite, with low silver. The management is at present sinking a winze on it from the 200-ft. level. The companies that will in all probability extend operations are the Kanuck, Green Meehan, Red Rock and Cobalt.

Toronto

Oct. 14—The merger of leading Canadian cement companies as recently completed under the name of the Canada Cement Company, Ltd., includes the following plants: International, Hull, Que.; Canadian, Marlbank, Ont.; Western Canada, Exshaw, Alta.; Vulcan, Montreal; Lakefield, Montreal and Lakefield, Ont.; Owen Sound, Shallow Lake, Ont.; Alberta, Calgary, Alta.; Belleville, Belleville, Ont. and Lehigh, Belleville. The total capital is $29,000,000—consisting of preferred stock $10,500,000; common stock $13,500,000 and bonds $5,000,000. The board of directors comprises Sir Sandford Fleming, president, J. M. Kilbourn, J. R. Booth, George E. Drummond, J. S. Irvin, Hon. W. E. Edwards, W. D. Matthews, R. W. Kelly, Hon. Robt. MacKay, W. R. Warren, W. H. E. Bravender, Hon. George A. Cox, W. M. Aitken, Chas. H. Cahan and E. M. Young.

On Oct. 9 a large delegation of Montreal capitalists and business men went to Ottawa as the guests of the company on a visit of inspection to the plant of the International, the largest in the merger, situated in the adjoining town of Hull. This plant has an output of 600,000 bbl. per year. The various operations were explained by J. S. Irvin, managing director, who stated that the effect of the merger would be to save upward of $700,000 per year in freight charges by arranging that each of the plants would first supply the locality tributary to it. It is also hoped to develop a large export trade with the West Indies, South Africa and Mexico. To meet competition abroad it is proposed to ship the cement in clinker form, having grinding mills at the terminal points on the seaboard for the final grinding processes.

As a result of this merger which places the Canada Cement Company in a position practically to control the trade, the smaller companies in western Ontario dependent mainly on local trade have been put on the defensive, in consequence of the pressure which has been brought to bear to force them into the merger. The threat has been made that in case they remained outside the merger would employ "Standard Oil methods" to crush them. In consequence of the feeling of insecurity created by the amalgamation of the larger concerns negotiations have for some time been in progress for a consolidation of a number of the independent companies including the following, capitalized at the figures given. Brant, of Brantford, $500,000; Colonial of Wiarton, $800,000; Hanover of Hanover, $500,000, Imperial of Owen Sound, $300,000; Ontario of Paris, $450,000; Bell's Lake of Markdale, $500,000; Superior of Orangeville, $500,000; Western Ontario of Attwood, $500,000, and St. Mary's of St. Mary, $500,000. All these smaller companies use marl as their raw material, whereas the great bulk of the output of the companies embraced in the big merger is from rock—and it is claimed that the companies producing from marl can secure greater uniformity in quality than the others and on that account could hold their own in fair competition. It is the intention shortly to apply for a charter of incorporation, but details have not yet been arranged.

The marl-using companies outside the merger take the position that while they are not anxious for a contest, they are prepared if attacked to retaliate effectively by exposing the methods by which the merger was effected. They assert that there is considerable water in the capitalization contrary to the law regulating the formation of companies and that promises were held out that an early effect of the combination would be an increase of the price of cement to $2 per barrel or more—an impossibility in view of the extensive importation which would result.

Mexico

Oct. 12—The prospects for the consideration of the new mining law by the senate at present do not seem favorable. The matter has been held up in committees, and is now deferred owing to the visit of the president to El Paso, in connection with the meeting with President Taft. The general opinion seems to be that the new law will be substantially a revision and modernization of the present statutes and that the law when enacted will be satisfactory to the mining interests of the country. At any rate the opinion seems to prevail that the law will not be passed now at this session of congress which adjourns in December. Some disappointment is felt over the delay in the enactment of the law, which delay has undoubtedly had a bad effect upon pending mining negotiations in the country. The recent purchase of the Santa Gertrudis and the negotiations for the La Blanca mine have in a way offset any doubt about the future of the Mexican situation, for these negotiations are of such a magnitude that they carry with them a presumption of faith in the continuation of satisfactory legislation and satisfactory conditions in the republic.

An authority on the Mexican mining situation referring to the delay in the enactment of mining law says: "There is an inexplicable delay about this important matter which has been pending for over three years to the great annoyance and loss of the mining industry."

During July the Mexican federal regulation expired which provided for the drawback of duties paid on machinery for new mining or metallurgical plants. The only way in which this refund can now be obtained is to follow the usual course pursued in obtaining a special concession. Briefly, this consists in making personal application and representation to the department of fomento and explaining convincingly the benefit which will accrue to the district generally. The department requires complete plans for its files. The construction of the plant must be completed within a certain time, and before the refund is made the work must be approved by an engineer appointed by the department and paid by the concessionnaire. For any but the largest plants, the delay incident to the routine of application for such a concession as well as the necessary expense, will not be warranted by the saving in duty, which is only 1.65 pesos per 100 kg. on mining machinery.

London

Oct. 9—The Canada Cement Company, Ltd., is offering in London cumulative preference shares carrying 7 per cent. interest to the amount of $1,175,000. The price asked per $100 share is $93. Purchasers of this stock are offered one share of $100 par in the common stock of the company for four preference shares purchased.

Purchasers who do not want to take up the bonus shares are offered by the Canadian Agency, Ltd., $25 cash for each share surrendered. The Canada Cement Company was incorporated to amalgamate a number of companies making portland cement in Canada, with the object of avoiding cut-throat competition. According to the Canadian Agency, Ltd., the company promoting the present fresh issue of capital, the cement company hopes to sell this year 4,000,000 bbl. and to secure a profit of $2,000,000 on an estimated sale price of $1.30 per barrel. A similar issue to that now made was offered in Canada a short time ago, and it is stated, was oversubscribed.

Mining News from All Parts of the World

New Enterprises, Installations of New Machinery, Development of Mines and Transfers of Property Reported by Special Correspondents

THE CURRENT HISTORY OF MINING

Alaska

Cordova—Construction of the Copper River & Northwestern railway from Cordova to the Bonanza country will be carried on all winter. Sledges will be used to freight what supplies cannot be taken up the river by steamboat.

Skagway—The "Princess Royal" sailed from Skagway, Oct. 5, with 2200 lb. of gold dust, valued at about $432,000, representing a part of the season's cleanup for that section.

Nome—The steamship "Senator" sailed from Nome with nearly a quarter of a million dollars of gold, and a large number of mine operators who are on their way out to spend the winter.

Arizona

Cochise County

Swisshelm and Heffron—These companies are operating in the Swisshelm mountains in the eastern part of the county, and have recently made important discoveries of copper-gold ore.

Arizona United Mines Company—The 100-ton copper smeltery at Johnson in the Dragoon mountain is in operation, treating ore from the Arizona United and Black Prince.

Calumet & Arizona—The company denies that it is negotiating for the Shattuck Arizona.

Gila County

Arizona Commercial—The 500-ton smelter at Copper hill, 4 miles east of Globe, is in operation. A converter will be added. J. W. Bennie is manager of the company and D. L. Williams, of Clifton, Ariz., smelter superintendent.

Inspiration—Drifting continues at the 400 ft. level of the Joe Bush shaft in all directions in ore, estimated to average over 25 per cent. The north drift has been opened for a distance of 60 ft.; the south drift is in ore an equal distance; the east drift, 30 ft., and the west drift, 40 ft., the ore here disclosed containing nearly 2 per cent. copper. The Scorpion shaft, about 2500 ft. northwest of the Joe Bush, is in carbonates at a depth of about 100 ft. The drill cores indicated that sulphides would be encountered between 150 and 200 ft. Thomas R. Drummond, formerly at the [illegible] mine at [illegible], Utah, will take charge of mining operations on [illegible] at Globe.

Graham County

Arizona Copper Company, Ltd.—Production for September was 1236 tons of copper. A crosscut in a development tunnel in the Simpson group has in the one end, entered 20 ft. into a body of oxide and sulphide ore averaging 9 per cent. copper, and in the other end about 150 ft. has entered a body of carbonate ore, 30 ft. wide, averaging about 3¾ per cent. copper.

Santa Cruz County

Alto—Several men are at work on the east extension on the vein from the tunnel, and have developed a body of lead-copper-silver ore not hitherto known. John H. Prout, Jr., manager.

Augusta—Manager William Kemp has formed a syndicate of railroad men to work the mine, 11 miles from Patagonia. The ore hoisted daily is about equal to the shipments to the smeltery at Globe.

San Antonio & Arizona—Charles Harrison, superintendent, has taken over J. W. Hackett's claims (the Rosario), near the Salero and is taking out ore for shipment.

Salero—The company is driving on the 400-ft. level in oxidized ore, carrying copper and silver with pockets of fine silver ore. The vein is 200 ft. wide. Superintendent, W. E. Balcom.

California

Amador County

Orr—Sinking is going on near Plymouth, L. Griffith in charge. The mine is being opened by men connected with the Kennedy company.

Butte County

Gold River—The company has installed pumping machinery on the Bumble Bee mine at Oroville.

Calaveras County

Mountain King—R. B. Parke has obtained ownership of the mine at Hodson and will start it up.

Bob Paul—The gravel claim at Chilgulch near Mokelumne hill is to be reopened under J. Rooney, of San Francisco.

El Dorado County

Wagner—The mine at Kelsey, recently known as the Douglas Brothers' mine, managed by R. S. Henderson, is showing good ore from a blind vein in a crosscut tunnel. The 10-stamp mill is to be moved from the hill to the mouth of the tunnel.

Mount Pleasant—Twenty men are working this mine near Grizzly Flat under A. V. Judson, and the 10-stamp mill has been started.

Shasta County

Mammoth—The company at Kennett has now 600 men at work, and daily ore shipments are from 1200 to 1700 tons. The construction of a two-compartment shaft at the Quartz Hill mine has been begun.

Sierra County

Kate Hardy—This mine, at Forest, is being reopened. J. W. Morrell, manager.

Cleveland—Twenty men are at work in the tunnel at Sierra City. The mill is being overhauled and compressors installed.

Tabor—The mine at Gibsonville, a continuation of the Bellevue, was recently purchased by Theodore L. Harlow.

Siskiyou County

Cherry Creek District—Near Yreka, the Mount Vernon, Ironsides, Cherry Hill and Schroder mines are being worked.

Yellow Butte—This property near Edgewood, after lying idle six months, has been started up.

Trinity County

Headlight—A 40-stamp mill with chlorination plant is being built at Carrville.

Tuolumne County

Duach—At this mine, Jamestown, the shaft is being retimbered. A larger force will be employed.

Yrma—Arrangements for obtaining water having been made, the mill at this mine will be started.

Hazel Dell—A lode 6-ft. wide carrying free gold has been uncovered.

Poor Man's Friend—The claim near Tuolumne has been bonded to Clinton Manley, of Dunsmuir, Cal., and work commenced.

Colorado

Lake County—Leadville

Little Ella—A body of gold ore has been opened on this property at South Evans gulch, at the second contract. This is the first discovery of the ore of this horizon in this section.

Hill Top—The mine in the Horseshoe district which has been producing heavily in lead and zinc ore recently disclosed in the lower level a body of gold silver ore which is being explored.

Wall Street—An electric plant will be installed on this property on Little Ellen hill, and shipments commenced.

SAN JUAN DISTRICT

Henrietta—The company has purchased the assets of the San Juan Smelting and Refining Company at Silverton. George H. Craft is manager.

Tomboy—This mine in Savage Basin, at 12,500 ft. elevation, under the management of David Herron, of Telluride, reports for September 7500 tons of ore crushed, yielding 44,000 gold bullion, and concentrates of a value of $5500.

SUMMIT COUNTY

Buffalo Placer—The property at Breckenridge, controlled by L. Kingsbury, has closed a deal for an extensive hydraulic plant, which will have a capacity of 6000 cu.yd. daily.

Wellington and Country Boy—These properties are shipping lead, silver and zinc ores extensively.

TELLER COUNTY—CRIPPLE CREEK

Republic—Sherman Bell has taken a bond and lease on the properties on Beacon hill and will sink the main shaft to 1000 ft. and develop extensively. The property will have the benefit of the new drainage tunnel.

Roosevelt Tunnel—Water has been encountered in the north heading for the intermediate shaft. No vein or dike shows in the heading.

Kansas

United Zinc Company—The company through C. C. Playter has purchased the 120-acre Foster tract west of Galena. The land is undeveloped but surrounded by mines. It will be thoroughly prospected by the new owners.

Nymo—The company has completed the new 300-ton mill on the Maggie Taylor land at Galena. H. A. Waterhouse, manager.

Empire Electric Power Company—This company, capital $6,000,000, has bought the land of Rains Brothers at Riverton, Cherokee county, Kan., north of the steam plant of the Spring River Power Company. A power plant will be built to generate 20,000 h.p., costing $2,000,000.

Michigan

COPPER

Michigan—The company has laid off 150 men, reducing its force to 25, which will carry on exploratory work during the winter, other operations to be suspended for a time, owing to the inability of the company to meet expense at the present copper price.

Lake—The crosscut from the 5th level has been extended 25 ft. into the formation and reveals a fine mineralization. The extension of drifts at the 3d and 4th levels continues to open a fine grade of rock. A diamond drill is securing data for the location of a second shaft.

New Arcadian—The drill to tap Baltic lode is down about 700 ft. but it is thought that it will be necessary to sink to about 1500 ft. before the lode will be reached.

Hancock—The excavation has been completed and the foundations started for a new steel engine and compressor house. In this building will be housed the present Sullivan hoist and a new hoisting engine capable of handling the hoisting requirements to a depth of 4000 ft. at a speed of 3500 ft. per minute. The compressor building will contain the two present compressors of 13- and 16-drill capacity and a new air engine of 30-drill capacity. A structural steel boiler house, will contain two batteries of four boilers each of the return-tubular type, and in short time a steel shaft and rock house will be erected on the site of No. 2 shaft, which is nearing the point where the West lode will cut.

Section 12—A copper-bearing amygdaloid formation has been cut with the drill at 350 ft., thought to be the Baltic lode.

IRON

Maas—The deposit at Negaunee is proving one of the largest in the Marquette range. The Cleveland Cliffs company is making large shipments from it.

Lot 3—The property at Crystal Falls belonging to the International Harvester company will soon become a shipper.

Mary Charlotte—More than 500 men are employed by the Brietung interests on this mine at Negaunee.

Minnesota

IRON

Armstrong Lake—The company has secured options on land in Section 7-62-13, and Section 13-62-14, Vermilion range. A new diamond drill has been received and exploration will be rushed as soon as the camps are completed. Headquarters will be at Robinson.

Vermilion Steel and Iron Company—The Sheridan claim in Section 5-62-15, near Tower is being prospected by the company.

North American—A drill is working on Section 33-62-15, at Tower Junction for this company.

Oliver Iron Mining Company—The company is preparing to open two new mines at Hibbing, the Uno and Dale. They will be open-pit mines.

Missouri

JOPLIN ZINC-LEAD DISTRICT

Prosperity—Meloan Brothers, of Cleveland, who have been operating at Duenweg and north of Webb City, have secured from the Boston-Get There Company a lease on the 40 acres north of Prosperity and will begin operations for the reopening of the tract, remove the American Beauty No. 2 mill from Duenweg and place it on the lease.

Producers—This company of Miami has purchased the 10-acre lease, mine and mill of the Radish Hollow Company at Belleville for $20,000.

Green Dog—The company has secured the Florence mine and mill east of Joplin and has remodeled the mill. J. H. McClannahan, Joplin, superintendent.

Picher Lead Company—The company is doubling the capacity of its litharge plant and will erect a building at a cost of $15,000. The plant will have a capacity of 75 bbl. of litharge daily.

Montana

BEAVERHEAD COUNTY

Calumet-Montana—At the company's Dark Horse mine work on the 3000-ft. tunnel will be begun shortly. The property is on the line between Montana and Idaho and the tunnel will connect the two States. The tunnel will attain an average depth of 700 feet.

BUTTE DISTRICT

Davis-Daly—At the Portland meeting the Heinze interests held a control of the proxies and elected a board of five members as follows: Augustus Heinze, H. Mason Raborg, L. S. Levy, George Baglin and W. C. Shaw. The Colorado mine of the company is shipping upward of 175 tons daily, and Mr. Heinze reports that by Jan. 1 the mine will be in position to ship 500 tons per day. The ore will be treated at the Basin concentrator for a time.

Tuolumne—Forty men are employed drifting east on the 1400-ft. level. The drift is now in 180 ft. and the face shows 15 ft. of ore. The drift will be continued an additional 211 ft. to the east end line and then stoping will be begun. About 100 tons are being shipped daily from the sill floor alone, and when stoping is begun the output should be greatly increased. From the point at which the crosscut intersects the lead on this level the distance to the west end line is about 560 ft., and as yet the orebody on this side of the crosscut has not been explored. The sump in the shaft is 50 ft. below the lowest level and will hold all water which comes into the mine for a period of 60 days, when the water is tanked out. The accumulation of the 60 days can be tanked out in less than eight hours. The doing away with the necessity for pumping is thus quite a factor in reducing the operating expenses of the property.

Nevada

CHURCHILL COUNTY

Fairview Eagles—Working shaft on this property at Fairview will be sunk to 300 ft. Monthly shipments reported 40 tons.

ESMERALDA COUNTY—RAWHIDE

Grutt-Balloon Hill—The lease is installing a compressor and will put in machine drills and sink the shaft to the 500-ft. No more ore is to be extracted till the mills are in working order.

Kerns No. 1—The lease which joins the Grutt-Balloon Hill will commence sinking main shaft Nov. 1.

Golden Arrow—Ore has been struck which is significant for the district, as the territory has been lacking of any ore so far.

Victor—The lease has encountered ore on the lower level, which proves the ore to 300 ft. The owners will add 10 more stamps and a cyanide plant to the old Murray mill, recently purchased.

LINCOLN COUNTY

Prince Consolidated—Water has been encountered in a winze from the 550-ft. level with first appearance of quartzite. The fissure of high-grade ore continues into the quartzite. The shaft has reached the quartzite at 600 ft. and will be continued to determine whether true water level has been found. E. L. Godbe, manager of Prince Consolidated and Ohio-Kentucky has gone east on business pertaining to consolidation of latter property with Nevada-Utah.

STOREY COUNTY

Mexican—The three-compartment winze from the 2000 level to the 2300 is down 200 ft. On the 2300 level a drift has disclosed high-grade quartz which is attracting much notice.

Baker—The property east of the Comstock is showing good ore. Other operations are under way in the locality. Negotiations for the sale of the Baker are under way.

WHITE PINE COUNTY

Nevada Consolidated—Notice has been given of the annual meeting to be held at Portland, Me., on Nov. 2, at which time a resolution will be presented authorizing an issue of 400,000 shares, increasing the present capital stock of 1,600,000 shares, of the par value of $5, to 2,000,000 shares of an aggregate value of $10,000,000, for the purpose of acquiring the capital stock of the Cumberland-Ely Copper Company at the rate of [illegible] shares of the latter for one share of the former company. The usual annual business, including the election of a board of directors, will also be transacted.

New Mexico

GRANT COUNTY

[illegible] The [illegible] of the Consolidated [illegible] [illegible] shaft [illegible] the [illegible] [illegible] [illegible] will soon be started [illegible]

OTERO COUNTY

Orogrande Smeltery—Repairs on plant are finished and the company is apparently planning to resume.

New York

ESSEX COUNTY

Cheever Iron Mine—The controlling interest in this mine, north of Port Henry in the Lake Champlain district, has been sold by the Presbrey estate to the Bethlehem Iron Mines Company, a subsidiary of the Bethlehem Steel Corporation. The Cheever is an old mine, having been first worked nearly 100 years ago, but it still contains large reserves and the grade of the ore is about the highest in the district. Witherbee, Sherman & Co. retain an interest in the mine, and will for the present conduct its management. It is understood that a considerable amount of money is to be spent in improvements and in machinery.

Oklahoma

Miami—The Swastika mill has been sold to the Miami-Joplin Company, and is being erected on the Sullivan lease. The Swastika was the farthest mine to the south and has been worked out, while the Sullivan lease is in the heart of the camp and has developed a mine between the Turkey Fat and Old Chief mines. W. G. Stevens, Joplin, is manager of the Miami-Joplin company.

Morning Star—The mine at Miami has struck a rich prospect and will build a mill.

Lincolnville—The Sweeney plant has been rebuilt and the mine reopened.

Oregon

DOUGLAS COUNTY

Kelso—The company, securing claims on Steamboat creek, is putting in a 10-stamp mill at the Mayflower. Two water wheels will be installed. The mill will handle 1000 tons a month.

JOSEPHINE COUNTY

Sugar Pine—After being abandoned 50 years the mine is again producing. Modern equipment will be added.

Alameda Consolidated—Work is now concentrated on the Alameda mine, sinking the vertical shaft to 500 feet.

LANE COUNTY

Steeplejack—S. J. Brand, owner of the mine on Elephant mountain, near Bohemia, has received a two stamp mill.

West Coast—The property at Oregon has been blocked out and the 30 stamp mill will soon be started.

Parker Hartley—H. H. Parker, manager of the property near Oregon, has uncovered ore in the lower tunnel. A 1500-ft. tunnel has been driven during two years.

Pennsylvania

ANTHRACITE COAL

Philadelphia & Reading Coal and Iron Company—The financial statement for August and the two months of the fiscal year from July 1 to Aug. 31 is as follows:

	August.	Two Months
Earnings	$1,780,163	$3,377,259
Expenses	1,842,089	3,533,424
Deficit	$61,926	$156,165

For the two months, as compared with last year, there was a decrease of $699,535 in earnings and of $514,333 in expenses; this year's deficit of $156,165 compares with $29,037 net earnings last year.

Lehigh Coal and Navigation Company—It is believed that fire which has been burning for a number of years in the old mine at Summit Hill has been finally extinguished. A fireproof wall has been built at heavy cost to shut off the fire.

Mineral Railroad and Mining Company—This company has decided to install electric haulage in its collieries near Shamokin. Contracts are to be let for the electric equipment at once.

BITUMINOUS COAL

Central Pennsylvania Coal Operators' Association—At a meeting held in Philadelphia last week the following officers were elected: B. Dawson Coleman, president; J. B. Irish, vice-president; Charles W. Mills, secretary and treasurer; executive committee, L. W. Robinson, G. S. Ramsay, F. H. Wigton, T. H. Watkins, R. H. Shillingford, W. J. Steineman, Ray A. Hatfield and Rembrandt Peale. The association is composed of mine operators in the Central Pennsylvania district, and its object is to secure a lower mining rate, as the present rate, it is claimed, is so high as to prevent competition with other districts for trade.

Franklin Coke Company—This company has a plant of 40 coke ovens now completed and ready to be put into operation at once. It is proposed to add to the number of ovens in a short time. James S. Braddock, of Uniontown, is president.

South Dakota

Montezuma—This and adjoining properties are in negotiation to a British syndicate represented by Robert Bunce, who is expected soon to come to the Black Hills district to start diamond-drill exploration. The properties were examined by H. S. Denny, of Mexico and London, last summer. They are near Rochfort.

Texas

EL PASO COUNTY

Republic—At a company meeting at Dallas it was decided to resume work on the mine properties in the Quitman mountains, 80 miles east of El Paso.

BREWSTER COUNTY

Quicksilver Deposits—Discoveries have been made 30 miles north of Boquillas in the southern part of the county, 50 miles east of Terlingua. Thomas Locke, of San Antonio, will develop the properties.

Utah

BEAVER COUNTY

Cedar-Talisman—A large body of zinc ore has been found in addition to the silver and lead deposits already uncovered.

Moscow—The mine has increased its shipments. A large amount of prospecting and development work is being carried out in addition to the regular operations.

Commonwealth—Four and a half feet of high-grade carbonate ore was broken into by a raise from the tunnel level of the Commonwealth Mines. The vein in which the raise is being driven has been prospected for 150 ft., and affords 350 ft. of good stoping.

JUAB COUNTY

Centennial-Eureka—Work is progressing rapidly on the tunnel to tap the shaft on the 500-ft. level. As work is being pushed from both ends, 400 ft. a month can be accomplished so that the 3000 ft. will be completed in six months. The tunnel will take care of a large flow of water and facilitate the transportation.

Selma Consolidated—The control has passed from Jesse Knight and associates to H. A. Leach and Charles Tyng. The company owns the northern extension of the Colorado zone and an 800-ft. tunnel has opened up a characteristic vein of the formation.

Chief Consolidated—Contracts have been let for the construction of an assay office and ore bins for the various mines included in this consolidation. Walter Fitch, manager.

Dragon Iron—Fifty men have been laid off at the Dragon Iron since the closing of the Tintic smeltery. Arrangements are pending with the United States smeltery to handle the present 400-ton output of high-grade iron ore.

Iron Blossom—The regular 8c. dividend on the Iron Blossom was passed this month. The delay caused by changing ore shipments from the Tintic to the United States smeltery is given as the reason.

May Day—The 1100-ft. mark has been reached in the May Day shaft. Drifting from this point will start as soon as a station is cut.

SALT LAKE COUNTY

Utah Apex—The mine at Bingham made for the year ended Aug. 20, a mining profit of $124,185 despite the waste due to treating its second-class ore in the old mill now being remodeled. The annual report shows that 33,407 tons of ore were mined, of which 9525 tons were first-class ore and 23,872 milling ore.

Emma Copper—Operations at the mine will be resumed at once.

SUMMIT COUNTY

New York Bonanza—The shaft is down 900 ft. in mineralized quartz. After sinking 125 ft. more drifting will be started.

UTAH COUNTY

Mountain Dell—Another strike has been made in the Mountain Dell at American Fork. The ore is a silver-lead carbonate. The Mountain Dell recently connected its upper workings with the tunnel which enters the ground on the 600-ft. level.

Washington

FERRY COUNTY

New Republic—The company will install a motor in Granite creek to pump water for the mine. A carload of sacked ore to Tacoma, assayed $200 per ton. The company is now shipping 200 tons per week.

Ben Hur—The lessees are employing nine men on the 125-ft. level. 100 tons of ore per week is being shipped.

Black Tail—An order for a compressor and power drills has been placed.

Flag Hill—The mine which has been idle for several years has passed into the hands of the Flag Hill Mining Company. John E. Gatenbein, manager.

KING COUNTY

Superior—A new seam of coal has been disclosed at the mine. The company is at work on Nos. 6, 0, 2 and 4 of the Issaquah veins.

Wisconsin

ZINC-LEAD DISTRICT

Platteville—A company has been organized to prospect by drill on the George Spiese land northwest of the Klar-Piquette.

Hodge—The mine has been unwatered and operation begun under new management.

Big Four—The Trego mine and equipment are being placed in shape for steady production. The Gritty Six mine, at Cuba City, will be reopened. P. R. Grey, Platteville, superintendent.

Lawrence—Mining will be resumed and a 50-ton mill erected. T. F. Cummins, Platteville, president.

Wisconsin Zinc Company—Two churn drills have been set to work on the land recently obtained from the LaFayette Land and Mining Company. Drifting has been commenced at the Drumm shaft, which showed 32 ft. of jack ground.

Kennedy—The Mineral Point Zinc Company has bought the mine, at Hazel Green, including the fee to 120 acres, at $250,000. This property was formerly held at $500,000, but was sold at a sacrifice in the effort to save from failure the First National bank of Mineral Point, Wis. The mine is equipped with two concentrators and is the largest producer in the district.

Wyoming

FREMONT COUNTY

Williams-Luman—The vein at Copper mountain is reported 130 ft. wide at the 800-ft. level, carrying copper, gold and silver.

Canada

BRITISH COLUMBIA—ROSSLAND

Le Roi—The most important work in progress is the driving of crosscuts on the 1650-ft. level to open the mine at that depth to allow of the diamond-drill bores being made diagonally so as to prospect the ground down to 2000 ft., or deeper, much more effectively than would be done were the holes to be sunk vertically. At the ends of the crosscuts, about 200 ft. from the main level, stations will be opened to a size sufficient for the convenient working of the drills. A second useful purpose will be served by the driving of these crosscuts, namely, they will prove whether another lode, not heretofore believed to carry ore below the 1000-ft. level, is ore-bearing at the greater depth now being developed. The only ore being taken out is that encountered in the course of development work being done in different parts of the mine, consequently the smeltery at Northport remains idle.

Le Roi No. 2—Ore shipments to the smeltery for nine months, to Sept. 30, total about 24,000 tons, as compared with 22,000 for the corresponding period of 1908. About 14,500 tons of lower-grade ore have been put through the concentrator, bringing this year's total production up to about 38,500 tons. Ore is being mined from various drifts and stopes down to the 700-ft. level. Steady progress is being made with the deepening of the Josie shaft, which is now down about 1200 feet.

Center Star Group—Published figures show that the Consolidated Mining and Smelting Company's Rossland mines have this year maintained production on a similar scale to that of last year. The total quantity of ore shipped to October 2, is stated at 128,500 tons, as against 127,250 tons to October 3, 1908. Daily shipments range between 400 and 600 tons, the latter being an exceptionally large output. Ore receipts at the company's smeltery at Trail, from all sources, have averaged about 90,000 tons a month for the three months last past. This includes gold-copper ores from Rossland, copper-gold ores from the Boundary district, silver and silver-lead ores from East and West Kootenay, and concentrates

from several comparatively small gold-quartz mines. The capacity of the company's lead refinery at Trail is being increased from 70 to 120 tons of refined lead per diem. Announcement has been made recently of an intended increase of capital from $5,500,000 to $7,500,000, a special meeting of stockholders having been called to authorize this.

NOVA SCOTIA

Dominion Coal Company—The number of miners at work in this company's mines is increasing, and the probabilities of success for the strikers are gradually disappearing. About 1700 men are still out, though there have been a number of desertions from the strikers. The output continues to show a steady increase, the production of coal for September being 188,500 tons as compared with 153,908 tons for August and 135,664 tons for July—the first month of the strike.

ONTARIO

Imperial Gold Mines Company—On the 9th inst. the court in Toronto granted a winding up order against the company at Manitou lake on the application of the Imperial bank. The liabilities are said to be over $100,000, and the property of the company is encumbered by a mortgage to secure a bond issue of $200,000, the bonds being pledged for advances amounting to $20,000. The bank has obtained judgment against Anthony J. Blum and Barbara Blum, of Brookline, Mass., for $20,000 and interest under a guarantee of the indebtedness of the company. Harry Vigeon was appointed interim liquidator.

Big Six—Rich ore was recently found at 165 ft. The shaft at Elk lake is now being put down to the 200-ft. level at which drifting will be undertaken.

O'Kelly—At the mine, Gowganda, a stringer running from vein No. 2 is appearing rich. A test pit was sunk showing that at 8 ft. the vein has widened to 3 to 4 in. of high-grade ore. Several sacks have been taken out.

ONTARIO—COBALT

Silver Leaf—A new vein has been struck 5 in. wide, yielding good ore, claimed to run 5000 oz. silver to the ton, at a depth of 100 feet.

Cobalt Lake—In drifting at the 105-ft. level on a vein near the McKinley-Darragh boundary which has yielded good ore, another 3-in. vein of calcite with rich silver contents was cut running at right angles to the drift. The new vein is being followed.

Kerr Lake—The annual report for the fiscal year ending Aug. 31 shows net earnings of $[illegible]29,047, on an average monthly production of [illegible]22,387 oz. silver, of which $[illegible]80,000 was paid in dividends. The cost of production was 12.38c. per oz. The silver yield was [illegible]2,268,043 oz. produced from [illegible] tons of ore averaging 248[illegible] and 600,000 lb. of screenings. Figuring silver at 50c. the gross value was $1,344,324 and the cost of production. The balance sheet shows total assets of $1,031,434, and $475,889 cash on hand.

YUKON TERRITORY

Dawson—Alki creek has been staked the last few days. No. 11 is the highest claim. The Lone Star, Ltd., one of the new quartz mines made its first cleanup recently after a run of 380 hours, during which 100 tons of ore were crushed. Wm. Catto is president. The Canadian-Klondike Mining Company, Ltd., Jos. Whiteside Boyle, manager, will add two new dredges to its plant and install a plant to generate electrical power with water next year.

Mexico

CHIHUAHUA

Borquillas—There is unusual activity in this section south of Parral 25 miles. The ores, carrying gold and silver, are amenable to cyanide.

El Rayo—The mine at Santa Barbara crushed during September 4080 tons of an approximate value of $14.14 per ton, and the estimated net profits were $18,644, the same as August.

DURANGO

Lucia—The company, operating near San Gabriel, is to resume work, sending silicious copper ore to Torreon. W. Thomas Moore, manager.

Villar—Adolfo Villar and associates, of Torreon, are planning the erection of a 50-ton cyanide plant at a property near Santa Maria del Oro on the Parral & Durango railway.

Coneto—Fletcher McNutt Hamilton and Charles M. Parker are developing the La Bufa and other gold-silver properties in this section, reached via Durango. A plant is to be remodeled and cyanide added.

OAXACA

Leona—Fred Rickard, engineer of the mine at Totolapam, is considering the advisability of installing a flotation process. The present mill does not give the required saving from the fines.

Ocotes—Diamond drills for prospecting from the 10th level of the Ocotes mine, belonging to the Teziutlan company, are on the ground, but the men who are to run them have not yet finished work at the Phenomales property in Hidalgo.

Rio Seco—Machinery for the mill near Parian has arrived from Veracruz.

SONORA

Greene Cananea—The Indiana Sonora has been purchased on a stock exchange basis of the Greene Cananea for 2½ of Indiana-Sonora. The controlling interest in the purchased property was with Phelps Dodge & Co. It included 400 acres in the Capote basin and several thousand acres in the district elsewhere. There will be no new issue of Greene-Cananea stock as contributions from large interests will be forthcoming to cover the transaction.

Santa Eduviges—H. Y. Acock, operating the mine 35 miles south of Sahuaripa, reports the resumption. The last shipment netted at El Paso $7500 for 15 tons.

Armagosa—George J. Cole is taking charge at Tabatacochi, 18 miles east of Nacozari. The first shipments are at Calabasas.

Lampazos—Development work has been resumed at the properties at Moctezuma of the Banco de Sonora, formerly operated by the Lopez family. Under C. T. Dozier the mines will be put in shape and exploration carried on. A new milling plant will be installed.

TEPIC

Zapote—Work is in progress on a reduction plant at Jala of five stamps, a tube mill and cyanide annex, operated by water power.

Cambio—The company has decided not to resume operations until the price of silver advances. The mines and a reduction plant are in the Rosamorada district, and have been idle for some time.

Morocco

Riff—The iron mines involved in the trouble between Spain and the Moore, are reported sold to a German company, presumably affiliated with Krupps. The deposit is described as an "iron mountain" and is said to run 60 per cent., in iron. The Spanish company is said to have defaulted in the payment. The mine is some distance from the coast.

Peru

Chimbote Coal and Harbor Syndicate—This English company, capital £250,000, will produce 200,000 tons yearly from the Recuay coalfield, 64 miles from Chimbote on the Pacific. The coal is anthracite—analysis, ash, 6; volatile, 17.50; fixed carbon, 77.00 per cent.; calories, 6800. Contracts are sought at $7.50 a metric ton.

Spain

Rio Tinto—The chairman announces a dividend of 2s 6d on the preference shares and 30s on the ordinary shares. In accordance with legal advice the English income tax is deducted on the dividends of the ordinary shares. Referring to the copper situation report says: "The world's stocks probably do not reach a figure represented by the normal consumption of three months, and should the demand for copper become as brisk as that which is recently developed for iron and steel, the stocks of the red metal would be none too large."

Metal, Mineral, Coal and Stock Markets

Current Prices, Market Conditions and Commercial Statistics of the Metals, Minerals and Mining Stocks

QUOTATIONS FROM IMPORTANT CENTERS

Coal Trade Review

New York, Oct. 20—Coal trade in the West continues to increase, with a steady demand for steam fuel, while that for domestic coal has been stimulated by colder weather. Business is reported good at all the large centers, but there has been no considerable advance in prices.

The bituminous trade in the East shows a continued increase in demand. There is some trouble on account of car shortage, but otherwise the trade is running smoothly.

The anthracite trade has followed its usual course with no special incident.

Anthracite Trust Suits—Testimony continues to be taken in the Government suits against the alleged anthracite trust; but no witness of special importance has been brought forward.

Coal Traffic Notes

Coal and coke tonnages originating on Pennsylvania railroad lines east of Pittsburg and Erie, year from Jan. 1 to Oct. 9, short tons:

	1908.	1909.	Changes.
Anthracite	3,921,674	3,705,847	D. 215,827
Bituminous	25,553,697	28,194,223	I. 2,640,526
Coke	5,302,856	8,361,447	I. 3,058,591
Total	34,778,227	40,261,517	I. 5,483,290

The total increase this year to date was 15.8 per cent.

Coal receipts at Boston, nine months ended Sept. 30, reported by Chamber of Commerce

	1908.	1909.	Changes.
Anthracite	1,274,144	1,233,882	D. 40,262
Bituminous	2,425,336	2,582,820	I. 157,484
Total domestic	3,699,480	3,816,702	I. 117,222
Foreign	289,850	177,903	D. 111,947
Total	3,989,330	3,994,605	I. 5,275

The foreign coal is chiefly from Nova Scotia.

Coal passing through the Sault Ste. Marie canals, season to Oct. 1, short tons:

	1908.	1909.	Changes.
Anthracite	971,083	916,740	D. 54,343
Bituminous	6,142,621	6,122,058	D. 20,563
Total	7,113,704	7,038,798	D. 74,906

The total decrease this year was only 1.05 per cent.

The Southwestern Interstate Operators' Association reports coal shipments for July as follows, in short tons:

	1908.	1909.	Changes.
Missouri	174,738	167,680	D. 7,058
Kansas	422,050	349,113	I. 72,937
Arkansas	132,970	189,269	I. 56,299
Oklahoma	214,658	203,290	D. 11,368
Total	944,416	909,352	D. 35,064

The total decrease was 3.7 per cent. Arkansas shows a large increase, in striking contrast to the other States.

Coal and coke tonnage of Chesapeake & Ohio Railway, two months, July 1-Aug. 31, short tons:

	Coal.	Coke.	Total
New River	1,304,409	57,582	1,361,991
Kanawha	965,921	4,404	970,325
Kentucky	52,465	.....	52,465
Connecting lines	8,884	7,947	16,831
Total	2,331,679	69,933	2,401,612
Total, 1908	2,038,067	47,326	2,085,393

Deliveries this year to points west of mines, 1,193,589 tons coal and 31,214 coke; points east, 268,206 tons coal and 38,719 coke; tidewater, 869,071 tons coal; anthracite to line points, 873 tons. Total increase in shipments this year, 316,219 tons, or 15.2 per cent.

New York

Anthracite

Oct. 20—The anthracite trade got a little push from the cold weather which set in this week, and dealers report an increase of orders. The effect on the wholesale market will be more evident next week.

Schedule prices for large sizes are unchanged at $4.75 for lump and $5 for egg, stove and chestnut, all f.o.b. New York harbor. For steam sizes quotations are: Pea, $3.10@3.25; buckwheat, $2.25@2.50; No. 2 buckwheat or rice, $1.75@2; barley, $1.35@1.50; all f.o.b. New York harbor.

Bituminous

The trade shows an improvement, although there is nothing like a boom in sight. Still, coal is being absorbed in larger quantities and orders come from almost all directions. The Far East is the most active, but the Sound and New York harbor are doing pretty well, while all-rail trade is good. The principal topic is car shortage, which is getting worse on nearly all the roads, especially on the Baltimore & Ohio, where shippers are not getting more than 50 per cent of the cars they ask for. Transportation, however, is a little better than it has been, coal coming through nearly on schedule time.

Prices are firmer than they have been for some time, and concessions are not in order. It can hardly be said, however, that there is any advance yet, though in some cases 5 or 10c. more has been asked for special coals.

In the coastwise trade vessels continue plenty and rates low. The advance usual at this season has not come as yet. New York harbor quotes on small vessels 50c to points around Cape Cod with 5 or 10c more to a few special points. On large vessels rates are 60@65c. from Philadelphia to Boston, Salem and Portland.

Birmingham

Oct. 18—Coal production in Alabama continues to approach normal output. There is a good demand for all grades of coal and the mining companies are now seeking miners, a scarcity of men having become decidedly apparent. Labor is scarce in all circles now and the coal operators are feeling it more than any others. There has been a steady improvement in coal prices lately. There will be no advance in wages around coal mines until the pig iron sold at the low prices that prevailed several weeks ago has all been delivered.

Coke is in strong demand. The resumption of operations at old coke ovens continues.

Chicago

Oct. 19—Sales of steam coal continue good, and those of domestic fuel have been started up by the colder weather of this week. Prices remain about the same, supplies being abundant enough to prevent any advance. Mines are inclined to increase shipments on the least chance of improvement in demand.

Illinois and Indiana coals bring, in general, $1.75@2.50 for lump, $1.65@1.75 for run-of-mine and $1@1.30 for screenings. Smokeless holds to $3.55 for lump and $2.95 for run-of-mine, and Hocking to $3.15. Gas coals are steady and quiet, Youghiogheny selling for $3.15 for ¼-in. Anthracite has sold better to dealers. The supply is good of all sizes.

Cleveland

Oct. 19—Steam trade continues good and domestic sales have been much improved by cold weather. Prices are unchanged, owing to the large supply.

No. 8 district steam coal sells at $1.90@2.15 for lump; $1.80 for run-of-mine and $1.40 for slack. Middle district about 10c. less. Pittsburg coal is $2.10@2.25 for lump, $2@2.05 for run-of-mine and $1.40@1.50 for slack. Massillon coal for domestic use is $2.05 for lump.

Indianapolis

Oct. 18—Work in the Indiana coalfields is more nearly normal than for two years. The present demand for domestic coal.

coupled with the increasing orders from the northwestern markets, has increased the number of men employed to a point greater than ever before. The car shortage is still in evidence but the railroads made considerable improvement in furnishing cars during the past week. The demand for steam coal is increasing rapidly.

Pittsburg

Oct. 19—Coal prices have advanced pretty squarely 5c. a ton in the past week, demand being good and cars somewhat scarce, while it is usual for the market to trend upward at this time. Mine-run is now quotable at $1.10, with occasional cutting to $1.05, while slack is quotable at 60@65c. The Lake movement continues heavy, and nearly all the mines could use more cars than they are getting.

Connellsville Coke—A contract for 8500 tons of furnace coke per month over the first half of next year has just been made at $2.90 at ovens, this following another transaction, same price and delivery, for upward of 25,000 tons a month, noted in last report. Furnaces are rather reserved about contracting for next year, but operators are firm. There are really few sellers at $2.90 for the first half, although there are a number who would sell for the entire year at this figure. Arrangements have just been concluded for the commencement of shipments on the contract made last summer between the Thompson Connellsville Coke Company and the Jones & Laughlin Steel Company, calling for approximately 30,000 tons a month for three years, at $2 at ovens. Shipments are to begin Nov. 1 to Aliquippa, where the steel company is completing three blast furnaces. We note sales of 25 and 35 cars of furnace coke at $2.85, for delivery to Dec. 1. For December alone $3 would probably have to be paid.

We quote prompt furnace coke at $2.85@3 and contracts for first half of next year or all year at $2.90@3; 72-hour foundry coke at $2.75@3 for prompt and $3@3.40 for contract.

The *Courier* reports the production in the Connellsville and lower Connellsville region in the week ending Oct. 9 at 437,820 tons, a gain of 14,000 tons over the preceding week, and shipments at 1024 cars to Pittsburg, 7016 cars to points west of Pittsburg and 915 cars to points east of Connellsville, a total of 13,525 cars.

St. Louis

[illegible] 18—The severe storm which swept over the country the first part of this week [illegible] weather and [illegible] the operations have been [illegible] the past few days. [illegible] the [illegible] and [illegible] the number of [illegible] their cars and the demand for [illegible] is increasing. High-grade coal is harder to get than ever and nearly all producing companies have issued instructions to their salesmen to stop selling lump entirely. A few firms that have had nothing to sell but high-grade coal have called their men off the road. Egg is a little easier than lump though it is very scarce also; nut coal is also in strong demand and prices on it are advancing. The medium grades of coal are also very strong and high with no spot coal being offered. Lump is very scarce and producers in general are sold ahead several weeks on this size. Egg and nut coal, though, can be readily obtained at figures 25 or 20c. per ton under the lump.

Standard and the lower-grade coals have also showed considerable strength this week and the domestic sizes have advanced from 10 to 15c. per ton all down the line.

Some 2-in. steam nut on demurrage was sold as low as 30c. per ton f.o.b. mine yesterday and some 1½-in. screenings of the poorer varieties have been sold for freight this week. The general market, though, on Standard screenings is 5@10c. per ton f.o.b. mine and 50 cents per ton St. Louis for 1-in. to 2-in. steam nut.

Carterville 6-in. lump and egg are being quoted at $1.75 at mine or $2.42 St. Louis; 3-in. Carterville nut is $1.30 at mine of $1.97 St. Louis. Screenings are bringing about 35c. at mine or $1.02 St. Louis. Franklin County 6-in. lump or egg is $1.80@1.90 per ton at mine or $2.47@2.57 St. Louis. Standard 6-in. lump brings $1.100@1.20 at mine or $1.67@1.77 St. Louis and 2-in. Standard is sold at $1 at mine or $1.52 St. Louis. Staunton, Mt. Olive or Springfield district coal is bringing about $1.40 at mine or $1.72 St. Louis for 6-in. lump.

Hard coal is in strong demand and dealers' stocks throughout the State have run very low. A number of them are almost willing to pay a premium for spot coal. The supply of anthracite has not been up to demand for the past month.

Foreign Coal Trade

United States Coal Exports—Exports of coal and coke from the United States, with coal furnished to steamships in foreign trade, eight months ended Aug. 31, long tons:

	1908.	1909.	Changes.
Anthracite	1,825,992	1,904,330	I. 78,428
Bituminous	5,796,077	5,988,051	I. 191,974
Total coal	7,621,979	7,892,381	I. 270,402
Steamer coal	1,080,303	1,065,520	I. 65,217
Total	11,032,282	11,957,901	I. 335,619
Coke	404,013	616,370	I. 212,357

Canada took this year 6,089,129 tons of coal, or 77.2 per cent of the total exports. The coke went chiefly to Mexico and Canada.

United States Coal Imports—Imports of coal and coke into the United States, eight months ended Aug. 31, long tons:

	1908.	1909.	Changes.
Anthracite	15,023	3,145	D. 11,878
Bituminous	1,015,301	747,534	D. 267,767
Total coal	1,030,324	750,679	D. 279,645
Coke	81,492	121,494	I. 40,002

Canada furnished this year 626,656 tons of coal and nearly all the coke; Australia, 102,223 tons of coal. Imports are chiefly on the Pacific Coast and in the Northwestern States—Montana, Idaho and Washington.

Iron Trade Review

New York, Oct. 20—The iron and steel markets continue active, although buying in some directions has been discouraged, owing to the crowded condition of the mills and the difficulty in getting material promptly.

Pig iron shows a heavy demand for bessemer and basic in the Central West and for foundry in eastern territory. Prices are strong, and furnaces are inclined to make advances, but are rather held in check by the prospect of imports of foreign iron.

In finished material some liberal orders for railroad equipment are coming in and there is a call for bridge work. Plates and bars are also in demand, and the sales to consumers by the jobbing interests are reported heavy.

Lake Iron Ore—Shipments of iron ore from the Lake Superior region, as reported by the Cleveland *Iron Trade Review*, were 7,050,985 tons. The shipments for the season to Oct. 1 were as follows, by ports, in long tons:

Port.	1908.	1909.	Changes.
Escanaba	2,006,192	4,002,796	I. 1,996,604
Marquette	871,107	1,979,517	I. 1,108,410
Ashland	1,521,146	2,422,004	I. 900,858
Superior	2,264,443	4,743,498	I. 2,479,055
Duluth	6,201,121	9,847,177	I. 3,646,056
Two Harbors	3,766,951	6,644,541	I. 2,877,590
Total	16,630,960	29,639,533	I. 13,008,573

The total shipments were only 919,673 tons below the record movement of two years ago.

Baltimore

Oct. 19—Exports for the week included 689,200 lb. steel billets to Liverpool. Imports included 14,500 tons iron ore from Cuba; 7050 tons manganese ore from India; 5590 tons cupreous pyrites from Spain; 405 tons ferromanganese from Liverpool.

Birmingham

Oct. 19—Pig-iron prices in the Southern territory show additional strength. A peculiar situation was noted in the Birmingham district during the past week. A meeting of the iron manufacturers and coal operators was held and expressions given deprecating the runaway iron market, the sudden advancing of the quotations and the wide publicity being given to the advancing market. At the same time there were statements made that

prices for the first quarter of next year had gone to $15.50. The inquiries are still active, though selling has been halted a little by the advancing prices. However, $15 per ton, No. 2 foundry, appears to be a strong level and while furnace companies are willing to sell large quantities of iron at that price for delivery during the first half of the coming year there is no inclination to sell at a lower price.

The industries employing iron and steel in their operation in the Southern territory are all doing well, the consumption of iron showing improvement right along.

Chicago

Oct. 19—The iron market is quieter, but sales of foundry iron seem to be steady, while inquiries continue to come in. Southern No. 2 is $15 Birmingham, or $19.50 Chicago, but makers are talking of $15.50, and are not willing to take anything beyond first quarter. Northern is firm and $19.50 is asked for first-quarter deliveries. Most sales are for first quarter, melters being generally supplied up to the end of the year, though a few small orders are still coming here and there.

Iron and steel products are in demand, especially railroad supplies. Coke is in good supply at $4.85 for Connellsville.

Philadelphia

Oct. 20—Eastern pig-iron makers report a continuance of demand for all kinds of pig iron from the general run of the trade. The surpassing activity in western Pennsylvania is reflected here in the unwillingness of most producers to make remote-delivery contracts. Some large consumers in the New England and Middle States are pressing their side of the case urgently and would like to arrange definitely for winter and early spring deliveries. Makers are unyielding on this point.

Malleable iron is being purchased frequently. The hardware industry is in vigorous condition. Prices are quoted today at $19 for No. 2X for Northern and Southern gray forge $17.75.

Scrap—The supply of heavy cast scrap is out. Supplies of machinery and yard scrap are low. Yardmen have orders for December delivery. Railroad scrap is quoted 50c. higher.

Pittsburg

Oct. 19—The iron and steel market shows a quieter condition all around. Except in a few products, notably sheets and tinplates, the mills are averse at this time to making heavy engagements for next year, but as a matter of fact they are already pretty well sold for first quarter on bars, plates and shapes. It is in sales to jobbers in particular that the producers are conservative, apparently feeling that there is danger of excess commitments. While general buying is lighter, the trend of railroad buying is distinctly on the increase.

While the market is quiet the mills are extremely busy. Specifications have been pouring in at a rapid rate. The mills are all working for maximum outputs.

Sheets and tinplates are being sold for delivery to April 1, but in rather a conservative way. Tinplates are $3.50 for 100-lb. cokes, sheets 2.30c. for No. 28 gage black and 3.35c. for galvanized; bars are at a minimum of 1.40c. and plates and shapes at a minimum of 1.50c., for the most desirable specifications and deliveries, but the average market prices are quotable at $1 a ton above these minima.

Pig Iron—Sales of bessemer pig iron continue large. The Republic Iron and Steel Company has taken 20,000 tons for first quarter, from the Bessemer Pig Iron Association. Two local interests have taken 5000 and 7000 tons respectively for this quarter; a merchant-furnace interest has picked up two lots aggregating about 15,000 tons for this quarter and a local steel interest has picked up several small lots of prompt, aggregating between 5000 and 10,000 tons, all these transactions being on the basis of $19, Valley, 50c. above the sales noted in last report, and the market seems to be making rapidly for the $20 level. There is heavy inquiry for basic, but business is slow in closing. Basic is quotable at $17.25, Valley, for prompt, and $17.50 for delivery through the year, with clear prospects of an advance. Foundry iron has been dull, but this does not retard furnaces from marking up prices. It is difficult to do $17, Valley, on No. 2 foundry iron, even for early shipment, while odd lots have sold up to $17.50 and some furnaces are asking $18. Consumers appear to be well covered. Consumption by foundries has hung behind consumption for steel-making purposes.

Steel—Crude steel is scarce and it is difficult to quote prices. It is a question of getting deliveries rather than of naming prices. Nominally billets can be quoted at about $26, maker's mill, Pittsburg district, with sheet bars at $27@28 at mill.

Ferromanganese—The market is stronger, with prompt quoted at $43. November and December $43.50@44 and first quarter at $44.50@45, f.o.b. Baltimore, freight to Pittsburg being $1.05 per ton.

St. Louis

Oct. 18—The pig iron market is very brisk this week, though the activity is confined almost entirely to selling for the first half of next year. There is practically nothing left for delivery this year and very little for the first quarter. The market is strong at $15.50 per ton, Birmingham or $19.25 St. Louis. Floods of inquiries were received this week, among which were some large ones. The Scullin-Gallagher Iron and Steel Company, of this city, issued a circular calling for bids on 10,000 tons of pig iron.

Metal Markets

New York, Oct. 20—The metal markets have been rather irregular. Advancing prices in some metals are balanced by weakness in others.

Gold, Silver and Platinum

UNITED STATES GOLD AND SILVER MOVEMENT

Metal.	Exports.	Imports.	Excess.
Gold:			
Aug. 1909	$ 9,230,000	$ 5,349,000	Exp. $ 3,881,000
" 1908	6,597,101	4,257,255	" 2,339,846
Year 1909	89,726,149	28,754,477	" 60,971,642
" 1908	64,960,348	33,614,330	" 31,346,018
Silver			
Aug. 1909	4,910,000	3,191,000	Exp. 1,719,000
" 1908	4,130,853	3,194,426	" 936,427
Year 1909	39,319,032	29,889,145	" 9,429,887
" 1908	34,556,144	27,355,355	" 7,200,789

Exports from the port of New York, week ended Oct. 16: Gold, $110,000, chiefly to Brazil; silver, $560,800, to London and Paris. Imports: Gold, $193,515, from Haiti, South America, Japan and Australia; silver, $122,717, chiefly from Mexico.

Gold output in the Transvaal in September is reported by cable at 606,385 oz. fine, being 5152 oz. less than in August, and 18,751 oz. more than in September, 1908. For the nine months ended Sept. 30, the total was 5,159,859 oz. in 1908, and 5,475,374 oz.—or $113,175,981—in 1909; an increase of 315,515 oz., or $6,521,695.

Gold—There was a strong demand for gold on the open market in London and quotations were 77s. 11¾d. per oz. for bars and 76s. 4¾d. per oz. for American coin. The Bank of England took most of the supplies. No exports from New York are noted.

Platinum—The advance continues, and dealers are this week asking $27.75 per oz. for refined platinum and $31.50 per oz. for hard metal. A further advance is anticipated. A consumer contributes the following: The market for platinum is advancing rapidly. We have been quoted within the last 10 days $2.50 higher than we paid for ingot in August. From all sources we receive the same story, that the platinum market is likely to reach high figures within the next few months.

The silver market dropped this week to 23 7/16d. in London, and was quoted weak at this price on Oct. 15, but since then has stiffened. On buying by Chinese banks the price improved to 23 9/16d. and closes steady at 23½d. in London.

Exports of silver from London to the East, Jan. 1 to Oct. 7, as reported by Messrs. Pixley & Abell:

	1908.	1909.	Changes.
India	£ 7,329,163	£4,576,406	D £2,753,757
China	516,400	1,555,200	I. 1,038,800
Straits	112,385	82,800	D 29,585
Total	£ 7,957,948	£6,313,406	D £1,644,542

Receipts for the week, £4000 from the West Indies, and £173,000 from New York; total, £177,000. Exports, £46,000 to India.

SILVER AND STERLING EXCHANGE

Oct	14	15	16	18	19	20
New York....	51	50⅞	50⅞	50⅞	51	51
London.....	23⅞	23⅞	23⅞	23⅝	23⅞	23⅝
Sterling Ex..	4.8605	4.8600	4.8610	4.8640	4.8650	4.8650

New York quotations, cents per ounce troy, fine silver; London, pence per ounce sterling silver, 0.925 fine.

Copper, Tin, Lead and Zinc

	Copper.			Tin.	Lead.		Zinc.
Oct.	Lake, Cts. per lb.	Electrolytic, Cts. per lb.	London, £ per ton.	Cts. per lb.	New York, Cts. per lb.	St. Louis, Cts. per lb.	St. Louis, Cts. per lb.
14	12⅞ @13⅛	12⅝ @12¾	57⅝	30¾	4.32½ @4.35	4.20 @4.22½	5.95 @6.00
15	12⅞ @13⅛	12⅝ @12¾	57⅝	30½	4.32½ @4.35	4.20 @4.22½	6.00 @6.05
16	12⅞ @13⅛	12⅝ @12¾	....	30½	4.32½ @4.35	4.20 @4.22½	6.02½ @6.07½
18	12⅞ @13⅛	12⅝ @12¾	57¾	30⅝	4.32½ @4.35	4.20 @4.22½	6.10 @6.15
19	12⅞ @13⅛	12⅝ @12¾	57¾	30⅝	4.32½ @4.35	4.20 @4.22½	6.15 @6.20
20	12⅞ @13⅛	12⅝ @12¾	57⅝	30⅝	4.32½ @4.35	4.20 @4.22½	6.15 @6.20

London quotations are per long ton (2240 lb.) standard copper. The New York quotations for electrolytic copper are for cakes, ingots and wirebars, and represent the bulk of the transactions made with consumers, basis, New York, cash. The prices of casting copper and of electrolytic cathodes are usually 0.125c. below that of electrolytic. The quotations for lead represent wholesale transactions in the open market. The quotations on spelter are for ordinary Western brands; special brands command a premium.

STATISTICS OF COPPER.

Month.	United States Production.	Deliveries, Domestic.	Deliveries for Export.
I	112,135,200	51,862,624	38,199,797
II	101,700,817	43,578,118	30,968,496
III	117,058,664	48,871,964	59,191,043
IV	114,574,292	47,546,010	65,110,111
V.....	118,356,146	61,163,325	70,542,753
VI	116,567,493	60,591,116	70,966,457
VII	118,277,603	75,520,083	75,018,974
VIII	120,597,244	59,614,207	48,482,504
IX	118,926,149	52,105,955	50,057,777
X			
XI			
XII			

VISIBLE SUPPLIES

	United States	Europe	Total
I	122,487,366	124,746,180	247,074,546
II	144,190,065	118,574,100	262,764,165
III	156,884,748	117,140,800	280,025,548
IV	160,[illegible]	115,094,000	275,[illegible]
V	165,[illegible]	114,[illegible]	279,[illegible]
VI	163,[illegible]	125,[illegible]	289,[illegible]
VII	154,[illegible]	150,[illegible]	305,[illegible]
VIII	132,[illegible]	151,[illegible]	284,[illegible]
IX	133,[illegible]	197,[illegible]	330,[illegible]
X	154,[illegible]	206,[illegible]	361,[illegible]
XI			
XII			

Figures are in pounds of fine copper. U. S. production includes all copper refined in this country, both from domestic and imported material. Visible stocks are those reported on the first day of each month, as brought over from the preceding month.

Copper—The market is quiet. Domestic manufacturers are busy and consumption is good, but in view of the statistical position they continue to buy from hand to mouth, and operate with smaller stocks of copper than usual. Producers, on the other hand, are not pressing sales. The bulk of the business since Oct. 13 has been for delivery in Europe, on which the sellers have realized somewhat less than upon sales for delivery in this country. For domestic business electrolytic copper has been freely offered at 12⅞c., delivered, 30 days, or a little less than 12¾c., cash, New York, and sales have been made at that figure. A moderate amonut of Lake copper has been sold at around 13c. The market closes unchanged at 12⅞@13⅛c. for Lake copper, and 12⅝@12¾c. for electrolytic copper in cakes, wirebars, or ingots. Casting copper is quoted nominally at 12½@12¾ cents.

Advices from consumers of copper in this country indicate that the business of the wire drawers is still lagging. On the other hand, business in the brass and sheet trade is booming. The mills at Waterbury are working overtime, and are said to be having some difficulty in keeping up to the market. They are said to be well stocked with the raw material.

Copper sheets are 17@18c., base for large lots. Full extras are charged, and higher prices for small quantities. Copper wire is 14½c. base, carload lots at mill. Business continues on a good scale.

The standard market in London has fluctuated within narrow limits. On Monday, it had advanced to £57 18s. 9d. for spot, but owing to the higher rates for money some realizations took place, and in consequence prices declined and at the close are £57 10s. for spot, and £58 10s. for three months.

Refined and manufactured sorts we quote: English tough, £61 10s.; best selected, £60 10s.@£61 10s.; strong sheets, £72 10s.@£73 10s. per ton.

Exports of copper for the week from New York and Philadelphia were 4413 long tons. Our special correspondent gives the exports from Baltimore at 789 tons of copper.

Tin—The London market has developed rather a firm tone, and speculation has become more extended. While a bearish element in the market is making use of the large shipments from the Straits to depress prices there, they have not succeeded to a very large extent; the bulls, on the other hand, point to the large and constantly increasing consumption in this country in defence of their position. The London market closes at £138 2s. 6d. for spot, and £139 12s. 6d. for three months. A fair business has been done in this market, quotations at the close being about 30¾@30⅞ cents.

The Dutch Trading Company, with the approval of the government, gives notice that the quantity of Banka tin to be sold next year will be about 225,000 pikuls.

Messrs. Ricard & Freiwald estimate the production of tin entering into the usual estimate of stocks as follows, for the 12 months ended Oct. 31, 1909: Straits, 58,971; Banka and Billiton, 14,093; Australia, 5204; total, 78,268 long tons. Deliveries for same period: London, 15,789; other Europe, 21,650; United States, 38,500; total, 75,939 tons, or 2329 tons less than supplies. This does not include Cornwall and Bolivian tin.

Lead—The market is quiet and unchanged at 4.32½@4.35c. New York, and 4.20@4.22½c. St. Louis.

The London market has been steady at £13 5s. for Spanish, and £13 7s. 6d. for English lead.

Spelter—The demand for this metal, both for galvanizing and for brass-making, has continued to increase, and during the week Oct. 14-20, there has been a large business from day to day, the aggregate amounting to many thousands of tons. With this demand and the strong position of the smelters, who are well sold ahead, the market gradually advanced and closes strong at 6.15@6.20c., St. Louis, and 6.30@6.35c., New York. Specials command a premium of 0.15@0.25 cent.

New York quotations for spelter on Oct. 14 were 6.10@6.15c.; Oct. 15, 6.15@6.20c.; Oct. 16, 6.17½@6.22½c.; Oct. 17, 6.25@6.30c.; Oct. 19 and 20, 6.30@6.35 cents.

The London market is unchanged at £23 5s. for good ordinaries and £23 10s for specials.

Base price of sheet zinc has been advanced to 8c. per lb., f.o.b. La Salle-Peru, Ill., less 8 per cent. discount.

Silesian Zinc Market—Paul Speier writes from Breslau, Germany, under date of Sept. 30, that the market has been strong specially on account of the demand from the British galvanizers. Exports have been heavy. The price is 47 marks per 100 kg. for ordinary brands, f.o.b works in Silesia—equivalent to 4.6c. per lb. Special brands bring 1 mark more. Zinc sheets are also active, and prices are 56 @61 marks per 100 kg. at works—equal to 6.3c. per lb. Zinc dust is quoted at 42 marks per 100 kg., boxed and delivered at Stettin, which is equivalent to 4.5c. per lb. Sales of dust have been good.

Other Metals

Antimony—Business is improving and there are more inquiries, so that the market shows a better tone. Prices have been better adjusted, and Cookson's is quoted at 8.5@8.6c. per lb., Hallett's, 8¼@8¼c., U. S., 7.5@8c.; outside brands, 7⅝@7¾c. Stocks of outside brands have been generally cleared out.

Aluminum—There is no change in the market. No. 1 ingots are 20@23c. per lb. in large lots, the American maker holding to the higher figure.

Quicksilver—Demand continues strong and prices are again higher. In New York the quotation is $47@48 per flask of 75 lb., for large lots, while jobbers quote 66@67c. per lb. for small quantities. San Francisco quotations are $45@46 for domestic orders; $2 less for export. The London price is £8 12s. 6d. per flask, with jobbers quoting the same price.

Magnesium—The price of pure metal is $1.50 per lb. for 100-lb. lots f.o.b. New York.

Nickel—Large lots, contract business, 40@45c. per lb. Retail spot, from 50c. for 2000-lb. lots, up to 55c. for 500-lb. lots. The price for electrolytic is 5c. higher.

Cadmium—Current quotations are 75c. per lb. in 100-lb. lots at Cleveland, Ohio. In Germany 450@475 marks per 100 kg., at factory in Silesia.

Imports and Exports of Metals

Exports and imports of metals in the United States, eight months ended Aug. 31, are reported as follows, in the measures usual in the trade.

Metals:	Exports.	Imports.	Excess.
Copper, long tons	211,047	91,511	Exp. 119,536
Copper, 1908....	215,361	51,800	Exp. 163,561
Tin, long tons....	294	28,454	Imp. 28,160
Tin, 1908.....	156	23,441	Imp. 23,285
Lead, short tons.	64,943	76,189	Imp. 11,246
Lead, 1908.....	47,606	72,061	Imp. 24,455
Spelter, sh. tons.	2,259	5,177	Imp. 2,918
Spelter, 1908....	2,111	504	Exp. 1,607
Nickel, lb.	7,421,687	13,258,622	Imp. 5,836,935
Nickel, 1908.....	7,406,545	11,849,238	Imp. 4,442,593
Antimony, lb.	6,648	6,272,943	Imp. 6,266,295
Antimony, 1908.	.....	5,291,489	Imp. 5,291,489
Platinum, oz.....	.....	72,538	Imp. 72,538
Platinum, 1908. .	.....	19,822	Imp. 19,822
Quicksilver, lb	181,865	.....	Exp. 181,865
Quicksilver, '08	109,936	.....	Exp. 109,936
Aluminum, value	$288,290	.....	Exp. $288,290
Aluminum, 1908	267,524	.....	Exp. 267,524
Ores, etc.:			
Zinc oxide, lb. ..	18,682,683	.....	Exp.18,682,683
Zinc oxide, '08..	16,838,200	.....	Exp.16,838,200
Zinc dross, lb....	12,227,995	.....	Exp.12,227,995
Zinc dross, '08..	12,859,411	.....	Exp.12,859,411
Zinc ores, lg tons	9,092	80,105	Imp. 71,013
Zinc ores, 1908.	18,887	30,305	Imp. 11,418
Antim'y ores, lb.	504	3,386,208	Imp. 3,385,704
Ant. ores, 1908.	.....	974,732	Imp. 974,732
Chrome ore, tons	24,891	.....	Imp. 24,891
Chrome ore, '08	.....	.....	.....

Copper, lead and nickel include the metal contents of ores, matte, bullion, etc. The exports given include reëxports of foreign material. Chrome ore was not reported separately last year.

Zinc and Lead Ore Markets

Joplin, Mo., Oct. 16—The highest price paid for zinc ore was $52.80 for one bin of ore that sold on a base price of $49.50 per ton of 60 per cent. zinc, and assayed 63.30 per cent. metallic zinc. All other ore sold from $49 down to $47 per ton of 60 per cent. zinc. Silicate ore was in unusually strong demand, the buyers of this ore scrapping for it until it was advanced out of proportion to the general market. One bin of 38 per cent. ore sold on a straight bid of $29, and base offerings were $27@28 per ton of 40 per cent. zinc. The average price, all grades, was $45.26. Lead ore sold as high as $55 on a straight bid and $54.50 per ton of 80 per cent. lead was paid. The average price, all grades, was $54.60 per ton.

Upward of 9000 tons of zinc ore has accumulated in the bins, nearly 4000 tons of which is being held for a base price of $50 or better. Half of the remaining stock is sold, but delivery is delayed from lack of cars.

SHIPMENTS, WEEK ENDED OCT. 16.

	Zinc, lb.	Lead, lb.	Value.
Webb City-Carterville	3,720,070	611,820	$104,246
Joplin.....	1,983,610	154,840	52,321
Aurora.....	806,330	14,640	15,200
Prosperity.....	241,680	273,420	13,198
Duenweg.....	406,960	62,240	11,274
Galena.....	417,170	67,030	11,240
Alba-Neck.....	311,270	58,070	9,348
Spurgeon.....	297,300	89,960	8,377
Carthage.....	328,220	.....	8,205
Granby	502,300	9,000	7,188
Carl Junction.....	200,700	.....	5,118
Badger.....	202,470	.....	4,859
Oronogo.....	.....	170,920	4,555
Cave Springs.....	126,640	16,590	3,409
Sarcoxie.....	143,240	.....	2,608
Quapaw.....	54,550	2,840	1,249
Totals	9,742,510	1,531,370	$262,392

42 weeks.....471,675,810 71,120,990 $11,234,784

Zinc value, the week, $220,578; 42 weeks, $9,295,200
Lead value, the week, 41,814; 42 weeks, 1,939,584

MONTHLY AVERAGE PRICES.

Month.	Zinc Ore. Base Price. 1908.	1909.	Zinc Ore. All Ores. 1908.	1909.	Lead Ore. All Ores. 1908.	1909.
January....	$37.60	$41.25	$35.56	$38.46	$46.88	$52.17
February..	36.63	36.94	34.92	34.37	49.72	50.50
March...	36.19	37.40	34.19	34.71	49.90	50.82
April.....	35.40	38.63	34.08	37.01	52.47	55.63
May.....	34.19	40.06	33.39	37.42	56.05	56.59
June.....	33.06	44.15	32.07	40.35	60.48	57.52
July	34.55	43.06	31.67	41.11	59.90	53.74
August	36.53	48.25	33.42	44.54	60.34	57.60
September ..	37.63	47.70	34.44	44.87	54.59	56.11
October.....	35.95	.....	33.28	.....	52.63	.....
November...	39.13	.....	35.02	.....	54.53	.....
December...	42.75	.....	39.63	.....	49.68	.....
Year.....	$36.63	.....	$34.31	.....	$53.93	.....

NOTE—Under zinc ore the first two columns give base prices for 60 per cent. zinc ore; the second two the average for all ores sold. Lead ore prices are the average for all ores sold.

Platteville, Wis., Oct. 16—The base price paid this week for zinc ore was $48@49 per ton. The base price paid for lead ore was $55@56 per ton.

SHIPMENTS, WEEK ENDED OCT. 16.

Camps.	Zinc ore, lb.	Lead ore, lb.	Sulphur ore, lb.
Benton.....	473,700	62,800	65,700
Cuba City.....	413,130	.....	118,785
Galena.....	320,000	.....	.....
Hazel Green....	304,800	.....	.....
Platteville	214,700	.....	309,500
Highland	193,100	.....	.....
Days Siding.....	160,000	.....	.....
Shullsburg.....	150,000	.....	.....
Linden	126,000	.....	.....
Livingston.....	80,000	.....	.....
Total.....	2,435,430	62,800	493,985
Year to Oct. 16....	108,760,085	6,896,375	10,681,830

In addition to the above there was shipped to the American Zinc Ore Separating Company, 745,900 lb. and to the Joplin Separator Works, 421,010 lb. zinc concentrates.

Petroleum

Exports of mineral oils from the United States, nine months ended Sept. 30, in gallons:

	1908.	1909.
Crude petroleum	70,836,199	107,551,376
Naphthas.....	26,529,833	47,396,995
Illuminating oil.....	859,087,807	781,079,734
Lubricating and paraffin..	105,316,678	109,258,012
Residuum.....	55,559,723	73,512,494
Total.....	1,117,930,260	1,119,398,611

The total increase in exports this year was 1,468,351 gal., or 0.1 per cent.

Chemicals

Oct. 20—Conditions are unchanged from last week. Contract deliveries are fair, but spot business slow.

Copper Sulphate—Business is quiet and prices are again a shade lower, at $3.90 per 100 lb. for carload lots, and $4.20 per 100 lb. for smaller parcels.

Arsenic—Buyers are holding back for lower prices, while sellers are inclined to hold for an improvement. White arsenic is quoted at 2.70@2.75c. for spot, and 2.87½c. for 1910 delivery.

Nitrate of Soda—The market is quiet and quotations steady at 2.10c. per lb. for both spot and futures.

Imports and Exports—Imports and exports of chemicals and raw materials in the United States, eight months ended Aug. 31:

	Imports.	Exports.	Excess.
Copper sulph. lb.	2,122,250	E.	2,122,250
Bleach, lb	56,883,701	13,964	I. 56,869,737
Potash salts, lb..	246,349,166	1,867,664	I. 244,481,502
Soda salts, lb....	10 241,570	445,205	I. 9,796,365
Acetate lime, lb.	50,358,623	E.	50,358,623
Nit. of soda, tons	253,542	6,240	I. 247,302
Phosphates, tons	10,277	737,065	E. 726,788
Sulphur, tons....	20,086	13,686	I. 6,400
Pyrites, tons.....	449,387	.....	I. 449,387
Magnesite, lb....	27,536,255	206,535	I. 27,329,720

Estimating sulphur contents of pyrites, total imports of sulphur this year were 199,841 tons. Exports include reëxports of foreign material. Magnesite figures are for July and August only.

Mining Stocks

New York, Oct. 20—There has been a good deal of activity on the Stock Exchange, but rather of a professional kind. Quotations have hardly held their own, but have varied from day to day in both directions. There was quite a sharp rise yesterday, but it was followed by an equally sharp decline, and the close was rather heavy. Higher rates for money had rather a depressing effect and the Bank of England increase to a 4-per cent. rate was an unfavorable factor.

There was one sale of Homestake of South Dakota, 100 shares changing hands at $91.25 per share.

On the Curb the principal activity was in coppers, Cumberland-Ely and Giroux

being the leaders. Quotations varied, but only to a moderate extent. Cobalt stocks were rather heavy and the Nevada gold stocks were not active.

Boston, Oct. 19—The talk of a copper combination has given stocks quite a smart rise. There is not so much activity nor is public interest yet aroused, but sentiment is considerably improved. There has been little in the way of news. Isle Royale had a smart rise which amounted to $4, putting the price up to $27, but it reacted to $24.50. Atlantic moved up $2 in sympathy, touching $12.25, while Michigan, on the other hand, broke from $9 to $5.75 on the practical closing down of the mine. Much surprise and disappointment are felt in this action as a $2 assessment was paid only last September. The explanation is that the money was to pay off floating debt. The company's mill is about 90 per cent. completed.

North Butte had a $2 advance to $60.50, but subsequently reacted to $57.50, under manipulative orders. Butte Coalition is selling on a higher level, being up $2.25 to $27.12½. Buying of the latter is said to be for good account.

Other strong stocks have been American Zinc and U. S. Coal and Oil. The former is at the highest this year, having risen $2.37½ to $36.25.

Curb business shows quite an improvement and at advancing prices. Ely stocks appear to be the favorites. Boston & Ely has advanced $1.25 to $2.87½. Ely Consolidated is up from 34 to 64c. per share.

STOCK QUOTATIONS

NEW YORK Oct. 20

Name of Comp.	Clg.
Alaska Mine	‡.11
Amalgamated	[illegible]
Anaconda	47⅝
Balaklala	‡2 1/16
British Col. Cop.	6¼
Buffalo Mines	3⅝
Butte Coalition	26½
[illegible] Silver	‡[illegible]
Cum. Ely Mining	7[illegible]
Davis-Daly	[illegible]
Dominion Cop	7
Douglas Copper	[illegible]
El Rayo	2½
Florence	2
[illegible] Cobalt	‡.32
[illegible] Creek	‡.05
[illegible]	[illegible]
[illegible] Hill	[illegible]
[illegible] Con	[illegible]
[illegible]	‡[illegible]
[illegible]	‡[illegible]
[illegible]	‡[illegible]
[illegible]	2
[illegible] Exp	21[illegible]
[illegible]	‡15
[illegible]	8[illegible]
[illegible]	[illegible]
[illegible] Copper	15[illegible]
[illegible]	[illegible]
[illegible] Co. of Am.	[illegible]
[illegible] of C. R.	[illegible]
[illegible]	1[illegible]
[illegible] M. & S.	1[illegible]
[illegible] M. & S.	[illegible]
[illegible] Mines	11[illegible]
[illegible] Hundred	[illegible]
[illegible] Queen	.30
[illegible]	[illegible]
[illegible] Cop'r	35[illegible]
[illegible]	[illegible]
[illegible] Copper	[illegible]
[illegible] Apex	‡[illegible]
[illegible] Copper	[illegible]
[illegible] Gold	[illegible]

‡Last quotation.

BOSTON Oct. 20

Name of Comp.	Clg.
Adventure	5
Allouez	59
Am. Zinc	35¾
Arcadian	4¼
Arizona Com.	44
Atlantic	10½
Boston Con	14¼
Calumet & Ariz.	100
Calumet & Hecla	662
Centennial	38½
Copper Range	80¼
Daly West	7[illegible]
East Butte	11
Franklin	16½
Greene-Can	11⅛
Hancock	11
Isle Royal	25
Keweenaw	[illegible]
La Salle	14½
Mass	6[illegible]
Michigan	6[illegible]
Mohawk	[illegible]
Nevada	[illegible]
North Butte	[illegible]
Ojibway	8
Old Colony	50
Old Dominion	52[illegible]
Osceola	156
Parrot	[illegible]
Quincy	89
Rhode Island	4¾
Shannon	15[illegible]
Superior	[illegible]
Superior & Bost.	14[illegible]
Superior & Pitts.	15[illegible]
Tamarack	70
Trinity	10[illegible]
U. S. Smg. & Ref.	56[illegible]
U. S. Sm. & Re., pd.	53[illegible]
Utah Con.	43
Victoria	[illegible]
Winona	[illegible]
Wolverine	148
Wyandotte	2[illegible]

‡Last quotation.

N. Y. INDUSTRIAL

Am. Agri. Chem.	46¼
Am. Smelt. & Ref.	97⅞
Am. Sm. & Ref., pf.	112
Colo. Fuel & Iron.	44¾
Federal M. & S. pf.	‡80
National Lead	88¾
National Lead, pf.	110½
Pittsburg Coal	20½
Republic I. & S.	46½
Republic I. & S., pf.	105¼
Sloss-Sheffield	92¾
Standard Oil	685
U. S. Steel	90[illegible]
U. S. Steel, pf.	127[illegible]
Va. Car. Chem.	‡45¼

BOSTON CURB

	Low
Ahmeek	210
Chemung	16¼
Chino	7
Gila	7¾
Indiana	6
Mason Valley	2
Ray Central	2¼
Ray Con	18[illegible]
San Antonio	8¼
Yuma	1¾

Furnished by Hornblower & Weeks, N. Y.

ST. LOUIS Oct. 16

N. of Com.	High.	Low.
Adams	.40	.30
Am. Nettie.	.10	.07
Center Cr'k	1.80	1.60
Cent. C. & C.	84.00	83.00
C. C. & C. pf.	83.00	82.00
Cent. Oil	110.00	100.00
Columbia	9.00	7.00
Con. Coal	18.00	17.00
Doe Run	115.00	105.00
Gra. Bimet.	27	23
St. Joe	12.50	11.00

LONDON Oct. 20

Name of Com.	Clg.
Dolores	£1 5s 0d
Stratton's Ind.	0 3 3
Camp Bird	1 7 9
Esperanza	2 17 6
Tomboy	0 19 6
El Oro	1 5 6
Oroville	0 11 3

Cabled through Wm. P. Bonbright & Co., N. Y.

NEVADA STOCKS. Oct. 20.
Furnished by Weir Bros. & Co., New York.

Name of Comp.	Bid.
COMSTOCK STOCKS	
Belcher	1.15
Best & Belcher	.85
Caledonia	.64
Chollar	.26
Comstock	.33
Con. Cal. & Va.	1.80
Crown Point	1.30
Exchequer	‡.43
Gould & Curry	.30
Hale & Norcross	.65
Mexican	1.90
Ophir	2.20
Overman	.64
Potosi	.63
Savage	.58
Sierra Nevada	.73
Union	.95
Utah	.14
Yellow Jacket	1.50
TONOPAH STOCKS	
Belmont	.75
Extension	.50
Golden Anchor	...
Jim Butler	.11
MacNamara	.26
Midway	.16
Montana	.85
North Star	.02
Tono'h Mine of N.	6.62
West End Con	.25
GOLDFI'D STOCKS	
Adams	.01
Atlanta	.10
Blue Bell	.02
Booth	.10
C. O. D. Con	.06
Columbia Mt.	.06
Comb. Frac.	.61
Cracker Jack.	.01
Dia'dfield B. B. C.	.01
Florence	2.75
Goldfield Belmont	.04
Goldfield Daisy	.08
Great Bend	.03
Jumbo Extension	.13
Kendall	.02
Lone Star	.02
May Queen	.04
Oro	.05
Red Hill	.05
Sandstorm	.05

Name of Comp.	Bid.
Silver Pick	.11
St. Ives	.05
Triangle	.01
BULLFROG STOCKS	
Gibraltar	.02
Homestake King.	‡.01
Mont. Shoshone C.	1.37
Tramp Cons	.04½
MISCELLANEOUS	
Cumberland Ely	7.50
Giroux	8.75
Greenwa'r Copper	‡.03
Nevada Con	24.62
Nevada Hills	.60
Navada Smelting	.75
Nevada Wonder	.55
Nevada-Utah	1.56¼
Penn-Wyoming	...
Pittsburgh S. Pk.	.60
Ray Central	2.18
Ray Con	18.00
Round Mt. Sphinx	.06

COLO. SPRINGS Oct. 15

Name of Comp.	Clg.
Acacia	.07
C. C. Con	.03
Doctor	.08¾
Elkton	.72
El Paso	.61½
Findlay	.10
Gold Dollar	.11
Gold Sovereign	.04½
Isabella	17[illegible]
Jack Pot	‡.08½
Jennie Sample	.07¾
Jerry Johnson	‡.06⅜
Lexington	‡.01¾
Mary McKinney	‡.46¼
Old Gold	.04⅝
Pharmacist	.03[illegible]
Portland	.92
U. G. M.	.07½
Vindicator	.72
Work	‡.07

Assessments

Company	Delinq.	Sale	Amt.
Alameda M. & M., Ida	Oct. 7	Nov. 4	$0.005
Black Traveler Copper, Ida.	Sept. 27	Oct. 27	0.005
Caledonia, Nev.	Oct. 21	Nov. 11	0.10
Copper Mt. M. & D., Ida	Aug. 2	Nov. 2	0.005
Gold Mt., Utah	Sept. 15	Nov. 15	0.0025
Hypothek, Ida	Sept. 30	Dec. 1	0.005
Idaho North Star, Ida	Oct. 25	Nov. 15	0.01
Julia Con., Nev	Oct. 14	Nov. 8	0.03
Missoula Copper, Ida	Oct. 4	Dec. 6	0.01
Pawhattan, Ida	Oct. 7	Nov. 8	0.001
San Antonio Copper, Mex	Dec. 1		1.00
Sheba G. & S. Mining, Utah	Sept. 28	Oct. 30	0.05
Sierra Nevada, Nev	Oct. 12	Nov. 3	0.10
Silver King Con., Utah	Oct. 4	Oct. 23	0.10
Silver Queen, Utah	Oct. 7	Nov. 15	0.0025
Silver Spray, Ida	Oct. 14	Nov. 15	0.0005
Square Deal M. & M., Ida	Oct. 14	Nov. 4	0.001
United Silver Lead, Ida	Sept. 21	Nov. 20	0.001
St. Louis, Nev	Oct. 22	Nov. 12	0.01
Utah, Nev	Oct. 26	Nov. 16	0.05
Wabash, Utah	Oct. 11	Oct. 30	0.05

Monthly Average Prices of Metals

SILVER

Month.	New York. 1908.	New York. 1909.	London. 1908.	London. 1909.
January	55.678	51.750	25.738	23.834
February	56.000	51.472	25.855	23.706
March	55.365	50.468	25.570	23.227
April	55.505	51.428	25.133	23.708
May	52.795	52.905	24.377	24.343
June	53.663	52.538	24.760	24.166
July	53.115	51.043	24.514	23.519
August	51.683	51.125	23.858	23.588
September	51.720	51.440	23.877	23.743
October	51.431	......	23.725	......
November	49.647	......	22.933	......
December	48.766	......	22.493	......
Total	52.864	......	24.402	.....

New York, cents per fine ounce; London, pence per standard ounce.

COPPER

	NEW YORK.				LONDON.	
	Electrolytic		Lake.			
	1908.	1909.	1908.	1909.	1908.	1909.
January	13.726	13.893	13.901	14.280	62.386	57.688
February	12.905	12.949	13.098	13.295	58.786	61.198
March	12.704	12.387	12.875	12.826	58.761	56.231
April	12.743	12.56¼	12.928	12.93¾	58.331	57.363
May	12.598	12.893	12.788	13.238	57.387	59.338
June	12.675	13.214	12.877	13.548	57.842	59.627
July	12.702	12.880	12.933	13.363	57.989	58.556
August	13.462	13.007	13.639	13.296	60.500	59.393
September	13.388	12.870	13.600	13.210	60.338	59.021
October	13.354	......	13.646	......	60.139	....
November	14.130	......	14.386	......	63.417	......
December	14.111	......	14.411	......	62.943	.....
Year	13.208	......	13.424	......	59.902	.....

New York, cents per pound. Electrolytic is for cakes, ingots or wirebars. London, pounds sterling, per long ton, standard copper.

TIN AT NEW YORK

Month.	1908.	1909.	Month.	1908.	1909.
January	27.380	28.060	July	29.207	29.125
February	28.978	28.290	August	29.942	29.966
March	30.577	28.727	September	28.815	30.293
April	31.702	29.445	October	29.444	
May	30.015	29.225	November	30.348	..
June	28.024	29.322	December	29.154	
			Av. year	29.465	

Prices are in cents per pound.

LEAD

Month.	New York. 1909.	New York. 1909.	St. Louis 1909.	London. 1908.	London. 1909.
January	3.691	4.175	4.025	14.469	13.113
February	3.725	4.018	3.868	14.250	13.313
March	3.838	3.986	3.835	13.975	13.438
April	3.993	4.168	4.051	13.469	13.297
May	4.253	4.287	4.214	12.938	13.225
June	4.466	4.350	4.291	12.600	13.031
July	4.744	4.321	4.188	13.000	12.563
August	4.580	4.363	4.227	13.375	12.475
September	4.515	4.342	4.215	13.125	12.781
October	4.351	......	......	13.375	.....
November	4.330	......	......	13.538	.....
December	4.213	......	......	13.156	......
Year	4.200	......	......	13.439	.....

New York and St. Louis, cents per pound. London, pounds sterling per long ton.

SPELTER

Month	New York 1908.	New York 1909.	St. Louis. 1908.	St. Louis. 1909.	London. 1908.	London. 1909.
January	4.513	5.141	4.363	4.991	20.563	21.425
February	4.788	4.889	4.638	4.739	20.875	21.563
March	4.665	4.757	4.527	4.607	21.075	21.438
April	4.645	4.965	4.495	4.815	21.344	21.531
May	4.608	5.124	4.458	4.974	19.906	21.975
June	4.543	5.402	4.393	5.252	19.000	22.000
July	4.485	5.402	4.338	5.252	19.031	21.969
August	4.702	5.729	4.556	5.579	19.350	22.125
September	4.769	5.796	4.619	5.646	19.563	22.906
October	4.801	....	4.651	......	19.750	...
November	5.059	.....	4.909	......	20.875	......
December	5.137	.....	4.987	......	20.625	.....
Year	4.726	....	4.578	.....	20.163	...

New York and St. Louis, cents per pound. London, pounds sterling per long ton.

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The Instituto Geologico de Mexico

A Commendable Government Undertaking—Purposes, Plans and Present Work of Institute—Investigations of Geologic and Seismic Phenomena

BY JOSE G. AGUILERA*

The Mexican government, realizing the advantages offered to the country by a careful study of its geology, presented before congress on May 26, 1886, through the department of fomento the plans for the formation of a Geological Institute. Its purposes were to be the geological study of the territory and the making known of these studies from a scientific, technical and industrial standpoint; to form and to publish the geological map of the Republic accompanied by a carefully written report; to publish special maps and studies on the most interesting regions of the country, such as mining districts, complex structures, important mountains, etc., and to establish and preserve a geological museum with classified collections which might serve in the preparation of original maps, etc.

In March, 1888, the secretary of fomento, General Carlos Pacheco, furthering the efforts of Antonio del Castillo, obtained from the President of the Republic permission to organize a Geological Commission, which would take charge of the formation of a geological and mining map of the Republic, while congress passed upon the initiative for the organization of the Geological Institute.

BUILDING OF THE INSTITUTO GEOLOGICO DE MEXICO

Work of the Institute

Work was confined at first to the formation of a general geological map, and a mining map of the country. The first of these was designed to give a general idea of the dominant and most important formations, and at the same time to serve as a basis for more perfect and detailed work to be done later on. The mining map was to show the country from an economic standpoint, a thing of great importance owing to the vast number of veins in the land, and the diversity of mineral substances contained by these veins. In the meantime careful and accurate statistical work was being done in order to make known the true value of the country's mineral wealth in a state of exploitation, as well as of that which may claim the initiation of new enterprises and new energies. In 1888, by decree of congress, the formation of the Geological Institute was approved, and, at the beginning of 1891, the Geological Commission that had taken

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charge of the preliminary work was converted into that institute. This is therefore a national institution, created by a decree of congress, established in 1891 and dependent on the department of fomento, its object being the permanent geological service of the Republic.

This staff is subdivided for the performance of its duties in nine sections as follows: (1) Mineralogy and petrography; (2) General geology; (3) Stratigraphical geology; (4) Paleontology; (5) Economic geology; (6) Chemistry and metallurgy; (7) Topography; (8) Drawing; (9) Administration.

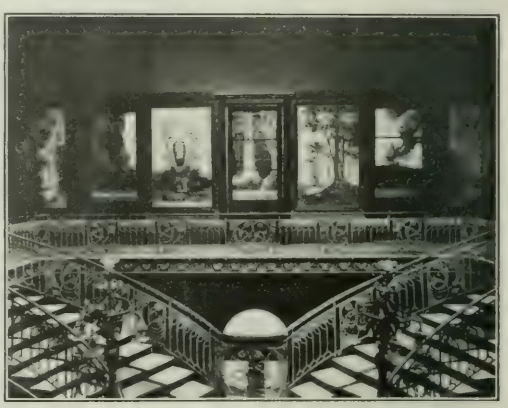
THE GEOLOGICAL MAP.

[illegible] the formation of the detailed geological map the work accomplished by the Geographical Commission is available, in the form of the topographical sheets prepared and published by that commission on a scale of 1:100,000. These sheets are then completed and corrected by the [illegible] points. But for the [illegible] portant in the mapping of formations; by mapping accurately the contour lines to give an exact idea of the geographical relief; and by constructing a first-class triangulation system, to cover the area to be studied, based on the astronomical determinations of the Geographical Commission. Upon this first-class triangulation, a secondary one is based, and from the latter the detail work is started, following water courses and ridges and determining locations by direction and distance, and elevations with the aneroid.

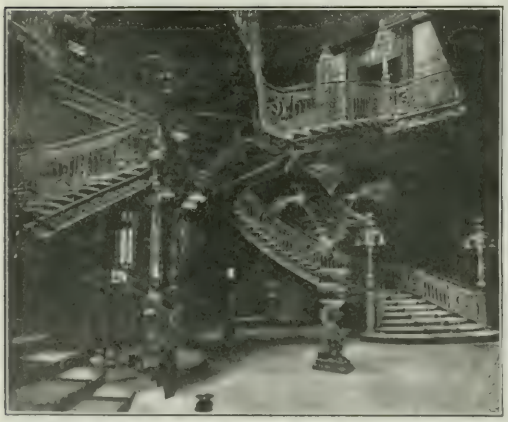
Upon the corrected sheets the rocks of the various formations are mapped and all points where rocks, minerals or other substances of economic importance are found, are indicated. These maps which give a general idea of the geology, are accompanied by sections, profiles and views that give a clearer notion of the appearance and structure of the ground, and by other maps indicating the possible or actual industrial application of the rocks. On the topographic sheets are indicated springs, wells and water currents, with the catchment areas, and advice which is thought will lead to the better usage of the waters. These hydrographic sheets have also all the known data on underground waters, and all that can be said on the courses and feed sources of said waters.

The detailed geological map will, therefore, contain all information relative to the ground which can be utilized and will thus show ultimately the natural elements of wealth in the Republic. It will be published in 1101 sheets to the scale of 1:100,000 in accordance with an accompanying diagram of the fractioning made by the Geographical Commission. Only that for better advantage the map has been divided into 57 vertical columns numbered from left to right with Roman figures and 52 horizontal zones numbered from top to bottom with Arabic figures, and each sheet is then distinguished by the most important city contained therein, and the number of the zone and column in which it belongs.

PALEONTOLOGICAL MUSEUM



CORRIDOR AND STAIRWAY



MAIN STAIRWAY IN THE INSTITUTE BUILDING

SALON ON MAIN FLOOR

Other Investigations

It is the institute's purpose to study the formation of soils and to indicate the rocks from which they originate, particularly those which may serve as fertilizers. For the investigation of the nature of tillable land a chemical study of rocks has been undertaken, especially of those that, seen under the microscope, show among their constituents, phosphates or other substances that may be used for the bettering of the chemical or physical conditions of soils. In this way we will contribute something to the formation of the agronomic maps of the country; for in presenting a map of the distribution of rocks, that of the soils is understood since the clay, lime and sand of which soils are composed come from the disintegration of the country rocks.

The Geological Institute in the performance of the working plan outlined contributes to the advance of all industries with which mining is more or less intimately related, to hydrographic works and to all practical applications where a knowledge of the surface and interior of the earth is essential.

In the northern region of the state of Oaxaca topographical and geological surveys are being made, specially in the parts where there is coal. The study of the mineral deposits is in charge of Y. S. Bonillas; that of the fossil plants of the region in that of Dr. G. R. Wieland. In the south of the same state the geologic study is being finished, Dr. E. Böse being in charge of the stratigraphy and Dr. P. Waitz of the petrography.

The region of the state of Guerrero in which the last earthquakes have occurred is being studied by the commission in charge of T. Flores. Work is continued on the study of the underg.ound hydrology of the southwest region of the valley of Mexico, in charge of J. D. Villarello. That of the valley of Ixmiquilpam, Hidalgo, has been studied by T. Paredes. The faunae of the Symon and Camacho mountains in Zacatecas are being studied by Drs. E. Böse and C. Burckhardt. In the near future a geological study will be made of the northern region of the state of Sonora, near the boundary with the United States. This work has been assigned to Y. S. Bonillas.

The network of national seismological observatories has been commenced under the direction of J. G. Aguilera, director of the institute. The central station at Tacubaya is near completion, that of Mazatlan is nearly done, the one in Oaxaca is under way and very soon the one in Chilpancingo, Guerrero, will be started. Independent of these works, those that have been started before are being continued, in general and applied geology, paleontology, mineralogy, petrography and analytical chemistry.

Publications of the Institute

No. 1. Fauna Fósil de la Sierra de Catorce, por A del Castillo y J. G. Aguilera. 1895.

No. 2. Las Rocas Eruptivas del S. O. de la Cuenca de Mexico, por E. Ordoñez. 1895.

No. 3. La Geografia Fisica y la Geologia de la Peninsula de Yucatán, por C. Sapper. 1896.

Nos. 4-6. Bosquejo Geologico de México. 1897.

Nos. 7-9. El Mineral de Pachuca. 1897.

No. 10. Bibliografia Geológica y Minera de la Republica Mexicana, por R. Aguilar y Santillán. 1898.

No. 11. Catálogos Sistemático y Geográfico de las Especies Mineralógicas de la República Mexicana. 1898.

No. 12. El Real del Monte, por E. Ordóñez y M. Rangel. 1899.

No. 13. Geologia de los Alrededores de Orizaba, con un Perfil de la Vertiente Oriental de la Mesa Central de México, por E. Böse. 1899.

No. 14. Las Rhyolitas de México (primera parte), por E. Ordóñez. 1900.

No. 15. Las Rhyolitas de México (segunda parte), por E. Ordóñez. 1901.

No. 16. Los Criaderos de Fierro del Cerro del Mercado en Durango, por M. Rangel. 1902.

No. 17. Bibliogratia Geológica y Minera de la República Mexicana, por R. Aguilar y Santillán. 1904.

No. 20. Reseña Acerca de la Geologia de Chiapas y Tabasco, por E. Böse. 1905.

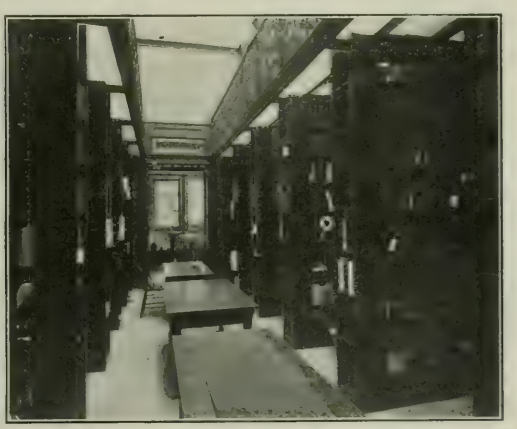
No. 21. La Faune Marine du Trias Supérieur de Zacatecas, par le Dr. Carlos Burckhardt. 1905.

No. 22. Sobre Algunas Faunas Terciarias de México, por Emilio Böse. 1906.

No. 23. La Faune Jurassique de Mazapil, Zacatecas, par le Dr. Carlos Burckhardt. 1906.

No. 24. La Fauna de Moluscos del Senoniano de Cárdenas, S. L. P., por Dr. E. Böse. 1906.

No. 26. Algunas Regiones Petroliferas de México, por J. D. Villarello. 1908.



COUNCIL ROOM AND LIBRARY OF THE INSTITUTO GEOLOGICO DE MEXICO

In addition to the bulletins published by the institute, numerous *paragones* or short scientific and economic pamphlets have also been issued.

The Mexican Geographical Exploration Commission is working on topographical surveys in Chihuahua, Durango, Morelos, Oaxaca and Yucatan and has completed a map of the state of Vera Cruz and of Puebla and Morelos. The plan is to complete a large-scale map of the Republic, similar to the folio maps being prepared by the United States Government. The geodetic survey is now at work establishing a base line in the state of Tamaulipas, from which to conduct triangulations of the Gulf points. The need of correct maps in the Republic is being rapidly supplied by these and other official commissions and by private surveys.

The Sociological Side of the Mining Industry

Progress in Europe and the United States; Vast Improvement as Compared with Conditions 20 Years Ago; Good Results from Welfare Work

BY W. H. MOULTON*

The mining industry must be considered as having one paramount purpose, that of producing ore at the least possible cost and disposing of it at the highest price. Usually this is the only side of the industry that has been presented to the public or to its owners, but there seems to be another side that should command our attention. To the officer and stockholders the business must first appeal as a money-making proposition. To the public it too often appears as the taking away of the treasures of a community without making adequate return.

In the early days of mining there was little thought given to anything but the physical aspects and to how the ores might be extracted and disposed of at the highest price, with no thought of lasting improvements because the mine was considered to be always decreasing in value, while in a manufacturing enterprise the value of the business and property is always increasing, so long as it is a going concern. There was too little consideration for the man or his family. He was a factor in production and the main question was a sufficient supply of him to produce the required output.

There has now come, however, an understanding of conditions not only in the mining industry, but in all others, which has clearly indicated the necessity of studying man's relation to his family, to his neighbor, to his fellow workers and the business or occupation in which he is employed, and to the community in which he more widely lives. This is sociology.

Employer's Interest in Welfare of Men

We must study to learn of the man's relation to his work, and find out if possible the responsibility that the employer has, not only to his employee, but to the public or to the community in which his business is established. It is not to find what you may do for the man's welfare, but to find what is necessary and wise in the newer, extensive and intensive conditions of business. We can well assume that this is a date which any business can set to the community in which its resources are developed. The mining industry is making the money for the enterprise usually occupied in this that be [illegible] and deeply into the [illegible] and is [illegible] [illegible] and the trial of many [illegible] meeting with

* [illegible]

success, that the desired result can be accomplished. The mining industry is not alone in the consideration of these problems; all others are meeting the same questions and increasing numbers are working for some solution. Across the water in the older countries and nations, the problem has come sooner and earlier work has been done upon it.

In France the mining industry early saw the need of studying the relation of its men to its own success. The work done by a large number of mining companies has been very satisfactory and of the greatest value. The coal mines of Blanzy, employing 8000 men and mining over a million tons of coal per year, has steadily increased its interest in the welfare of men. Since 1834 the company has built more than 1200 houses for its employees, selling land and houses to them at cost, and on long-time payments for little more than the usual monthly rental, and in some cases for even less than the rental established by outside interests. A mutual aid society, to which the company contributes an amount equal to that paid in by the men, provides for regular payments during injury, also hospital service, medical attendance, medicines, nursing and attending of the sick in their own homes. The company has for many years paid a retiring pension to all old employees and a pension to the widows and orphans. It supports 15 primary and six infant schools for 6000 children. It also conducts evening schools and lends its encouragement to various athletic, educational, musical and other social organizations. The company has always stood for individual initiative and encourages independent action in the 20 or more organizations which it assists.

The Work In Our Own Country

In our own country good progress is now being made. The Colorado Fuel and Iron Company has organized its sociological department, with Dr. R. W. Corwin, chief of hospital staff, in charge, and has given the most careful consideration to the welfare features of its business in connection with the life of its men. With Doctor Corwin are associated Dr. W. Montague, superintendent; Margaret G. Grabill, superintendent of kindergarten and domestic science; Dwight W. Baker, superintendent of the Colorado Fuel and Iron Company Normal and Industrial School; Miss Mary Small, matron, and [illegible] kindergartners.

At most different mining locations are club houses and school halls, at two other smaller places. The company has tried operating its new club at Calcite without selling liquor, and its report says: "No liquors are sold and, in fact, none are to be had in camp. There are likewise no speakeasies or blind pigs, and the men are satisfied and no time is lost after pay days because of drunkenness. This is one instance at least where the liquor problem is being successfully handled and all credit is due to the superintendent at that place." This is a small location and does not present the same difficulties as found in the larger places where the work of substituting something for the saloon is at the very least a great problem and as yet not solved. According to its last report the following plans have been in effect.

The old hospital building at Pueblo as a social center for the community serves as a home for 50 people. In this building is the night school, Young Men's Social Club, the C. F. and I. Jr. Club for boys, the Penny Savings Banks, library, tennis club, Junior Roycrofters; many socials, lectures and entertainments also are held in it. The new hospital at Pueblo is considered the finest in the country.

All drys are furnished by the company with shower baths, individual wash basins and lockers. Lectures and entertainments are frequently given and dances held. Night schools have been conducted in several of its camps with some degree of success. Women's clubs in various camps have become strong allies of the kindergarten teachers and social workers. Libraries and kindergartens are maintained at all localities where not provided by the public schools.

Surgeons give practical talks to the older scholars of the schools. Penny savings funds are encouraged. Lessons in domestic economy are given in connection with housekeeping and sewing classes. Boys' clubs are organized and picnics held. Much attention has been paid by Doctor Corwin to the building of school houses, and he has developed his plan of single-story buildings on the pavilion system, which has much merit, especially in a climate where the weather conditions are not too severe. The following summary in Doctor Corwin's report is a concise statement of the things that make for success in his work.

"Improvements that have been made and are anticipated depend for their success largely upon local cooperation and enthusiasm. The local leaders and officials can [illegible] influence social conditions for good or bad as they desire.

hence the necessity for cordial coöperation of all company officials as well as employees in the work of this department. If all unite in an uplift movement, welfare work is simple, but if indifference, or worse, no desire to improve exists, their social betterment is not only discouraging but impossible. People who help themselves will always be helped. This cannot be too strongly impressed upon any community."

The sociological side of the industry presents to us the following important matters for consideration among the great variety incident to different conditions and concerning which our time will permit of only the briefest mention.

Our Foreign Population

The foreign non-English-speaking population of our mining communities is rapidly increasing. The question of assimilating these large additions is of vital moment. As we accept them as our employees, we must in some measure accept a degree of responsibility for them. From figures prepared by Dr. Peter Roberts we obtain the following data:

The upper peninsula of Michigan comprises about 25 per cent. of the land area of the State and 11 per cent. of the male white population. This population is composed as follows: Native born of native parentage, 12.3 per cent.; native born of foreign parentage, 40.5; foreign born, 47.2.

Of the total white population of foreign parentage in the State the lower peninsula has 53.7 per cent., the upper peninsula, 46.3 per cent. The upper peninsula contains 11.5 per cent. of the total male white population, but it has 46.3 per cent. of the total male white population having foreign parentage. As Doctor Roberts says, the foreign problem in the State concerns the upper peninsula more than any other part of the commonwealth, and if Michigan is to do its part in solving this problem, it will largely be accomplished in that part of the State and by the people residing there.

The problem in Michigan has its counterpart in Wisconsin and Minnesota as in all other mining States. Have we not a duty in this work and toward these people? It would seem that we must of necessity for self-preservation if not for motives of friendly interest do all that we can to bring to these people the teachings of our Government, regard for law and order and a spirit of respect for our institutions. It is becoming more and more a problem, and it is only by the most careful study and experiment that it can be properly met. As Doctor Roberts says, "It is not likely that the State as a whole will give this matter the attention it deserves. The way must first be blazed by private enterprise."

Education Is Important

One of the first things undoubtedly is the matter of education. The mining companies have always stood for good schools and been generous in the question of taxation for school purposes, and the amount of money expended for buildings, equipment and salaries. We too often are perfectly willing to let it go at that and think we have no further consideration or responsibility. We should at least keep in touch with our school system and see that the work is such as is demanded in the localities where we reside, and while the course of study should be as uniform as possible in the State (and the superintendent of public instruction is in the best possible position to study the requirements and plan for methods and courses of study that will give the best results), we should watch the work so zealously that fine-spun theories may not be carried out at the expense of the practical education of our students. Fifty per cent. of the boys in our schools drop out before they are 16 years old and it is necessary that the school work up to that age be the best possible for their use. We should see that the attention given to the higher grades in our public schools should not detract from the value of the work done in the lower grades in which the majority of our boys receive all the education given them by the public schools; and that the school teachings be so presented that our young men may consider it worth while to look for their future work in our mines.

Civic Activities

In addition to the matter of education of the children, the social life of the community has a great deal to do in establishing the kind of citizenship to which these men look forward. The mining companies should take active interest in community problems and lend their aid to plans for the betterment of conditions. There are various agencies that can be called upon to assist in such work. Club houses such as have been erected for the men at Pulatka by the Pickands, Mather Company, and at Mountain Iron by the Oliver Iron Mining Company, are of great value. They give a meeting place for the men with bowling alleys, billiard and pool tables, smoking rooms, game rooms, baths, places for club meetings, musical and other entertainments, dances and social gatherings of all kinds.

Clubs and Social Organizations

Clubs established by the men have been productive of much good. Such organizations as the Oliver Club and the Cleveland-Cliffs Club, both in Ishpeming, are sure to be a benefit to any business. These clubs have bowling alleys, billiard or pool tables and recreation rooms. A monthly meeting is held, usually with supper, for the discussion of topics of interest, addresses by outside speakers or entertainments for the members. These clubs usually have an outing during the summer. Mining clubs have also been organized, which have for their membership the mining captains, shift bosses, timber bosses, the superintendents and the heads of the departments, either as active or honorary members. Monthly meetings are held from October to June at which addresses of interest are given, often with the aid of the stereopticon. Lunch or supper is served and topics relating to the mining work discussed. The superintendents also have a club, meeting from time to time, at which the problems of mining are discussed, committees of investigation appointed and their recommendations acted upon at these meetings are put in force. These club meetings are beneficial not only in the introduction of new plans and methods, but also in the social fellowship promoted among the members.

Young Men's Christian Association

Taking everything into consideration there is probably no agency better fitted for handling the work in connection with the men at our mining locations than the Young Men's Christian Association. The Pennsylvania Railroad Company has approved of the Y. M. C. A. as an established policy of the company, and is contributing to the support of over 35 associations on the lines of its road in addition to having provided the majority of the buildings. The following statement referred to in an address by Max Riebernack, comptroller of the Pennsylvania Railroad Company, shows the estimate put upon it by the officers of the company in connection with their railroad work.

President Cassatt recently said: "I am in full sympathy and accord with the work which is being so successfully carried on by the Young Men's Christian Association. I am satisfied that excellent results, from the standpoint of the employees as well as of the company, are being accomplished through this agency."

In the anthracite and bituminous regions of Pennsylvania, great progress has been made in Y. M. C. A. work. About 30 buildings in this region, many of them in small locations, are now in use. From these buildings workers reach other camps where buildings are not yet located and the plans are thus extended. Mining institute meetings are held each year in the different buildings and a variety of topics pertaining to all features of mining are discussed by the best posted engineers and mining men, not only from that section, but elsewhere.

In the Lake Superior District

Through the generosity of the Cleveland-Cliffs Iron Company, the Oliver Iron Company and Lake Angeline Company in assisting the local people, a Y. M. C. A. has been established in Ishpeming. This building is thoroughly equipped for the use of the men, with bowling alleys, swimming pool, shower baths, locker room, reading room and li-

brary, gymnasium and lecture room, and one floor for dormitory rooms for members. The building was opened June 1, and the work during the coming season will include clubs of all kinds for every group of men who may wish to study or pursue some plan of recreation or mutual benefit. Entertainments and lectures will be given and the building will be used for social activities of every description. Educational classes of various kinds will be conducted, giving non-English speaking men a chance to first learn our language and become acquainted with the standards of our citizenship and become a part of our city life under the best conditions. It has always been found that the men are anxious to avail themselves of every opportunity of bettering themselves and their condition, and that they will spend much effort in this direction. All such agencies should be systematically encouraged. If the broad Y. M. C. A. plans should be introduced in all of the various mining localities, even with buildings with small accommodations, much might be done in solving the problem of how to assimilate the large numbers of men coming to our communities not acquainted with our customs, habits of living and ideals of government. I cannot too highly commend to the members of the Lake Superior Mining Institute the value of the Y. M. C. A. in its effect on local affairs and conditions.

The Cleveland-Cliffs Iron Company has begun the erection of a building for Y. M. C. A. and club purposes at its new mining town at Gwinn. In addition to the features usually planned for in the various clubs and Y. M. C. A's., careful attention will be given in the matter of neighborhood clubs for various groups of women and educational and entertaining features for them and for the boys and girls of the community. This building will be the recreation center for the town and be the leading factor in all social and educational development and improvement activities. The mining companies can, I believe, well afford to contribute largely to such efforts. Individual initiative should be encouraged in this work, the company through its different men supplementing and assisting in the direction and execution of the plans.

Sanitary Conditions and Medical Service

The sanitary conditions of the mines demand a most careful consideration. It was only a few years ago that any old place was sufficiently good for the men to change to their mine clothing, and for their clothing for street wear to be taken care of while they were underground. Every facility has now been given to provide the men with the best accommodations in change houses or drys. No one would think of building a dry without the best of washing facilities, with hot and cold water, shower baths, lockers for the care of the clothing, and a good system of ventilation. In the use of toilets in many cases some education is necessary, but anything that can be done to improve the sanitary conditions underground is of value to the men and in actual production through the possibility of securing the best of labor.

The health of the community is of the most vital consideration. The greater number of our mining locations are well provided with physicians the peers of any in their education, ability and character of professional service. There is no large mining town or city but what has its hospital with suitable equipment. The kind of buildings more recently erected, such as that at Coleraine, Ironwood and Gwinn indicate the consideration of the importance of providing the best of facilities for the handling of those cases which are the results of the hazard of the business. The payment of $1 per month by the men employed should guarantee suitable equipment, competent physicians, efficient nurses and good medicine. The hospitals that have inefficient men, lack of proper nursing or a greater regard for the income received than the service rendered, are few, but when found cannot be too severely condemned.

Visiting Nurse

For over a year the Cleveland-Cliffs Iron Company has employed a visiting nurse for the benefit of the families of all employees. The nurse works under the direction of the physicians of the hospital, visiting and assisting in families to whom her services can be of benefit. This work is not given as a charity, but as the means of assistance in cases not only of serious need, but in advice and usefulness in the home as occasion might require.

She has often been of material assistance in cases of emergency before a regular nurse could be obtained. She is not doing the work of the physicians, but is supplementing their efforts, seeing that their directions are carried out and families instructed in the care of the sick as well as in the general subject of the improvement of hygienic conditions. She can actually demonstrate how the work should be done. The saving of a child's life in several cases and the restoring to the active life of a family of the wife and mother who had been in bed eight months with every probability of remaining so as long as she lived, not to mention various other cases in which valuable assistance as well as sympathy have been given, are sufficient to repay the company many times for the cost of this work. I would consider that of the various features coming under my attention, in this improvement work that of the visiting nurse shows the greatest direct benefit and value.

Rest Cottage a Great Boon

In her work the nurse has found the mothers in many homes who, through the work occasioned by large families and household cares, have never had an opportunity for rest or recreation. A comfortable house was secured during the last two seasons and many mothers taken for an outing from one to two weeks. Sometimes they went alone and at others taking the younger child or baby of the family with them. Meals were provided for them so that they had no work to do other than they might wish to occupy themselves with and many a mother has gone back to her family refreshed in body and in spirit. The cost is not very heavy, but the benefits are large and the women have been glad to take advantage of this opportunity of securing a little relaxation from the monotony of their daily lives. In a number of instances it has really been the first vacation that has ever come into the life of the mother of a large family. It has in some cases warded off approaching sickness occasioned by over strain in household cares.

Prevention of Accidents

It is so well known that the mining industry is one of danger that we consider too little the accidents occuring so frequently in all mines. These accidents should demand a most careful study, not only for the reduction in economic loss and the added cost of production, but the effect upon the men employed. We must recognize that mining is a dangerous occupation, and accidents will occur and cannot always be avoided, but it should be a part of the duty of the companies to study the causes and results of these accidents carefully in each case in order to provide such remedies as may be possible. In looking over the equipment and machinery of the present day and comparing it with 25 years ago, it will be seen that additional care is being exercised, this care being of great value to the men as well as to the company economically. We see improved devices for hoisting and lowering the men with various appliances to guard against accident. We find automatic closing gates at shaft openings and a better and uniform system of signals. We find our mines better ventilated and with better methods of fire protection. The mine surroundings from being a scrap heap have become an orderly place of work with supplies properly stored.

Special commendation should be given to the Steel Corporation for the study it has given to promote the safety of its employees. The full description of these plans given in the *Iron Trade Review* of July 22, 1909, clearly illustrates the value to be derived from a careful consideration of the cause and remedy of accidents, both as it affects the men and from an economical standpoint.

In the coal-mining regions of Pennsylvania much attention has been paid to the first aid to the injured. Regular courses of study have been pursued and men instructed in their duties in times of acci-

dents and injury to the men. Exhibitions have been given and contests held showing the proficiency attained in this work. Our different mines can well afford to promote some definite plan for first aid and provide proper equipment and facilities.

Benefit Funds

Practically all the mining companies in our section contribute equally with the men to the benefit funds from which the men receive a monthly payment up to one year in case of injury, and in the event of a fatal accident sums from $200 to $500 are paid to the family or administrator. In Ishpeming alone in 1908 there was paid the sum of $10,158.58 for accident and death benefits. It is of the greatest value to the men to be assured of some degree of care or assistance during periods of injury, and the administration of these funds can well be studied to see if further improvement in benefits and assistance cannot be made.

In this connection I would mention the administration of the Carnegie fund through the Steel Corporation which has been of very great helpfulness in the many localities in which its operations are conducted and which is so well known as to need no extended description.

In the matter of benefit payments, in case of injury there has been no great degree of uniformity in the practice of the different companies. It must come more and more to be recognized that these injuries are a hazard of the business, and that the business should stand the reasonable cost of such, and every one on the same basis, in which event it would not be a hardship to any or carry suggestion of unfair comparisons.

Pension Systems

As a further aid to the men and to their families, pension systems such as have been established by the Calumet & Hecla Mining Company and the Cleveland-Cliffs Iron Company are of great benefit. A man who has worked for a very long period of years, devoting, in many cases, the best of his life to the service of the company, can well have such services recognized by some payment during his declining years. After a careful study of the pension systems in use in Europe and by various companies in the United States, the Cleveland-Cliffs Iron Company adopted a pension system, taking effect Jan. 1, 1909. In the inauguration of the system the board of directors made the following statement:

"The object of this system is to recognize the value of long continued and faithful service, and in some measure to provide for those whose years of activity have been expended in the service of the company and who through age, injury or infirmity have become incapacitated for further labor in connection with our work." The system provided that any employee who has attained the age of 65 years or more and been in the employ of the company for 25 years, may on his own request be retired and pensioned. Any employee who has worked for the company for 25 years and is 60 years of age may be retired by the pension board if in their opinion his injury or infirmity may make it desirable to assist him in this way. This pension does not prevent them from securing any other employment which is not prejudicial to the interests of the company, and of which their condition will permit. The monthly allowance of payment is on the following basis, and is continued through the life of the beneficiary:

For each year of service 1 per cent. of the average monthly pay for the 10 years next preceding retirement is to be paid to them monthly. The minimum pension to be paid is $15 per month, so that in case the amount computed upon the above plan should be less than $15, this monthly payment is increased up to the minimum amount as stated. As a further means of benefit to the men and guarantee to them that their families are not to suffer privation from loss occasioned by their death, the pension system provides certain payments to the widows and orphans. To the widow of a man accidentally killed at work a pension of $12 per month is paid for a period of five years, and for each child under the age of 16 years $1 per month additional. In case the children are all under the age of 10 years when the accidental death occurs, payments may be continued longer than five years, or until such time as the widow remarries, or the family through the aid of the mother or assistance of the children become self-supporting. The object of this is to provide the family with some assistance up to the time that the members become of such age as to render further support unnecessary. This payment, in addition to the amount received through the benefit fund in case of death, is usually sufficient to provide the family with some degree of comfort and insure against serious hardships.

The company is sure that these payments are of great benefit, and while not lessening a man's disposition to provide for his family, leads him to feel that the dangers incident to mining are not such as to make his family entirely dependent upon charity in case of his accidental death. These benefits are to be paid for the care of those needing them and are not liable to attachment, levy or seizure under any process whatever.

Improved Surroundings

The mining companies can do much to promote the sanitary conditions of the town. A proper regard for the surroundings of the mines, a prompt disposal of waste and coöperation with the health auhtorities will serve to lead the people into like habits. The character of the home and the home surroundings has a great effect upon the life of the people and the efforts in this connection are to be much commended. At Ishpeming for 15 years the prizes offered by one of the mining companies for best kept premises, vegetable gardens, vine planting, etc., have been of the greatest value in producing a mining city of which the character of the homes cannot be surpassed.

We say that the men make the character of the town in which they live. We are also convinced that the character of the town in which a man lives has a great deal to do in molding him. There is no question about the value of building towns in such a way as at Coleraine, Minn., Gary, Ind., and the new town at Gwinn, Mich., in which features of benefit to its citizens have been carefully considered. At Gwinn, the town has been laid out under the direction of Warren H. Manning, the eminent landscape designer, who has provided for the retaining of all the natural beauties that were possible. The land was cleared under the directions of Mr. Manning and his engineers so that all trees of value should be saved, and all roads and streets located and graded under his supervision. First of all a waterworks system was put in and at the same time a complete system of sewers, so that these were available previous to the erection and occupation of the houses. As result of this plan of work, the three years of town building has continued without a single case of typhoid fever, which is usually so very prevalent in new towns. Coincident with the building of the town, a hospital was established for which benefit and medical services the men pay the $1 per month customary at all the mining locations. Houses have been built and sold on reasonable terms and long time payments.

Problems Should Be Studied

It is essential to the greatest success that a proper amount of time be given to the study of the different problems and this can best be done by a suitable organization such as has been effected in the Colorado Fuel and Iron Company, and introduced by William G. Mather as a part of the work of the Cleveland-Cliffs Iron Company. This organization serves as a clearing house for problems of a sociological character that may arise in connection with the business.

There should be no thought of paternalism in the effort to surround the men with such environments as to make for their best welfare, but they should be encouraged to do what they can for their own improvement and benefit, the companies lending their help, coöperation and assistance so far as practicable. I know of no one question connected with the mining industry that will pay better from every standpoint than the study of the sociological conditions.

Ore Dressing in the United States and Mexico—I

Individual Stamps and Increased Weight in Stamp Mills; Tendency Is toward All-slime Plants. Practice in Concentrating Plants Compared

BY H. A. GUESS*

I have attempted, in so far as seemed possible within the limits of this paper, to give an outline of the principal processes of ore treatment, other than smelting, now employed in this country and in Mexico. For convenient reference these may be grouped as follows:

(1) *Amalgamation Group*—
- Amalgamation without subsequent treatment.
- Amalgamation followed by concentration, but not cyaniding.
- Amalgamation followed by cyaniding or by concentration and cyaniding.

(2) *Cyaniding Group*—
- Cyaniding without concentration.
- Cyaniding preceded by concentration.

(3) *Water Concentration Group*—
- One product.
- Two or more products.
- Two or more products with subsequent separation of the more complex products.

(4) *Miscellaneous Processes.*

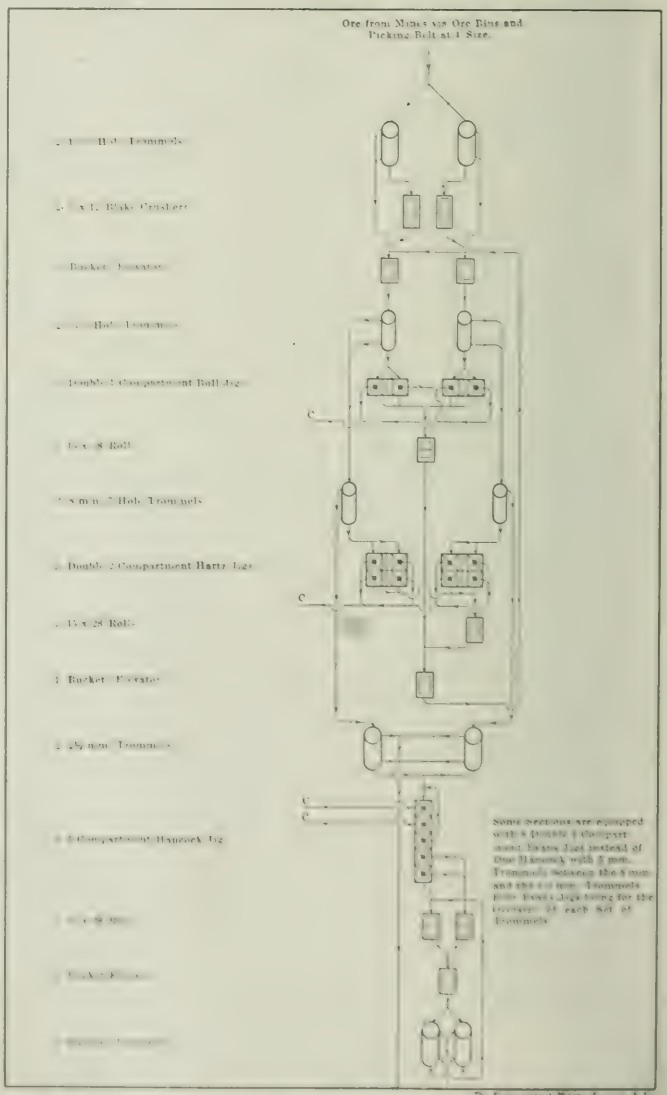
Amalgamation Group

Occasionally gold-quartz ores of workable grade are found, tailings of which, after amalgamation, do not have sufficient value to warrant either cyaniding or concentration of the sulphides. Such conditions are infrequent, however, and usually only temporary.

In general, nowadays, the tailings from amalgamation are given subsequent treatment over stratifying tables, vanners or canvas or all these for the recovery of sulphides, the sulphides being either shipped to the smeltery, roasted and chlorinated, or finely ground and cyanided. Where the tailings, even after careful concentration, carry sufficient gold or silver to warrant further treatment, cyaniding is usually found applicable as a supplementary process.

Frequently where cyaniding has been employed as an adjunct in this way to an amalgamation concentrating process, it is in time found profitable to discontinue amalgamation and run as a straight concentrating cyaniding process, with crushing in KCN solution. The decision as to this practice will depend on the amount of amalgamable gold and to what extent the advantage of not long part of the gold early in the treatment possibly with a slightly higher total recovery, offsets the added expense of amalgamation, coupled with the necessity of subsequent pulp thickening before adding KCN solution, and of wasting larger volumes of weak KCN solution than when crushing in solution.

The Dos Estrellos mill at El Oro,



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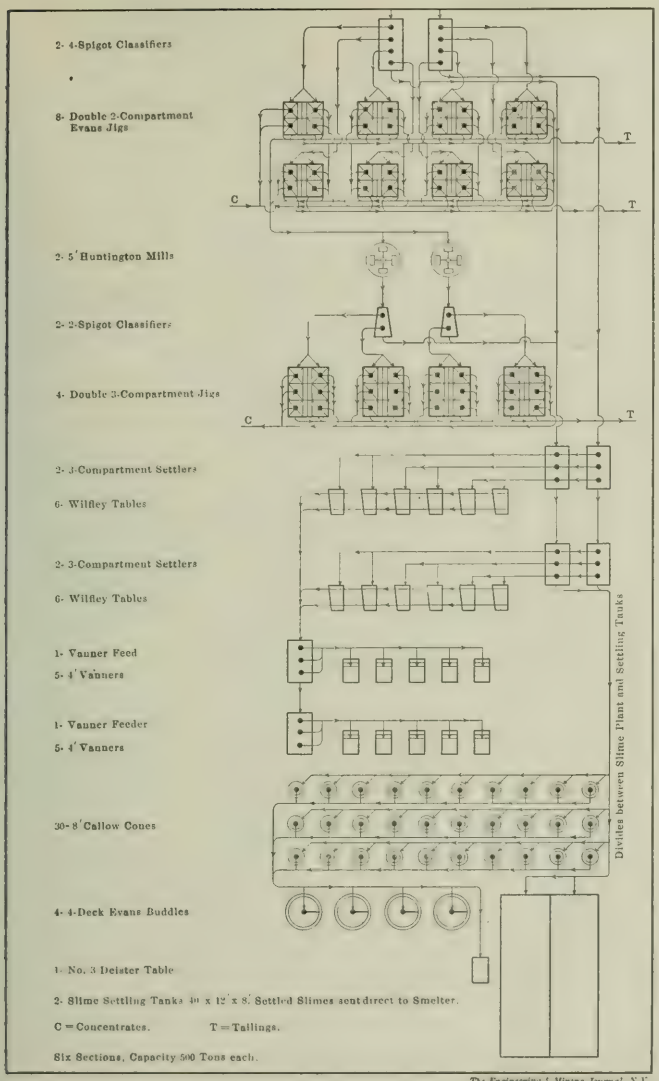


FLOW SHEET OF BOSTON & MONTANA CONCENTRATOR—Concluded

TREATMENT DATA OF GREAT FALLS CONCENTRATOR OF BOSTON & MONTANA CO

District—Butte, Montana.
Ore—Mixed copper sulphides and pyrite in siliceous and aluminous gangue.
Treatment—Concentration begins at approximately 1½ in. maximum size.

Product	Dry Wt. % of Total	Average Au Oz. Per Ton	Average Ag Oz Per Ton	Average Cu %	Average Fe %	Average S %	Average CaO %	Average Al_2O_3 %	Average SiO_2 %	Percentage Recovery Au	Percentage Recovery Ag	Percentage Recovery Cu
Crude Ore Feed	100	0.007	1.18	3.40	10.4	12.7	0.1	11.5	56.5			
Course Concentrates	11.1	0.019	3.28	10.03	24.2	30.9	0.1	4.8	26.7			
Fine Concentrates	24.9	0.021	2.69	7.56	29.8	36.8	0.1	4.8	18.0	94.8	82.1	83.1
Slime Concentrates	2.2	0.004	1.88	2.31	2.8	3.1	0.2	22.5	58.4			
General Tailings		0.002	0.23	0.66	1.8	1.5	0.1	12.4	77.7			

Mex., is an illustration of this transition in treatment methods, in that it started as a pan-amalgamation mill, then worked as a cyaniding plant with amalgamation discontinued, and later crushing in KCN solution was adopted. At the Homestake on the other hand, where, some years ago, cyaniding was added as a supplement to the simple amalgamation treatment, it still serves only as a supplement, amalgamation being practiced the same as previously.

One of the best examples of the combined amalgamation-concentration-cyanidation system of treatment is probably found in the recently constructed mill of the Goldfield Consolidated Mines Company, amalgamation being carried out at this plant both on the battery discharge and on the reground sands after passing through tube mills, with subsequent concentration of all slime over No. 3 Deister tables before de-watering and addition of cyanide solution.

Amalgamation Equipment

Neglecting for the present the cyaniding feature, which will be considered more in detail under the cyaniding group, the equipment of mills coming under the amalgamation group presents much sameness. The initial crushing machinery may vary a little and be either gyratory or some of the various jaw crushers of the Blake type, but almost invariably the subsequent crushing is done by stamps.

The tendency is in general toward heavier stamps, but outside of this and such lesser features as individual stamp guides, concrete mortar blocks, etc., there have been no important changes in the design of stamp batteries in recent years. An exception to this statement is found in the Nissen stamp, with its circular individual mortar, but this has so far found its best application in crushing finely disseminated concentrating ores and will be considered under the concentration group.

For concentration after amalgamation, hydraulic or surface classifiers are usually used, one or more sizes made from the sands for concentration over stratifying tables, and the slime thickened and sent to vanners, or some of the various slimers now manufactured. Sometimes, particularly in California, mechanical concentrators are not used on the tailings after amalgamation, but the total tailings are sent over canvas tables of varying slope with intermittent washing off of the concentrates.

Cyaniding Group

The cyaniding ores of the United States, as so far treated, with a few notable exceptions, have been largely gold, the silver being of lesser value; as a consequence a large number of the milling plants come under the amalgamation-cyanidation class of treatment, instead of the straight cyaniding here considered.

[illegible] NO. [illegible] MILL OF THE FEDERAL MINING AND SMELTING COMPANY

[illegible] feldspathic gangue with siderite.
[illegible] concentration beginning at approximately $1\frac{1}{4}$ inch maximum
[illegible]

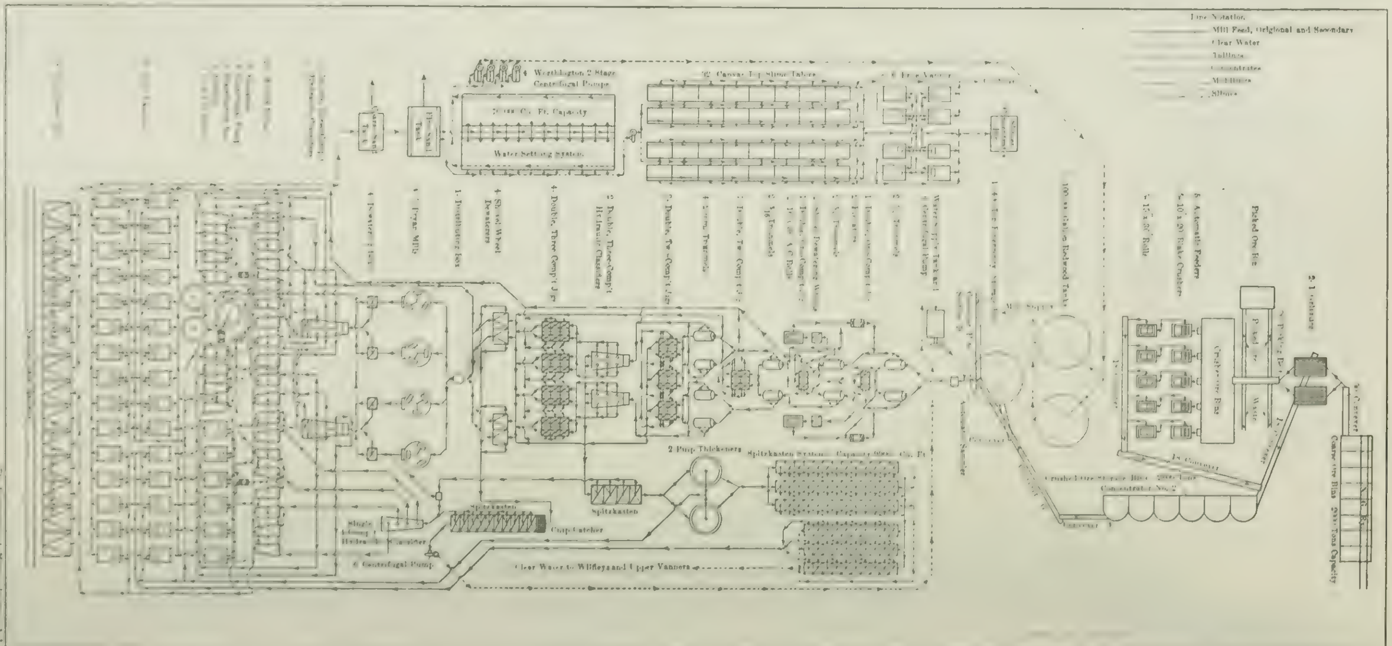
Product	Dry Wt. % of Total	Average: Ag Oz. Per Ton	Average: Pb % (Wet)	Average: Zn %	Average: Fe %	Average: S %	Average: Insol %	Percentage Recovery: Ag	Percentage Recovery: Pb (Wet)
[illegible]	100.0	6.3	8.0	3.0	15.2	6.1	57.1		
[illegible]*	13.8	39.6	50.5					79.8	80.2
[illegible]		0.8	1.1						
[illegible]		2.2	2.5						

*Contains 21 per cent. vanner and other slime concentrates.

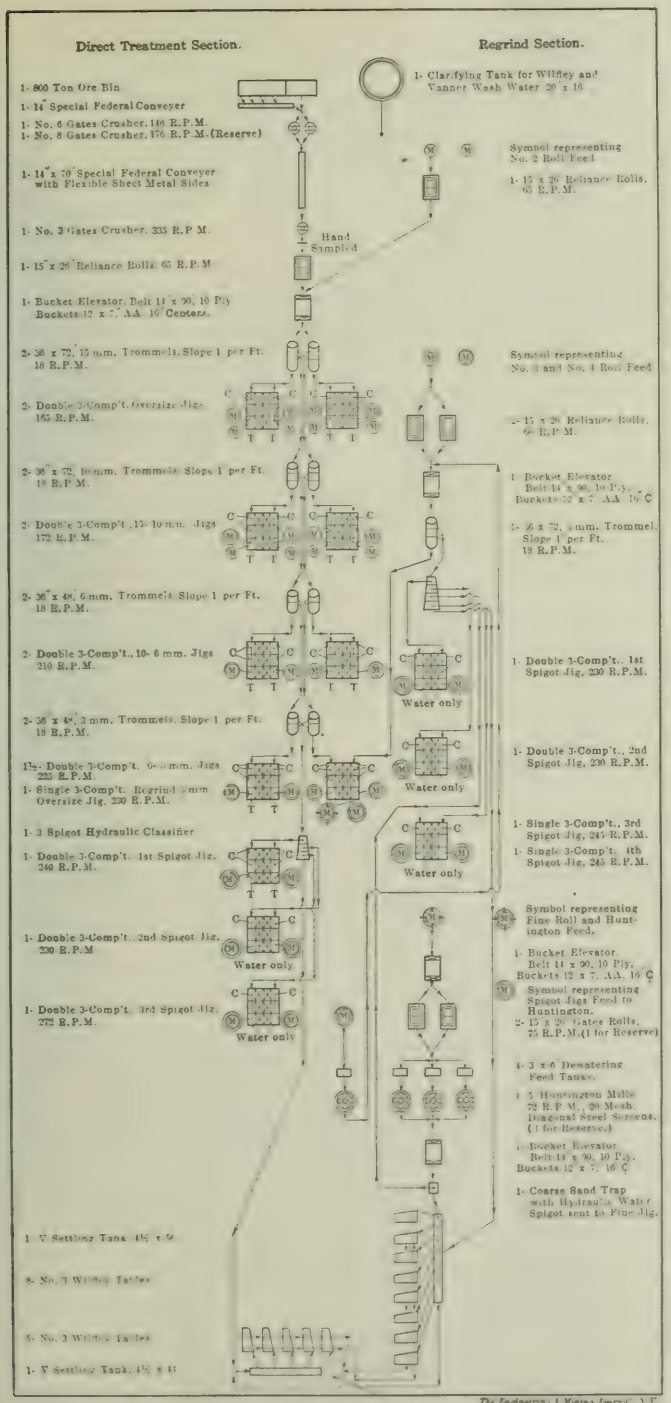
PRODUCTS OF THE GREENE CANANEA CONCENTRATOR

District—Sonora, Mexico.
Ore—Pyrite with chalcocite and some bornite and chalcopyrite in a siliceous porphyry gangue with some garnet.
Treatment—As per accompanying flow sheet, concentration beginning at approximately ¾ inch maximum size.
Results—As per subjoined tabulation, the ore varying more or less in different years and these results being typical, rather than definite period averages.

Product	Dry Wt. % of Total	Average: Cu %	Average: Fe %	Average: S %	Average: CaO %	Average: Al_2O_3 %	Average: SiO_2 %	Percentage Recovery: Cu
Crude Ore Feed	100.0	2.7	13.2	13.0	1.6	10.0	54.5	
General Concentrates	31.2	6.0	31.0	31.8	1.0	3.5	15.4	70.5
Coarse Tailings	0.9							
Slime Tailings		1.6	1.4	1.7	1.7	22.8	57.2	



FLOW SHEET OF 750-TON SECTION OF CONCENTRATOR NO. 2 OF THE GREENE-CANANEA COPPER COMPANY



FLOW SHEET OF MACE NO. 2 MILL OF THE FEDERAL MINING AND SMELTING COMPANY, WALLACE, IDAHO—Continued

In Mexico, on the other hand, where the ores in general contain relatively large silver values, amalgamation is rarely practiced in conjunction with cyaniding, and at most plants in Mexico crushing is now done in cyanide solution.

Until about five years ago, slime in connection with cyaniding was as undesirable as is still the case in strictly concentrating ores. About this time, however, the El Oro Mining and Railway Company began extensive experiments[1] looking to an improvement over the low extractions from leaching battery sands, and demonstrated conclusively that a large portion of the gold of these sands was silica incased, and was not released for dissolution by cyaniding until the ore was ground to approximately 150 mesh. These experiments also showed that by fine grinding, not only was the extraction increased, but the period of treatment shortened.

El Oro was the pioneer on this continent in the use of tube mills on an extensive scale for fine grinding in connection with the cyaniding process, and from the success at this camp with gold-silver ores, the cyaniding of more distinctively silver ores was developed at Guanajuato and at Pachuca.

Higher extractions can be made on a given ore in the condition of slime than as sand, and for this reason wherever the gold-silver values of the ore justify the extra expense, cost of power, etc., duly considered, not only finer grinding, but all sliming is usually adopted as the process giving maximum profit.

This is the process at most of the plants of El Oro and Pachuca; it is also the process contemplated for a large plant now being figured on at Guanajuato. In the United States, the Montana-Tonopah and the recently constructed Goldfield Consolidated are on this all sliming basis of treatment, and at the Homestake Mining Company's large plants treating both sand and slimes, regrinding of the coarser of the sands now being leached, has been decided upon, necessitating additions to the slime plant.

In the matter of concentration before cyaniding, much variation in practice is found. Some plants cyanide direct without removal of sulphides, experience with their ore leading them to decide that though a slightly higher percentage recovery of the gold and silver in the concentrates might be obtained by their removal and separate treatment by smelting or cyaniding with stronger solutions, finer grinding and longer treatment, yet in commercial results it was more profitable to adopt the simpler treatment system with the slightly lower recovery of the metals in the sulphides.

Some plants, on the other hand, concentrate the battery discharge, either

[1] "The Cyaniding of Ores at El Oro," Trans. I. M. M. Oct., 1908. "Fine Grinding of Ores by Tube Mills and Cyaniding at El Oro, Mexico," Trans. A. I. M. E., Vol. 37, pp. 5-55.

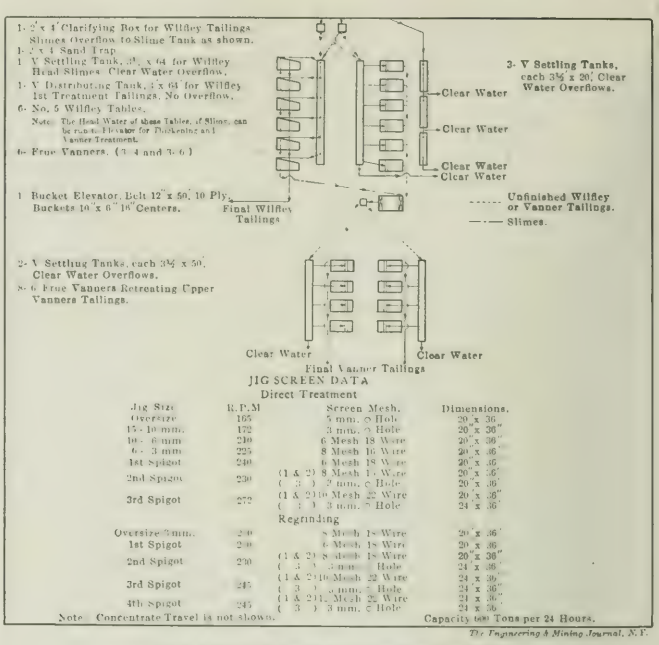
ASSAY AND SCREEN TESTS OF PRODUCTS OF THE BOSTON CONSOLIDATED MINING COMPANY MILL AT GARFIELD, UTAH

[illegible] in composite porphyry, minerals, chalcocite, bornite, chalcopyrite, pyrite and covellite. [illegible] begins at approximately 20-mesh maximum size.

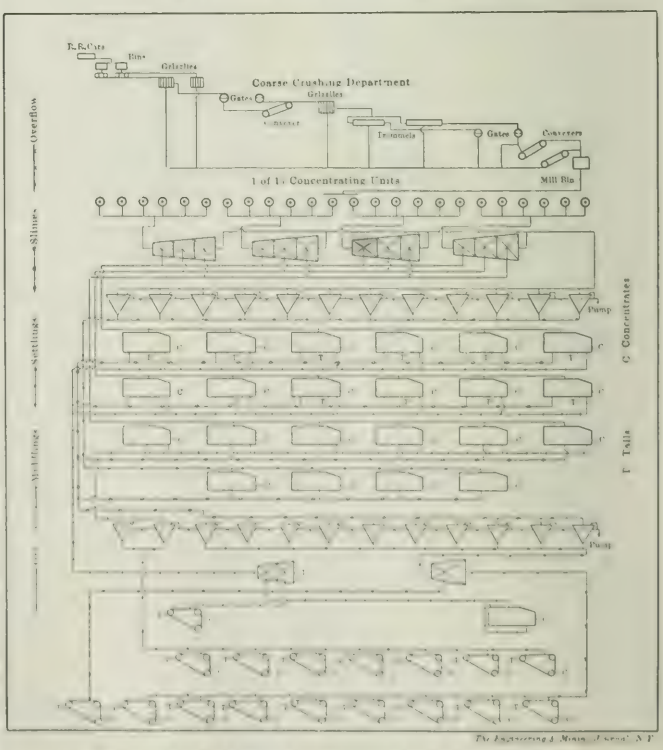
Products	Dry Wt. % Total	Average Au Oz. Per Ton	Average Ag Oz. Per Ton	Average Cu %	Average Fe %	Average S %	Average SiO_2 %	Percentage Recovery Cu	Percentage Recovery Au	Percentage Recovery Ag
[illegible]	100.0	0.004	0.035	1.6	1.9	2.1	55.0			
[illegible]	3.4	0.07	0.55	17.9	31.2	34.8	15.1			
[illegible]	0.8	0.07	0.70	27.8	17.6	26.6	26.9	74		
[illegible]	1.4	0.08	0.70	25.1	18.0	23.6	32.3			
[illegible]	5.6	0.07	0.60	21.2	25.8	30.8	21.20			
[illegible]	60.0			0.4	0.40					
[illegible]	34.0			0.5	0.60					

Screen Tests	General Concentrates Wt. %	General Concentrates Cu %	Tailings Wt. %	Tailings Cu %
On 50 mesh	11	9.1	25	0.48
On 80 mesh	22	18.0	20	0.37
On 100 mesh	17	20.2	12	0.18
On 150 mesh	20	24.3	9	0.26
On 200 mesh	6	26.4	2	0.38
Through 200 mesh	24	27.5	32	0.51
Totals and Averages	100	21.4	100	0.41

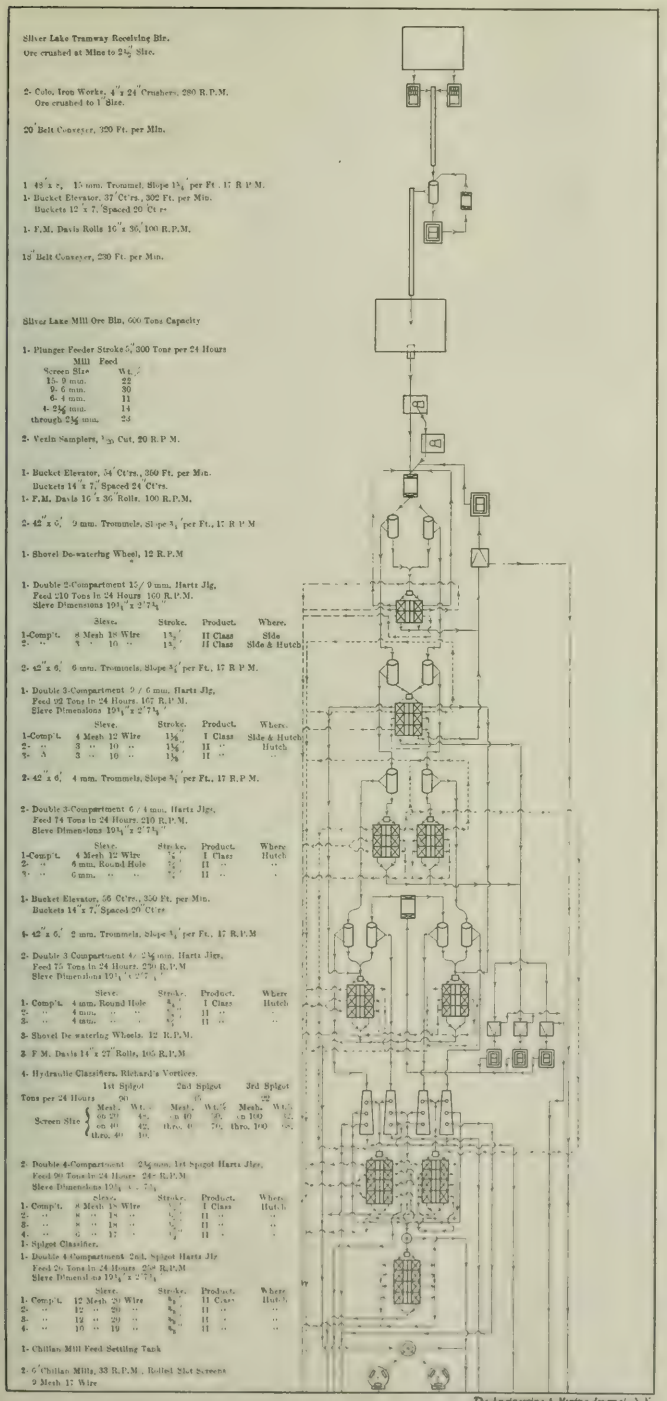
Crude ore too low for precise Au-Ag determination.



FLOW SHEET OF MACE NO. 2 MILL—Concluded



[illegible] OF THE BOSTON CONSOLIDATED MILL AT GARFIELD, UTAH



FLOW SHEET OF SILVER LAKE MILL NEAR SILVERTON, COLORADO. Continued

sands only, or sands and slimes, and still others, with higher-grade, more refractory sulphides, find it profitable to go into the matter still further and concentrate also the slime resulting from tube mill grinding of the concentrated battery sands.

Cyaniding Equipment

The modern cyanide plant on an all-sliming basis usually starts off with gyratory or jaw crushers, followed by stamps crushing in solution. The battery discharge is classified into slimes for further treatment and sands for regrinding, either by cones, or in the more recent plants by mechanical classifiers. The sand thus delivered is thickened for regrinding in tube mills.

The tube mills themselves are usually of the trunnion type, or trunnion bearing at the feed end, with tire on roller supports at discharge end, thus permitting a large discharge throat into which can be shoveled pebbles or mine ore for similar purpose. They use a reverse worm in feeding, coupled with a baffle plate of the Neal type in discharge. The lining is usually of the El Oro ribbed type. The usual trunnion feed has been a fixed pipe with stuffing box, but of late at many plants a smaller curved pipe has been used, which fits loosely into a round hole of larger diameter in the vertical plate covering of the feed end. Through this the feed is projected as a jet into the mill.

The final slime is then agitated, either by revolving arms in round tanks of moderate depth with or without the aid of centrifugal pumps, or more recently by tall Pachuca tanks. These latter employ a central tube for agitating by the air-lift principle. They were originally designed in New Zealand and have within the last year or two been adopted by many of the newer plants.

For filtering the treated slime, either with or without previous washing by decantation, vacuum filters, pressure filters, or filter presses are used. Of the vacuum filters the type most largely used is the Butters or Moore; of the pressure filters, the Burt; and of filter presses, the one principally used is the Merrill sluicing-discharge type. The initial and the largest Merrill filter-press installation is at Lead S. D., where twenty-six 96-frame presses handle 1,500 tons per day of Homestake slime. This is a rather crystalline slime and enables a porous cake to be made with frames of 4 in. thickness.

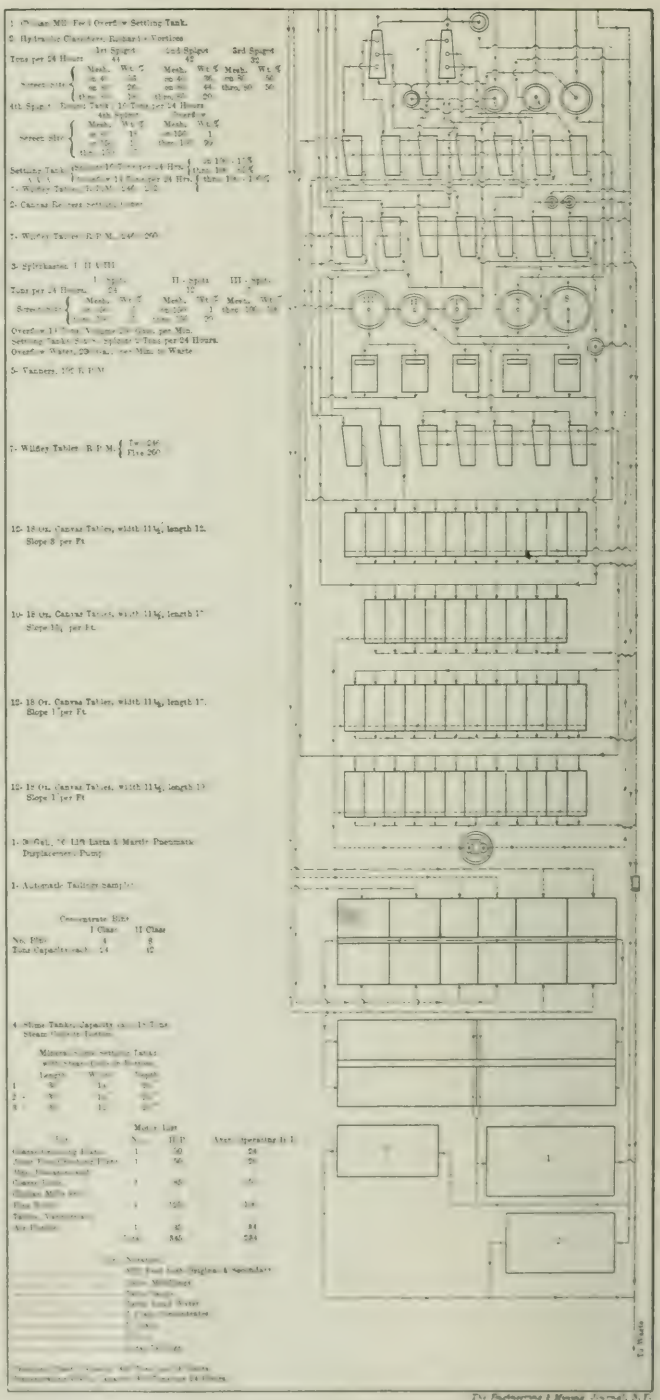
It was not thought that slime of flocculent character could be satisfactorily filtered and washed in such a press as a commercial proposition, but within the past year experiments have shown it entirely feasible to fill the frame only about 80 per cent. full, leaving a close center parting through which washing can proceed both ways through the cake. This is the system employed at Silver Peak.

TREATMENT DATA OF THE SILVER LAKE MILL OF THE GARFIELD SMELTING COMPANY, NEAR SILVERTON, COLORADO

Description: New [illegible] County, Colorado.

Ore: [illegible] — A [illegible] carrying [illegible] sheet, concentration beginning at 13-mm. maximum size.

Product	Dry Wt. Total	Average														Percentage Recovery				Typical Screen Tests		Total Tailings			
		Au Oz. Per Ton	Ag Oz. Per Ton	Pb % (Wet)	Cu %	Zn %	Fe %	S %	Insol. %	Mn %	MgO %	CaO %	Au	Ag	Pb	Cu		Wt. %	Au Oz.	Ag Oz.	Pb %	Cu %
Concentrates	100.0	0.14	8.0	2.28	1.53	2.70	7.6	3.7	62.8	4.8	3.9	2.0					On 150 mesh	58.2	0.10	1.70	0.45	0.45
Middlings	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]					Through 150 mesh—Sands	28.3	0.28	1.15	0.65	0.65
Tailings	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]					Through 150 mesh—Slimes	13.6	0.30	1.15	1.10	1.10
Average for Concentration	24.7												91.4	72.4	81.6	74.2	Totals and Averages	100.0	0.29	2.26	0.50	0.48



FLOW SHEET OF SILVER LAKE MILL—Concluded.

using 3-in. frames, and will also be employed for a certain class of slime at the new Esperanza plant at El Oro. The standard 4-in. Merrill frame will be used, however, for the reground-sand slime.

For precipitation, zinc shavings is still the usual method, returning short zinc to the boxes and omitting acid treatment. Precipitation by zinc dust is, however, gaining in favor, and whenever acid treatment of the zinc-dust precipitate can be dispensed with, its use will show an economy over the shaving method both in labor and in supplies.

For the average cyaniding ores, say, of Nevada, and particularly Mexico, the amount of gold and silver present in the ore and therefore in the pregnant solution is sufficient to insure a low ratio of zinc consumption to bullion, say not over 4:1, and in such case the cakes of precipitate from the press can be melted direct without the above-mentioned acid treatment.

Water Concentration Group

In point of tonnage handled and value of product, the treatment processes of this group are in this country more important than all others combined—exclusive of smelting. All methods of water concentration are based on differences in specific gravity, and as extremely finely divided material or slime—200 mesh and finer—does not in treatment respond as readily to this difference as coarser and more granular particles, it follows as a fundamental principle in water concentration that the less the particles of minerals are crushed beyond the size necessary to effect their complete releasement from the gangue or from themselves—where two or more minerals are present requiring separation—the better is the condition of the ore for recovery by the concentrating machinery of the process.

This being the principle adhered to by all well designed, water-concentration plants, it follows that wide differences in details of treatment result, this being due to the diversity of mineralization in the concentrating ores. The accompanying flow sheets and tabulations give details of treatment and the results at a number of typical water-concentration plants, representing the various districts and ore types.

Perhaps the extremes of practice in this respect may be found in comparing, say, the Mace concentrating mills of Wallace or the Bunker Hill & Sullivan at Kellogg, Ida., separating silver-bearing galena from a silicious and feldspathic gangue, with, say, the Boston Consolidated at Garfield, Utah, separating copper and iron sulphides from a porphyry gangue.

At the former mills, after preliminary crushing with breakers and coarse rolls, concentration begins, with jigging at about 1½-in. size, and tailings are made for discard at this size. This is good metallurgical practice under the conditions and is possible because of the coarse character of the mineralization, coarse crushing liberating both coarse mineral and coarse gangue.

At the latter plant the cupriferous sulphides are finely disseminated throughout the gangue, few particles being over 1 mm. in size, and as a consequence no attempt at concentration is made until the ore has been crushed to pass a screen of 20 to 30 mesh.

(To be continued.)

Notes on the Effect of Earthquakes on Deep Underground Water Circulation

By W. H. Yeandle*

A small note stating that earthquake shocks frequently jar the mine workings in Oaxaca, which was recently published in one of our technical journals, attracted my attention. Although I have resided in Oaxaca over four years, I had never noted any effect from the frequent earthquakes. To the contrary, in November of last year I was underground in the Rosario mine at Taviche, Oxaca, during a rather hard shake and on coming out to the surface I found the top crew excited over the extent of the movement, which according to their version was sufficient to cause the galvanized-iron roofs to rattle and the stacks to sway alarmingly. I had felt nothing and inquiry among the underground men failed to find one who had even noted the shock.

I have been told repeatedly, however, by trustworthy men that the earthquakes affected the flow of water in the mines in this state. As a result I resolved to watch for such action.

On July 25, it was decided to determine the exact amount of water entering the mine per 24 hours, and to collect data on the power required to operate the pumps; this involved an evaporative test on the boilers, during which the temperature of the mine water was taken, same being used for steam purposes. That these data should have been taken just at this time was purely accidental.

At about 4 a.m., July 29, an earthquake occurred the duration of which I estimate to have been about 45 sec. After 5 hours and 30 min. the customary second shock came: This lasted about 20 sec. Inquiry brought out that neither shock was felt underground, nor did a careful examination of the mine workings lead to the discovery of any effect that could be attributed to this cause. There can be no doubt, however, that these shocks and subsequent ones affected to a marked extent the flow of water in the mine.

*Engineer and superintendent, Mina Rosario, Ocotlan, Oaxaca, Mex.

Measurements of Flow of Water

The pumping facilities at the Rosario exceed the capacity required, and the pumps in consequence are run at stated intervals. One of these intervals is at 6 a.m. On the morning of the shock the sumps were found overflowed to a marked extent, and note was taken of the increase of the water. On the following day my attention was called, by drillmen making a practice of bathing in the settling sump, to the fact that the water seemed warmer. I then began taking the temperature of the water several times daily. The quantity of the water was found in the following instances by multiplying the plunger displacement, by strokes per minute, by time pump was run, allowance being made for irregularities in starting, so that there can be no question as to comparative accuracy of amounts of water. The accompanying table presents the results of my observations covering a period of 10 days.

FLOW DURING EARTHQUAKE PERIOD.

Date.	Rate of Flow per 24 Hours.	Increase Over Normal.	
July 15.	38,000 gal.	normal	76 deg. F
July 29.	41,000 gal.	3,000 gal.	(?)
July 29.	56,000 gal.	18,000 gal.	(?)
July 30..	60,000 gal.	22,000 gal.	84 deg. F.
July 30..	64,000 gal.	26,000 gal.	84 deg. F
Next hard shock occurred at 9 p.m., July 30.			
July 31..	52,000 gal.	14,000 gal.	84 deg. F.
July 31.	52,000 gal.	14,000 gal.	80 deg. F.
Aug. 1...	59,600 gal.	21,600 gal.	79 deg. F.
Next hard shock occurred at 7 a.m., Aug. 1.			
Aug. 1...	55,000 gal.	17,000 gal.	81 deg. F.
Aug. 2...	50,000 gal.	12,000 gal.	80 deg. F.
Aug. 2...	60,500 gal.	22,500 gal.	77 deg. F.
It is quite probable that another shock occurred in this interval and was not noted, as about 20 shocks of varying intensity were noted during six days recorded.			
Aug. 3..	55,000 gal.	17,000 gal.	77 deg. F.
Aug. 4....	53,000 gal.	15,000 gal.	76 deg. F.
From Aug. 4 to Aug. 15 water has varied from 45,000 to 50,000 gal.			

It is to be regretted that owing to lack of facilities, no account can be given of the chemical characteristics of the water during this period. The ordinary mine water carries considerable iron and sulphuric acid, and when allowed to stand the odor of sulphureted hydrogen is notable. The water during and after the shakes seemed to be more acid and the sulphureted hydrogen more noticeable.

Careful search was made to find if the sources (springs in lower level) of the water had increased in number or changed in location, but it was found that no change had occurred, the old sources simply giving forth more water.

The earthquake here mentioned is the same as felt in Mexico, D. F., and that caused so great damage at Acapulco and Chilpancingo, Guerrero, so that its center must have been some hundreds of miles from this district.

Beyond the increase in the fuel bills due to increased pumping no damage or inconvenience whatsoever was experienced here; not so much as a fall of loose rock in the stopes of a very loose vein.

The Many Peaks Copper Mine, Queensland

Worked by the Mt. Morgan Gold Mining Company; Low-grade Silicious Ore; Used at Mt. Morgan as Flux in Pyritic Smelting

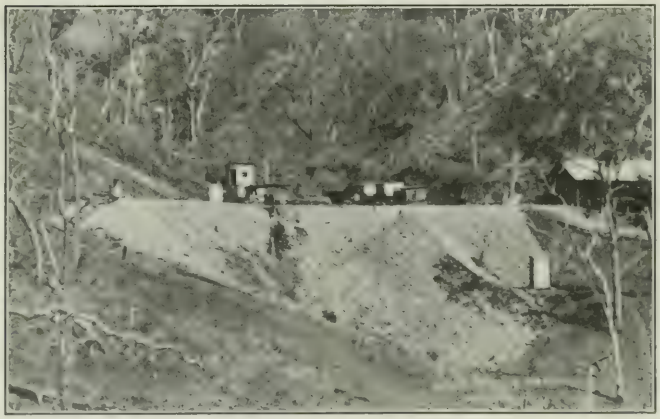
BY J. BOWIE WILSON*

The property, which is owned by the Many Peaks Copper Mining Company, Ltd., but is being worked by the Mt. Morgan Gold Mining Company under lease, is situated 25 miles south-southwest of Miriam Vale, a railway station on the Queensland Government North Coast Railway. A very rough track leads from Miriam Vale over the Many Peaks range to the mine, and during the initial stages of the development of the property all stores and supplies either came over this track, by horse and bullock teams, or by the longer but flatter road up the Boyne river from Gladstone, a town upon the shores of Port Curtis, the finest natural harbor upon the Queensland coast.

The climate of the district is good and the surrounding country, although extremely rough, is well timbered and there is a plentiful supply of iron bark and other hardwood timbers for mining purposes, while at a little distance from the railway there is a big forest of pine which it is proposed to open up to supply soft wood not only for building construction at the mine but for the district surrounding Gladstone. The official name of the township in which the mine is situated is Nanandu, but is more commonly known as Many Peaks.

The District

Upon the Mt. Morgan Company taking control of the property toward the end of 1906, the government decided to connect the mine with the railway system of the state as the company had stated that they would haul 80,000 tons per year from Many Peaks to its smelteries at Mt. Morgan. The Boyne Valley Railway was started in 1908 and it is expected to be open for traffic to the mine early in 1910. Instead of connecting with the railway at Miriam Vale the new line will follow the valley of the Boyne river for the greater part of the way, and, although this means the construction of nearly double the length of line, this route avoids the extremely rough Many Peaks range of mountains which would have necessitated steep grades and expensive tunnels. The longer route will also make available for closer settlement the fertile banks of the Boyne river and thus assist in the opening up of the district. This railway will open up a district which has been proved to carry mineral, chiefly copper, over a large area, but the development of these deposits has been delayed owing to lack of transportation to the coast. There are, or have been, mining camps at Glassford Creek, Mt. Hector and Cannindah, where the mining and smelting of copper ore have been in progress but without success, largely, it is claimed, through the excessive freight charges. The only mine at present being actively developed in the district is the Many Peaks, where work is being actively pushed ahead to enable a large daily tonnage to be extracted from its enormous deposits as soon as the railway arrives.



MAIN TUNNEL ENTRANCE WITH OFFICE AT THE RIGHT

Character of the Property

The mine was discovered by Messrs. Bailey & Lynch, who located the outcrop and did a little work in trenching and sinking pits. In 1898 they sold their prospecting claim to a small syndicate, called the Many Peaks Prospecting Syndicate, composed chiefly of young mining engineers employed at Mt. Morgan. After securing two prospecting areas of 160 acres each this syndicate immediately started to exploit the property.

The outcrop strikes roughly north and south and across a steep spur which runs down to the Boyne river and has Deception creek upon its northern side and a small unnamed creek to the south. The highest point in these prospecting areas is 700 ft. above the bed of Deception creek and the outcrop of the lode lies just below this level. The outcrop consists of ironstone and gossans and can be traced on the surface over a considerable distance. In several places it is characterized by the occurrence of big masses of ironstone. Most of the outcrop was either barren or only low in value.

The outcrop lying, as it does, upon the top of a steep spur, lends itself to prospecting by means of adits. The first work started by the syndicate was the driving of a tunnel on the eastern side of the deposit to cut the orebody at a depth of 150 ft. The lode was cut at 110 ft. from the mouth of the tunnel but was a great disappointment as it was found to be still oxidized. It showed quite a width of oxidized material and, that the original material had been heavily mineralized was indicated by the existence of huge vugs, some of them almost large enough to be called caves, but the fact that the material carried only a low copper content instead of the rich secondary ores expected was very disheartening. After driving some distance both north and south along the lode and connecting the workings with the surface by a raise, to improve the ventilation, a winze was sunk in the orebody. This passed through a couple of caves and entered the sulphide zone at a depth of 30 ft. and continued for 70 ft. in an ore composed of a dense fine-grained marcasite. At a depth of 60 ft. a crosscut was driven west, proving the lode to be at this point at least 40 ft. wide. The ore exposed in the winze and crosscut consisted of the same dense microcrystalline iron pyrites and averaged about 2½ per cent. copper but did not carry more than about 5 per cent. silica.

The No. 2 workings were started about

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1000 ft. to the south at a point where a steep gulley, running into the spur, allowed a tunnel to be driven along the strike of the lode about 300 ft. below the highest point of the outcrop. In all about 670 ft. of driving and crosscutting was done here with rather satisfactory results. At a point 300 ft. in from the mouth of the tunnel a crosscut showed 75 ft. of ore. At 200 ft. a winze was sunk 40 ft. in ore and from the bottom a crosscut showed 40 ft. of ore of a dense pyritic nature carrying about an average of 5 per cent. copper and about the same percentage of silica. As this was considered payable, and as no payable copper ore had been previously reported in the district, in July, 1909, application was made to the government for the conversion of one of the prospecting areas into a "reward claim" of 160 acres; this was granted.

Reward Claims in Queensland

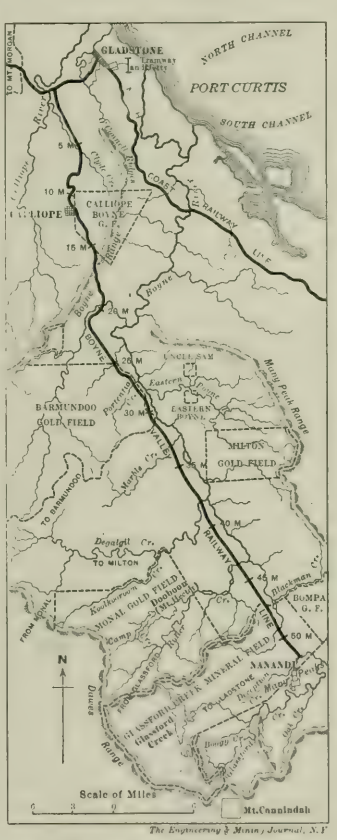
The great advantage in possessing a reward claim is that whereas a mineral lease requires the employment of one man for every 10 acres to fulfil the labor conditions, and failure to employ this number, without having first obtained exemption from the minister of mines, which exemption has to be renewed every six months and is hard to obtain after the first application, makes the lease liable to forfeiture and jumping, a reward claim is fully manned by one man. These reward claims are only granted to the first discoverers of payable mineral in a district and the mining warden has to visit the locality and satisfy himself that payable mineral has been discovered before he recommends the registration of the claim.

To prospect the northern end of the orebody, located in the No. 1 workings, a tunnel was started at a greater depth in a gulley on the eastern side of the spur so as to cut the deposit at a depth of 370 ft. The lode was intersected 480 ft. from the mouth of the tunnel but after driving 12 ft. in dense pyritic ore of low grade an intrusive dike was met and the tunnel stopped. A drive was then driven along the western edge of the orebody for 260 ft. south, which brought it beneath the winze sunk below the No. 1 workings. Crosscuts from this drive at 60 ft. and the end showed 40 ft. and 70 ft. respectively of dense pyritic ore, but the copper content only averaged about 2 per cent. while the silica ran a little higher.

History of the Company

In 1903 between £4000 and £5000 having been spent in prospecting work, 2050 ft. of driving and 370 ft. of raising and sinking and it being estimated that fully 300,000 tons of sulphide ore averaging 2½ per cent. copper had been proved, an attempt was made to form a company with a capital of £25,000 to mine the ore and extract the copper by the natural cementation process or leaching so successfully used at Rio Tinto, Spain, to extract the copper from an ore almost identical, both chemically and physically, with the Many Peaks ore. The proposed process being new to Australia and the metal markets being depressed, the attempted flotation was a failure and had to be withdrawn.

Shortness of funds necessitated the temporary suspension of prospecting work and three mineral leases, that had been taken up to the north and south of the



BOYNE VALLEY RAILROAD, QUEENSLAND

reward claim, had to be abandoned through inability to comply with the labor conditions. These leases were afterward taken up by the Queensland Copper Company, a London company owning and working the Mt. Perry copper mine, and are still held by them. The reward claim was continuously manned and the workings kept in order and a little work done.

Geology of the Deposit

The non-existence of rich secondary ores is perhaps explained by the nature of the inclosing country rocks. These, although they have not, as far as I know, been carefully examined microscopically, consist of altered sedimentary rocks and are much shattered and of an open nature. They have not allowed the copper-bearing solutions, resulting from the oxidation of the lode capping, to concentrate in the lower portion of the lode but have allowed their dispersion over a large area. This is well illustrated in the old No. 1 tunnel where the country rock, for some distance before the leached lode was reached, carried a low percentage of copper distributed, as carbonate and oxide, along the many joint faces. This wide distribution of the secondary copper has prevented the formation of rich bodies of secondary ore. Another interesting feature about the Many Peaks deposit is that in several places, where ore was expected, only boulders of pyritic ore have been exposed, surrounded by shattered country. An explanation of this may be that the boulders are the remains of the once solid orebody which has oxidized in this form, leaving kernels of ore to represent the disappearing orebody. If this is so it is only natural to find the boulders surrounded by crushed or shattered country rock, as such a basic ore as this could not leave a silicious skeleton strong enough to support the walls.

The genesis of the deposit is not at present clear and before any theory can be advanced more knowledge is required about its behavior in the lower levels. The orebody appears to belong to the class of replacements but the action has been very complete and the junction between ore and country in most places is clearly marked. Limestone outcrops on the western side of the deposit but so far has not been proved to have any influence upon the formation of the orebody.

Acquisition of Property by Mt. Morgan Company

In 1906 the Mt. Morgan Gold Mining Company, Ltd., which was searching for a suitable flux for its silicious copper gold ores, approached the Many Peaks Syndicate and an agreement was eventually signed in November of that year by which the Many Peaks Syndicate sold to the Mt. Morgan company the exclusive right of mining upon the reward claim in consideration of the payment of a royalty of 2s. 6d. per ton on all ore treated by the Mt. Morgan company. This agreement cannot be terminated by the Many Peaks Syndicate but the Mt. Morgan company, which is bound to mine or pay for a minimum quantity of 25,000 tons per year, can do so by giving six months' notice.

The Mt. Morgan company took over the working of the reward claim in December, 1906, and also took up, in its own name, a mineral lease for the construction of a tram line and the erection of ore bins,

etc., water rights along Deception creek, and homestead areas for the erection of offices, stores, etc. After a survey of the underground workings and surface features had been made, it was decided to attack the deposit from the northern end of the reward claim, as the rugged nature of the country at the southern end, where the richest ore had been exposed, made it practically impossible to construct a line to connect with the proposed terminus of the government railway. A large working tunnel, upon the 470-ft. level, is now being driven from a gulley near the northern end of the reward claim on a bearing nearly due south. This tunnel, 7 ft. high and with an 8-ft. cap, will act as the main entry of the mine, and is driven for the greater part of its length in the country upon the eastern side of the orebody.

Plan of Operations

The general scheme, originally laid out, for mining the orebody is as follows: Upon the 470-ft. level a main ore way to be driven clear of the orebodies and to be kept as nearly as possible 50 ft. away; turnouts, on a radius of 70 ft., as it is proposed to haul the ore from this level with electric locomotives and side-dumping ore cars, to be spaced every 200 ft. and to connect with the drive along the ore channel above which mining will be carried on. This scheme of a double drive upon this level was adopted because it was recognized that this main tunnel, being the only exit for ore, should be protected against accident as carefully as if it was the main shaft of a mine. If only the one drive, along the orebody, had been relied upon, then when mining had advanced and it was necessary to fill large areas of depleted stopes immediately above the drive, there would always be present the danger of an accident causing a block and if this occurred near the mouth of the drive the whole output of the mine would be affected. By having the main ore way well in the country rock this danger is avoided and the working part of the mine is divided into sections by the turnouts, in any one of which accidents, through squeezes or falls of ground, can occur without affecting the rest of the mine.

Levels will be opened up along the ore channel on the 370-, 270- and 170-ft. levels and connected in the usual way by filling passes and oreshoots to the levels above and below, all ore being eventually passed down to the 470-ft. level before it is withdrawn from the mine. The passes from one level to the other will be placed so that they will come one below the other and break joint with each other. The chute doors will be arranged to deliver either into trucks or into the top of the pass below as desired. The details of the method of mining to be adopted were not worked out, but, as the orebody is wide (in one place being at least 90 ft.), the ore hard, and the country on the walls promises to be treacherous, it will be clearly necessary not to have too much ground open at any one time and to keep the stopes well filled. With an orebody containing such dense pyrites and drained by a main tunnel it will also be necessary to take great precautions to guard against fire.

Development by Mt. Morgan Company

Since the Mt. Morgan company took control of the working of the mine and up to May 30 of this year, when it issued its usual report, 5889 ft. of driving, sinking and raising has been completed and a careful estimate shows the ore actually in sight above the 470-ft. level to be 840,000 tons of 2240 lb. Up to the present no attempt has been made to explore for other orebodies along the strike of the lode. The lode at the 470-ft. level maintains its size and composition and has every appearance of extending in depth.

The ore will be delivered from the mine by electric locomotives to the top of bins, built beside a siding or extension of the government railway, which will deliver directly into the railway trucks and be hauled to Mt. Morgan.

The acquisition of the mining rights of this large pyritic copper-bearing orebody is of great value to the Mt. Morgan company, as by substituting a copper-bearing pyritic flux for the barren ironstone now in use both the capacity of the furnaces and the cost of smelting should be materially affected and both in the right direction. As the ore contains just about sufficient gold to pay the royalty it is estimated that the copper contents will be sufficient to pay for the mining and transport of the ore and a flux for the silicious ores will be provided at a small profit.

Transvaal Gold Production

Gold production in the Transvaal in September and the nine months ended Sept. 30 was as follows:

	1908.	1909.	Changes.
September, oz.	587,634	606,385	+ 18,751
Nine months, oz.	5,159,759	5,475,274	+ 315,515
Nine mos. value	$106,654,256	$113,175,981	+ $6,521,695

The number of mines reporting this year in September was 72, having a total of 9620 stamps in the mills. Of the gold reported for the month 585,730 oz. came from the Witwatersrand, and 20,949 oz. from outside districts.

Recruiting labor has been slower in recent months than the losses by expiration of time, deaths, etc. It is estimated that the present supply of unskilled labor is about 85 per cent. of that which could be profitably used in the mines. In September, 3204 Chinamen were still employed in the mines.

Rhodesian Mining Notes

Special Correspondence

The mining outlook in Rhodesia is exceedingly promising. The most talked of district at present is the Abercorn, where an undoubtedly important discovery has recently been made. This is the Shamva, on which the Consolidated Goldfields company is rumored to have exercised an option. The orebody is an auriferous conglomerate. The mode of occurrence of the gold, however, differs in some important respects from that of the Witwatersrand, and although the conglomerates themselves extend for many miles there is no reason for expecting that continuity of pay ore which characterizes the Witwatersrand conglomerates. There is little official information regarding the Shamva, and indeed only one published report, and that by a Mr. Powell, who is stated to be an Australian engineer.

The Shamva property is situated on a hill which rises about 850 ft. above the level of the surrounding plain. The side of the hill is steep and for this reason the lode lends itself very favorably to being worked by adits to a depth of about 600 ft. The lode formation is a fine-grained sandstone showing pebbles throughout. The dip is nearly vertical. The Shamva mine has nearly 4500 ft. on the strike of the conglomerate and, owing to the Rhodesian mining laws, allowing a company which has the outcrop of the lode in their property to follow it on the dip as far as it can be worked, is in a very favorable position. How much of the strike is auriferous is not yet known.

Development of the Shamva Mine

The following is a summary of results so far achieved:

No. 1 tunnel is the farthest west. It is in about 150 ft. and the orebody was struck at 80 ft. For the first 30 ft. the value was 21 dwt.; since then no assays have been made, but the pannings are good. The hight of back above this tunnel is about 75 ft. No. 2 tunnel, situated about 525 ft. east of No. 1, has been driven about 240 ft. The lode was cut at 100 ft. and the last 140 ft. averaged 12½ dwt. The face of the tunnel is still in pay rock as shown by pannings. A drive has been carried along on the footwall of the lode for a distance of about 130 ft. east and is still in good ore. At a point about 70 ft. east along this drive a crosscut has been started, and the first 30 ft. driven averaged over 10 oz. per ton.

About 1½ miles to the west on the same line the Consolidated Goldfields company has an option on another property. The formation is exactly similar to the Shamva and the ore so far is proved over a fair width.

Chrome and Other Deposits

Base metals are already receiving attention. The most important at present is probably chrome iron ore, which is destined to play a substantial part in the success of the Rhodesian mineral industry. A big scheme for development is now being planned. Ore has been exported for the last four years. Lead, copper and antimony are produced as by-products. The Edmundian copper mine has been producing for some time, while another of great promise, the Umkondo, starts producing this year. All these ore occurrences are described in Johnson's "Ore Deposits of South Africa," Vol. I.

In the country north of the Zambesi other copper mines are developing and form a connecting link with the great Katanza deposits. Scheelite and wolframite are also being mined.

Rhodesia is essentially a country of small mines worked by private individuals. It possesses already over 300 producing mines and has produced over £13,000,000 worth of gold since 1898. It, however, has three or four moderately large gold mines and holds out promise of quite a number of big low-grade deposits.

The important Waukie coal mine has been reconstructed on a basis which is confidently expected to turn the concern into a dividend payer. It has suffered under great disadvantages, but has practically a monopoly of the Rhodesian trade and consequently a fairly large output. It should share the prosperity which now seems to pervade the whole country.

Asbestos

Occurrences of asbestos, discovered in 1908, are being opened in the Victoria district. The syndicate has just issued a report of operations from August of last year to the end of March, 1909, which show that about 120 tons have been exported to England. In addition there were mined about 100 tons of lower-grade fiber, which has been stacked on the property awaiting the time when it can be handled at a profit. It would seem from advices issued by the manager that not only can a monthly output of 30 tons of best grade fiber be maintained, but that a new quarry containing larger and richer material than that now being worked is about to be opened up.

Diamond Mines

There has been no diamond output lately. The Somabula alluvial in which the diamonds were found is now practically deserted. Development is proceeding apace on the diamond pipes recently discovered at Bambesi. The largest of these—named the Colossus—is claimed to be larger than any diamond pipe discovered. Washing tests have been delayed owing to the fact that a section of the mine has been under water, with the results that all the rock extracted has been the unoxidized "blue" which, without mechanical treatment, would take at least a year to disintegrate sufficiently for treatment. Crushing rolls capable of treating 120 loads a day are now being erected.

La Rose Consolidated

D. Lorne McGibbon, the new president of La Rose Consolidated Mines Company announces changes in the directors as follows: John McMartin, Duncan McMartin, Henry Timmins and Frank W. Holmes resigned and George Washington Stephens, Shirley Ogilvie, Alex. Pringle and Victor E. Mitchell, K. C., all of Montreal, elected in their place.

The annual report of the company for the fiscal year ended May 31, 1909, shows the net value of its product for the period was $1,320,147. The cost of producing silver was 16.31c. per oz., while the average selling price was 51c. per oz. Almost the entire output of silver (about 3,000,000 oz.) was mined from the La Rose mine, nevertheless the same ore reserves as were reported a year ago have been maintained. In the spring of 1909, the company acquired the Lawson mine, upon which considerable development has been done, and which promises to be an important and profitable acquisition.

The work done during the year was as follows: Drifting, 3586 ft., raising, 410; sinking, 322; crosscutting, 1985; trenching, 12,145; open-cutting and stoping, 7477 cu.yd. Nearly all this work was upon La Rose. A shaft on the No. 3 vein of this vein developed good ore to a depth of 135 ft. On the Princess 72 ft. of sinking was done and a new level started at a depth of 135 ft. A vein of cobalt ore was open-cut on the University and a shaft 90 ft. in depth sunk on the No. 4 vein. On the Lawson work was chiefly confined to trenching with the result that several new veins were discovered.

The accompanying tables give the shipments, production costs and ore reserves. In the table of production costs the item $206,258, for marketing ore includes charges as follows: Smelter deduction on silver, $87,396; treatment charges, $47,359; transportation, $61,524. In the table of ore reserves in La Rose, the estimated profit is figured by assuming a value of silver of 51c. per oz., adding $20 per ton of ore for cobalt, and deducting operating and marketing charges estimated according to previous year's results. No estimate is made of ore reserves in the other properties.

The contract made with the Northern Customs Concentrators, Ltd., for treatment of the low-grade ore at present upon the various dumps and which the company continues to mine, is expected to prove an important source of revenue. During the year there has been paid to shareholders out of net earnings dividends to the amount of $633,080 and at the same time, a surplus of $421,481 has been accumulated.

The ore shipments for the period were 6063 tons containing 2,015,706 oz. of silver. The sales of cobalt amounted to $24,059 and of arsenic $332. From the sale of ore, $1,320,147 was received.

ORE RESERVES IN LA ROSE.

	Tons.	Ounces Silver.	Estimated Profit.
Partly Developed			
Main vein	3,187.2	1,668,088	$ 987,329.96
No. 3 vein	278.6	790,605	283,326.11
McDonald vein	926.7	748,621	277,469.42
No. 10 vein	188.6	100,391	38,100.40
	4,583.3	4,307,705	$1,586,225.89
Country Rock			
McDonald	5,747.0	454,013	142,812.95
	10,330.3	4,761,718	$1,729,038.84
Indicated Ore			
No. 3 vein	68.9	206,700	74,019.61
	10,399.2	4,968,418	$1,803,058.45

LA ROSE SHIPMENTS, JUNE 1, 1908, TO MAY 31, 1909.

	Dry Tons.	Net Value per Ton.	Gross Ounces Silver.	Net Value.	Oz. Silver per Ton.	Cobalt, Per Cent.	Nickel, Per Cent.	Arsenic Per Cent
Silver-Cobalt-Nickel ore	1,671.8260	$ 663 32	2,264,895.49	$1,108,947.09	1,354.7	8.28	8.26	36.27
Low-grade Silicious ore	4,318.5200	41 72	604,646.43	186,539.86	140.0			
Low-grade Cobalt ore	39 8430	78.90	1,288.58	3,143.75	32.3	12 57		
Concentrates	31 6210	272.13	18,528.51	8,605.13	586 0			27.46
Nuggets	1 8605	6,940.12	26,347.57	12,912.09	14,161.8			
Total	6,063.6705	$ 217.71	2,915,706.58	$1,320,147.92	480.8 (average)			

PRODUCTION COSTS AT LA ROSE.

		Per Ton Ore.	Per Oz. Silver.
Operating expense	$259,088.77	$42 73	$0 0889
Depreciation on plant	3,343.47	0 55	0 0011
Marketing ore	206,258.37	34 01	0 0707
Concentration	6,375.20	1 05	0 0022
Corporation and Toronto office	2,100.00	0 35	0 0007
	$477,165.81	$78 69	$0.1636
Less rents and interest	1,603.28	0 26	0 0005
Total cost of production	$475,562.53	$78 43	$0.1631

Safety Precautions in Shot Firing

Description of Mining Methods and Details of the System of Shot Firing at the Dalton Main Collieries, One of the Largest Operations in England

BY HENRY M. PAYNE*

The Dalton Main Collieries, Ltd., operating the Roundwood and Silverwood mines, near Rotherham, England, is one of the largest coal companies in that country. In July last I visited their Silverwood mine, from which is taken the greatest output of coal per year, of any shaft of its depth in England.

The shafts are circular, 21 ft. in diameter, and extend 2238 ft. to the Barnsley seam. The sinking of these two shafts, which was carried on simultaneously, was commenced in April, 1900, and completed in December, 1903. Large quantities of water were encountered during the first 450 ft., and were handled during the sinking process by huge pumps, suspended by chains. Subsequently a 12-ft. circular shaft was sunk 450 ft. to serve as a reservoir, and it now supplies the entire colliery for all purposes.

Rope Guides Are Used in the Shaft

The hoisting engines at this plant are also the largest of their kind, having 48-in. cylinders, 7-ft. 6-in. stroke, with 24-ft. winding drum, and are capable of hoisting 6000 tons per day, at a steam pressure of 120 lb. The cages are 18 ft. high, carrying three decks of four cars each, and are loaded and unloaded at the top by a hydraulic decking arrangement which changes all 12 cars simultaneously. Instead of using fixed cage guides, at each corner of the cages is a lock-coil rope, under 14 tons tension, and between the cages hang two rubbing guides under similar tension. Each car carries 1200 lb of coal, making about seven tons per hoist.

Ventilation is furnished by a 13-ft. 4-in. Schiele fan, giving 220,000 cu.ft. of air at 1 in water gage. Electric haulage is used throughout the mines of the company, the haulage motors varying from 7½, 20, 40 and 65 to 110 h.p., using a three-phase current of 550 volts, 50 cycles per second.

The tipple and screens are located 450 ft. from the shafts, in order to avoid the dust from the screens passing into the intake air supply. The coal is cleaned by pickers from conveyer belts, and the gob is thrown onto other conveyer belts which deliver it into hoppers whence it is loaded into cars and emptied on the culm pile.

The whole of the small coal is passed through a washer whose capacity is 130 tons per hour, after which it is carried by aërial tramway to the coke ovens. These ovens are in two batteries, the first consisting of 36 horizontal-flued by-product ovens producing 800 tons per week, and the other of 44 regenerative vertical-flued ovens producing 1200 tons per week. The principal by-products are ammonium sulphate, ammonium chloride, tar and benzol.

The company also operates a brickyard fitted with Bradley and Craven machines and a 14-chamber Warren continuous-type kiln, having a capacity of 20,000 bricks per day.

The Longwall System of Mining Is Used

The longwall system of mining is used, and the average progress of the face is from 250 to 300 ft. per year. The cost of timbering is held down by heavy cribbing at the face, so as to render possible the recovery of much of the back timber without danger to the miners.

Special shot-firers are employed, and are appointed in writing by the manager, with special reference to their experience, reputation and sobriety. One of the requirements for eligibility is that the applicant must hold a second-grade foreman's certificate.

When the miner has his working place ready to load and fire, he comes out and reports to the mine boss the number and location of the holes. The shot-firers, who go in the mines after the shift has come out, learn from the mine boss the locations and number of shots to be fired in each district, and each shot-firer then goes to the storekeeper and receives a definite number of detonators, for which he signs a receipt. The explosive having already been taken to the working place by the contractor or miner, *in a sealed, locked car whose capacity is limited to 5 lb., and to which only the shot-firer has a key*, the shot-firer then proceeds to examine the place. He has previously received for a certain number of detonators, and on his report he also notes the depth of the hole, its direction, the amount of stemming, the effect of the shot, etc., numbering each hole he shoots consecutively. The style of report blank used by the shot-firer is shown by the accompanying diagram.

When the shot-firer comes out of the mine he turns in this report, together with any unused detonators, and the total number of shots fired and detonators returned must equal the number of detonators for which he receipted.

The company provides the explosives and detonators, and the prices paid the miner are fixed accordingly. There are 60 "permissible" explosives available for use in England, and the coal-mines regulation acts from 1887 to 1909, inclusive, are very rigid in their requirements. Among other specifications it is required that:

"The charge shall be fired by a competent person appointed in writing by the owner, agent, or manager, and not being a person whose wages depend on the amount of mineral to be gotten.

"The charge to be placed in a properly drilled shot hole with sufficient stemming, and to consist of a cartridge or cartridges of not more than one description of explosive.

"When two or more shots are being fired in the same place and are not being fired simultaneously, the shot-firer must make an examination for gas immediately before the firing of each shot, and must not fire the shot unless he finds the place where the shot is to be fired, and all contiguous accessible places within 20 yd. free from gas, and safe for firing.

"The use of permitted explosives in main haulage roads and intakes is subject to the further condition that every part of the roof, floor and sides, within a distance of 20 yd. from the place where the shot is fired, must, unless naturally wet, be thoroughly watered at the time of firing."

The precautions of the record book, and check on number of holes shot, detonators issued, etc., are all taken by the Dalton Main Collieries Company, in addition to the requirements of the coal mines regulations.

I am indebted to William H. Pickering, H. M. inspector of mines, and James Elee, Esq., of the Collieries company, for much of the information which I have here outlined.

REPORT BLANK USED BY SHOT-FIRERS.

Date.	No. and Name of District.	No. of Place.	Time.	Amount and Kind of Explosive.	Kind of Date.	No. of Shot.	Good or Bad.	Depth of Hole.	Amount of Stemming.	If Horizontal. Yes or No.	If Vertical.	If Slanting up or down.	If a Miss Shot.	Date. Recovered by Whom.	Amount of Explosive Recovered.	Name.

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The Safe Use of Electricity in Coal Mining

By Sydney F. Walker*

George Wood's paper, read before the Coal Mining Institute of America, and reported in The Engineering and Mining Journal, July 3, is full of matter that is of great interest, both to mining and to electrical engineers. At the present time, in the United Kingdom, both mining and electrical engineers are much exercised over the somewhat frequent accidents that have taken place in mines, by which men have been killed, and anything which can be done to reduce the chances of accidents should be of great value.

Mr. Wood has apparently given considerable thought to the whole matter, but it appears to me, from a perusal of his paper, that he is mistaken in some of the points which he makes. He says, for instance, that it has been repeatedly attempted to ignite fine coal dust by means of the electric arc, but so far, he believed, without success. I think that a little consideration would have led him to modify his view of the matter. The ignition point of coal is about 1000 deg. C., and the temperature of the electric arc is some 5000 deg. C. It appears to me a self-evident proposition that coal dust will be ignited, if placed in an electric arc.

Coal Dust Can Be Ignited by an Electric Arc

I believe I am correct in saying also that fires have occurred, in the United Kingdom at any rate, through the ignition of coal dust by arcs formed between the ends of broken cables. In addition to this, experiments have been made with incandescent lamps, whose temperature is considerably lower than that of the arc, by burying lamps in coal dust, with the result that the dust has been raised to ignition temperature.

Mr. Wood then goes on to observe that an electric spark of almost any potential will ignite gas in proper percentages, and illustrates the ignition of the charge in automobile engines as proving his contention. I am afraid that Mr. Wood is again mistaken. The fact that a spark passes is proof of a very high temperature and of the presence of a certain amount of energy, but a spark does not always possess sufficient energy to ignite an explosive mixture. The spark which passes through the charge in an automobile engine has a pressure of some 6000 to 8000 volts, and automobiles will know how often trouble arises, when a "fat spark" is not obtainable. A great many of the troubles with motor cars are due to misfires, arising from the spark not being sufficiently fat, that is to say, its not having a sufficient amount of energy present in it.

A good many years ago, I carried out a series of experiments, to determine this. It was at the time when the electric jump-spark fuse was coming into general use, and there was considerable trouble with the fuses. Some would fire and some would not. My experiments pointed out that it was not only a spark *per se* that was required, but a spark carrying a certain energy. The temperature of the spark was necessary, but it was also necessary that a certain energy, or as automobilists express it, a certain fatness should also be present. A weak spark might ignite an explosive mixture, if everything was very favorable, but the chances were against it.

On this side of the water, there has been a good deal of controversy as to whether the spark, which sometimes passes when electric signal wires are pressed together on engine planes to make a signal, would ignite gas. I made some careful experiments upon this about the same period, and my experiments were repeated by the managing director of one of the largest coal-owning firms in the United Kingdom, on a much more elaborate scale. The result we both arrived at was, that the signal spark would not ignite gas. It is fair to say that a later experimenter did succeed in igniting gas by means of the spark at the trembler contact of an electric bell, but the cases in which gas would ignite were few. Mr. Wood remarks that ignition will only take place when a current is broken. This again is not strictly correct, as a small wire carrying a large current, as it may do in the case of a short circuit, raising the wire to a white heat, would also ignite an explosive mixture. I have ignited an explosive mixture with a few inches of copper wire raised to a red heat. The time factor is an important one in all these questions, and therefore the velocity of the air current, and the rapid passage of the air past the point where sparking or arcing is taking place, would have an important bearing upon the ignition.

Electric Shocks

Mr. Wood also discusses the interesting question of the comparative danger of electricity, at different pressures, and expresses the opinion that 500 volts is more dangerous than 250. This is quite correct, providing that both are continuous-current pressures. With alternating currents, 250 volts is sufficient to kill. In fact, men have been killed in the United Kingdom with considerably less than 200 volts alternating. It should be borne in mind that the effective alternating pressure, that which is applied to lamps, motors, etc., is less than half the actual difference of pressure that a man will receive in the form of a shock. The alternating pressure applied to lamps and motors, the effective or virtual pressure as it is termed, is practically the average pressure. The pressure rises from zero to very much higher than the working pressure, falls to zero, rises to higher than the working pressure, in the opposite direction, falls to zero again, and so on, these changes taking place within 1-100 part of a second, in modern apparatus. The actual difference of pressure experienced when a shock is received, say from a 200-volt alternating-current service, is 560 volts, and this is one of the reasons why alternating-current pressures are so much more dangerous than continuous current, for the same working voltage. Once, however, that killing pressure is reached, the danger of higher pressures is apparently no more than the lower pressures, except in special cases.

Ability of Men to Withstand Shocks.

The conditions under which men receive shocks vary, and the ability of men to withstand shocks also varies. There is a record of a man, in the early days of electric power work in mines, who used to test for disconnections on a 500-volt continuous-current service, with his tongue. Such men are rare. As a rule the average man will be killed by a 200-volt alternating-current service, or 500 volts continuous taken from hand to hand, hand to foot, or head to foot, and he apparently runs no more danger from 1000 volts, or 2000 volts, than from 200 volts. There is also a peculiar feature in connection with high pressures. Many a man has owed his life, when making contact with a service at very high pressure, to the terrible burning which he received from the arc formed between the conductor he touched, and his body. The arc formed, burns the surface of the skin to such an extent that it sets up a resistance in its own path sufficient to save a man's life. This does not always happen with very high pressures, but it has in a number of cases.

Conditions Produced by Electric Shock

Mr. Wood is quite correct in saying that the conditions produced by electric shock are similar to those produced in drowning. Drowning, hanging, poisoning by carbonic acid gas, electric shock, and to a smaller extent the common complaints known as chest troubles, in which breathing is rendered difficult, are all of the same nature, chest troubles being of course a minor form. In all of them the action of the heart is arrested, either directly by a shock passing along the nerve controlling the heart and the lungs, or indirectly by the cessation of the action of the lungs, and by additional work being placed upon the heart to such an extent that it gradually ceases to beat. In all cases the heart is only temporarily stopped, and if the cause is removed, as when water is allowed to run out of the lungs in drowning, when the patient is removed to fresh air after carbonic acid poisoning, if the

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rope is removed in time after hanging and the mechanical actions which go on normally, during life, are imitated, the heart may gradually recover, gradually acquire the power of restarting, and the victim then lives once more.

It would be exceedingly interesting to have some account of the results obtained with the cables insulated with varnished cloth, in mines, mentioned by Mr. Wood. The insulation of cables in mines is one of the greatest difficulties that have to be contended with in the use of electricity in mines. Rubber is affected by wet. Its gums are oxidized, and it tends to break up. Rubber also is expensive, if it is used in sufficient thickness to be a proper protection to the conductor, and hence there has been the temptation to use a small thickness, with generally disastrous results. Again the large amount of poor rubber that was brought from West Africa some little time ago, and which was worked up into insulating material for cables, and which could not be distinguished, when laid on the cables, from the best rubber, but which broke down in a comparatively short time, has led to rubber being largely discounted.

In the coal mines of the United Kingdom, bitumen has largely taken the place of rubber. Its insulation resistance is not as high as that of rubber, but it can be obtained in greater purity. It has a greater sparking resistance for a certain thickness, and it is considerably cheaper. Paper-covered cables are also being used to an increasing extent in British coal mines, particularly with high tensions, 3000 volts or thereabouts, with three-phase currents. One of the principal reasons for its use is the lower cost, and the higher resistance to sparking. The insulating envelop of a cable has two distinct offices to perform. It has to prevent the leakage of current from the conductor, and it also has to prevent sparking from one conductor to another, in the case of three-phase cables, and from the conductor to any other conductor in the neighborhood, in the case of continuous currents.

With high pressures, 2000 and 3000 volts, the resistance to sparking is at least as important as the resistance to leakage. The pressure available for driving a spark through the insulating envelop of the cable is not merely the pressure of the service, 3000 volts, or whatever it may be, it is 2.8 times that pressure, owing to the rising and falling and reversing of the pressure, and in addition it is often multiplied considerably above those figures, owing to the induction which takes place when a large portion of the load is suddenly thrown off.

The Blaisdell-Coscotitlan Syndicate is successfully treating, by cyanidation, tailings at Pachuca, Mexico, that average $3 in gross content, $1.25 of which is gold and $1.75 silver.

Coal in Peru

The Peruvian Consul General at New York reports the discovery of an important new coal district in the department of Huayday, near Libertad. The coal is found in two beds, 7 and 9 meters thick. An analysis gives the following: 3.30 to 4.81 per cent. volatile; 2.18 to 9.10 per cent. moisture; 82.90 to 87.74 per cent. fixed carbon; 4.70 to 5.27 per cent. ash; calories, 7666. The coal has been tested on steamers and is reported equal to Lehigh coal. The district is 155 kilometers from Port Salaverry and 112 kilometers from Malabrigo. Railroads are already built toward the new district, and in one case it will be necessary to extend the line only 65 kilometers, and in the other 90 kilometers. The coal area is from 100 to 120 sq.km. The district was discovered by American engineers. It is a plan of the government to take control of it and develop it for the use of the coast steamers and for domestic purposes. The coal in Peru is now received from Australia and England. The English coal costs 40 marks a metric ton, and the Australian, 30 marks. It is believed that this new coal can be laid down for about 16 marks. The coal discovery is considered the most important that has been made recently in the Andean countries.

Coal Dust Experiments

SPECIAL CORRESPONDENCE

Experiments with coal dust have been carried on for some time past at the Altoft colliery near Normanton, England, with the object of finding some means of preventing or mitigating explosions in collieries. An account of the plant used and of the methods employed was given in the JOURNAL a year ago (Oct. 24). During the last week a further demonstration was given to a large party of mining engineers and Government officials, when the beneficial effect of the use of stone dust was again shown.

The experimental gallery was filled throughout with coal dust and fired by a cannon, the result being a tremendous explosion extending the whole length of the gallery. On the second day stone dust was distributed over certain sections of the gallery and the coal dust again fired. Pieces of gunnotton and cotton-wool fixed at short intervals showed that the flame only extended a short distance into the stone dust sections. The stone dust used was prepared from a gray shale which had been ground to a rough powder.

ONE POUND OF COAL DUST GIVES OFF 43 CUBIC FEET OF GAS

The explosive character of coal dust is now generally accepted, but there are still some engineers who think that it is gas and not coal dust that is the cause of colliery explosions. The investigations that have been made at Altofts have demonstrated that 1 lb. of coal dust, when heated to 1650 deg. F. gives off 43 cu.ft. of gas, and this fact may play a considerable part in an explosion, although the origin of the explosion may be due to the ignition of coal dust.

With regard to the quantity of stone dust necessary to prevent an explosion, experiments have shown that an atmosphere containing 0.2 oz. of dust per cu.ft. is explosive, but that when the mixture contains 90 per cent. of coal dust and 10 per cent. of stone dust, there is no risk of an explosion. When the quantity of dust in the atmosphere is 0.4 oz. per cu.ft., a mixture of 80 per cent. coal dust and 20 per cent. stone dust is equally non-explosive. These figures are taken from the London *Times* report of Sept. 29.

The method of checking coal-dust explosions by the use of stone dust is known as the zone system, and is an alternative method to the watering method and to the use of salt or chloride of calcium. From the experiments conducted at Altofts it appears that the use of stone dust, while not freeing collieries from the danger of explosion, must go a long way toward localizing an explosion and toward preventing the whole mine being wrecked.

ALL METHODS FOR PREVENTING DUST EXPLOSIONS ARE STILL IN THE EXPERIMENTAL STAGE

The Royal Commission on mines whose second report was recently issued, and which was reviewed in the JOURNAL, went fully into the subject of the prevention of colliery explosions. The conclusion come to by the commissioners was that there was no method of prevention yet proposed that they could recommend for compulsory adoption. The method of complete watering practised in the Westphalian coalfield was open to objections and the zone method was in their opinion still too much in the experimental stage to allow of any definite recommendations being made.

Toward diminishing the risk of explosions, the commissioners thought that as regards Great Britain, there was room for improvement in ventilation and in inspection, or in what they called the "primary" methods of preventing dust explosions. Such explosions being, it is believed chiefly initiated by the ignition of explosive gas, the greater the care taken to prevent accumulation of gas, the less would be the risk of an explosion taking place.

Sulphur is being shipped to Europe from Los Cerritos, San Luis Potosi, Mexico. Other sulphur deposits are at Conejos, Durango, in Tamaulipas and in Lower California.

Mica is produced in small quantities in the State of Oaxaca, Mexico. Shipments have been made to England and the United States.

Mining Coal in the Philippine Islands

By Robert Hawxhurst, Jr.*

The island of Cebú in the Philippine archipelago, is situated about 300 miles southeast of Manila. The island is 120 miles long, with an average width of 23 miles. It is traversed from north to south by mountain ranges forming an island plateau, about 500 ft. in elevation. Cebú is the most densely populated island of the Philippine group, having an area of 1762 square miles and a population of 650,000.

Cebú City, the largest town, with 40,000 inhabitants, is possessed of an excellent harbor, formed by a widening of the straits between Mareta and Cebú islands. The harbor is easy of access and by reason of its almost complete protection from storms by the highlands of the two adjacent islands is considered to be the safest harbor in the group. By virtue of this harbor, Cebú controls the greater part of the trade of the southern Philippines. The hemp, sugar, tobacco and copra of Mindanao, Bohol, Samar and Seyte are brought to Cebú, in light-draft steamers; these products are then exported by direct lines of steamships to Hong Kong, Liverpool, Bremen and Hamburg.

The insular government has entered into a contract with the firm of J. G. White & Co. of New York for the construction of about 60 miles of broad-gage railway on Cebú. One section of this road will extend north, from Cebú City to the towns of Compostela and Danao. The coalfields in question are situated 20 miles to the northward of Cebú City, on the eastern slope of the coastal range of mountains, five or six miles west of the coast towns of Danao and Compostela, in a district of the same name. The elevation of the coal lands is from 600 to 800 ft., the surrounding hills rising about 1000 ft. higher.

From a hasty and somewhat incomplete examination, it would appear that these coal measures are of recent formation, probably of the Tertiary age, or later. From their outcrop on the western border of the field, the measures dip to the eastward with an inclination varying from 50 deg. to 70 deg.; the strike approximates N. E. and S. W.

A section embracing the successive formations from the basal sandstone to the argillaceous limestone caprock consists of limestone, slate, shale, and clay; the coal seams themselves are separated by strata of slates and clays, the whole resting in a transition bed of yellow clay that merges into ferruginous sandstone, the basal member of the measure.

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The Exposed Coal Seams

The coal beds are numerous but were not counted. The seams actually exposed by the workings are five in number, with a thickness of 0.8 m., 1.5 m., 1.6 m., 2.5 m. and 1.2 m. Besides these there exist numerous undeveloped seams of from 6 to 7 m. thick. The shales are of various kinds, bituminous, calcareous, argillaceous and arenaceous, and are permanent features of these measures; however, the coal itself as it occurs in the thicker seams is fairly clean and free from the slate and shale.

Numerous irregular isolated deposits of coal are reported just beyond the marginal area of the Danao and Compostela beds. These irregular coal beds usually occur in the banks of ravines and exhibit signs of disturbances. Although apparently unconnected with one another they bear the same general characteristics. It is probable that they are the remnants of some former field that has been removed by geologic agency. They have never been mined but have occasionally furnished a little coal for immediate local use.

The Danao and Compostela coal is probably a Tertiary lignite; its physical characteristics are as follows: Color, jet black; luster, resinous; streak, dark gray to black; ashes, light yellowish red to white; specific gravity, 1.32 to 1.34; contains a small amount of sulphur and does not slack upon exposure. The following comparative analyses were made in the laboratory of the insular mining bureau:

1. Coal from Esperanza mine, Compostela.

Specific gravity	1.329
Fixed carbon	51.96
Volatile matter	37.56
Water	7.80
Ashes	2.68 brick red in color
Flame	Long, reddish in color
Coke	Almost solid
Calorific value	7461

2. Coal from Caridad mine, Compostela.

Specific gravity	1.340
Fixed carbon	54.56
Volatile matter	34.33
Water	9.60
Ashes	1.31 clear red in color
Coke	Pulverized
Flame	Medium, reddish in color
Calorific value	7.012

3. Imported Australian coal, Sydney and Newcastle.

Specific gravity	1.365
Fixed carbon	71.45
Volatile matter	16.25
Water	2.90
Ashes	9.40 reddish gray
Flame	Long and brilliant
Coke	Swollen and brilliant
Calorific value	6.637

4. English Cardiff Coal.

Specific gravity	1.389
Fixed carbon	83.00
Volatile matter	8.60
Water	4.50
Ashes	3.90 gray in color
Flame	Short and dark
Coke	Almost pulverized
Calorific value	8.372

From these comparative analyses it would appear that the Danao and Compostela coals are essentially steam coals. While their calorific value falls below that of English Cardiff, it is superior in this respect to the Australian and Japan coals, upon which sources Philippine shipping and industrial enterprises rely for their fuel supply at present.

An analysis of average Japanese steam coal by Frank Brown, government chemist, Hong Kong, 1898, is as follows:

Fixed carbon	50
Volatile matter	40
Moisture	2 to 5
Ashes	3 to 5 to 20

Coal Was Discovered about 1860

These coal outcrops were discovered about 1860, and from 1870 down to the present time have been intermittently worked in a desultory fashion. No development work was done, the chief idea seemingly having been to mine and market a few tons of coal to cover current working expenses. However, it is doubtful whether the aggregate output during this entire period of working has reached 20,000 tons.

Two tramways were built; one from the Compostela group of mines to the coast town of Compostela, a distance of 15 km., and one from the Danao mines to a wharf at Danao. The idea seems to have been to ship from these two ports, but as they are open roadsteads, with neither protection nor depth of water, it is not clear how this method of exportation could have been pursued with any degree of success, had it ever been attempted upon a commercial scale. However, these tramways, through neglect, have fallen into a state of disrepair and ruin, a rather fortunate circumstance as regards the Compostela line at least, since its location, grade and curvature were such that its operation as a freight-handling proposition would prove an expensive luxury.

Many Difficulties Have Attended Mining

In spite of their present state of semi-abandonment, the Danao-Compostela mines are of great economic value, but the conditions of the past in the Philippine islands have been continuously unfavorable to their successful working. Mismanagement, ignorance of modern coal-mining practice, lack of sufficient capital, onerous government regulations, all played their parts in the undoing of the successive proprietors, while the unsettled conditions of the islands, due to revolts against Spanish rule, the Spanish-American war and the Philippine insurrections, have rendered it impossible to secure a satisfactory class of labor, and still more impossible to interest foreign capital in the development of the mines.

The climate of the island of Cebú is excellent, unskilled labor is plentiful, water sufficient for coal-washing purposes is at hand. The surrounding mountains furnish an abundant supply of light timbering material, while heavier sticks

may be readily obtained from the nearby island of Negros. A large local (insular) consumption and high prices (14 pesos per ton) await the Cebú coals.

Although the property at the present time may be called a mere prospect, and a thorough examination with surveys and borings is requisite to definitely determine the actual extent of these coal beds, still enough work has been done to make possible an approximate estimate of the coal tonnage. The total thickness of five seams exposed by the workings, is 7.15 m.; the lengths of the same, all comprised within the bounds of the property, is 14,000 m. Assuming a depth of 500 m., these seams would contain 52,800,000 cu.m., or upward of 60,000,000 tons. The assumption of a depth of 500 m. is perfectly logical in view of the formation. The minimum elevation of the outcrop is 200 m., which gives about 280 m. on the pitch, leaving about 200 m. of the assumed depth below sea level. The estimate of 60,000,000 tons applies only to the coal contained within the seams now opened; it is probable that future development will prove the existence of a tonnage greatly in excess of this amount.

Present Equipment Is Inadequate

The present workings and equipment of the mines, as before stated, are of practically no value to a scheme for their development along modern lines, and an estimate of the cost of modern equipment could, of course, be made, only after a more careful survey of the property and a knowledge as to the periodical production desired.

In any event, one considerable expenditure would be necessary, namely, the constructing of about 10 km. of aërial cableway or railway, from the Danao mines across the Mt. Licos ridge to the Compostela group. Neither of these improvements, however, presents any difficult or costly engineering features.

The cableway and railway would connect the mines with the Cebú Railway to Danao, which is to be completed within 18 months, thus giving a means of transportation of the product from the mine to wharves and bunkers at Cebú City. This latter town would be the port of exportation for the coals, to foreign ports of the Orient as well as to the adjacent islands of the Philippine group, where the consumption, already large, is soon to be increased with the completion of 700 miles of island railways, now contracted for by the insular government. The present price of coal in the islands ranges from 10 to 14 pesos per ton, and it is probable that the Danao Compostela coals could be marketed at a profit, if the price obtained was only from 40 to 60 per cent. of these figures.

A [illegible] of nickel ore has recently been [illegible] from Tepic, Mex., to Europe

Testing a Mine Fan

An interesting test was made recently on a 12-ft. 6-in. by 6-ft. double-inlet Clifford reversible fan. This ventilator was used as an exhaust and was run by an 18x18-in. single oil-splash engine. The test was made Aug. 20, 1909, at the Nottingham mine of the Pittsburg Coal Company. Practically all the officials of the Pittsburg Coal Company were present at the trial. The results of three tests are given in the accompanying table:

RECORD OF MINE FAN TESTS.

No. of Test.	Time of Test.	Rev. of Fan per Min.	M.E.P. Lb. per Sq.In. Steam.	Initial Steam Pres.	I.H.P. Engine.	Observed W.G. at Fan. (Inches).	Size of Airway at Fan. (Sq.Ft.)	Velocity of Air per Min. (Feet).	Volume of Air per Min. (Cu.Ft.)	Horsepower of Air.	Useful Effect. (Per Cent.)	Volume of Fan Wheel. (Cu.Ft.)	Volume per Revolution. (Cu.Ft.)	Volumetric Efficiency. (Per Cent.)	Peripheral Speed of Fan.	Diam. of Circ. Inlet, Ft.
1	11.30 to 11.35	150	20.3	95	69.6	2.65	52.3	1997	104,443	43.6	62.6	705.5	696.3	98.7	5890	79
2	11.45 to 11.50	175	29.3	95	117.0	3.78	52.3	2846	148,845	88.6	75.8	705.5	850.5	120.5	6872	79
3	12.00 to 12.05	200	38.6	95	164.5	4.70	52.3	3166	165,522	122.6	74.5	705.5	827.9	117.3	7854	79

Colliery Notes

The Sydney coalfield is the oldest worked in Canada. The existence of coal in the Sydney district was first recorded in 1672. When the foundation of Sydney was laid in 1784, coal mining was being carried on; however, it was not until after 1827 that the systematic and uninterrupted working of the Sydney coalfield commenced.

It should be remembered that although reciprocating plants cost more than high-speed centrifugal installations, the saving in the running cost will frequently pay back the difference in the initial expenditure, in a short period of time. The foundations for reciprocating plants have to be built stronger and consequently cost more than do foundations for centrifugal installations; however, reciprocating pumps do not depreciate as rapidly as centrifugal pumps, and the former have the additional advantages that they can always be brought back to their original efficiency.

If the cost of electric power is 1c. per unit of measure, then a difference of 1 per cent. in the efficiency of a 100-h.p. plant would mean about $60 per year. It is, therefore, evident that all mine operators who are attempting economy in operation should serve to attain the highest efficiency in their power plants. It is not unusual to find two plants operating under like conditions and in the same locality, and one plant having an efficiency 10 or 20 per cent. higher than the adjacent operation. From the foregoing figures, therefore, it is clear that a 20 per cent. difference in efficiency would amount to something like $100 per month, which item of unnecessary expense is not to be ignored by the most careless manager.

A careful record of the operations in sinking a shaft at a new coal mine, recently showed that the total amount of explosive used was 36,950 lb. of 50 per cent. powder. The total distance sunk was 2520 ft. The average weight of powder per foot sunk equaled 14.66 lb. The average number of holes was 12 holes in each sump and 6 holes in each bench, making a total of 24 holes per round. The average charge was equal to six sticks of 12-in. dynamite per 12-ft. hole. The number of cubic feet of muck per round of powder equaled 48 cu.ft. The quantity of solid per round of powder equaled 22 cu.ft. The amount of muck per foot sunk equaled 726 cu.ft. The total weight of water and muck hoisted out of the two shafts amounted to 101,105 tons. To mine and hoist this tonnage required 5730 tons of coal, or one ton of coal was equal to mining and raising 17.64 tons per hour, which was equivalent to 569 cubic feet.

The coal-mining industry in America, during the last five years has made rapid strides toward the adoption of precautions tending to provide greater safety for miners working underground. The question of naked lights underground, however, has not received the attention this important problem deserves. Practically all of the modern coal mines in Europe have adopted some type of safety lamp irrespective of whether or not the mine was known to contain explosive mine gases in dangerous quantities. American coal operators, backed up by American laws, take the stand that safety lamps should only be used in very gassy mines. The principal contention is that naked lights give greater illumination and enable the men to work better. With the present style of safety lamps, such an excuse is weak. Time will soon be when safety lamps will be used in all up-to-date coal mines, and this style of light will be adopted because it is the safest and eventually the cheapest.

The Pennsylvania Bureau of Industrial Statistics reports that in 1908 out of 137,648 persons employed in the bituminous coal mines of the State, 95,295 were of foreign birth. Of 134,992 employed in the anthracite mines 89,165 were foreigners.

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October 2	13,000
October 9	9,500
October 16	9,500
October 23	9,500
October 30	9,500

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•*Illustrated.*

The Tariff on Zinc and Antimony Ores

In referring last week to the situation in the zinc industry, we said that if zinc ore be smelted in bond, the smelter may liquidate by delivery of 90 per cent. of the metals. This is the present ruling of the Treasury Department, but we should have added that there is some doubt as to this matter because of confusion in the Payne tariff law. In schedules 173, 181 and 193, relating to antimony, lead and zinc respectively, provision is made for smelting in bond. In section 24, however, relating to bonded smelteries and refineries, although the general smelting of ores and refining of crude metals is specifically referred to in the first sentence of this section, the liquidation is specifically limited to lead. The use of the word "lead" instead of "metals" in this place may have been inadvertence; or it may have been a "joker"; or it may have been intentional. At all events, the Treasury Department has taken the position, pending a judicial construction of the law, that the whole of section 24 pertains only to lead ore, and that inasmuch as section 29 of the Dingley act provided for the smelting in bond of all metals, its provisions have not been repealed by section 24 of the Payne act except so far as they relate to lead. The Treasury Department has thus ruled that the duty on zinc ore smelted in bond may be liquidated by the delivery of 90 per cent. of the zinc and contents of the ore as shown by assay.

Over these sections of the Payne act there will doubtless be controversies that will have to be decided by the courts. The smelting of antimony, lead and zinc in bond was clearly contemplated in the schedules. Section 24 also authorizes the smelting in bond of ores and crude metals. It is a strain of the language to interpret this as meaning anything but *all* ores and crude metals. The first proviso of section 24 tells something else that may be done, namely that the charges against imports introduced into a bonded works "may be canceled upon the exportation or delivery to a bonded manufacturing warehouse * * * of the actual amount of *lead* (the italics are ours) produced from the smelting or refining, or both, of such ores or crude metals." The next proviso arranges for a similar cancelation in the event of withdrawal for consumption or export of the lead actually produced. Thus it would appear that, according to the strict letter of the law, a zinc smelter might, if he recovered some lead, say 10 lb., from the zinc ore imported, liquidate all import charges by delivery of the lead recovered, thus admitting the zinc content of the ore free of duty.

As the case stands on the face of the law it seems that the smelting in bond of antimony, lead and zinc is provided for in the schedules, the liquidation to be made as "provided by law." How the law provides for this is then set forth in section 24, which says that the liquidation may be made by delivery of the actual amount of lead produced. In the case of lead ore or lead bullion the produce that has heretofore been known as "exempt lead" is obviously excluded under the new law. The smelters and refiners of lead must now deliver the actual produce in order to secure liquidation. No specific provision is made for the liquidation of antimony and zinc imports that contain no lead, or are caused to yield no lead. As to this particular the Treasury Department may be able legally to refer back to the previous law and grant liquidation upon delivery of 90 per cent. of the metals, but all provisions of previous laws that are inconsistent with the Payne law were specifically repealed by section 41 of the latter, and an inconsistency would appear to exist with respect to section 24.

Nevada Consolidated Declares a Dividend

Nevada Consolidated last week declared a dividend of 37½c. per share, payable at the end of the present quarter. This company thus becomes the second of the porphyry mines to begin the payment of dividends, being preceded only by the Utah Copper Company.

It is interesting to note that Nevada Consolidated was first brought prominently to the attention of Eastern investors in the summer of 1905, and the production of blister copper was begun on July 9, 1908. This gives an idea of the length of time required to bring such an enterprise to the dividend-paying stage. However, it is to be remarked in this case that in the early days of this company developments were not pushed very rapidly. The mines had already been well opened by Bradley and Ropes previous to the time when the stock was introduced in

the East by Hayden, Stone & Co. The construction of the reduction works was not begun until the early part of 1907, and during the 18 months of construction the panic of 1907 occurred.

In connection with the pending consolidation of Nevada Consolidated and Cumberland-Ely, it is interesting to quote Hayden, Stone & Co., of whom Mr. Hayden is one of the directors of Nevada Consolidated, in a recent circular of this firm, which says: "While there may be enthusiasts in each of these companies that think that the ratio of exchange was unfair to the respective company in which he is interested, the fact remains that after a thorough discussion of the subject from all standpoints by people who are able to look at the thing in a broad way, this vote was unanimous, and it seems to us that that should be a sufficient recommendation for the shareholders of one company to authorize it and of the other company to accept it. As the original sponsors for the Nevada Consolidated in the market, our sympathies and interests are identified almost entirely with the Nevada Consolidated, and we do not hesitate to advise the shareholders of that company to vote for the increase of stock to be thus used. At the same time we most emphatically state that we believe the Cumberland-Ely shareholders are to be more than congratulated upon their being in a position at the present time to obtain for their shares as attractive an offer as we feel that they have obtained in this transaction." These remarks lend point to what we said last week about this deal.

The Steel Corporation Statement

The statement of the United States Steel Corporation for the September quarter is altogether a favorable one. The net earnings for the quarter were $38,246,007, showing gains of $8,[illegible] over the June quarter, and of $11,[illegible] over the September quarter of 1908, while they were only $3,[illegible] below the high level reached in the third quarter of 1907. The surplus after all charges for the quarter was $[illegible] and this seemed to the management sufficient to warrant an increase in the common stock dividend to 1 per cent for the quarter, and also an appropriation of $10,000,000 for new construction, [illegible] the first for nearly two years. This is the Steel Corporation is able to resume expenditures for the increase of its working plant, besides doubling the dividend paid on the common stock for several years. The first step is undoubtedly a wise one; as to the second, there may be differences of opinion, though the stockholders will be satisfied, and the stock will probably continue to rise in the market.

The statement of unfilled orders is also satisfactory showing a gain of 739,000 tons over June 30, and of 1,375,000 tons over a year ago. Considering the promptness with which it was possible to fill orders during the earlier part of the year, it is a sufficient guarantee of good business for half a year to come.

The Situation in the Coal and Coke Industries

During the last few months the coal and coke industries have been emerging slowly from the cloud of gloom that has for a long time surrounded them. The coke industry, because of the present great activity in the steel trade, is actually buoyant, and the production of coke is at the highest rate ever recorded, producers in some instances having been led to fire up old ovens that had been discarded. Some of the coking companies are out of the market, having sold their output for a year ahead, and prices are high, $2.90 being paid for furnace coke, and $3.50 for foundry coke.

It is really fortunate for the coke manufacturers that labor is already scarce, inasmuch as otherwise there might be no check to the present enthusiasm, and production might be pushed with such energy that the producers would be responsible for their own undoing, which has been the case in other periods of business recovery. It is to be hoped that conservatism will prevail and that the situation be handled with caution.

That present coke prices are already high is evident from a glance at the average prices prevailing in previous years. Pennsylvania produces more than 50 per cent of all the coke manufactured in America, and may, therefore, be regarded as a good guide to the condition of the industry as a whole. The average prices per 2,000 lb. at the ovens in previous years were as follows: In 1904, $1.68; in 1905, $2.05; in 1906, $2.35; in 1907, $2.55; in 1908, $2.10. Compared with previous years, therefore, the condition of the coke market at present is highly encouraging, but stability of prices will depend largely on the action of the manufacturers in refraining from over-production. The temptation to be greedy in the present good times, after the lean years that have been experienced, will be hard to resist.

The demand for coal has also increased materially during the last few months, and there is a similar tendency on the part of coal operators to strive individually to profit too largely from the betterment in trade by starting to make an output in excess of all previous records. The sure result of such a course will be to hold down the price. It may be remembered that the collieries of the United States can produce 1,000,000,000 tons annually, and that present consumption is not quite one-half that quantity. Over-production, therefore, is now, as in previous years, the great danger to be guarded against. A large output generally means a decrease in cost of production, and the temptation to ship a big tonnage is often too strong to be resisted. In many instances operators are now sending shipments forward on consignment, trusting that their agents will be able to find a place for the product. This condition is serving to keep prices down and it will probably continue so long as there is no organization of the bituminous industry. A coal producers' association, through which regular statistical reports of the situation in all the important markets could be obtained, might act to improve the stability of the coal-mining industry.

In reports concerning business in the daily papers and in many trade publications we find constant use of such expressions as "trade is approaching its normal condition," or "prices are at their normal level." If such statements are analyzed or are capable of analysis, we will generally find that by "normal" is meant the condition of business or prices at the top of the latest boom. This it would seem is altogether a misuse of the word "normal," which has a certain good and definite signification. It is altogether out of place in this connection, however, for who is to determine what is the "normal" condition of business or the "normal" level of prices? Usually, we think, it is taken to mean a level where everybody is satisfied except the unfortunate ultimate consumer and perhaps it is his normal condition to be dead broke.

Views, Suggestions and Experiences of Readers

Comments on Questions Arising in Technical Practice and Debatable Points Suggested by Articles in the Journal

CORRESPONDENCE AND DISCUSSION

Sulphuric Acid Lead Chamber Construction

The new sulphuric-acid chamber construction of Frederick J. Falding, published in the JOURNAL of Sept. 4, 1909, is decidedly a novelty and will evoke a little revolution in that industry. Hitherto, it has not been attempted to carry the process completely to the end in one chamber, but always a little auxiliary chamber, or at least a reaction tower, has been employed to work off the last remnants of the SO_2 gases. In recent times, the practice has been to build the chambers increasingly high and narrow, since it had become known that such chambers give better results.

Mr. Falding deserves credit for having gone the farthest in this direction; properly, his chamber must be called a "tower." According to his plan, these peculiar dimensions now lead to a finish of the reaction inside the chamber. This fact further shows that the prescribed path of the gases through the structure is correctly calculated. It is also notable that the difference of temperature between the roof and bottom is comparatively small, and therefore, that the reaction goes almost to the bottom and yet quantitively comes to an end.

Through the long path down from the top, in the comparatively small space, a continuous mixture of the gases is attained, or rather their separation is hindered; the movement is intense and constant; dead spaces do not exist; and, therefore, the reaction cannot come to a standstill, but goes on with almost unchanged intensity to the end. The Meyer tangential chambers are indeed similarly conceived and operate upon a like principle, yet there it is not proposed to bring the reaction to an end in one chamber, and with equal intensity of production, this would not be possible. It is especially interesting that Falding with his chamber undertook to use up effectively the copper smelting furnace gases containing CO_2. Hitherto in the few cases where gases containing CO_2 had to be dealt with, as for example, in the use of colliery pyrites, great difficulties have always been encountered through the presence of the CO_2, and I know of still another case in the use of crude brimstone containing bitumen. If now, Falding has succeeded in using up the sulphur gases under such circumstances, this indicates that the gas movement in his chamber is extremely intense and that the CO_2 cannot collect by itself and cripple the process, but will simply be drawn along as an inert gas like nitrogen. Therein lies the best proof that his construction is excellently adapted to the use of the chamber process.

I believe that the chief value of this new construction lies in the hight with small cross-section. The other advantages—saving of space and installation costs—I can admit only for the chamber itself, not for the entire system. According to Falding's plan, he builds the chamber of 5000 cu.m., with a complete auxiliary equipment for each individual chamber. Thus the saving in cost of construction for the chamber would be offset by increased costs for the auxiliary apparatus. Still, the chambers are built as large as possible, and the other parts of the system thus stand as cheaper. When this construction is most advantageously employed several chambers must be connected behind each other, or near each other. The latter plan, especially, recommends itself, since thus the operation can be forced at will. For this form the cost of auxiliary apparatus would be much reduced and in such cases the cost of the entire system would be considerably less than for others.

The Falding single-chamber system requires more service for raising acid, etc., and correspondingly more repairs. A plant like the 1000-ton works in Tennessee must then have 25 systems, each with its own acid hoist and control. That, however, is going too far and nowhere except in this case is such centralization desirable. Falding draws conclusions from a few data over only a short period. It would be interesting to obtain data covering a period of great activity and giving the output and saltpeter consumption during this time. Some information as to the temperature at the roof of the chamber would also be important.

The production of the chamber is moreover not greater than that of other intensive systems; it amounts to 0.4274 to 0.4709 cu.m. per kilogram of sulphur; today, perhaps, it reaches 0.36. The saltpeter consumption is not particularly low, although it does not exceed a fair average. That, indeed, is principally attributable to the small Glover and to the warm gases at entrance to the Gay-Lussac.

Falding, in his examples, mentioned a sulphur deposit. I assume that this refers to raw sulphur. In this case, however, the gases with 7.9 and 8.1 per cent. are not strong enough. The gases of raw sulphur must have 10 to 11 per cent. of SO_2 if everything is to go right. If, therefore, this defect be remedied, I am sure that the results will be improved. In any event, Falding's invention is one of the most interesting and important for sulphuric-acid manufacture in chambers and its further development should be carefully noted. One wishes, however, that the various data, such as gas pressure, temperatures, etc., might be made known.

JOSÉ SAUERSCHNIG.

Mexico, D. F., Oct. 2, 1909.

Ely Central Copper Company

I beg to express my appreciation of the remarks concerning this company in the JOURNAL of Oct. 9. This company was originally brought out by O. A. Turner, who paid $280,000 for the property. Immediately following its organization the company drilled six holes from 100 to 400 ft. deep, all of which showed rhyolite only. Partly as the result of this prospecting and partly from the study of other conditions, engineering and geological opinion generally became adverse to this property, except possibly the extreme west end of the tract, which may have a little piece of the Eureka orebody.

The capital stock of the company was originally 1,200,000 shares of $10 each, of which 900,000 shares were retained by the vendors and 300,000 shares were held in the treasury for the purpose of raising funds. Recently a block of the treasury stock (75,000 shares) was contracted at 50c. per share to one George Graham Rice. He also obtained options on some other stock at 37½@75c. per share. The purpose of the present advertising and curb-market campaign is to sell this stock. Another person associated with this campaign appears to be Nat. Goodwin, the actor, whose claim to fame in mining finance is based upon Rawhide Coalition.

Out of the comparatively small portion of the proceeds of the stock sales that go into the treasury of the company, some development work is being done, wherefore the company is at least doing something. A shaft is being sunk near the boundary line of the Eureka (Copper Flat) property of the Nevada Consolidated, and it may encounter a fringe of that orebody, but even so, this will be far from insuring any great productive capacity to the Ely Central Copper Company, the bulk of whose area has not yet been proved to be mineral-bearing.

ENGINEER.

New York, Oct. 24, 1909.

Details of Practical Mining

Notes of Interest to the Operators of Small Mines as Well as of Large Mines. The Things That Have to Be Done in Everyday Mining

REPORTS FROM EXPERIENCE

Readers of the JOURNAL are invited to contribute to this department. Articles should be brief, thoroughly practical, and preferably illustrated by drawings or sketches. Our draftsmen will prepare properly any kind of a pencil sketch that is intelligible. Something that is an old story in one district may be quite unknown in another. Articles accepted and published are suitably paid for.

A Movable Sorting Floor Grizzly

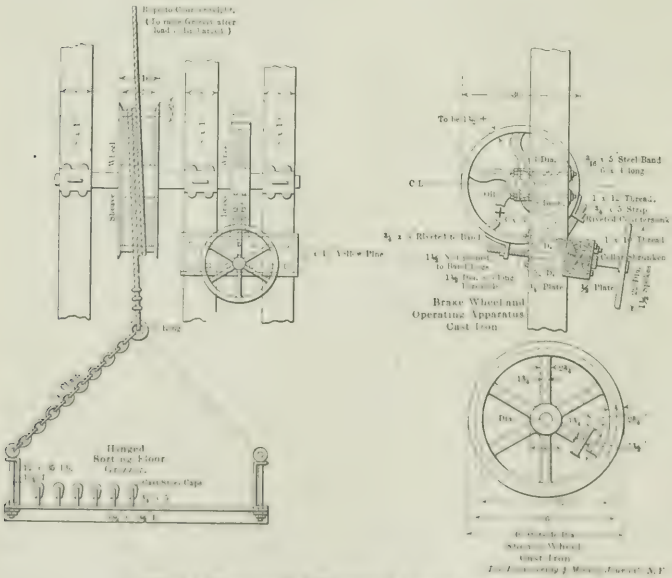
By Guy C. Stoltz*

A sorting-floor grizzly of the following description is used in the several head frames on the Port Henry Iron Ore Company's property at Mineville, N. Y. It is the intermediate one of three grizzlies and provides hand sorting for the lump magnetite ore before it is delivered into storage bins.

The grizzly is 11 ft. long, 6 ft. wide, and provided with steel plate side boards 18 in. high. It will receive two dumps from a 4-ton skip. When receiving a dump the grizzly is in a horizontal position, thus enabling a man to look over the material thoroughly, pick out all large pieces of rock and drop them into a nearby chute delivering to a rock-storage bin. After two skip loads have been sorted the grizzly is lowered (about 35 deg. to dump on the next grizzly) by releasing a band brake operating on a wheel keyed to a line of shaft on which is also mounted a sheave wheel, which wheel in turn receives several winds of a 1⅛-in. cable leading from the front of the hinged grizzly to a counterweight hung in the frame.

The counterweight is heavy enough to just raise the empty grizzly back to its horizontal position. The band brake is then made tight and grizzly is held in position until it has received another two dumps. The band brake must needs be released slowly to prevent the grizzly from receiving racking jars on dumping its load.

From a point of economy a sorting floor operated in this manner has an advantage over one operated by an air hoist and again the simple device will work at all times while in winter the air hoist frequently freezes up and gives trouble.

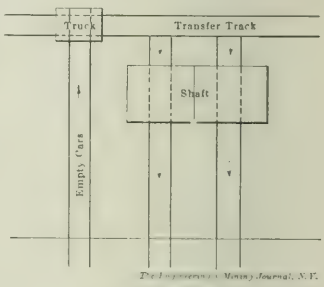


DETAILS OF APPARATUS TO OPERATE SORTING GRIZZLY

*Mining engineer, Mineville, N. Y.

Car Transfer

The use of a car transfer is often advantageous, and especially on trestles, headframes, or in a mine where space for extra track is limited. The accompanying sketch shows the arrangement as used at Ishpeming, Mich. The truck used is the same as the ordinary car. The essential feature is a substantial platform about 4 ft. wide by 5 ft. long, with a track to receive the car. The top of the truck, of course, should be level with the main track; this necessitates sinking the transfer track 15 to 18 in. The cars are run on to the truck and then shifted to the track which leads to the cage.

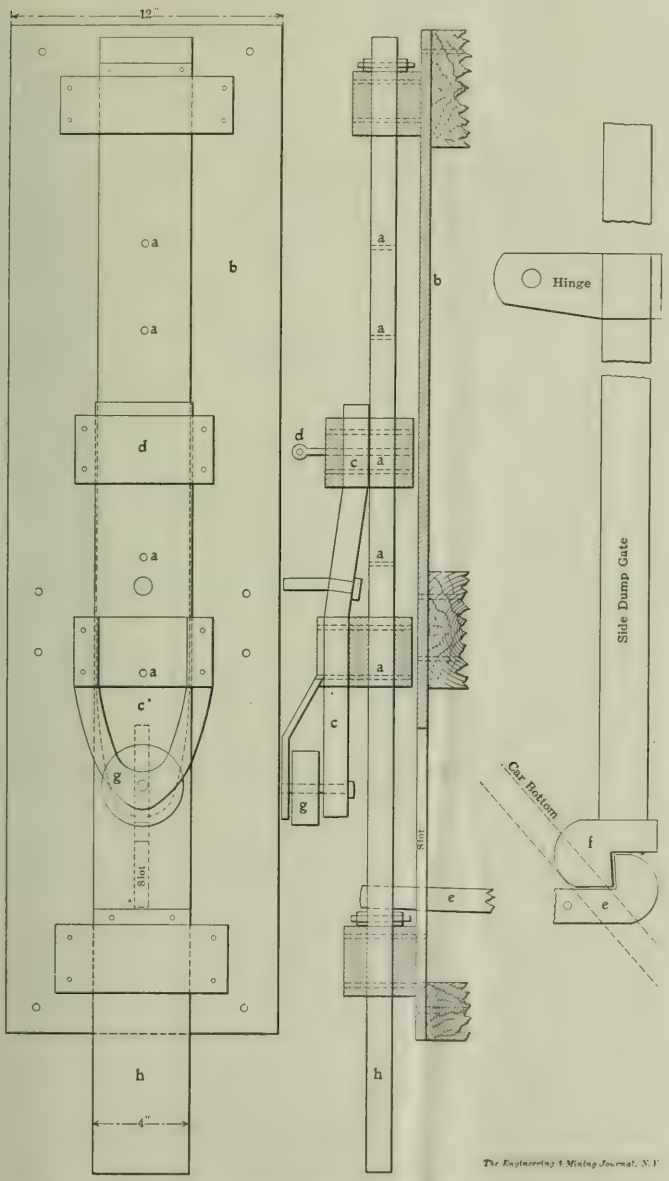


CAR TRANSFER

Automatic Trip for Side Dump Car

Tail rope haulage is used by the Penn Iron Company, Vulcan, Michigan. The car is of the side-dump type with a double truck. The car weighs 6500 lb. and carries 3½ tons of ore. With this car it is possible to dump ore in five different bins. The dumping arrangement is on the opposite side from the gate as shown in the accompanying illustration. This device is bolted to the car and is connected with the gate by a lever *c* which engages the catch *f*. The wheel *g* is attached to a movable part *c*, and by means of a pin *d*, *c* may be set at any desired position on the bar *h*. The holes *e* are 5 in. apart; *i* is a small handle by which to lift the part *c* when changing the position of the dumping wheel. At each bin is a jack which the wheel *g* strikes and as the wheel passes over the jack it raises the bar *h*,

which in turn lifts the end of the lever *e*. These jacks are set by the side of the track with the lowest one nearest the shaft, while the highest one is at the farthest end of the track. The haulage distance in about 500 ft. An electric motor is used to drive the rope-haulage system. It requires one man at the motor and one man to attend the loading of the cars.



AUTOMATIC TRIP FOR ORE CAR

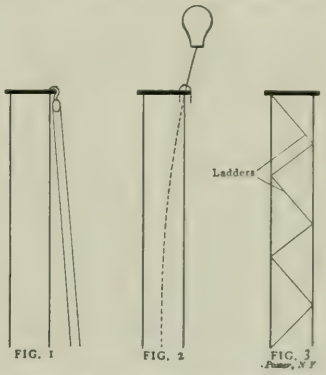
A Movable Ore Chute

At the Chapin mine, Iron Mountain, Mich., there are three classes of ore to be handled from one shaft, as well as an occasional shipload of waste rock. To provide for this there are four bins in front of the shaft, but the two skips cannot dump into all four of the bins. This difficulty is overcome by means of a movable side-dump car, which is used as a chute. This car is operated by a tail-rope cable on a small winding drum. The man who loads the ore at the bottom of the shaft signals to the surface the class of ore to be hoisted. The man in charge of the air hoist sets his car to receive the ore direct from the skip. As soon as the skip dumps, the car is moved to the proper bin and dumped by the tender.

Painting Power Plant Stacks

A correspondent of *Power and the Engineer*, says:

A short time ago we got tackle and material ready to paint the stacks of the power plant; but when we came to hoist the tackle by means of the small cables (Fig. 1) with which each stack was equipped, they were found to be broken and useless.



SCHEMES FOR HOISTING TACKLE IN STACK

We procured some paper balloons and sent them up inside the stack (Fig. 2) with a cord attached, intending to pull up a small rope, and then a wire cable. Everything worked nicely until we began pulling the string. It caught on a ragged edge on the top and refused to go farther. Several attempts were made, but always with the same result. The string method was a failure.

The stacks are 116 ft. high and 5 ft. in diameter. We were not in a mood to give up, and the job was shortly accomplished by building 19 ladders each 8 ft. long, the longest we could take in at the base of the stack. These ladders were built to fit together at the proper angle and set up inside the stack, as shown in Fig. 3. New cables were placed in the sheaves at the top and the painting was soon in progress.

The Broken Hill Proprietary Company is experimenting with a Calyx drill for boring 12-in. holes for ventilation and for passes for filling with tailings.

Patents Relating To Mining and Metallurgy

A Selected and Classified List of New Inventions Described during the Past Month in the Publications of the Patent Offices

UNITED STATES AND BRITISH PATENTS

A copy of the specifications of any of these patents issued by the United States Patent Office will be mailed by THE ENGINEERING AND MINING JOURNAL upon the receipt of 25 CENTS. British patents are supplied at 40 cents. In ordering specifications, correspondents are requested to give the number, name of inventor and date of issue.

ALUMINUM.

FUSIBLE COMPOUNDS AND RECOVERY THEREFROM—Improvements in Methods of Making Fusible Compounds of Aluminum and Recovering Aluminum Therefrom. L. R. Keogh and C. A. Douglas, Ottawa, Canada. (Brit No. 18,356 of 1909.)

SOLDER FOR ALUMINUM. Jacques F. Guggenbuhl, Paris, France. (U. S., No. 933,433. Sept. 7, 1909.)

BORAX.

PRODUCTION. A Process for the Production of Borax from Native Compounds of Boron. G. E. Bailey and Archie Stevenson, Los Angeles, Cal. (Brit. No. 794 of 1909.)

CEMENT.

PORTLAND CEMENT. Method of Making Portland Cement. Joseph M. Carrère, Allentown, Penn., assignor to Blanc Stainless Cement Company, Allentown, Penn., a Corporation of New Jersey. (U. S. No. 932,374. Aug. 24, 1909.)

SLAG CEMENT.—Improvements in the Manufacture of Slag Cement. John G. A. Rhodin, Liverpool, Eng. (Brit. No. 23,988 of 1908.)

COAL AND COKE.

COAL CUTTING—Improvements in Cutter Chains for Mining Machines. John Liddle, Glasgow, Scotland. (Brit. No. 10,045 of 1909.)

COAL-SEPARATOR. Nelson Mowery, Wilkes-Barre, Penn. (U. S. No. 936,015. Oct. 5, 1909.)

COAL WASHER. Freeman R. Willson, Jr., Worthington, Ohio, assignor, by mesne assignments, to The Jeffrey Manufacturing Company, a Corporation of Ohio. (U. S. No. 933,808. Sept. 14, 1909.)

COKE. Apparatus for Drawing Coke. Eldred D. Ratliff, Birmingham, Ala. (U. S. No. 934,215. Sept. 14, 1909.)

COKE MANUFACTURE. Improvements Relating to Mechanism for Levelling the Charge in Coke Ovens and Furnaces. Franz Meguin and Company, Ltd. and Wilhelm Muller, Dellingen-Saar, Germany. (Brit. No. 8035 of 1909.)

COKE OVENS. A Method of Preserving Coke Oven Walls. Heinrich Koppers, Essen Ruhr, Germany. (Brit. No. 4792 of 1909.)

COKE OVENS. Improvements in or Relating to Regenerative Coke Ovens. Actien Gesellschaft für Kohlendestillation, Gelsenkirchen Buenke, Westphalia. (Brit. No. 19,261 of 1909.)

COKE OVENS. Improvements in Regenerative and Non-regenerative Coke Ovens. R. F. F. Fabry, Chesterfield, England. (Brit. No. 8820 of 1909.)

COKING OVEN. Samuel B. Sheldon, Buffalo, N. Y. (U. S. No. 933,349. Sept. 7, 1909.)

MINING METHOD. Method of Mining Coal. David F. Loomis, New Philadelphia, Ohio, assignor of one-half to Joseph A. Beidler, Cleveland, Ohio. (U. S. No. 935,762. Oct. 5, 1909.)

PEAT. Apparatus for Producing Fuel and Gas from Peat. William J. Shepard, Elmwood, Conn., assignor of one-half to Horace F. Weldon, Manchester, Conn. (U. S. No. 936,049. Oct. 5, 1909.)

SAFETY APPLIANCE for Colliery and Other Inclines. John Norton, Wigan, England. (U. S. No. 931,078. Aug. 17, 1909.)

COPPER.

ALLOY and Process for Its Production. Auguste J. Rossi, New York, N. Y., assignor to Titanium Alloy Manufacturing Company, New York, N. Y., a Corporation of Maine. (U. S. No. 935,863. Oct. 5, 1909.)

RECOVERY FROM RESIDUES. Process for the Recovery of Copper from Cuprous Residues. Dominic Crispo, Antwerp, Belgium. (U. S. No. 936,762. Oct. 12, 1909.)

REFINING. Apparatus for Refining Copper. Frank L. Antisell, New York, N. Y., assignor of one-fourth to William S. Higgins, Perth Amboy, N. J. (U. S. No. 13,020, reissue, Sept. 14, 1909.)

GOLD AND SILVER.

AMALGAMATING—Apparatus for Pulverizing and Amalgamating Ores. Royer Luckenbach, Colwyn, Penn., assignor to Borindum Extraction Company, a Corporation of Arizona. (U. S. No. 936,645. Oct. 12, 1909.)

AMALGAMATING—Process of Amalgamating and Separating Metallic Ores. Royer Luckenbach, Colwyn, Penn., assignor to Borindum Extraction Company, a Corporation of Arizona. (U. S. No. 936,633. Oct. 12, 1909.)

DREDGING. Collecting Means for Gold Dredges. Thomas J. Barbour, San Francisco, Cal. (U. S. No. 936,754. Oct. 12, 1909.)

EXTRACTION—Improvements in Extracting Gold and Silver from Crushed Ore and Ore Slimes and Means Therefor. Andrew E. Crosse, Hyde Park, London, Eng. (Brit. No. 269 of 1909.)

EXTRACTION. Process of Extracting Precious Metals from Ores. Isidor Kitsee, Philadelphia, Penn. (U. S. No. 936,545. Oct. 12, 1909.)

FILTERING APPARATUS—Improvements in Filtering Apparatus for Use in Connection with the Washing of Slimes and for Other Similar Purposes. John F. Webb, Battersea, and Percy Tarbutt, London. (Brit. No. 24,474 of 1908.)

GOLD-SAVING APPARATUS. Victor P. Yelmini, Alameda, Cal. (U. S. No. 932,936. August 31, 1909.)

GOLD-SEPARATING APPARATUS. John D. Luttrell, Benton Harbor, Mich. (U. S. No. 933,772. Sept. 14, 1909.)

GRINDING PAN. William Middleton and Hervie N. G. Cobbe, Kalgoorlie, Western Australia, Australia. (U. S. No. 936,794. Oct. 12, 1909.)

IRON AND STEEL.

BESSEMER CONVERTER. Guy J. Stock, Darlington, England. (U. S. No. 935,615. Sept. 28, 1909.)

BESSEMER CONVERTERS. Improvement in Connection with Bessemer Converters. Guy J. Stock, Darlington. (Brit. No. 12,212 of 1908.)

BLAST FURNACE. Edward B. Cook, Pottstown, Penn. (U. S. No. 936,308. Oct. 12, 1909.)

BLAST FURNACE OPERATION. Method of Operating Blast Furnaces and Converters. James Gayley, New York, N. Y. (U. S. No. 935,628. Sept. 28, 1909.)

CASTINGS. Manufacture of Steel Castings. Jacob K. Griffith, Latrobe, Penn. (U. S. No. 936,623. Oct. 12, 1909.)

ELECTRIC FURNACE. Improvements Relating to Electric Induction Furnaces. Rudolf Hugsche, Essen, and Stahlwerke Gesellschaft and Wilhelm Rodenhauser, Volklingen on Saar, Germany. (Brit. No. 18,513 of 1908.)

INGOTS. Method for Making Sound Metal Ingots and Other Castings. Robert A. Hadfield, Sheffield, England. (U. S. No. 933,751. Sept. 14, 1909.)

NICKEL STEEL SCRAP—Process of Recovering Nickel-Steel Scrap. Ralph H. Watson, Munhall, Penn. (U. S. No. 934,864. Sept. 21, 1909.)

REMOVING SALAMANDERS.—Method of Disintegrating and Removing Annular Salamanders in Nodulizing-Kilns. August Bräutigam, South Orange, N. J., assignor to August Herkscher, New York, N. Y. (U. S. No. 936,981. Oct. 12, 1909.)

STEEL PLANT. John C. Cromwell and Horace W. Lash, Cleveland, Ohio, assignors to The Garrett-Cromwell Engineering Company, Cleveland, Ohio, a Corporation of Ohio. (U. S. No. 935,964. Oct. 5, 1909.)

LITHIA.

MANUFACTURE of Pure Lithium Compounds. Erland Zell, Gottenborg, Sweden, assignor to General Electric Company, a Corporation of New York. (U. S. No. 935,880. Oct. 5, 1909.)

MAGNESIUM.

ELECTROLYTIC PRODUCTION of Magnesium. Franz von Küzelgen, Holcombs Rock, Va., and George O. Seward, East Orange, N. J., assignors to Virginia Laboratory Company, New York, N. Y., a Corporation of New York. (U. S. No. 935,796. Oct. 5, 1909.)

NICKEL.

NICKEL ALLOYS. Method of Manufacturing Nickel and Nickel-Copper Alloys. David H. Browne, Copper Cliff, Ontario, Canada, assignor to The Canadian Copper Company, Cleveland, Ohio, a Corporation of Ohio. (U. S. No. 934,278. Sept. 14, 1909.)

SALT.

MANUFACTURE of Salt. Balfour F. McTear, Lea Green, via Rainhill, England. (U. S. No. 933,572. Sept. 7, 1909.)

ZINC.

CONDENSER. Metallurgical Condenser. Woolsey M. Johnson, La Harpe, Kans., assignor to The Continuous Zinc Furnace Company, Hartford, Conn., a Corporation of Connecticut. (U. S. No. 933,843. Sept. 14, 1909.)

ELECTROLYTIC WINNING of Zinc from Solutions of Zinc Sulphate. Victor Engelhardt and Max Huth, Charlottenburg, Germany, assignors to Siemens & Halske, Aktien gesellschaft, Berlin, Germany, a Corporation of Germany. (U. S. No. 935,250. Sept. 28, 1909.)

PROCESS OF TREATING ZINC. Salomon Frank, Frankfort-on-the-Main, Germany. (U. S. No. 935,960. Oct. 5, 1909.)

RETORT FILLING. Apparatus for Filling Zinc-Retorts with Granular Material. John D. James, Pulaski, Va. (U. S. No. 936,245. Oct. 5, 1909.)

MINING—GENERAL.

EXPLOSIVES. Device for Detecting Decomposition of Explosives. Edouard Bouchard-Praceig, Paris, France. (U. S. No. 934,500. Sept. 21, 1909.)

SHAFT SINKING. Sinking Shafts and the Like. Daniel E. Moran, Mendham, N. J., and John W. Doty and Edwin S. Jarrett, New York, N. Y. (U. S. No. 933,776. Sept. 14, 1909.)

VENTILATING. Improvements in Ventilating System for Mines. John Quin, Houtzdale, Penn. (Brit. No. 6006 of 1909.)

WOOD PRESERVATION. Liquor for Impregnating Wood. Karl H. Wolman, Idaweiche, near Oppeln, Germany, assignor to Max Barschall, New York, N. Y. (U. S. No. 936,070. Oct. 5, 1909.)

WOOD PRESERVATION. Process of Preserving Wood. John M. Nelson, Jr., Sher-

wood, Md. (U. S. No. 937,008, Oct. 12, 1909.)

ORE DRESSING—GENERAL.

CENTRIFUGAL CONCENTRATOR and Classifier. Frederick Laist, Anaconda, Mont., assignor of one-half to Oscar Max Kuchs, Anaconda, Mont. (U. S. No. 935,311, Sept. 28, 1909.)

CONCENTRATOR—Apparatus for Concentrating. George F. Rendall, New York, N. Y., assignor to American Reduction Company, a Corporation of New Jersey. (U. S. No. 936,563, Oct. 12, 1909.)

CRUSHING—Improvements in Crushing, Pulverizing and the Like Machines. Edgar Allen & Co., Ltd., Imperial Steel Works, Sheffield, Eng. (Brit. No. 26,464 of 1908.)

CRUSHING—Improvements in Means for Crushing or Grinding Rocks, Ores of the Like Substances. Anthony M. Robeson, London, England. (Brit. No. 17,213 of 1908.)

ORE-CRUSHER. Charles O. Michaelsen, Omaha, Neb. (U. S. No. 931,210, Aug. 17, 1909.)

ORE-CRUSHER—Eccentric Ore-Crusher. Smith Abernathy, Ponoka, Ala. (U. S. No. 935,630, Oct. 5, 1909.)

SCREEN—Ore-Screen. Archie B. Meikle-john and Jessie R. Villars, Butte, Mont. (U. S. No. 935,216, Sept. 28, 1909.)

SCREENING, ETC.—Apparatus for Screening, Sizing, and Classifying Granular Materials. Charles A. Pringle, Chihuahua, Mexico, assignor to Calera Mining Company, a Corporation of New Jersey. (U. S. No. 936,162, Oct. 5, 1909.)

STAMP-MILL. Oliver C. Purkeypile, Ashland, Ore. (U. S. No. 934,354, Sept. 14, 1909.)

METALLURGY—GENERAL.

FURNACE CHARGES—Improved Means for Calculating or Estimating the Amount of Constituents of the Charges of Smelting Furnaces and the Like. Robert Marshall, London, England. (Brit. No. 23,981 of 1909.)

MELTING—Improvements in Apparatus for Melting Metal, Casting it Into Ingots and Cooling the Latter. Robert T. Johnston, Scotch Plains, N. J. (Brit. No. 14,959 of 1908.)

REDUCTION—Metallurgical Process. Oliver B. Dawson, El Paso, Tex., assignor to American Reduction & Refining Company, New York, N. Y., a Corporation of South Dakota. (U. S. No. 936,095, Oct. 5, 1909.)

REDUCTION PROCESS—Method of Reducing Ores. Karl A. F. Hiorth, Christiania, Norway. (U. S. No. 934,170, Sept. 14, 1909.)

SEPARATION—Wet Method of Separating Metallic Compounds. John H. Thwaites, Peterborough, England. (U. S. No. 935,337, Sept. 28, 1909.)

SLAG—Improved Process and Apparatus for Granulating Slag. "Pyrotrass," Société Anonyme pour la Fabrication du Trass Artificial (Brevete) et Ses Applications Industrielles, Paris, France. (Brit. No. 2849 of 1909.)

SLAGS—Process of Deoxidizing Slags. Otto Thallner, Bismarckhütte, Germany, assignor to The Firm of Bismarckhütte, Germany. (U. S. No. 936,382, Oct. 12, 1909.)

SMELTER SMOKE—Device for Preventing Waste of Minerals. Michael J. Smith and Martin O. Kongsli, Tacoma, Wash. (U. S. No. 936,377, Oct. 12, 1909.)

SMELTING—Process for Smelting Ore. Joseph P. Welch, Salt Lake City, Utah, assignor of one-half to Jay J. Snider, Salt Lake City, Utah. (U. S. No. 937,031, Oct. 12, 1909.)

SULPHUR DIOXIDE FROM GASES. Improvements in the Removal of Sulphur Dioxide from Gases and Its Recovery as Sulphuric Acid. Hans Kuhne, Goslar, Germany. (Brit. No. 17,520 of 1908.)

SULPHIDE ORE TREATMENT. Process of Oxidizing Ores. Byron E. Eldred, Bronxville, N. Y., assignor to Combustion Utilities Company, New York, N. Y. (U. S. No. 932,689, August 31, 1909.)

WELDING—Process of Welding Metals. Hans Goldschmidt, Essen-on-the Ruhr, Germany, assignor, by mesne assignments, to Goldschmidt Thermit Co., New York, N. Y., a corporation of New York. (U. S. No. 13,010, reissue, Aug. 17, 1909.)

MINING MACHINERY AND APPARATUS.

BLASTING—Mine-Firing Device. Thomas C. Hallam, Gardner, Ill. (U. S. No. 936,885, Oct. 12, 1909.)

COUPLING FOR DRILL-STEELS. Charles C. Hansen, Easton, Penn., assignor to Ingersoll-Rand Company, New York, N. Y., a Corporation of New Jersey. (U. S. No. 934,069, Sept. 14, 1909.)

DREDGERS—Tooth for Steam Dredgers, Excavators, &c. Charles E. Gardner, Unionville, Va. (U. S. No. 935,147, Sept. 28, 1909.)

DRILL—Mining-Drill. Joseph R. Place, Chicago Heights, Ill. (U. S. No. 936,937, Oct. 12, 1909.)

ELECTRIC DRILL. William O. Duntley, Chicago, Ill., and Henry J. Kimman, Cleveland, Ohio, assignors, by direct and mesne assignments, to Chicago Pneumatic Tool Company, Chicago, Ill., a Corporation of New Jersey. (U. S. No. 936,870, Oct. 12, 1909.)

HOISTING—An Improved Safety Apparatus for Lifts, Hoists or the Like. J. G. Childs and Thomas S. Hill, London, Eng. (Brit. No. 15,935 of 1908.)

HOISTING—Improvements in Safety Hooks for Lifting, Lowering, Hauling and Like Tackle. F. J. Plater, Durham, England. (Brit. No. 22,619 of 1908.)

HOISTING—Improvements in or Relating to Safety Suspending Apparatus for Mine Cages and the Like. William Francis and Alfred Sedgwick, Derby. (Brit. No. 20,501 of 1908.)

HOISTING — Improvements Relating to Safety Catches for Suspended Lift-Cages. F. Weidig, Alfeld, Germany. (Brit. No. 11,447 of 1909.)

HOISTING—Safety Attachment for Mine-Elevators. Morgan E. Jolliffe, Uniontown, Penn., and John H. Cowan, Jefferson, Ohio. (U. S. No. 934,816, Sept. 21, 1909.)

LAMP—Miner's Lamp. Adletia M. Van Liew, Houghton, Mich., assignor of one-half to John Van Liew, Houghton, Mich. (U. S. No. 934,243, Sept. 14, 1909.)

MINER'S CAP. Ida M. McPherson, Yatesboro, Penn. (U. S. No. 931,463, August 17, 1909.)

MINER'S LAMP. Otto M. Müller, Gelsenkirchen, Germany. (U. S. No. 935,219, Sept. 28, 1909.)

RESPIRATORY APPARATUS. Jules Tissot, Paris, France. (U. S. No. 932,515, Aug. 31, 1909.)

ROCK-BREAKER. Charles C. Lane, Los Angeles, Cal. (U. S. No. 936,729, Oct. 12, 1909.)

ROCK-DRILL. Robert A. Fowden, Germantown, Penn., assignor to United States Electric Rock Drill Company, Dover, Del., a Corporation of Delaware. (U. S. No. 933,702, Sept. 7, 1909.)

ROCK-DRILL. William L. Smith, Columbus, Ohio, assignor, by mesne assignments, to Jeffrey Manufacturing Company, a Corporation of Ohio. (U. S. No. 934,102, Sept. 14, 1909.)

ROCK DRILLING—Improvements in and Relating to Water Feed Devices for Rock Drills and the Like. Heinrich Flottmann, Cardiff, Wales. (Brit. No. 6668 of 1909.)

ROCK DRILLS—Improvements in Rock Drills. Karl Ruschenbaum, Jeppestown, Transvaal. (Brit. No. 16,771 of 1908.)

SAFETY LAMPS—An Improved Apparatus for Electrically Igniting Miners' Safety Lamps in Mines. John C. Best, Morley, Eng. (Brit. No. 10,828 of 1908.)

SAFETY LAMPS—Ignition Device for Miner's Safety Lamps. Ferdinand A. Wicke, Barmen, Germany. (Brit. No. 9662 of 1908.)

SAFETY LAMPS—Improvements in or Relating to Miners' Safety and Other Lamps. Ernest A. Hallwood, Morley, Eng. (Brit. No. 23,096 of 1908.)

METALLURGICAL MACHINERY AND APPARATUS.

DOORS FOR RETORTS, ETC.—Improvements in Doors for Retorts, Coke Ovens and Other Furnaces. F. Shaw, T. M. Percy, and J. K. Entwistle, Wigan. (Brit. No. 17,647 of 1908.)

DRYING AND GRINDING—Apparatus for Drying and Grinding Materials. Gottlieb Suter, Basel, Switzerland, assignor to the Firm of Society of Chemical Industry in Basle, Basel, Switzerland. (U. S. No. 932,727, August 31, 1909.)

ELECTRIC FURNACE. Frederick M. Becket, Niagara Falls, N. Y., assignor to Electro Metallurgical Company, a Corporation of West Virginia. (U. S. No. 932,368, Aug. 24, 1909.)

ELECTRIC FURNACE. John A. Hay, London, England, assignor to American Electric Furnace Company, New York, N. Y., a Corporation of New York. (U. S. No. 932,469, Aug. 31, 1909.)

ELECTRIC FURNACE. Gilbert C. Landis, York, Penn., assignor to American Phosphorus Company, Camden, N. J., a Corporation of New Jersey. (U. S. No. 932,296, Aug. 24, 1909.)

ELECTRIC FURNACE. William A. Smith, Niagara Falls, N. Y., assignor to International Acheson Graphite Company, Niagara Falls, N. Y. (U. S. No. 935,937, Oct. 5, 1909.)

ELECTRIC FURNACE TERMINAL. Eben C. Speiden, Niagara Falls, N. Y., assignor to International Acheson Graphite Company, Niagara Falls, N. Y., a Corporation of New Jersey. (U. S. No. 935,939, Oct. 5, 1909.)

ELECTRIC FURNACE. Frank J. Tone, Niagara Falls, N. Y. (U. S. No. 932,069, Aug. 24, 1909.)

ELECTRIC FURNACE. Jean B. Trillon, St. Jeoire, France, assignor to himself and La Société Electrochimique du Giffre, St. Jeoire, France. (U. S. No. 932,835, Aug. 31, 1909.)

ELECTRIC FURNACES. Improvements Relating to Electric Induction Furnaces. Gröndal Kjellin Co., Ltd., London, Eng. (Brit. No. 8194 of 1909.)

FURNACE for Smelting Ores. William Kemp, Tucson, Ariz., assignor, by direct and mesne assignments, to The Kemp Hydro-Carbon Furnace Company, a Corporation of New York. (U. S. No. 936,781, Oct. 12, 1909.)

FURNACES. Improvements in Furnaces. John J. Jones, New Castle, Penn. (Brit. No. 4070 of 1909.)

FURNACES—Improvements in or Relating to Furnaces for Volatile Metals. W. Hommel, London, and The Metals Extraction Corporation, Ltd., London, E. C. (Brit. No. 19,667 of 1908.)

FURNACE-PORT COOLING MEANS. Frank E. Parks, Pueblo, Colo. (U. S. No. 932,493, August 31, 1909.)

LADLE CONSTRUCTION. Richard H. Stevens, Munhall, Penn., assignor of one-half to Per Torsten Berg, Stockholm, Sweden. (U. S. No. 934,946, Sept. 21, 1909.)

MELTING APPARATUS. William M. Carr, New York, N. Y., and Charles H. Speer, Chester, Penn. (U. S. No. 936,759, Oct. 12, 1909.)

MELTING FURNACE and Process of Using the Same. William M. Carr, New York, N. Y., and Charles H. Speer, Chester, Penn. (U. S. No. 936,758, Oct. 12, 1909.)

METALLURGICAL FURNACE. Robert Hübner, New York, N. Y. (U. S. No. 934,532, Sept. 21, 1909.)

OIL-BURNING FURNACE. Charles A. Hammel, Los Angeles, Cal. (U. S. No. 935,202, Sept. 28, 1909.)

REDUCTION FURNACE—Furnace for Reducing Ores. Gustaf Gröndal, Djursholm, Sweden, assignor to American Gröndal Kjellin Company, New York, N. Y., a Corporation. (U. S. No. 936,124, Oct. 5, 1909.)

REGENERATIVE FURNACE. Jacob B. McKennan, Pueblo, Colo. (U. S. No. 936,930, Oct. 12, 1909.)

REGENERATIVE FURNACE. Flue and Valve System for Regenerative Furnaces. Jacob B. McKennan, Pueblo, Colo. (U. S. No. 936,931, Oct. 12, 1909.)

SLAG GRANULATION. Improvements in or Connected with Granulators for Molten Slag or other Substances. William R. Warren, New York City. (Brit. No. 1236 of 1909.)

SLAG-HANDLING TABLE. David F. Croxton, Cleveland, Ohio. (U. S. No. 934,998, Sept. 28, 1909.)

SMELTING FURNACE. Joseph P. Welch, Salt Lake City, Utah, assignor of one-half to Jay J. Snider, Salt Lake City, Utah. (U. S. No. 937,030, Oct. 12, 1909.)

SMELTING FURNACE. Christian Debus and Josef Debus, Hochstadt-on-the-Main, Germany. (U. S. No. 934,892, Sept. 21, 1909.)

SMELTING-FURNACE. Transforming Smelting-Furnace. Hugo Helberger, Munich, Germany. (U. S. No. 932,986, Aug. 31, 1909.)

STARTING AND CONVEYING DEVICE FOR FURNACES. Utley Wedge, Ardmore, Penn. (U. S. No. 927,389, July 6, 1909.)

Personal

Mining and metallurgical engineers are invited to keep THE ENGINEERING AND MINING JOURNAL informed of their movements and appointments.

Charles E. Hart, of Joplin, Mo., is in Guatemala on mining business.

C. S. Herzig, of London, is on his way to Nevada. He will return to New York, and then will go to Central America.

E. G. Spilsbury, of New York, has gone to Nevada on professional business, which will probably occupy him for some time.

F. W. Denton and R. T. McKeever have been chosen vice-presidents of the Copper Range Consolidated Mining Company.

A. E. Drucker has just completed a visit to the Witwatersrand gold mines. He expects to be in New York in December.

Harold Boericke, of the firm of Stein & Boericke, of Primos, Penn., is looking after tungsten mining interests in Boulder county, Colorado.

Professor Reiji Kanda, professor of mining engineering in the Imperial University at Tokyo, Japan, has been visiting mines in the United States.

O. Potter has been appointed assistant superintendent of the Superior copper mine in the Lake district, which is controlled by the Calumet & Hecla.

W. H. Herdsman, of London, has been examining iron properties in Nova Scotia. After doing similar work in Newfoundland, he will return to England.

James Cronin, of Spokane, Wash., has returned south from the Babine range, in northern British Columbia, where he is prospecting a silver-lead property.

Anthony J. McMillan, general manager of Le Roi Mining Company, has returned to Rossland, B. C., from a business visit to New York and other eastern points.

Charles Camsell has returned to Ottawa, after completing his third season of geological survey fieldwork in the Similkameen district, in British Columbia.

H. A. Megraw has been appointed superintendent of the Hacienda Santa Elena at San Luis de la Paz, Guanajuato, Mexico, and has taken charge of the works.

R. H. Chapman, of Washington, D. C., in charge of a party making a topographical survey of Vancouver island, in British Coulmbia, has left Victoria for Ottawa.

Holland F. Benedict, assistant superintendent of the United States Smelting Company, at Brigham Junction, Utah, was married on Oct. 20, to Miss Amelia Bridgeman Gilbert of Boston.

Dr. A. R. Ledoux will shortly visit South Dakota to inspect the recent developments on the old property of the Harney Peak Tin Company, now owned by the Pahasa Mining Company.

Charles E. Hellier, president of the Big Sandy Coal Company, has been visiting Connellsville, Penn., for the purpose of making tests of coal from the Pike county field of Kentucky in the making of coke.

James Bartlett, inspector on the staff of the Provincial geologist of Ontario, is making an official investigation of the reported discoveries of gold near Night Hawk lake, in Whitney township, Northern Ontario.

Walter Harvey Weed and Frank H. Probert are examining the mines of the Proprietary Mines Company at Guanajuato, Mexico. When this work is completed Mr. Probert will visit Pachuca before returning to Los Angeles.

Dr. W. R. Crane, dean of the Mining Department of the Pennsylvania State College, has arranged to deliver a series of lectures before the local mining institutes in both the anthracite and bituminous regions of Pennsylvania.

Peter Eyerman, chief engineer of the Dubois Iron Works, Du Bois, Penn., has resigned that position and accepted an engagement with the Witkowitz Steel Works, the largest in Austria. That company is preparing to enlarge its works, and proposes to introduce some features of American practice.

Leslie Hill, of Nelson, engineer in charge of the Hastings (British Columbia) Exploration Syndicate, and the Head Syndicate, recently accompanied James Head, of London, chairman of both companies, on a visit of inspection of the gold mine of the former and the coal mines of the latter, in British Columbia and Alberta.

Obituary

E. G. Vogel died at Las Minas, Vera Cruz, Mexico, Oct. 9; aged 72 years. He had been a resident of Mexico for 45 years, most of that time engaged in mining. He was manager and part owner of Las Minas Mining Company for a number of years.

A. E. Humphreys died in Pittsburg, Penn., Oct. 19, aged 63 years. He was well known as a coal-mine manager in western Pennsylvania. He was born in Wilkes Barre, Penn., and had his first experience in the anthracite country, going later to the bituminous fields. He lived at Irwin, Penn., for 25 years, holding the position of general superintendent of the Westmoreland Coal Company. He resigned to accept a position with the Edgewood Coal Company, and later with the New River Coal Company of West Virginia, and at his death was president and chief owner of the Humphreys Colliery Company, of Philippi, W. Va. He leaves a widow and eight children.

Frank H. Sherman, for years the leader of organized labor in the coal-mining districts of Alberta and southeastern British Columbia, died at Fernie, Crow's Nest Pass, B. C., Oct. 11, aged 40 years. His untimely death occasioned general mourning throughout the somewhat extensive region in which he had for years been a prominent and striking figure. He was born in Gloucester, England, and brought up as a coal miner in Wales. In 1903 he went to Canada and settled in the Crow's Nest Pass country. When the United Mine Workers organized in the district, he was chosen district president and had held the office ever since. He was generally recognized as an able and adroit, but fair and honest leader.

Societies and Technical Schools

Kanawha Coal Operators' Association—At the annual meeting in Charleston, W. Va., Oct. 16, the following officers were chosen: President, William Seymour Edwards, Charleston, W. Va.; vice-president, William Mitchell, Plymouth, W. Va.; treasurer, E. O. Dana, Cincinnati, O.; secretary and commissioner, D. C. Kennedy, Charleston, W. Va.; executive board, John L. Dickinson, J. W. Dawson, Quinn Morton, L. H. Lee, N. D. Monsarrat, J. W. Moore and F. H. Palmer.

West Virginia Coal Mining Institute—The winter meeting will be held at Huntington, W. Va., Dec. 7-9. The program inculdes two business sessions each day, on Dec. 7 and Dec. 9, at which the following papers will be read and discussed:

"What shall we do with the Oil and Gas Wells on our Coal Properties?" E. B. Moore, Fairmont, W. Va.

"The Underground Manager." Joseph Virgin, Plymouth, W. Va.

"Practical Fuel Values." W. P. Young, Myersdale, Penn.

"Outside Arrangements of a Modern Coal Mine." Warren R. Roberts, Chicago, Ill.

"Observations in European Coal Mines." Frank Haas, Fairmont, W. Va.,

"Some Conditions Affecting the Coal Mining Industry of West Virginia." E. W. Parker, Washington.

"The Relation of Foreign Labor to the Demand for Increased Coal Production." Neil Robinson, Charleston, W. Va.

"The Mine Department of West Virginia, its Relation to the Coal Producing Interests of the State in General." John Laing, Charleston, W. Va.

"Required, A New Pair of Glasses." Fred C. Keighley, Uniontown, Penn.

"Proper Material for Coke Oven Construction." T. I. Brett, Fairmont, W. Va.

Dec. 8 will be devoted to a visit to the mines of the U. S. Coal and Oil Company at Holden. The meeting will close with a dinner at Huntington.

Special Correspondence from Mining Centers

News of the Industry Reported by Special Representatives at Butte, Denver, Salt Lake City, Goldfield, Cobalt and Toronto

REVIEWS OF IMPORTANT EVENTS

San Francisco

Oct. 22—The largest hydraulic mine in California, and for that matter, in the United States, is the La Grange, near Weaverville, Trinity county, where the practice is of the best under the direct supervision of P. Bouery, a skilful mining engineer. The company has a large body of gravel and a fine water supply on which large sums have been spent. Now there is to be a rival to this mine at Scales, Sierra county, where the Neocene Placer Mining Company is about to begin operations with three giants, the new dam having been completed. This new concrete dam for débris, built under supervision of the California Débris Commission, is 200 ft. long, 45 ft. high, and 14 ft. thick at base, narrowing to four feet at the top. It is designed to restrain 400,000 cu.yd. of mining débris. The ground to be worked is that of the old Cleveland company which just got into operation when the anti-débris laws became effective. The superintendent of this new enterprise is K. D. McLean, of San Francisco, but the company is of Los Angeles origin. The dam has been built to comply strictly with the prevailing laws and no trouble is expected from those opposed to hydraulic mining although, no doubt, a close watch will be kept on operations by the Anti-Débris Association, which is opposed to hydraulic mining under any conditions. The company owns some 9000 lineal feet of the gravel channel. There is every chance to enlarge the capacity of the holding reservoir behind the dam when it becomes filled. Operations will commence on this property within a few weeks.

The Pittsburg mine, Nevada City, has now been fully reopened and the mill started on ore from the 700 and 900 levels. The electric equipment on the Pittsburg is one of the most complete in the mines on the coast.

The Inca Treasure Company has attached the mines on Dog Creek, near Delta, owned by the Delta Consolidated company to secure payment of several thousand dollars alleged to be due. A few weeks previous the Delta Consolidated Mining Company brought suit against the Inca Treasure company demanding a lot of money and stock. The affairs of both companies are intertwined and the courts are called upon to unravel the tangle.

Denver

Oct. 22—In the Cripple Creek district, in view of the advance of the Roosevelt deep drainage tunnel, now within measurable distance of completion, additional interest is lent to the oft-recurring strikes of high-grade ore in the deep levels, say, 1000 ft. and more below the surface, and sinking is greatly on the increase in consequence. Bull hill is especially active. The leaser on the Burns claim of the Acacia company is said to be shipping $30 ore, as is also the South Burns Leasing Company; and the Silver Tip mine, adjoining the Pharmacist, is also shipping and installing additional machinery. The lessees on the Bison, of the Free Coinage company, are also reported to be shipping 2-oz. gold ore. Three lode claims on Beacon hill, adjoining the El Paso company's mine, have been taken under bond and lease by Eastern people, and will be extensively worked under the management of Gen. Sherman M. Bell. These mines, the property of the Republic Gold Mining Company, are among the first to be drained by the Roosevelt drainage tunnel. The Sam Macdonald lease and the Jesse Waters lease on the Jennie Sample, on Raven hill, are producing steadily. The Empire State workings of the Isabella company, on Bull hill, have been leased for two years to T. B. Burbridge. A Denver syndicate, represented by Allen Burris, president of the El Paso company, is rapidly acquiring the shares of that company, and has just paid $45,000 on account for 72,500 shares. The September production of the Vindicator mine will approximate a bullion value of $45,000. This mine has made a remarkable record inasmuch as it has been producing steadily for 16 years with a record of a gross product of gold ore to the value of $8,200,000 up to Jan. 1, 1908, and a total, including that to be paid Oct. 25, of $2,047,500 in dividends. It has upward of 29 miles of underground workings, and not the least important fact is that some of the best ore discoveries and production have been made at the 1200, 1300 and 1400 levels.

Prof. R. D. George, the director of the Colorado Geological Survey, has issued his first report on the tungsten area of Boulder county; reports will also be issued on the Montezuma mining district, and on the Hahns Peak region.

Butte

Oct. 23—The plan of the American Metal Company to erect a mill at Butte for treating the zinc ores of the Butte & Superior company has aroused much interest. The Metal company will advance to the Butte & Superior company $250,000, of which $150,000 will be used in the erection of the zinc mill, and the remainder used for surface improvements and development at the Black Rock mine. Besides the zinc deposits in the Butte & Superior porperty, the Elm Orlu mine of W. A. Clark has a large body of the same ore, and Butte Coalition's Alice mine and the LaFrance company's Lexington mine and the Butte Copper and Zinc Company's Emma mine all have large deposits of zinc. In the Emma mine a report, made several years ago, shows that between the 400- and 800-ft. levels there is an orebody of from 125 to 130 ft. wide which assays from 17 to 32 per cent. zinc. The shaft of the Black Rock mine is now down 1600 ft. A 50-ft. sump will be sunk and then a station will be cut at the 1600-ft. level. The Butte-Milwaukee Copper Company, the property of which adjoins that of the Butte & Superior, will soon resume operations.

The Butte & Balakalava Copper Company will soon begin making shipments to the Washoe smeltery, Anaconda, at the rate of 50 and 100 tons daily. The new ore bins of the property have been completed. Work is being done on the shaft, which, when completed, will make the entire length three compartments. A new steel gallows frame 98 ft. high has been ordered. The property has been well developed within three years, and now has 11 levels from which ore is being produced. The water from the mine is brought to the 1200-ft. level and from there flows into the workings of adjoining Amalgamated properties, and is pumped by the latter company under an agreement.

Salt Lake City

Oct. 22—The control of the Ajax mine has passed into the hands of Col. C. E. Loose and associates which may mean another consolidation in the Tintic district. Colonel Loose also owns a control of the Golden Chain, and a large interest in the Pedro and Cleveland, properties adjoining the Ajax, and it is supposed that the mines will be consolidated into one company and that they will be worked through the Ajax workings which have reached a depth of 1200 ft. While the Ajax is considered a "worked out" mine, its deep workings and valuable equipment may be used to an excellent advantage to develop the virgin country in the adjoining properties.

The Superior Fuel and Briquet Company has taken over the Gomer Thomas coal mine near Coalville and has installed machinery that will manufacture briquets at a rate of 160 tons a day. Exhaustive

tests have proven the coal of this mine exceedingly well suited for briquet manufacture. A native asphalt has been found which makes an excellent binder.

The Boston Consolidated output during September was over 2,000,000 lb. of copper, a material increase over the August output of 1,600,301 lb. The report given to the American Institute of Mining Engineers during the visit to the camp showed that during September 7178 dry tons of sulphide ore were mined at a cost of $1.08 per ton and the caving system in the porphyry deposits brought down 71,880 tons at a cost of 66.7c. per ton. The mill treated 72,000 tons of ore during the month producing 1,569,000 lb. of copper, an average recovery of 21.8 lb. to the ton. The management states that the cost of production is at present below 10c. per pound.

Mineral, Virginia

Oct. 24—Near Mineral, Louisa county, Va., the pyrite mines of the Armenius Chemical Company and the Sulphur Mining and Railroad Company are running with full crews of about 300 men each.

The Armenius has now reached a depth of 1060 ft. but the orebody which was 60 ft. wide on the 960-ft. level has not as yet been cut on the lowest level. Ore is being extracted from the 200, 860 and 960 levels and about 400 tons sent to the mill per 24 hours. A new shaft, 6x14 ft. in the clear, is being sunk to the north of the present shaft; it is situated about 50 ft. from the orebody in the footwall and from it drifts and crosscuts will be run in order to rob the ore which has been left in the stopes.

At the Sulphur Mining and Railway Company's mine work is being pressed on the new vertical three-compartment shaft which will replace the three inclined ones now used and the necessary underground development to enable the orebody to be worked from the new shaft. Sinking has now reached a depth of 250 ft. To meet the contingencies of the large tonnages a new mill with a capacity of 30 tons per hour will be erected to replace the present one which was designed for 20 tons per hour. It is expected that the new mill will be in operation by the middle of next year. At the present time the output of the mine, [illegible] amount of [illegible] being carried on below normal.

The Boyd Smith mine is still closed down [illegible] between [illegible] and Trust Company [illegible] The property is [illegible] the Armenius and the [illegible] [illegible] It has been [illegible] that the [illegible] [illegible] the [illegible] [illegible] [illegible]

[illegible] of Mineral [illegible] has a gang of [illegible] developing the old Allie Cooper lead-silver mine which was opened before the Civil war. Over in Spottsylvania county John M. Holladay, and James B. Elam and Thomas Jeffress, of Richmond, has a small crew at work developing what is claimed to be a large pyrite orebody.

Cobalt

Oct. 24—Much uneasiness was caused by the slump in La Rose and Nipissing stocks, which was much more pronounced in the former. There does not seem to be any good excuse, although it is reported that the Guggenheims are responsible, and that they hammered the stock in an effort to buy in at a lower figure. The probable fact is, however, that it is due to manipulation by some inside New York interests. The La Rose stock has always been very carefully nursed, and this is the first time it has been affected since the consolidation.

The first mine to benefit by the electric power which is being brought into camp is the Colonial, when a few days ago the mill was started. The transmission line is now being extended to the King Edward, where everything has been in readiness for some time. This power, however, is being furnished by a small temporary generator, and the main plant will not be completed for some time yet. This is one of the most important events in the history of the camp, and when all the mines are in a position to benefit by the air and electricity, a great impetus will be given to operations, and mining costs will be materially lessened. At the present time the cost of power on the average is about $175 per horsepower a year, but a great many of the mines run well above this figure. The new power will be sold for $50. Good progress is being made with the work on the Cobalt Hydraulic Company's plant, and about nine miles of the 20-in. mains and five of the 12-in. have been connected up. This company expects to have the air ready for delivery in December. The work on the plant of the Mines Power, Ltd., is also progressing rapidly, and there are about one thousand men at work. The big 5000-ft. compressors are to be shipped from England within the next two weeks.

The cyanide plant in operation at the O'Brien mine has now been running over two weeks, and the results so far have exceeded the expectations of the management. It was found that the cyanide consumption amounted to about one pound, which is much less than was estimated, and the tailing assays only run about 90 to the ton. It is understood that the management will not put up a cyanide plant for the present, but will ship the concentrates to a cyanide plant. This process is practically new to the mining world, only being used in one place, [illegible] It is thought [illegible] very complex nature of the Cobalt ores, if direct cyaniding can be successfully applied, but the probability is that before long many of the concentrators will be equipped with plants for cyaniding the slimes. This process is being used at the Buffalo with marked success.

It has been announced that the Union Pacific Mining Company, operating on Peterson Lake, has secured control of the Michigan property, which adjoins the Farah and Silver Leaf. The price was $240,000, $140,000 of this to be paid at once, and the remainder within five years. This property is very well located, but up to date very little work has been done. One shaft has been sunk to a depth of 120 ft., and from this a few drifts were run. A Montreal company, called the Cobalt Twins, has purchased a 20-acre claim near the Century mine, and several other claims in the neighborhood will be secured by the same company.

Toronto

Oct. 24—The Ontario government has imposed a new condition in connection with the sale of mining lands on the Gillies Limit. A stipulation is introduced that the purchaser must not sell or dispose of the land to any corporation other than one incorporated under the laws of Ontario, otherwise the patent will be void. The reason assigned is that purchasers at former sales have, in at least one instance, obtained a Dominion charter, giving much wider powers than are conferred by the province.

Prospectors in large numbers continue leaving the Cobalt district and other places in northern Ontario for the new gold field in Whitney township. Twenty canoe parties left Haileybury, Oct. 20.

An official of the Canadian Geological Survey has discovered a valuable specimen of fluorspar in Madoc township, Hastings county, Ont. Samples of celestite have also been found in Lansdowne township, Leeds county, Ontario.

Reports of the new goldfields in the Porcupine country continue to come in, and there is no indication as yet that the rush into this section is abating. Mosco Vici, who is associated with Dr. Milton Hersey, of Montreal, in some of his interests in this camp, is now on his way to inspect some of the recent discoveries. The discovery of [illegible] has also sent in an engineer to examine this district, and make a report on the townships where the discoveries are reported, namely, Mattice, Tisdale and Whitney. It is reported that one claim has changed hands for $[illegible]. The Pushkin Lake district is [illegible] and will soon develop [illegible]

Most of the prospectors are now beginning to leave the Gowganda district, and it is expected that very little will be done before the winter roads are in shape. When that time comes two or

three of the properties will be in a position to ship ore, as the Reeves-Dobie and the Blackburn have on hand enough to make a shipment. Up to date the Bartlett, of which so much was heard last winter, has found little of note. The shaft on the main vein was sunk a distance of 100 ft. and a crosscut driven to catch the vein on the dip, but it has not been found, and it is believed that the veins pinched out before that depth. The No. 2. shaft, however, sunk on a smaller vein, has opened up some good ore at the 75-ft. level. Transportation conditions will be much better this winter and consequently supplies will be much cheaper. The Reeves-Dobie has made a contract to take their ore out over the Bisco road from the mine for $15 per ton.

Mexico

Oct. 23—A correspondent from Monterey writes as follows concerning the zinc situation: "The general conditions of the zinc-mining industry in northern Mexico have lately suffered to a certain extent by reason of the new American tariff. Since the date of the said tariff becoming effective, shipments to the United States have ceased, or have been limited to the ores that were in transit from the mines to the railroad shipping stations, or under contract with the purchasers. But this has only been a temporary setback of short duration and of unimportant ill consequences as compared with the improvements that we expect from our actual awakening to the adaptation of future commercial conveniences. It is unquestionable that the United States tariff, or its effects on our zinc ores, will stimulate improvements in the methods of their disposal, which I do not hesitate in believing will be, in the end, the smelting of these ores at home, followed by the development of industries in the various applications of the zinc products. For the present, however, our immediate relief comes from shipments being diverted to Europe. Arrangements have been made to handle the ore economically and in bulk at Tampico, and shipments have already started on that route, by way of San Luis Potosi, to be followed by others from Monterey and tributary points, directly to Tampico, just as soon as the flood damages to the railroad have been repaired. Arrangements have also been made and concluded for shipments by way of Galveston, Tex., the ore in this case, of course, going in bond. These shipments will commence just as soon as the International & Great Northern railroad can legally make effective the freight rate that it has named for transportation between Laredo, Tex., and Galveston. The cost of freight and shipment, as above, compares about equally with the charges for transportation that were previously paid to the United States markets, but we are expecting a reduction of about $2 per ton in favor of European shipments. There is great demand of zinc ore for Europe at present, and this accounts for the price of spelter gradually rising. This, with the added possibility of lower freight rates by the Mexican roads, and the further expectation of competition between the ports of Tampico and Galveston indicates some improvement over the present anomalous conditions into which the American shut-off has thrown us."

The Mexican zinc miners are interested in the prospects of some arrangements by which the foreign ores can be treated in the United States and a drawback allowed for the export of the equivalent of the metal product. The matter is before the United States Treasury Department, and some arrangements are confidently expected soon.

Owing to the unseasonable frosts in Mexico, extensive areas are likely to suffer on account of the failure of the corn crop. In order to obviate this, the government has removed the import duties on corn as it did in the case of wheat last summer. The agricultural conditions of the countries tributary to the mining section is a vital matter to the mining industry, as it affects the price of labor, and in years when the agricultural interests are exceedingly active, labor is scarce. When the products are high, it is necessary for the mines to pay more in wages, as the average wage in Mexico is based on a very close margin over the actual living scale.

The exports for Mexico for July, 1909, as reported at the customs' offices, amounted to 12,273,843 pesos, an increase over the corresponding month of last year of 728,966 pesos. The imports for the month amounted to 22,143,792 pesos, an increase of 5,692,839 pesos. The mineral products exports amounted to 3,364,777 pesos, a decrease of 178,186 pesos. The increase in imports is accounted for largely by gold and silver imported. The gold import was 4,476,745 pesos, an increase of 2,794,635 pesos, and the silver 7,008,942 pesos, an increase of 2,794,635 pesos over the corresponding month of 1908.

London

Oct. 23—There has been issued the prospectus of a new mining company to acquire a group of mining leases situated at Silverton, Slocan lake, British Columbia. These leases have been acquired and reported on by M. S. Davys. The principal lease to be acquired is that of the Hewitt mine, which has so far produced 15,000 tons of ore, of which about one third has been sorted out and sold to smelters for a net return of $42.37 per ton. The remaining two thirds of the tonnage produced lies on the dumps and in stopes, being reserved for milling. The working capital now being offered for subscription is £10,000, which is to be devoted to driving tunnels on the Hewitt group and for opening the mine for a daily output of 100 tons, for the purchase of a small compressor and for certain development work on the Tiger group. The ores to be worked are silver-lead and zinc. The working capital provided seems very small and attention is directed to some observations made below.

The Akrokerri (Ashanti, Africa) Mines, Ltd., a company which has been in existence about nine years, is to be wound up on account of failure to make profits. During 1907 the mine produced 14,341 fine oz. of gold and during 1908, 14,504 oz. Since crushing started in 1905 the gold production has totalled about £307,000. It is a pity to see a mine like this, which has given proof of the presence of mineral wealth, go under. The failure to make both ends meet in spite of a considerable output, calls attention to the disadvantages that West African mining labors under. The grade of the ore has been such as would give handsome profits to a mine working in South Africa or the United States. Whether the ore is really all exhausted or whether development has been neglected, are questions which without an intimate knowledge of the history of the company, cannot be answered. But it seems not unlikely that the failure is due to the neglect of development.

Several of the West Africa mining companies from which great results were expected last year have been reconstructed, owing to neglect of development on a sufficient scale. Mines without reserves soon get into financial difficulties, leading to instructions being sent to the manager to raise the grade in order to keep the company alive. There is always the chance that by some piece of luck a fresh orebody may be met with which will enable the normal position to be eventually recovered. But, as a rule, a heroic measure such as this leads only to an exhaustion of the reserves and a collapse of the company.

Insufficient development is one of the principal reasons for the failure of mines to pay dividends. It leads to overcapitalization, for mines in difficulties can only raise fresh funds on disadvantageous terms. If engineers would insist on the provision of adequate capital for development when recommending mines for flotation, the number of mines that pay no dividends would be far smaller. But in many cases under pressure from the financier the engineers allow themselves to take a too optimistic view of the money that will be required to put the property in a sound remunerative position with the result that the mine does not have a fair chance and ends in bankruptcy. Akrokerri may or may not have been mismanaged, but it provides a text for calling attention to the reasons why so many mines come to grief, which if the lessons taught by experience had been paid attention to, might have succeeded.

Mining News from All Parts of the World

New Enterprises, Installations of New Machinery, Development of Mines and Transfers of Property Reported by Special Correspondents

THE CURRENT HISTORY OF MINING

Alaska

Juneau—The Alaska Gold Quartz Company in the Willow creek region recently lost its entire cleanup through the explosion of the retort.

Cordova—Railroad traffic on the Copper River & Northwestern has been interrupted by a coal famine. In resolutions adopted by the chamber of commerce of Cordova, Congress is urged to pass laws which will allow Alaska to mine its vast coal deposits.

Fairbanks—The unexpected freeze on the Tanana river caught a number of steamers. Two loaded with stampeders for the new Iditarod diggings were frozen fast. Over 1000 tons of machinery within a short distance of Fairbanks will not be available until May.

Arizona

COCHISE COUNTY

Arizona Metals Company—A company with Charles F. Dick, of Washington, D. C., at the head, has purchased 540 acres of mineral land at Teviston, formerly Bowie.

GILA COUNTY

Boston-Miami Development Company—This company has contracts for 42 claims in the Miami district adjoining the Live Oak and New Keystone. Exploration by churn drills will be undertaken. F. W. Hoar is superintendent.

Ray Consolidated—The company has spent $125,000 for lands and right of way at Winkleman for a smeltery. Work on the foundation for the plant has been commenced. Twelve drills are being used and the prospect bores are down to 900 ft. in some cases. The shaft is now at 300 ft., and four levels will be run. Steel for the 5000-ton concentrator is being received and work on site is progressing. About 80 per cent. of the railroad grade from Kelvin to Ray is completed. The orebody, as disclosed by the drills, is thicker toward the upper end.

SANTA CRUZ COUNTY

Pulaski—Martin Michelski has given a bond on the group, in the Josephine cañon of Santa Rita range, for $[illegible] to F. E. Bethel, who will begin work.

Mowry—The mine has hopes of starting up again after a closure of two years.

YAVAPAI COUNTY

Pacific Copper Company—Extensive development is under way on the property in the Silver mountain district. The shaft is down [illegible] ft. and in all about 1000 ft. of work has been done. The ore developed carries gold and copper. C. W. Mitchell, who is also interested in the Arizona-Empire, is consulting engineer.

Gold Road—The new mill is now in operation treating ore from the 1000-ft. oreshoot on the 700-ft. level of the Billy Bryan and Gold Line claims.

YUMA COUNTY

Southwestern Mining and Milling Company—The company has been organized at Phœnix with J. D. Mitchell, manager, to operate properties northeast of Vicksburg. A 20-stamp customs mill will be erected.

Arizona-Empire—The company is developing a property near Parker and is planning to erect a smeltery. About 6000 ft. of development work has been done.

California

MARIPOSA COUNTY

Number Five—E. S. O'Brien, of Merced, manager, has bought machinery to sink 300 ft. for the mine near Hornitos, and a mill will be installed.

Crown Lead—The property at Nameless dam has been purchased by E. S. Lewis, who has bought a 20-stamp mill. An aërial tramway is to be built from the mine to mill, and the mill increased to 40 stamps.

MONO COUNTY

Masonic Mountain—The property of this company is now under option to the Pittsburg-Liberty Mining Company. A tunnel is being run on the True Friend claim.

NEVADA COUNTY

Shebley—George Shebley has bonded his claim in Chicago Park district and it will now be steadily worked.

Delhi—Fire has destroyed the compressors and buildings at North Columbia owned by the St. Gothard company, loss $20,000.

Grass Valley Dana—All the machinery at this mine, Grass Valley, has been started up with the new electric power plant. The shaft will be sunk 500 ft. before doing other work; Frederick Godfrey, superintendent.

Erie—The work of reopening this mine at Graniteville has begun under R. G. Eckis, and the 30-stamp mill started.

Yuba Consolidated—The company has been reorganized with John M. Chase as president. The new company will put in a tramway, another air compressor, and a larger electric plant. It owns the Yuba and Gray Eagle mines at Washington. A new hoist will be built for the Yuba, a concentrating plant will be installed, and the mill enlarged. The Gray Eagle has a 10-stamp mill.

Erie—At the mine, Graniteville, R. G. Eckis, manager, the 30-stamp mill will soon be running.

Red Cross—The company at Omega has ordered a Huntington mill and operations are to be resumed at the mine on a larger scale.

PLACER COUNTY

Adventure—This quartz mine at Sucker Flat, has been sold at administrator's sale to R. L. Turner of Colfax.

PLUMAS COUNTY

Gassner—San Francisco men are reported to have bought this mine, on the north fork of Feather river. A steam shovel will be used to mine the gravel.

SHASTA COUNTY

Mammoth—The company will probably build a bag house to relieve the smoke-damage situation. The other smelters in the Shasta district are considering similar action.

SIERRA COUNTY

Bunker Hill and Gibraltar—The shaft of the Gibraltar mine, near Downieville, is down 300 ft., and the gravel has been cut. Gravel has also been struck in the Bunker Hill, near the same place.

Kate Hardy—Good ore has been found in this mine at Forest and a mill will be erected.

Sailor Ravine—At this mine, worked by Frye & Winrod, the arsenical sulphurets being taken out are improving. The richest are being treated at the mine in a small furnace.

SISKIYOU COUNTY

Yellow Butte—This company has been reorganized and the development of the copper mines at Weed will now commence.

Mt. Vernon—This mine, near Yreka, is again being opened up after being closed a few years.

Colorado

BOULDER COUNTY

Dom Pedro—An air compressor will be installed for driving the tunnel at Jamestown.

Victoria—This property at Summerville is being unwatered.

Gold Farm—This mine at Magnolia has

been sold to H. Wilkins, of Columbus, Neb., for $20,000, and a 50-ton cyanide plant to handle the low-grade ores will be built.

Lincoln—A 50-ton cyanide mill will be built at Sugar Loaf. N. M. Nelson, manager.

Alton—A 50-ton cyanide mill will be built at this property near Cardinal.

CLEAR CREEK AND GILPIN COUNTIES

Elephantine—This group has been purchased by Lendecke & Shields, of Georgetown, who will operate.

Gregory-Bobtail—A strike in the Gregory, of the Fifty Gold Mines Company, at Central City, of 4½ ft. of ore, 12 in. of which is said to carry 12 oz. of gold per ton, with silver and copper, making a total value of $300 per ton. The balance is good milling ore. The ore is delivered to the mill at Black Hawk through the old Bobtail tunnel.

Egyptian—The lessees of this mine on Quartz hill, have installed a new 60-h.p. boiler, and are shipping smelting ore of good grade.

Griffith—The company will work its mine through the Doric tunnel, by arrangement with the Doric Trust, Ltd., of London. The ores are lead and zinc, and will be treated in the "electrochemical" plant now being built near the entrance to the tunnel, and which it is expected will "extract the metals in bullion form."

Stanley—This mine at Idaho Springs, which has been practically worked out above water level, and the lower levels of which have been under water for many years, is to be pumped out and work resumed under the management of James Bowden.

FREMONT COUNTY

Copperfield Consolidated—The company has been formed to acquire the Red Gulch, Fremont, Queen-Princess and other properties near Cotipaxi. The new company will install an adequate plant and inaugurate extensive work. J. B. Conger is in charge.

GUNNISON COUNTY

Victor—A Boston company, Emil Peterson, manager, has a contract on the property in the White Pine silver-lead district and is shipping.

LAKE COUNTY—LEADVILLE

A large tonnage of iron ore is being shipped to the Arkansas Valley smeltery from the different shafts of the Penn mine, on Breece hill. Work has been started on the Curran and Grand Prize claims on Breece hill by the lessee, John Cortillini. The Highland Mary on Breece hill is sinking in ore, and the winze in the St Louis tunnel, present depth 150 ft., is going down on 3½ ft. of smelting ore.

Yak Tunnel—The bore has now reached the Resurrection No. 2 shaft, and drill holes are being advanced to drain the property.

Water Lily—The property on Cabinet hill is shipping argentiferous iron ore to the local smeltery and manganese ore to Pueblo.

Forest City—Work has been resumed in Big Evans gulch with the view of prospecting for the Valley oreshoot.

New Monarch—The company will install heavier machinery and sink the Cleveland shaft, South Evans gulch, to 1000 ft. The monthly output is 1500 tons.

PARK COUNTY

London—This mine at Alma has 16 four- and six-horse teams hauling ore daily from the mine to the railroad, and this will be kept up through the winter.

PITKIN COUNTY

Lead King—Work is started on this property near Crystal, by T. B. Crawford of Denver. The ore is complex.

Smuggler—A new orebody has been found in this mine and about 500 tons a day is being won from it. The find has stimulated other activity in the camp.

SAN JUAN DISTRICT

Silverton Camp—The Iowa-Tiger Leasing Company is still paying 20 per cent. per month dividends, and is said to have ore enough in sight to continue this for six months. The ore is silver-lead and is being concentrated at the mill in Arastra gulch. The lessees on the Silver Lake, on the same vein, are also doing well, and the lessees on the Zanoni lode recently shipped a small lot of 100 pounds of ore, on which the net smeltery return was $2100. The Gold Prince mine is sending 120 tons per diem to be concentrated at the Animas Forks mill. Reserves of ore are being rapidly blocked out under J. O. Campbell, manager.

Frank Hough—This mine, on Engineer mountain, has opened a vein of the high-grade copper ore which for some years has made this mine famous. The ore is going via Animas Forks to the Durango smeltery.

Treasury Tunnel—The bore at Red mountain has already penetrated one mile, and the company is preparing for all-winter work. A rise is being driven on one of the veins of ore intersected.

New Gold King—The mill is in commission with 80 stamps treating 200 tons daily. A saving of 90 per cent. is expected.

SUMMIT COUNTY

Wellington—A strike of galena ore is reported. The ores are delivered into the mill by electric haulage, a 60-ton electric locomotive having just been purchased. The production is about 300 tons per month at present.

Kimberly - Wilfley—The Marquette, Mich., company controlling this property at Kokomo, is planning to resume.

TELLER COUNTY—CRIPPLE CREEK

Dexter—An important strike has been made on Bull hill at 830 ft. by leasers.

Indiana

VERMILION COUNTY

Crown Hill No. 1—This mine, owned and operated by the Clinton Coal Company, has resumed work. The mine employs 300 men and has been closed for about 20 days during the past year. A cage became fast while coal was being hoisted and the large pulley wheels and timbers supporting them, at the top of the tipple, were pulled into the mine, making a shutdown necessary.

The United States Steel Corporation during the middle week of October paid to the land owners of Clinton Township more than $100,000 for coal lands and there are several hundred acres yet held under option that are to be likewise taken over soon.

Because eight machine men and as many helpers in the Leyford mine have been required to work at night they went on a strike and closed the mine for two days. The work was resumed after the company procured a new force of machine runners. The employees insist that the company enlarge its boiler capacity so that all men can be taken care of in day work. The officers of the company say that a new boiler will be ordered in a short time, with other improvements.

VIGO COUNTY

It is reported that a large tract of coal land in this county will soon be taken over by the United States Steel Corporation. This land adjoins that bought in Clinton Township, Vermilion county.

Idaho

BONNER COUNTY

Swastika—The company is doing development work at Lakeview. The plants for the smelter will not be developed until next spring. The manager is J. S. Ferguson, Sandpoint.

IDAHO COUNTY

Eagle—Two Tremain steam stamps and a cyanide plant have been purchased for this mine near Edwardsburg, W. A. Edwards, manager.

Oliva—A 15-ton Huntington mill is being installed and operation will be resumed.

Red Cross—The company will install a 250-ton mill.

Majestic—A 600-ft. tunnel is being driven and the working force increased.

Iowa

Shady Creek Coal Company—This company has been organized and has purchased three small mines near Oskaloosa. The intention is to consolidate and enlarge the mines, working them through a single slope, and largely increasing the output.

Dubuque & Superior—The zinc mine west of Dubuque will resume after two years' suspension. H. J. Connor, of Superior, Wis., is in charge.

Michigan

COPPER

Hancock—No. 2 shaft is 2000 ft. deep and a change has been noted in the formation. This has been unlooked for before 2200 ft. The winze from the 13th level of No. 1 shaft sinking on this lode has reached the 18th level, where it will be intercepted by the large working crosscut from No. 2 shaft, through which the rock coming from the 13th level down will be hauled and hoisted through No. 2 shaft to surface. The rise on this same lode from the 13th level has reached the 10th level with the same good results in a copper way. The drifts from the various levels are all in good ground and it is estimated that over 40,000 tons of stamp rock has been blocked out.

Gratiot—Work has started on the railroad spur to this property and rock shipment will be started.

Superior—No. 1 shaft is sinking below the 12th level and the drifts from the various levels are being extended with good results. Rock shipments continue to the Atlantic mill.

Isle Royale—The shaft on the Baltic lode is below the 600-ft. level. A change has been noted in the formation but without copper contents. The past month was the smallest from a tonnage point of view that this company has had in a long time, but it has been a better mineral yield.

IRON

Verona—Operations will be resumed on the Verona at Quinnesec and the Calumet at Metropolitan in charge of Charles E. Lawrence.

Channing—A branch of the railroad is being built to this new mine in the Amasa district, which was explored this summer successfully.

Conrad—This property at Clarksburg is being drilled by the Maas interests. It is two miles from the American.

North Armenia—A permanent equipment will be installed on this mine, known also as the MacDonald, at Crystal Falls. G. W. Young, Iron River, is in charge.

Walpole—High grade iron ore has been found in this property at Iron River and drilling is under way to prove the extent of the find.

Minnesota

IRON

[illegible] Mines—The company will [illegible] on the St. James at [illegible] and the St. Paul at Hibbing after Jan. 1.

Vermilion Iron Development Company—The company is exploring on Pine and [illegible] lands near Lower. A shaft will be sunk to 500 ft. W. P. McMillan is engineer.

Missouri

JOPLIN ZINC-LEAD DISTRICT

Little Pearl—This company mining on the land of the Continental company west of Joplin, has reported another rich drill strike of lead ore at 98 feet.

Carl Junction—Lead ore has been struck on the Bristow land north of Carl Junction at a depth of only 3 ft.

Cambria—Bendalari & Cook have installed a belt conveyer to handle the boulders from the platform to the dump, the first use of such device in this district.

Symmes—The company west of Joplin has begun operations after a long shutdown. A tramway 1700 ft. long has been built to a shaft southwest of the mill sunk in soft ground.. The mill formerly operated on sheet ground.

Overland—The mine at Duenweg in the sheet-ground district has resumed operations after two years. L. J. Stevison, Webb City, is one of the owners.

RANDOLPH COUNTY

Higbee Block Coal Company—A new 1000-ton plant is being put in at the mine near Higbee. The office of the company is in Kansas City. C. E. Larson, treasurer.

Montana

BUTTE DISTRICT

Coalition—The Tramway shaft is now down 105 ft. below the 1700-ft. level. The shaft at the Rarus is down 190 ft. below the 2000-ft. level, and a station will be cut when the 2200-ft. mark has been reached. The Rarus air-shaft is being enlarged to four compartments its entire length. It will take several months before this work is completed. The daily output of the Coalition properties now averages 1700 tons.

Davis-Daly—The Colorado shaft is down 1750 ft., and is being sunk 5 ft. per day. The company is shipping about 175 tons daily to the Washoe smeltery from the 1400-ft. level.

BROADWATER COUNTY

Ohio Keating—Sinking is in progress, and the first car of ore has been shipped. On the 120-ft. level the drift north is advancing at the rate of 6 ft. a day.

Keating—On the 500-ft. level a new orebody 8 ft. wide has been struck. Seventy men are now employed and 100 tons of ore are hoisted daily.

DEER LODGE COUNTY

[illegible] Lodge—H. Lonkin has recently been appointed superintendent for the company. It is the intention to begin extensive development work at once.

Bielenberg & Higgins Coal Mines—R. L. Stewart has been constructing an experimental plant at the mine for the manufacture of coal briquets. The property is three miles from Drummond.

Modoc Mining Company—The company has been formed to operate the Showers property on Cable mountain, under lease and bond.

FERGUS COUNTY

Kendall—A body of high-grade cyaniding ore has been struck on the 500-ft. level. Neither the foot nor hanging wall has yet been reached.

GRANITE COUNTY

Alps Group—Paul Neal and J. C. English, of Anaconda have obtained a lease and bond on the property for $60,000. The mines are in the Harvey Creek district and carry gold and silver.

JEFFERSON COUNTY

Boston & Corbin—The last of the new electric surface equipment is being installed and will probably be in operation by Nov. 1, at which time sinking to the 1000-ft. level will be resumed.

Montana-Corbin—W. D. Gibson, superintendent, has returned from the East and is in charge. The shaft will be unwatered, and then sinking continued to 500 feet. A 5-drill compressor is being installed, completing the surface plant.

LINCOLN COUNTY

Victor-Empire—A power plant is being constructed and a flume to bring water from Granite creek to the plant.

Kearney Group—John Lacharity, W. S. Megquier and M. S. Fullmore are working claims on Rainy creek, seven miles west of Libby. The tunnel on the North Star is in 190 ft. and the lode cut.

MADISON COUNTY

Tri-State—A new perpendicular shaft will be sunk 500 ft. on the Broadway in the Silver Star district.

SANDERS COUNTY

French Bar—The new two-compartment shaft is now in ore and will be continued to 125 ft. below the 150-ft. level. An electric hoist has been installed. Robert Roskelley is in charge.

Nevada

ESMERALDA COUNTY—RAWHIDE

Mint—The lease made a rich strike on the 440 ft. level, and the Coalition Mining Company is also working a part of the ground through the shaft owned by the Mint.

Pedro—The group of claims was recently bonded to E. C. Klinker, of Los Angeles, for $22,000. This is an old mine, and has a 100 ft. shaft and several tunnels. Machine drills have been purchased, and control of the Knight Colon mill has been secured. The Pedro group is eight miles northeast of Rawhide.

Bovard Consolidated—The company at Bovard has a 25-h.p. engine in commission, and has the shaft down to 130 feet.

LYON COUNTY

Yerington District—The mines are soon to be reached by a railroad from the

Southern Pacific north of Wabuska over to the Mason Valley company and around to the Nevada-Douglas company. The latter is across the range from the Blue Stone mine.

LINCOLN COUNTY

Pioche Camp—The properties shipping to the Tintic smeltery have been unable to get satisfactory arrangements with other plants to handle the ore. An investigation of the practicability of a smeltery at Pioche or Caliente is being made and the treatment of the zinkiferous ores of the camp is also being studied.

STOREY COUNTY

Comstock-Phoenix Company—On the Baker claim on the Brunswick lode in Six Mile cañon, this company is cutting a station on the main tunnel level to install an electric hoist preparatory to resuming sinking the winze now 60 ft. in ore.

Comstock-Mohawk—This company developing west of the Comstock-Phoenix has cut a lode supposed to be the Baker lode.

Lady Bryan—The company is crushing ore at the mill in Six Mile cañon. Pfeiffer Brothers, owners.

Mexican—The strike on the 2300-level continues to show good ore.

Ophir—The mine is shipping regularly with increased tonnage and improved grade. The Kinkead mill is running full time on Ophir ore.

Consolidated Virginia—This mine is again on the producing list from the 1850 level.

Savage—The upraise of this mine from the Sutro tunnel continues in low-grade ore.

Butters Mill—The plant in Six Mile cañon is working full capacity on tailings and ore from the Chollar mine.

Sutro Tunnel—The installation of 15,200 ft. of wood-stave pipe for carrying the hot water from the Ward and C. & C. shafts has been completed.

WHITE PINE COUNTY—ELY

Nevada Consolidated—The first dividend of this company amounting to 37½c. per share per quarter, or at the rate of $1.50 per year, has been declared for stockholders of record on Dec. 1, this date being set to permit bondholders of the company and shareholders of the Cumberland-Ely to take advantage of the conversion privilege. At the property the steam-shovel pits are being put in shape for winter operations.

Cumberland-Ely—It is stated that a sufficient number of proxies have already been received for the approval of the proposed consolidation with the Nevada Consolidated company.

New Jersey

Pahaquarry Copper Mining Company—This company, which has been reopening the old copper mine at Pahaquarry on the Delaware in Warren county, is now under the control of parties in Allentown, Penn., who have purchased the interest formerly owned by H. D. Deshler, of Belvidere, N. J. Work is going on steadily at the mine.

United States Metals Refining—The company has purchased a plot of 12 acres near the copper refinery at Chrome. It was reported that this ground was to be used for a new plant for refining lead bullion, but the company denies any immediate intention of utilizing the ground for this purpose.

New Mexico

GRANT COUNTY

Chemung—Good ore has been found at the 600-ft. level.

Mangas—The company has commenced drilling. Holes will be put down on every 200-ft. square of the estate.

Azure—This company has acquired 1500 acres more ground in the Burro Mountain district. W. Rogers Wade is engineer.

LINCOLN COUNTY

American—Operations are soon to be resumed at this mine at Nogal.

New York

Harmony—Witherbee, Sherman & Co., have begun work on a new separating plant with a capacity of 1600 tons of ore a day at this mine near Mineville. The plant will be driven by electricity, current being supplied from the power station at Port Henry, six miles distant.

North Carolina

Consolidated Nickel Company—This company is about to start its newly constructed electric smeltery at Webster. The initial power consumption will be 800 h.p. Extension to 6000 h.p. is contemplated. The product will be nickel silicide. It is expected that 27 lb. will be obtained per kilowatt per hour.

Oklahoma

Eastman—The mill at the Baxter-Quapaw camp has inaugurated a complete sizing system whereby the tailings which carry away a large percentage of the metal are now re-run and most of the values recovered. Upon the different cleaning devices only the proper sizes are run, the separating of the different sizes being obtained by a series of screens and hydraulic classifiers which exceed in number those found in any other plant in the district. By this means the ores that are free are taken from the cleaning devices while all the chats are reground and sent back over the jigs or tables. The resulting fines are also carefully classified and treated on separate tables insuring better separation.

Oregon

BAKER COUNTY

National—The company is installing a tube-mill and slime filter at the Cougar mine. The mill capacity is now 80 tons per day.

Independence—The property west of Sumpter is in high-grade ore at the 200-ft. level. W. G. Gleson, manager.

Keystone Dredging Company—Options on the gravel land have been taken and prospecting will be commenced.

GRANT COUNTY

Mollie Gibson—Development is under way on this property on the John Day river.

Blue Bird—Work has been started on this mine belonging to the Consolidated British-American Mines Company.

Hoggard & Niven—An important discovery has been made on the property showing gold-silver-lead ore.

Pennsylvania

ANTHRACITE COAL

Summit Branch Mining Company—This company has finally succeeded in extinguishing the fire which has been burning for eight years in the Big Lick shaft near Williamstown. Recent examination warrants the assertion that the fire is entirely out. The company is putting in new equipment and preparing to reopen the colliery.

Lehigh Valley Coal Company—The Pennsylvania Supreme Court has reversed the decision of the Luzerne county court in the suit brought by H. W. Pierce to recover damages done to his land by culm dumped into the Lackawanna river and carried by that stream into the Susquehanna. The lower court decided in favor of the company because it had not been positively shown that the culm was from its workings. The Supreme Court holds that "it was the duty of the plaintiff to introduce evidence to show to what extent the injury complained of was the consequence of the defendant's action, but it cannot be expected that this can be done with mathematical exactness. Evidence which reasonably tends to support the plaintiff's claim is sufficient."

BITUMINOUS COAL

The mine at Evans station in the Connellsville district, which has been opened by J. W. Buttermere and A. Stickel, has been completed and is now ready to ship coal. It is not proposed to make coke at present. The owners control about 100 acres of coal land.

Rochester & Pittsburg Coal and Iron Company—This company has bought the Seeger farm at Rossmoyne and will use it as the site for a new shaft through which its coal property adjoining can be worked. It is understood that the sinking of the shaft will be begun at once.

South Dakota

Pahasa Mining Company—This company, recently organized, bought in all the property of the Harney Peak Tin

Company, recently sold under foreclosure of mortgage. Development work is now going on in the mines. During the receivership of the Harney Peak company, the big concentrating mill was preserved intact and is ready to be started whenever adequate ore supply is assured.

Tennessee

JEFFERSON COUNTY

New Market District—Drilling is to be started in several points in this district. On the Gardner farm J. T. Williams is prospecting, and on the Taylor farm and the Gillespie place exploration is being carried on by E. E. Wooten.

Grasselli Chemical Company—This company is mining zinc carbonate at New Market under a lease of the New Market Zinc Company and shipping regularly.

Tennessee Mineral Company—The company is enlarging the milling facilities at New Market, and has installed a Lidgerwood cable from the mine to the mill, which will materially reduce the costs of handling the zinc ore.

Jefferson Zinc Company—Successful results from development have been obtained on the 60-acre tract, bought by this company. Arrangements for a hoisting plant are being made.

Utah

BEAVER COUNTY

Cactus—The mine will resume operation in November. The new company will take over the property and pay off the debts incurred in remodeling the mill and the mine will soon be put on a large productive basis.

Frisco Consolidated—A body of lead-silver ore 30 in. thick has been encountered. The crosscut in the 600-ft. level is also in mineral bearing ground. D. P. Rohfling, manager.

JUAB COUNTY

Raymond-Illinois—The work of developing is at 1500 ft. The company is using diamond drills below this level, thus avoiding the installation of a pump.

Tintic Central—A contract has been let for sinking the shaft below 450 ft. to explore for the Iron Blossom vein at 500 ft. A new pump has been ordered.

West Dip—The mine after being closed for twelve years has been reopened. The new slime process, so successful at the Consolidated Mercur and Boston-Sunshine, makes it possible to work the West Dip with profit.

Tintic Standard—The 600-ft. shaft has been completed. Prospecting is being done to determine whether to continue the shaft or drift from present depth. F. J. Raddatz, manager.

SUMMIT COUNTY

Iron Copper—Shipments will be discontinued during the winter months. Low metal prices and difficulty in transportation from mine to railroad in winter are given as reasons. A. M. Spooner, manager.

Daly Judge—The drain tunnel has been connected with a back crosscut making much easier access to workings. The connection also drains and ventilates the mine.

Washington

OKANOGAN COUNTY

Apex—This mine has begun shipping from the 286-ft. level.

Grant—Work has been resumed at Copper mountain.

Copper World Extension—Bids are being received for a tram, electric plant and mill.

STEVENS COUNTY

Northport Smeltery—The plant is to be enlarged and a refinery added. When the addition is completed, 800 men will be employed.

Oriole—The company will install a hoist and 3-drill compressor and pump to lift 500 feet.

Neglected—Ten tons a day is being sorted for shipment. The property is near Colville. A. W. Miles, manager.

YAKIMA COUNTY

North Yakima—E. F. Wright will erect a stamp mill on a new gold strike near Mt. Adams.

Wyoming

CARBON COUNTY

Aetna—After five years' suspension, work has been resumed on the mine in the Encampment district. The shaft is down 220 ft. and over 1000 ft. of development has been completed. Julius Thielman, Merrill, Wis., is president of the company.

SHERIDAN COUNTY

Utah-Wyoming Consolidated—This company has been incorporated to develop the oil lands in Big Horn basin. It owns 5000 acres on the three anticlines of Big Horn basin. Three wells sunk through only the first two strata of oilsand have a capacity of 20 bbl. per day. The new company will install drilling and pumping machinery and contract for its product.

Canada

BRITISH COLUMBIA

Velvet—Edward Ehrenberg, of Spokane, Wash., formerly superintendent of the Tiger-Poorman, has leased the Velvet mine, near Rossland. This mine was worked in 1901-3 by an English company; and shipped about 6000 tons of good grade copper ore. Amalgamation with the adjoining Portland property took place in 1904, a concentrating plant costing $25,000 was put in, and 150 tons of concentrate shipped that year. With the exception of 240 ft. of development work in the spring of 1906, nothing has since been done on the Velvet. The mine is opened to the 800-ft. level.

NEW BRUNSWICK

New Brunswick Petroleum Company—No. 5 well on the McClusky farm, near Hillsboro and 12 miles from Moncton, has struck a heavy flow of gas. The company has spent a large amount of money prospecting this tract, and this discovery of gas is taken as an indication that oil will be found at depth.

NOVA SCOTIA

Dominion Iron and Steel Company—Contracts have been closed by this company with the Canada Foundry Company, of Toronto, for an additional blast furnace, two new open-hearth furnaces of special type, each with a capacity of 500 tons daily, and an extension of the bessemer plant, including another converter. These contracts involve the expenditure of over $500,000, and it is estimated will double the output of steel. At present, owing to the limited capacity of the open-hearth furnaces, steel cannot be supplied fast enough to keep the mills in continuous operation. Coke ovens to the number of 120, capable of handling 1000 tons of coal per day are now under construction and are expected to be completed by the end of March next. A number of new mills are also in contemplation including a 22-in. plate mill and a new rod mill. A new electric plant will be installed capable of generating 4000 kw. per hour. Recent work has been somewhat interfered with by interruptions in the coal supply, owing to the strike at the mines of the Dominion Coal Company, but coal is now arriving steadily from Philadelphia.

ONTARIO

Lake Superior Corporation—At the annual meeting a contest threatened to develop between the Philadelphia interests in the company and the Anglo-Canadian syndicate which has recently advanced a large amount of money for improvements. After some discussion, however, a compromise was reached and Thomas J. Drummond, of Montreal, who represents the new interest, was chosen president, and J. Tatnall Lea, of Philadelphia, first vice-president. W. K. Wingham and J. F. Taylor were chosen second and third vice-presidents; T. Gibson, secretary and treasurer.

ONTARIO—COBALT

Ore Shipments—Shipments from Cobalt for the week ended Oct. 16, were as follows: Cobalt Central, 44,442; Crown Reserve, 115,420; La Rose, 381,434; McKinley-Darragh, 89,706; Nipissing, 129,402; O'Brien, 64,042; Silver Queen, 58,000; Trethewey, 65,000; Coniagas, 61,700; total, 1,009,146 pounds.

Provincial—Since this mine, lately owned and operated by the Ontario government, was taken over by private parties, a good vein has been found at the 125-ft. level and a strong calcite vein showing smaltite on the surface. Diamond-drill tests have shown good results at 108 feet.

Shamrock—In drifting on the 200-ft. level, a wide vein, 5 in. wide, has been encountered carrying native silver, the discovery being shortly followed by the finding of another vein of good quality, about 4 in. wide.

Little Nipissing—The shareholders at a meeting held in Toronto, Oct. 20, indorsed the recommendations of the directors to increase the capital by $500,000. Shareholders will be offered the opportunity to take up 250,000 of the new shares at 20c. per share.

Kerr Lake—The directors have announced the increase of the quarterly dividend, due Dec. 15, to 4 per cent. regular and 3 per cent. bonus, thus placing it on a 28 per cent. instead of 26 per cent. basis.

Coniagas—This company has decided to resume the regular quarterly dividend of 3 per cent. The last quarterly due Aug. 1 was passed to raise funds to complete the company's smeltery at Thorold, and to increase the mill capacity at Cobalt.

Cobalt Lake—Another high-grade vein, about 6 in. wide, was encountered on the 190-ft. level.

ONTARIO—SOUTH LORRAIN

Weltlaufer—Rich ore has been taken out at the 110-ft. level, samples showing upward of 8000 oz. silver.

Newman—Trenching to the extent of 400 ft. has disclosed a rich vein 18 in. wide in places and carrying native silver.

Keely—The property, in the South Lorrain district, has shipped two cars of medium-grade ore.

Haileybury Silver—The company has declared a 50-per cent. dividend from the funds resulting from the sale of the south half of one of its lots in South Lorrain.

Mexico

CHIHUAHUA

Hinds Consolidated—A committee of the bondholders which has been investigating the property at Parral has recommended foreclosure to protect the interests of the creditors and bondholders.

Esmeralda-Parral—The company is having plans made for a 100-ton concentrator plant. There are five shafts on the mine which develop it to a depth of 300 ft. The stock of the company is held largely in Philadelphia.

Encinillas Mining and Smelting Works, Ltd.—This company, operating a 150-ton lead smeltery at Santa Rosalia, will determine among other matters at its annual meeting in Paris, in November, the advisability of increasing the plant. J. L. St. Dizier is in charge.

Uruachic—John J. Watterson and associates are carrying on successful operations in this old camp in the Sierra Madre mountains at the San Martin. The ores are concentrated and then roasted in wood-burning reverberatory furnaces.

Lluvia de Oro—The concentrating plant has been in operation at about 50-ton capacity since August. A hydroelectric plant is being erected.

Ricamole—This Parral company is to resume work.

GUANAJUATO

Proprietary Mines Company—The company has acquired a control of the stock of the Mineral Development Company. Carl Henrich will remain as manager, and the development be continued.

Guanajuato Amalgamated Gold Mines—Plans are nearly completed to discharge the receiver in compliance with the court conditions. The reported deal for consolidation with the Guanajuato Development Company is denied.

Guanajuato Consolidated—The September crushing was 7407 tons of dry ore; estimated bullion produced 50,850 pesos; concentrates, 51,000 pesos; total 101,850 pesos. Profit, estimated, 33,350 pesos. A decrease for the month is due to a cavein.

HIDALGO

La Blanca—The reported negotiations of the Exploration Company, of London, for this mine are without foundation in fact.

JALISCO

Lupita—Work in the Lupita mines, Mascota, has been resumed and hoisting and drilling machinery is being installed.

El Favor—The company has placed an order for electrical equipment for its mill now completed. The mine is in condition for stoping.

Carrizo—The custom smeltery at Ayutla will be soon blown in. The plant has been idle for months. The company has been developing the San Felipe mines near Ayutla.

Navidad Mines and Reduction Company—The last payment on the price of 300,000 pesos for the properties at San Sebastian, has been made. A modern plant will replace the present works.

Magistral-Ameca—A 100-ton plant using the Elmore flotation process, instead of a reverberatory smelter, will be installed at the Magistral mines, Ameca.

MEXICO

El Oro—The September crushing was 24,536 tons, yielding bullion, $207,790. The mine profit was $73,120, and the railway profit, $10,000.

Mexico Mines of El Oro—The mill crushed 11,200 tons in 30 days, yielding bullion, $106,630, with a net profit of $54,820. In addition, 20 tons of ore yielded net $2150. Approximately $12,700 was spent in development.

OAXACA

Escuadra—This mine in Taviche reports the discovery of a new vein three meters wide.

Soledad—Construction has begun on a 10-stamp mill at the mine in Totolapam.

Rico Seco—The installation of the 5-stamp mill is progressing rapidly. The plans allow for another similar battery. Amalgamation only is used.

SINALOA

El Arco—The company is developing extensively at San Bartolo, Copala. Olof Zetterlund, manager.

SONORA

La Artemisa—A small force is developing the property near Huepac under contract with A. G. Wilcox and C. A. Parker, of Denver.

San Lorenzo—A second payment has been made on this mine 15 miles east of Huepac by John A. Rice, of El Paso.

Washington—About 40 men are at work on this mine near Huepac, proving up a good orebody. Bostwick & Dickson of Huepac are in charge.

San Ignacio and El Olvido—These properties at Tabatacochi are shipping to Douglas. This ore goes out via Calabasas.

Monte Negro—The company operating the Esperanza gold mine 10 miles west of Nacozari is working 40 men and considering a concentrating plant for base ores. Charles E. Le Paige, manager.

Silver Seal—The company has ceased operations on the Silver Hill and El Aguaje at Nacozari, and has turned them over to F. O. Colson on a lease.

Pacific Smelting and Mining Company—This corporation, with $8,000,000 capital, will take over the Theodore Douglas properties in Mexico, included in the Mexican Mining and Exploration Company.

Asia

Kolar Goldfield—Gold production in September is reported at 47,274 oz. bullion, being 236 oz. more than in August. For the nine months ended, Sept. 30, the total was 408,404 oz. bullion in 1908, and 415,137 oz. in 1909; an increase of 6733 oz. The bullion reported this year was equal to $67,722,785, or 373,623 oz. fine grade. The report includes two new mines outside of the district, the Hutti Nizam and Dharwhar Reefs in the Deccan.

Australia

Gold production in Queensland in September is reported at 38,600 oz., or $797,862 in value.

South America

CHILE

Braden Copper Company—A contract for 100 Frue vanners for the mill at La Junta has been let.

COLOMBIA

Gualcala Mining Company—A contract for a sectionalized cyanide plant including stamps and tube mills has been let in San Francisco. The weight limit is 200 lb. for any piece, hence the cam shafts are made hollow.

Metal, Mineral, Coal and Stock Markets

Current Prices, Market Conditions and Commercial Statistics of the Metals, Minerals and Mining Stocks

QUOTATIONS FROM IMPORTANT CENTERS

Coal Trade Review

New York, Oct. 27—The coal trade generally is gaining, but prices have advanced very little, owing to the readiness of the mines to increase their production on the slightest provocation. In the East the bituminous trade is making some gains, and business is better than it has been through the summer. The anthracite trade has been helped a little by cold weather and is in good condition.

In the West also domestic trade has been decidedly boosted by cold weather and is active over a large part of the consuming territory. Steam-coal trade continues good and on a steadily increasing scale. The mines, however, stand ready to take advantage of the least increase in demand, and at some of the consuming centers there is more or less complaint of oversupply.

The coke trade is in a booming condition, demand and prices increasing rapidly, as is shown in our local report from the Connellsville region.

Exports to Nova Scotia—Dealers report some shipments of bituminous coal from the United States to Halifax and other points in Nova Scotia. This is a result of the short production in that province, due to the strike at the Cape Breton mines.

Coal Traffic Notes

Coal and coke tonnages originating on Pennsylvania railroad lines east of Pittsburg and Erie, year from Jan. 1 to Oct. 16, short tons:

	1908.	1909.	Changes.
Anthracite	4,043,429	3,812,928	D. 230,401
Bituminous	26,434,082	28,973,166	I. 2,539,084
Coke	5,156,959	8,637,149	I. 3,481,090
Total	35,634,470	41,423,543	I. 5,790,073

The total increase this year to date was 15.6 per cent.

Comparative shipments of coal from principal Atlantic ports, eight months ended Aug. 31, long tons:

	Anthracite.	Bituminous.	Total.	Percent.
New York	1,479,170	9,861,984	11,307,154	61.2
Philadelphia	1,294,877	3,097,757	4,392,634	16.7
Baltimore	152,408	2,444,711	2,597,119	9.9
Newport News		2,276,365	2,276,365	8.7
Norfolk		1,356,724	1,356,724	5.1
Total	2,926,455	19,037,541	21,963,996	100.0
Total, 1908	11,141,552	14,884,476	26,026,028	

Total tonnage this year, 20,937,[illegible] tons. Of Cape Cod and New York includes all the New York Harbor shipping points.

Coal transported at St. Louis, eight months ended Aug. 31, 1909, [illegible] short tons, as [illegible] coal [illegible] in 1909, decrease 79,[illegible] tons.

Shipments of Broad Top coal over the Huntington & Broad Top railroad, nine months to Oct. 1, were 466,376 tons in 1908, and 334,602 in 1909; decrease, 131,774 tons.

Coal shipments by water from Seattle and Tacoma, eight months ended Aug. 31, were 386,419 tons in 1908, and 233,378 in 1909; decrease, 153,041 tons.

Coal passing Davis Island dam on the Ohio, eight months ended Aug. 31, was 1,721,514 short tons in 1908, 2,360,370 in 1909; increase 638,856 tons.

Coal passing through the locks on the Monongahela above Pittsburg, eight months ended Aug. 31, was 5,314,980 short tons in 1908, and 6,140,520 in 1909; increase, 825,540 tons.

Receipts of domestic coal at San Francisco, eight months ended Aug. 31, were 301,018 tons in 1908, and 203,239 in 1909; decrease, 97,779 tons.

Bituminous coal and coke shipments, Pennsylvania and West Virginia, eight months ended Aug. 31, short tons:

	Coal.	Coke.	Total.
Balt. & Ohio	14,453,912	2,881,806	17,335,718
Buff., Roch. & Pitts.	4,148,306	304,115	4,452,421
Buff. & Susquehanna	946,937	216,568	1,163,505
Penn. lines, N. Y. C.	4,587,948	62,827	4,650,775
Pitts. & L. Erie	5,932,522	3,269,786	9,202,308
Norfolk & Western	8,771,320	1,622,707	10,394,027
Ches. & Ohio	8,502,254	300,392	8,802,646
Total	47,333,199	8,658,201	55,991,400
Total, 1908	41,162,609	5,390,706	46,553,315

Total increase this year 9,438,085 tons, or 20.3 per cent. In addition to the above, the Baltimore & Ohio carried 485,177 tons anthracite in 1908, and 500,431 in 1909; increase, 15,254 tons.

Coal tonnage of railroads in Ohio Coal Traffic Association, eight months' ended Aug. 31, short tons:

	1908.	1909.	Changes.
Hocking Valley	1,856,956	1,834,049	D. 19,907
Toledo & Ohio Cent.	896,930	802,838	D. 93,792
Baltimore & Ohio	903,357	911,615	I. 8,258
Wheeling & L. Erie	1,792,632	1,955,357	I. 222,725
Cleve., Lorain & Wh.	1,568,090	1,527,689	D. 40,401
Zanesville & Western	742,441	683,448	D. 58,993
Toledo Div., Pen. C.	981,681	1,149,708	I. 168,027
L. Erie, Alliance & Wh.	618,185	644,470	I. 26,287
Marietta, Col. & Clev.	29,449	50,630	I. 21,181
Wabash Pitts. Term.	..	15,756	I. 15,756
Total	9,426,389	9,575,560	I. 249,171

The total increase in tonnage this year was 2.6 per cent. Only the Ohio lines of the Baltimore & Ohio are included above, the mains being given elsewhere.

New York

Anthracite

Oct. 26—The market at the coast still is showing a little life this week in the wholesale trade. Shipments are increasing, and some collieries have been put on full time. Prices now on the market will probably be steady.

Schedule prices for large sizes are unchanged at $4.75 for lump and $5 for egg, stove and chestnut, all f.o.b. New York harbor. For steam sizes quotations are: Pea, $3.10@3.25; buckwheat, $2.25@2.50; No. 2 buckwheat or rice, $1.75@2; barley, $1.35@1.50; all f.o.b. New York harbor.

Bituminous

Soft coal again continues to be taken more freely. The Sound is doing pretty well, and New York harbor is better than it was, while the shoalwater ports are rubbing their eyes and beginning to hustle a little under the influence of a few sharp frosts. All-rail trade has been pretty steady. While no boom is in sight, producers are beginning to feel a little better.

Prices are about the same. Dealers are talking of 5c. and 10c. advances, but they have hardly materialized so far, except for a few special coals.

Car supply continues to trouble shippers, although the railroads promise to improve conditions. It is no longer possible for a shipper to secure all the cars he wants and this must be taken into account in calculating the time within which orders can be filled. Transportation is generally fair, and cars come through in about schedule time. Few shippers have any considerable stocks at tidewater, the trade continuing in this respect as it has been for six months past.

The usual fall advance in cargo rates has not arrived yet and coastwise rates continue low and unchanged. New York quotes on small vessels 50c. to points around Cape Cod, with 5c. or 10c. more for a few special points. Philadelphia reports 60@65c. for large boats to Boston, Salem and Portland.

Birmingham

Oct. 25—Three new coal mines, plans being drawn for extensions at present collieries and the construction of some new coal tipples is a report gathered from the coalfields of Alabama. Two new coal companies were organized during the past week and it was given out that each would open a new mine. Then it was announced that the Tennessee Coal, Iron and Railroad Company has plans in hand for the opening of a new coal mine in the western part of Jefferson county. The coal production in this State is only held back by the railroads, which are not able to furnish all the cars that are needed, and by scarcity of labor. Some excellent contracts are in hand, it is announced.

which means that the production is to be kept up for some time to come. The greater amount of the coal mined now is used in the home territory, but some is shipped to Louisiana and Mississippi points.

Coke is in strong demand. Virginia producers of coke are making a bid for trade in this State and it may be necessary to resort to that section for a supply.

Chicago

Oct. 25—General conditions in the coal trade are bettering, there being little surplus on tracks from western mines, while the tendency of prices is upward. In some cases shortage of cars has caused the lessened supply; this, however, would be a benefit to the local trade if it could prevail generally long enough to raise prices, and then modify to the extent of keeping off the market the aggregations of shipments that chronically cause demurrage sales. Generally speaking, there does not yet seem to be any injurious car shortage, but apprehensions of a shortage are common in the trade. Sales of both steam and domestic coals are large and increasing. Fine coals have become weak, and lump continues to grow stronger.

Illinois and Indiana coals, the chief supply of the market, bring $1.75@2.75 for lump, $1.65@1.75 for run-of-mine, and $1@1.20 for screenings.

Hocking is strongest of the coals from east of Indiana, bringing the full circular price, $3.15. Smokeless alone of the Eastern coals shows something of oversupply and sells for $3.40@3.65, lump and egg, and $2.95@3.05 for run-of-mine. Pittsburg No. 8 at $2.55 and Youghiogheny gas at $3.15 for ¾-in. in each case, are steady. Anthracite is selling well in both city and country.

Cleveland

Oct. 26—There is a rush on in the Lake trade. Steam trade is steady, and domestic trade has been started up actively by the cold weather. Car supply is becoming a serious question.

Middle-district coal is $1.90@2 for lump; $1.80@1.85 for nut; $1.70@1.75 for run-of-mine; $1.25 for slack, all f.o.b. Cleveland. No. 8 district brings about 15c. more for all grades. Pittsburg is quoted $2.25@2.35 for lump; $2.10@2.15 for nut; $2@2.05 for run-of-mine; $1.40@1.50 for slack. Pocahontas is $3.05 for lump and $2.35 for run-of-mine, f.o.b. Cleveland.

Indianapolis

Oct. 26—The coal trade continues good, both in steam and domestic lines. Mine operators, however, are limited in shipments to some extent, as cars are not so easy to get. There is hardly a general shortage yet, but the railroads are careful in allotting cars.

Pittsburg

Oct. 26—About 2,000,000 bu. of coal were sent down the river yesterday, on the first rise since June. There is not a shipping stage today, but some empties will be brought back. There has been no material change in the coal market since last report, when we noted an advance of about 5c. a ton. Mine-run is quotable at $1.10 at mine, but there is frequent cutting to $1.05. Slack is 60@65c. at mine.

Connellsville Coke—A contract for 10,000 to 12,000 tons of furnace coke monthly over the first half of the year has just been made at $2.90, which has been the regular price for more than a month, although about three weeks ago there was a little flurry in which this figure was shaded 5c. or 10c. on a few contracts. Generally speaking, the tone of the market is unchanged, but it is probably not altogether as strong as it was, there being less hope than there was of prices getting well above $3 on contracts for next year. Prompt coke is a trifle easier, and whereas $3 was being demanded for December coke, it is now possible to buy coke for delivery through December at $2.85, with occasional spot lots going at a trifle less.

We quote prompt and near-by furnace coke at $2.75@2.85, and contracts for first half or all of next year at $2.90, with 72-hour foundry coke at $2.75@3 for this year and $3.25@3.50 for next year.

The *Courrier* reports the production in the Connellsville and lower Connellsville region in the week ending Oct. 16 at 427,313 tons, a decrease of 10,000 tons from the previous week; shipments at 5067 cars to Pittsburg, 7888 cars to points west of Pittsburg and 845 cars to points east of Connellsville, a total of 13,800 cars.

St. Louis

Oct. 25—The weather this week has been unusually warm which has checked the flow of retail orders. Householders have been unusually late in ordering this year and laying in their supply until actually forced by the weather. This has had a perceptible effect on the wholesale market and Standard coal has been very hard to move all week. This has had no effect on the high-grade mines whatever as they were already far behind with orders. The country trade has served to bolster up the market again and orders are coming in freely from all directions. Six-inch lump of all grades is consequently moving freely though 2-in. lump and steam sizes are dragging.

Carterville 6-in. lump has advanced slightly and the price is $1.75 at mine or $2.42 St. Louis. No. 1 nut has also advanced and is in better demand that at any time this year. It is bringing $1.30 at mine or $1.97 St. Louis. Screenings are about 35c. at mine or $1.07 St. Louis.

Franklin county coal has also advanced and is being quoted at $1.90 at mine or $2.57 St. Louis for 6-in. lump or egg. It is scarce at even that figure. Nut coal is bringing about $1.40 per ton at the mine or $2.07 per ton St. Louis. The famous Trenton coal of which only a small tonnage is being produced now, is $2.25 at mine or $2.77 St. Louis for 6-in. lump.

Staunton, Mt. Olive or Springfield district coals are strong at $1.50 at mine or $2.02 St. Louis for 6-in. lump; $1.25 at mine or $1.77 St. Louis for 2-in. lump. Nut coal is about 85c. at mine or $1.37 St. Louis. Standard 6-in. lump is $1.20 at mine or $1.72 St. Louis and 3-in. lump is $1 at mine or $1.52 St. Louis; 2-in. lump is 5c. less. These two sizes are not moving as freely as could be desired. Domestic roller screened nut coal is 75c. at mine or $1.27 St. Louis, while steam nut is freely offered at 40@50c. at the mines or 0.92c.@$1.02 per ton St. Louis. Screenings have at last gotten to a point where they are being given away for the freight. Those who think they have screenings a little better than the average are asking the princely sum of 10c. per ton at the mine for them.

Washed coal is very slow this Fall and outside of No. 1, which is moving to the domestic trade, washers are all complaining that business is very bad. Washed Carterville No. 1, is bringing $1.75 at mine or $2.42 St. Louis. Standard washed coal is bringing about 25c. per ton less than Carterville.

The demand for hard coal is exceptionally strong and spot coal is at a premium. Chestnut and egg are short. The demand seems to be quite a bit ahead of the supply at present.

Foreign Coal Trade

British Coal Trade—Exports of fuel from Great Britain, nine months ended Sept. 30, with coal sent abroad for use of steamships in foreign trade, long tons:

	1908.	1909.	Changes.
Coal	46,579,500	46,777,014	I. 197,314
Coke	847,082	830,966	I. 13,884
Briquets	1,136,691	1,115,658	D. 21,033
Total exports	48,543,473	48,723,638	I. 190,165
Steamer coal	14,490,594	14,642,679	I. 152,085
Total	63,024,267	63,366,517	I. 342,250

The larger exports this year were 7,808,275 tons to France, 7,080,304 to Germany, 6,804,888 to Italy and 2,771,124 to Sweden.

German Coal Trade—Exports and imports of coal in Germany, eight months ended Aug. 31, metric tons:

	Exports.	Imports.	Excess.
Coal	11,785,681	7,509,458	Exp. 7,276,224
Brown coal	22,374	5,395,196	Imp. 5,372,822
Coke	2,202,410	689,566	Exp. 1,509,837
Briquets	1,078,919	173,101	Exp. 905,818
Total	15,046,414	13,477,258	Exp. 4,569,056
Total, 1908	16,986,077	13,819,430	Exp. 3,166,647

Of the exports this year, 28,410 tons of coke went to the United States.

German Fuel Production—Coal production of German Empire, eight months ended Aug. 31, metric tons:

	1908.	1909.	Changes.	
Coal	98,011,055	97,895,931	D.	715,124
Brown coal	43,768,329	43,887,316	I.	718,987
Total mined	141,779,384	141,783,247	I.	3,863
Coke made	14,097,385	13,991,259	D.	106,126
Briquets made	11,996,884	12,205,417	I.	208,533

Of the briquets reported this year 9,687,892 tons were made from brown coal or lignite.

Austrian Coal Production—Coal production of Austria-Hungary, eight months ended Aug. 31, metric tons:

	1908.	1909.	Changes.	
Coal	9,475,527	9,260,312	D.	215,215
Brown coal	17,801,795	16,966,201	D.	835,594
Coke	1,269,229	1,231,826	D.	37,403
Briquets	98,813	116,876	I.	18,063

The output of brown coal, or lignite, largely exceeds that of bituminous coal.

Transvaal Coal—The total coal mined in the Transvaal for the eight months ended Aug. 31, was 3,240,121 tons. The coal sold and shipped was 2,365,945 tons. The balance was used for fuel at mines, or sorted and screened out as waste.

Welsh Coal Market—Messrs. Hull, Blyth & Co., London and Cardiff, Wales, report prices of coal as follows on Oct. 16: Best Welsh steam, $4.14; seconds, $3.90; thirds, $3.72; dry coals, $4.02; best Monmouthshire, $3.48; seconds, $3.36; best small steam, $2.16; seconds, $1.68. All prices are per long ton, f.o.b. shipping port, for cash in 30 days, less 2½ per cent. discount.

Iron Trade Review

New York, Oct. 27—The iron and steel markets continue in an active condition in almost all lines. In some cases where buying has fallen off, it is due to the fact that manufacturers have supplied their wants well over the first quarter of next year and are not yet ready to go much beyond that.

In pig iron the Central West continues to show a heavy demand for bessemer pig and one almost as heavy for basic iron. Steel companies are hardly able to supply their requirements from their own blast furnaces and are looking for considerable quantities from the merchant stacks. In the East sales of foundry iron continue on a good scale, and the demand for basic pig has sprung up again. Some large sales of Alabama basic are reported at $14.50 @15 at furnace. Virginia foundry and basic iron have been pretty well sold out for some months to come. Cast-iron pipe makers have taken some large quantities of low-grade foundry and forge iron for 1910 delivery. The fact that some of them were reported to have placed orders for Middlesbrough pig in England has made furnaces here willing to accommodate so far as prices are concerned.

In finished steel orders continue large. Structural steel is quieter than it has been, but the demand for bars, sheets and small material generally is heavy. The railroad companies have placed some large orders for new freight cars, the total within the last 10 days amounting to something like 11,000 cars. The Lake ship-building companies have also taken several contracts for large freighters to be built during the winter. Combined, these orders will make a heavy demand for plates and shapes. As a general rule the mills are full of orders, and will not be able to make prompt deliveries. Already talk of premiums for early deliveries is heard, and this will probably increase.

United States Steel Corporation—The report for the quarter ended Sept. 30 gives the following figures, the net earnings being the excess over all expenses, repairs and maintenance:

	1908.	1909.
July	$ 8,599,630	$12,530,770
August	9,152,311	12,437,754
September	9,354,333	13,278,383
Net for quarter	$27,106,274	$38,246,907
Depreciation, reserve funds, etc		$7,391,888
Interest and sinking funds		7,506,096
Total charges		$14,703,85
Surplus for the quarter		$23,543,057
Dividends		$11,387,914
New construction		10,000,000
Total appropriations		$21,387,944
Balance		$ 2,155,113

Dividends declared were 1¾ per cent. on preferred stock—$6,304,919—and 1 per cent. on common stock—$5,083,025. The common-stock dividend is an increase of ¼ per cent. over that for the June quarter, and of ½ per cent. over that paid for a series of quarters previously. The appropriation for new construction is the first made since 1907. The unfilled orders on the books Sept. 30 reached a total of 4,796,833 tons, an increase of 738,894 tons over June 30 last, and 1,374,856 tons over Sept. 30 of last year.

Baltimore

Oct. 26—Exports for the week included 511,724 lb. tin-scrap to Rotterdam; 2000 tons steel rails to Brisbane, Australia; 1261 tons rails and 101 tons rail fastenings to St. John, N. B.; 980,502 lb. structural steel, 215,500 lb. steel plates and 289,857 lb. miscellaneous steel to Panama. Imports included 11,000 tons iron ore from Cuba, and 3655 tons cupreous pyrites from Huelva, Spain.

Birmingham

Oct. 25—The Southern pig iron manufacturers are receiving a steady line of inquiries and are closing some sales for delivery during the first half of the coming year. The greater amount of business is for the first-quarter delivery, two or three furnace companies abstaining from the market on the second quarter in the expectation of a further advance in quotations, over $15 per ton, No. 2 foundry, which is the basis of the business that is now being booked. Nothing under that price is to be heard. Another furnace belonging to the Southern Iron and Steel Company (Chattanooga, Tenn.) will be making iron before the end of this week. There is a belief that all the iron that can possibly be manufactured in this section will be needed. The fact that some of the manufacturers are selling into the second quarter of the coming year has allowed kindred interests, such as the cast-iron pipe makers, to begin preparing for the business of the coming year. The pipe demand has been good right along, the prices advancing as the iron went up.

Chicago

Oct. 25—A condition of steady sales of fair amounts, but no rush for supplies, seems to have settled upon the iron market. Pig iron is firm and the belief is expressed by both melters and sales agents that prices will not lower. Foundry outputs continue large despite some lessening of productive capacities owing to labor conditions, and seem bound to continue large. Generally increased production of Northern pig iron has not affected the ready sale from Northern furnaces, No. 2 foundry bringing $19@19.50. Southern holds to $15 Birmingham ($19.35 Chicago), with some sales at $15.50 and occasionally a small lot sold under favorable conditions of an early delivery at $14.50. The greatest number of sales is for first-quarter delivery, but many extend over the first half. No general disposition exists to run into third-quarter contracts yet, but second-quarter sales are steadily increasing. The average sale continues to be 300 to 800 tons, with occasionally a transaction running into the thousands, and buying is very generally distributed. On the whole, the market appears to be healthy, though quiet.

Iron and steel products share something of this quiet but firm tone. Sales are of medium volume throughout practically every branch of the trade. Coke is unchanged, selling well at $4.85 per ton.

Cleveland

Oct. 26—Already there is talk of ore prices for next season, but sellers are not disposed to do anything yet.

Pig Iron—New buying is lighter on all grades, but furnaces are holding prices firmly. Bessemer is quoted $19.25@19.50; No. 2 foundry, $18.25@18.50; gray forge, $17@17.25, No. 2 Southern, $18.85, Cleveland.

Finished Material—New sales are lighter, but specifications on contracts are heavy, and the mills are quite contented with the situation. Quite a demand for light rails has developed, especially for mining purposes.

Philadelphia

Oct. 27—The pig-iron market continues strong, though new sales have been fewer. Most large consumers are provided for the first quarter and sellers are not willing to go much beyond that, except at prices which buyers do not want to give. Small orders continue to come in. For No. 2X the general quotation is $19@19.50, with makers talking of $20 for second quarter. Some business has been done in basic at $18.50@19, and in forge at about $17.50. The tone is strong.

Steel Billets—Only small sales reported. As high as $29@30 has been named, the higher range for next year. Forging steel is quoted $32 on small lots.

Bars—Steel bars are scarce, which has turned some business to iron. Steel bars are 1.65c.; refined iron, 1.60@1.70c. Store trade is heavy.

Sheets—Mills are full for this year, but do not want to quote on 1910 deliveries, though there are plenty of inquiries. No. 28 gage is 2.90c., with a premium for extended deliveries.

Plates—A good many orders are coming out. For delivery up to December, 1.70@1.75c. are the quotations; for next year mills want more.

Structural Material—No heavy contracts are reported, but small orders are coming in. Mills are holding back on 1910 orders, as with other material.

Scrap—The market is still quiet and prices are rather nominal. Stocks are not heavy, and yardmen are sitting on their piles, confident of good prices soon, when demand looks up.

Pittsburg

Oct. 26—The quieter condition in the iron and steel trade noted in last report has been intensified. The market has become dull and the change has been rather a sudden one. The situation, however, can hardly be considered an unfavorable one because the mills are all very well sold up and the clamor for deliveries is unabated.

An exception to the statement as to a dull market must be made in favor of railroad material. The railroads continue to buy with considerable freedom. They have lately bought liberally in steel cars and rails, and there is more business of this sort in sight. The car plants are booked well ahead, and railroads are urging as early deliveries as possible. The car plants are unable to run full on account of the scarcity of labor and material, particularly the former. The Pressed Steel Car Company has lately increased its operations, and is now making 75 steel cars a day, with the Standard Steel Car Company doing about the same.

Pig Iron—The market has become quiet in all grades. Prices remain firm, but show no marked tendency toward a further advance. Bessemer iron, which was easily the market leader, has quieted down and does not promise much activity for awhile. A sale of 3000 tons was made this week to an eastern interest, for prompt delivery, at the former price of $19, Valley. Basic is quoted at $17.25@17.50, Valley, according to delivery, and foundry iron at the same range. After a long period of quiet, some business in malleable iron came out last week, and a seller was found at $17.50, Valley, not only for this year, but even through the first half of next year.

Steel—Unfinished steel has become scarcer than it was and the market is more interested in finding steel than in determining the price. It can be quoted largely nominal at $26@26.50 for bessemer and $27 for open-hearth billets, with sheet-bars $28@28.50 and rods at $32, all at maker's mill, Pittsburg district.

Ferromanganese—Prices are strongly held, with prospects of an advance before long. We quote prompt at $43, November and December at $43.50@44, and first quarter and half at $44.50@45, all f.o.b. Baltimore, the freight to Pittsburg being $1.95 per ton.

Sheets—Mills are booked pretty fully through this year, and while they are selling for first quarter they are rather conservative about booking contracts. The sharp rise in spelter has made the situation serious for the galvanized trade, as the advance in galvanized sheets since last spring is quite insufficient to cover the advance in spelter in the same period. The market is firm at 2.30c. for black and 3.35c. for galvanized sheets, 28 gage, with corrugated roofing at $1.60 a square for painted and $2.85 a square for galvanized.

St. Louis

Oct. 25—The iron demand is continually increasing. Some large orders have been placed this week for delivery during the first quarter and first half of next year. Buying is almost exclusively confined to deliveries for the second quarter, as the available supply for the first quarter is practically all sold up. A number of foundries find that they are running short and are asking producers to accommodate them by letting them have small shipments on orders during December. All industries using pig iron seem to be running full blast now. A number of inquiries have been received from the far West and Southwest which as a rule do not buy from this market. The present price is $15@15.25 per ton Birmingham or $18.75@19.25 St. Louis.

Sault Ste. Marie Canal Traffic

The total freight passing through the Sault Ste Marie canals for the season to Oct. 1 was as follows, in short tons:

	1908.	1909.	Changes.
East-bound	18,884,150	30,957,325	I. 12,073,175
West-bound	7,841,112	8,082,123	I. 241,011
Total	26,725,262	39,039,448	I. 12,314,186

The mineral freights included in the totals were as follows, in short tons, except salt, which is in barrels:

	1908.	1909.	Changes.
Coal	7,113,504	7,088,798	I. 74,906
Iron ore	16,127,105	28,107,722	I. 11,980,617
Pig and man. iron	191,885	345,361	I. 153,476
Copper	64,841	79,891	I. 15,050
Building stone	1,019	1,129	I. 110
Salt, bbl.	406,504	483,967	I. 77,463

Iron ore was 72 per cent. of the total freight this year, and coal 18 per cent.

Metal Markets

New York, Oct. 27—The metal markets generally show little change from last week. Prices are rather irregular, weakness in some directions being balanced by strength in others.

Gold, Silver and Platinum

UNITED STATES GOLD AND SILVER MOVEMENT

Metal.	Exports.	Imports.	Excess.
Gold:			
Sept. 1909..	$ 7,546,442	$ 2,350,958	Exp. $ 5,195,484
" 1908..	3,974,391	4,767,051	Imp. 792,660
Year 1909..	97,272,834	31,105,193	Exp. 66,167,641
" 1908..	68,937,380	38,427,973	" 30,509,407
Silver:			
Sept. 1909..	4,385,532	3,261,397	Exp. 1,124,135
" 1908..	4,198,296	3,370,591	" 827,695
Year 1909..	43,289,116	33,240,530	" 10,048,586
" 1908..	38,781,380	30,792,704	" 7,988,676

Exports from the port of New York, week ended Oct. 23. Gold, $220,000; silver, $601,913, chiefly to London and Paris. Imports: Gold, $114,676; silver, $42,217, both from the West Indies, Central and South America.

Foreign commerce of the United States, nine months ended Sept. 30, as reported by the Bureau of Statistics, Department of Commerce and Labor:

Merchandise:	1908.	1909.
Exports	$1,230,767,349	$1,160,811,859
Imports	798,498,168	1,068,518,977
Excess, exports	$ 432,269,181	$ 92,292,882
Add excess of exports, silver		10,048,586
Add excess of exports, gold		66,167,641
Total export balance		$ 168,509,109

The gold and silver movement in detail will be found in the table at the head of this column.

Gold—The demand for gold on the open market in London continued good, but the price was a shade lower at 77s 11¼d. per oz. for bars. American coin, however, advanced a little, 76s 5½d. per oz. being paid. The Bank of England took nearly all the supplies. In New York $950,000 were taken for shipment to Brazil, $100,000 to Hayti and $800,000 to Canada.

Platinum—The market continues very strong, demand being good especially for the jewelry trade. Dealers ask this week as high as $28.50 per oz. for refined platinum, and $32.25 for hard metal. Offers at lower than dealers' rates are not being made

Our special correspondent writes from St. Petersburg, under date of Oct. 14, that the market has a tendency to still higher prices. The demand is good and some large sales have been made. In St. Petersburg last fortnight some poods were sold at 21,500 rubles per pood. At Ekaterinburg small lots are offered at 5.45 rubles per zolotnik. Generally the prices remain unchanged. The metal is quoted in St. Petersburg at 21,500@21,750 rubles per pood. At Ekaterinburg 5.40@5.45 rubles per zolatnik. The averages of these prices, which are for crude metal, 83 per cent., are $21.19 and $20.40 per oz., respectively.

Silver—Owing to pressure to sell on both China and India bazar account, silver declined to 23 3/16d., with 23 1/16d. the lowest point touched, on Oct. 26. Stocks continue large in the chief silver centers, and no great rise is anticipated.

SILVER AND STERLING EXCHANGE

Oct.	21	22	23	25	26	27
New York....	51	50¾	50⅝	50½	50	50⅜
London.....	23⅛	23⅛	23⅛	23⅛	23 1/16	23 1/16
Sterling Ex..	4.8730	4.8770	4.8750	4.8765	4.8740	4.8715

New York quotations, cents per ounce troy, fine silver; London, pence per ounce sterling silver, 0.925 fine.

Exports of silver from London to the East, Jan. 1 to Oct. 14, as reported by Messrs. Pixley & Abell:

	1908.	1909	Changes.
India.....	£ 7,349,863	£4,744,900	D. £2,604,963
China.....	516,400	1,555,200	I. 1,038,800
Straits.....	112,385	82,900	D. 29,585
Total.....	£ 7,978,648	£6,382,900	D. £1,595,748

Imports for the week, £10,000 from Mexico and £189,000 from New York; total, £190,000. Exports, £2200 to Port Said and £69,550 to India; £71,750 in all. India Council bills in London, 16.0625d per rupee.

Copper, Tin, Lead and Zinc

Oct.	Copper				Tin	Lead		Zinc	
	Lake c/s	Electrolytic c/s	Cakes c/s	Ingots c/s	Straits £ per ton	English £ per ton	Foreign £ per ton	London £ per ton	Foreign £ per ton
	12¾	12⅝				4 32½		4 20	6 20
21	13	12⅞	57	30		4 35	4 22½	4 25	6 25
	12¾	12				4 32½		4 20	6 22½
22	13	12⅞	56	30		4 35	4 22½	4 25	6 27½
	12¾	12				4 32½		4 20	6 22½
23	13	12⅞		30		4 35	4 22½	4 25	6 27½
	12¾	12				4 32½		4 20	6 22½
25	13	12⅞	56	30		4 35	4 25	4 25	6 27½
	12¾	12				4 32½		4 20	6 22½
26	13	12⅞	56	30		4 35	4 25	4 25	6 27½
	12¾	12				4 32½		4 20	6 22½
27	13	12⅞	56	30		4 35	4 25	4 25	6 27½

[illegible] 2,240 [illegible] New York [illegible] the bulk [illegible] Western [illegible] 6 [illegible]

Copper—The situation is dominated by the uncertainty of the speculative position in London. The lot of the bull over there has been very hard on account of the ever increasing stocks, and now that money rates have tightened and the Bank of England has raised its discount rate to 5 per cent., a wave of liquidation has spread over the market, which has carried quotations down to a point enabling consumers abroad to buy their electrolytic copper from warehouse cheaper than the lowest prices that have been named here. In our market there have been sales, both of Lake and electrolytic, to a moderate amount during the week Oct. 21-27. While some fancy brands of Lake have sold as high as 13⅛c., good ordinary brands of this grade have been freely offered at 13c. Electrolytic copper has been freely offered at 12¾c., delivered, 30 days, or a little less than 12⅝c., cash, New York. At the decline in price manufacturers on this side appear to be showing some interest, but no one has yet been willing to inaugurate a general buying movement. The market closes uncertain at 12⅞@13⅛c. for Lake copper, and 12½@12⅝c. for electrolytic copper in cakes, wirebars or ingots. Casting copper is quoted nominally at 12⅜@12⅝ cents.

Copper sheets are 17@18c., base for large lots. Full extras are charged, and higher prices for small quantities. Copper wire is 14½c. base, carload lots at mill. Business continues on a good scale.

The standard market in London has been depressed throughout the week, due to causes as aforesaid, and closes uncertain at £56 10s. for spot, and £57 12s. 6d. for three months.

Refined and manufactured sorts we quote: English tough, £61; best selected, £60@61; strong sheets, £72@73 per ton.

Exports of copper for the week from New York and Philadelphia were 6020 long tons. Our special correspondent gives the exports from Baltimore at 1284 tons of copper.

Tin—The report of smaller shipments from the East than were generally anticipated advanced the London market, which had been rather easy until the beginning of this week. The close is cabled as steady at £138 15s. for spot, and £139 12s. 6d. for three months.

In this market buyers are holding off, and few transactions were made in spot material, which is [illegible] selling at a premium, while [illegible] are being offered at [illegible] prices. The market [illegible]

Lead—There [illegible] a shade better [illegible] The market is somewhat easier [illegible] New York and [illegible] Lead.

The London market has been [illegible] and the close is cabled at £14 [illegible] for Spanish lead and £14 [illegible] for English lead.

[illegible] Lead on the week there was a good deal of speculative participation which carried prices up still further, but at the close the market is quiet, although quotations are well maintained at 6.22½@6.27½c., St. Louis, and 6.37½@6.42½c., New York.

Quotations for spelter in New York on Oct. 21 were 6.35@6.40c.; Oct. 22-27, inclusive, 6.37½@6.42½ cents.

The London market is steady at £23 2s. 6d. for good ordinaries, and £23 7s. 6d. for specials.

Base price of sheet zinc is now 8c. per lb., f.o.b. La Salle-Peru, Ill., less 8 per cent. discount.

Exports and imports of zinc and zinc products in Germany in August are reported as below, in metric tons:

	Exports.	Imports.	Excess.
Spelter and zinc scrap	7,242	3,925	Exp. 3,317
Zinc sheets	1,534	38	Exp. 1,496
Zinc dust	106	42	Exp. 64
Zinc pigments	2,126	397	Exp. 1,729

Imports of zinc ore were 20,946 tons, and imports 3104 tons.

Other Metals

Antimony—Business is quieter and prices are unchanged. Cookson's is quoted at 8⅞@8¼c. per lb.; Hallett's 8¼@8¾c.; U. S., 7⅞@8c.; outside brands, 7⅝@7¾c. per pound.

Aluminum—No change is noted. No. 1 ingots are still quoted 20@23c. per lb. in large lots, the higher figure being that named by the American maker.

Quicksilver—Business continues good and prices are unchanged. In New York the quotation is $47@48 per flask of 75 lb., for large lots, while jobbers quote 66@67c. per lb. for small quantities. San Francisco quotations are $46@47 for domestic orders, $2 less for export. The London price is £8 12s. 6d. per flask, with jobbers quoting the same price.

Magnesium—The price of pure metal is $1.50 per lb. for 100-lb. lots f.o.b. New York.

Nickel—Large lots, contract business, [illegible] per lb. Retail spot, from 50c. in 200-lb. lots, up to 55c. for 500-lb. lots. The price for electrolytic is 5c. higher.

Cadmium—Current quotations are 75c. per lb. in 100-lb. lots at Cleveland, Ohio. In Germany 150@175 marks per 100 kg., at factory in Silesia.

British Metal Imports and Exports

Imports and exports of metals in Great Britain nine months ended Sept. 30, figures in long tons, except quicksilver, which is in pounds.

Metals:	Imports.	Exports.	Excess.
Copper, long tons	128,167	46,821	Imp. 81,346
Copper, 1908....	129,674	50,092	Imp. 79,582
Tin, long tons....	31,495	31,462	Imp. 33
Tin, 1908.....	35,664	29,958	Imp. 5,706
Lead, long tons..	154,980	35,715	Imp. 119,265
Lead, 1908.....	176,383	38,728	Imp. 137,655
Spelter, l'g. tons.	82,470	5,827	Imp. 76,643
Spelter, 1908....	79,135	6,173	Imp. 73,962
Quicksilver, lb...	3,056,261	847,537	Imp. 2,208,724
Quicksilver, '08	3,130,466	1,295,071	Imp. 1,835,395
Ores:			
Tin ore and con.	18,005	.....	Imp. 18,005
Tin ore, 1908...	19,298	.....	Imp. 19,298
Pyrites.....	583,921	.....	Imp. 583,921
Pyrites, 1908...	598,015	.....	Imp. 598,015

Copper totals include metallic contents of ore and matte. Exports include re-exports of foreign material. Of the imports in 1909 the United States furnished this year 180 tons copper matte, 50,789 tons fine copper and 25,854 tons lead. This lead was chiefly Mexican, refined in this country.

Zinc and Lead Ore Markets

Platteville, Wis., Oct. 23—The highest price paid this week for zinc ore was $52 per ton; the base price, 60 per cent. zinc, was $49@50 per ton. The base price paid for lead ore was $55@56 per ton.

SHIPMENTS, WEEK ENDED OCT. 23.

Camps.	Zinc ore, lb.	Lead ore, lb.	Sulphur ore, lb.
Benton.....	559,700	157,060	180,900
Highland.....	438,200	.....	.....
Cuba City.....	387,570	225,600	188,000
Platteville.....	379,860	.....	352,000
Hazel Green.....	362,400	88,000	.....
Days Siding.....	165,000	.....	.....
Montfort.....	150,000	.....	.....
Rewey.....	148,800	.....	.....
Linden	130,970	.....	.....
Livingston.....	80,000	.....	.....
Galena.....	80,000	.....	.....
Harker...	78,620	105,860	.....
Shullsburg.....	70,000	.....	.....
Total.....	3,031,120	576,520	720,900
Year to Oct. 23.....	111,791,205	7,412,895	11,402,730

In addition to the above there was shipped to the American Zinc Ore Separating Company, 344,360 lb. and to the Joplin Separator Works, 277,600 lb. zinc ore.

Joplin, Mo., Oct. 23—The highest price paid for zinc-sulphide ore was $53 per ton, the base price advancing to $48@50.50 per ton of 60 per cent. zinc. Zinc silicate ore sold as high as $32 on a base of $27 per ton of 40 per cent. zinc. The average price, all grades, was $45.72. Lead ore advanced $2 today, a large amount of the ore being purchased the past two days on a base price of $55 per ton of 80 per cent. lead. The average price, all grades, was $54.94 per ton.

The week opened with bidding for zinc ore at $46@49.50, but the stronger tone of the spelter market had the effect of advancing bids on Thursday to a $50 base and on Friday a large tonnage was purchased for delivery when the cars can be secured on a base of $50.50. Of the 8500 tons stock in the bins fully three-fourths is sold, and part of the remaining tonnage is not for sale on the present market. Most of the producers who were holding for a $53 market sold yesterday and today.

SHIPMENTS, WEEK ENDED OCT. 23.

	Zinc, lb.	Lead, lb.	Value.
Webb City-Carterville	4,055,280	631,940	$114,714
Joplin.....	1,461,650	195,550	40,887
Galena.....	682,200	91,670	18,905
Prosperity.....	456,440	197,820	16,394
Duenweg.....	640,040	49,590	14,702
Badger.....	411,090	5,470	10,218
Alba-Neck.....	392,900	9,580	10,080
Oronogo.....	401,110	3,860	8,870
Carthage.....	324,870	.....	8,122
Quapaw.....	334,150	11,720	7,840
Aurora.....	395,210	.....	7,746
Spurgeon.....	337,070	19,210	7,609
Sarcoxie.....	322,420	....	5,929
Granby	408,300	10,800	5,735
Cave Springs.....	230,630	.....	5,534
Miami.....	188,880	53,940	4,883
Zincite.....	157,750	.....	3,944
Carl Junction.....	109,820	.....	2,848
Davis, Oklahoma.....	31,670	.....	570
Totals	11,341,540	1,281,150	$294,530
43 weeks.....	483,017,350	72,402,140	$11,529,314

Zinc value, the week, $259,330; 43 weeks, $9,554,530
Lead value, the week, 35,200; 43 weeks, 1,974,784

MONTHLY AVERAGE PRICES.

Month.	Zinc Ore. Base Price. 1908.	Zinc Ore. Base Price. 1909.	Zinc Ore. All Ores. 1908.	Zinc Ore. All Ores. 1909.	Lead Ore. All Ores. 1908.	Lead Ore. All Ores. 1909.
January.....	$37.60	$41.25	$35.56	$38.46	$46.88	$52.17
February...	36.63	36.94	34.92	34.37	49.72	50.50
March.....	36.19	37.40	34.19	34.71	49.90	50.82
April	35.40	38.63	34.08	37.01	52.47	55.63
May	34.19	40.06	33.39	37.42	56.05	56.59
June.....	33.06	44.15	32.07	40.35	60.48	57.62
July	34.55	43.06	31.67	41.11	59.90	53.74
August.....	36.53	48.25	33.42	44.54	60.34	57.60
September...	37.63	47.70	34.44	44.87	54.59	56.11
October.....	35.95	.....	33.28	.....	52.63	.....
November...	39.13	.....	35.02	.....	54.53	.....
December...	42.75	.....	39.63	.....	49.68	.....
Year.....	$36.63	.....	$34.31	.....	$53.93	.....

NOTE—Under zinc ore the first two columns give base prices for 60 per cent. zinc ore; the second two the average for all ores sold. Lead ore prices are the average for all ores sold.

Chemicals

New York, Oct. 27—The market, as a whole, is improving slightly, especially on contract deliveries.

Copper Sulphate—On a moderate business, prices are unchanged, at $3.95 per 100 lb. for carload lots, and $4.20 per 100 lb. for smaller parcels.

Arsenic—Trade is still slow, and quotations rather nominal. White arsenic is 2.70@2.75c. per lb. for spot, and 2.87½c. for next year deliveries.

Nitrate of Soda—Only a small business is reported, at 2.10c. per lb. for both spot and futures. Supplies are abundant.

Potash Salts—According to Berlin despatches, the Kali-Syndikat has persuaded the German government to take action to neutralize the advantage obtained by some American fertilizer companies through contracts made with mines which are now outside the syndicate. The latest despatches, however, state that the government has not decided what course to take.

Magnesite—The American Refractories Company, Chicago, Ill., announces the completion of its Austria-American magnesite works, located at Radentheim, Austria, which have been in course of construction for a year. The initial firing of the calcining kilns and starting up of the plant took place Oct. 2. It has begun operations with a yearly capacity of 60,000 tons of dead-burned magnesite.

Mining Stocks

New York, Oct. 27—In the early part of the week the general stock market showed a degree of weakness and there was some falling off in quotations. On Monday there was something of a rally, although there was no sharp advance, but the general tone was rather firmer. This did not last, however, and the close may be called uncertain. The advance in the Bank of England rate to 5 per cent. had an unfavorable effect on the other side which was reflected here. The strong feature in the market was Steel common, which held its price well to the close.

The increase in the dividend on Steel Common to 1 per cent. for the quarter, the second successive advance of ¼ per cent., was a strong card for an advance in the market, although it had been generally expected. It had a favorable effect on today's conditions.

The Curb was busy in the early part of the week, but later was less active, with a tendency to weakness. The copper stocks closed uncertainly. There was quite a decline in several Cobalt stocks, and the Nevada issues were not actively dealt in. Amalgamated Copper declared the usual quarterly dividend of 50c. a share, but this had been expected.

Boston, Oct. 26—The copper-share market continues disappointing and prices have sought lower levels during the week, as a rule. A bit of encouragement is gleaned by the persistent demand for Butte Coalition and Greene Cananea. The resumption of dividends by the former is considered significant and is thought, in a way, to be a straw showing which way the wind blows. A quarterly dividend of 25c. per share at this time, is looked upon as unprecedented, particularly in view of the fact that payments were suspended two years ago. The price advanced to $27.25 upon the declaration.

Amalgamated, after touching $84.25, broke to $79.25, although slight recovery followed the low level. Calumet & Hecla fell $22 to $610, and Tamarack broke $4.50 to $65.50 on small selling and a lack of buying orders.

Boston Development had a sharp advance from 52 to 58½, which is a good rise on the percentage basis. This company has sold land for agricultural purposes which will warrant a dividend of about 20%. Ten years ago the company sold land to the Santa Rita, now the Chino, which enabled the payment of a $8.50 dividend.

Curb trading has shown activity in the Ely stocks particularly. Boston & Ely was well bought up to $2.75, on knowledge that an offer had been made for a controlling interest. Union Copper rose to above $3.50 and Consolidated Arizona has been in good request up to above $1.50. Davis-Daly, First National and Ohio Copper are fractionally lower.

STATISTICS OF COPPER.

Month.	United States Product'n.	Deliveries, Domestic.	Deliveries for Export.
I	112,135,200	51,862,624	38,499,797
II	103,700,817	43,578,118	30,968,496
III	117,058,661	48,871,964	59,191,043
IV	113,574,292	47,546,010	65,110,111
V	118,356,146	61,163,325	70,542,753
VI	116,567,493	60,591,116	70,966,457
VII	118,277,603	75,520,083	75,018,974
VIII	120,597,234	59,614,207	48,382,704
IX	118,023,139	52,105,955	50,077,777
X	......	......	......
XI	......	......	......
XII	......	......	......

VISIBLE STOCKS.

	United States.	Europe.	Total.
I	122,357,266	124,716,480	247,073,746
II	144,130,045	118,574,400	262,704,445
III	173,284,248	117,140,800	290,425,048
IV	182,279,902	115,024,000	297,303,902
V	183,198,073	114,050,320	297,248,393
VI	169,848,141	127,352,960	297,201,101
VII	154,858,061	150,928,960	305,787,021
VIII	122,596,607	171,492,160	294,088,767
IX	145,196,930	197,993,600	343,190,530
X	151,037,137	210,224,000	361,261,137
XI	......	......	......
XII	......	......	......

Figures are in pounds of fine copper. U. S. production includes all copper refined in this country, both from domestic and imported material. Visible stocks are those reported on the first day of each month, as brought over from the preceding month.

Monthly Average Prices of Metals

SILVER

Month.	New York. 1908.	New York. 1909.	London. 1908.	London. 1909.
January	55.678	51.750	25.738	23.834
February	56.000	51.472	25.855	23.706
March	55.365	50.468	25.570	23.227
April	55.505	51.428	25.133	23.708
May	52.795	52.905	24.377	24.343
June	53.663	52.538	24.760	24.166
July	53.115	51.043	24.514	23.519
August	51.683	51.125	23.858	23.588
September	51.720	51.440	23.877	23.743
October	51.431	......	23.725	......
November	49.647	......	22.933	......
December	48.766	......	22.493	......
Total	52.864	......	24.402	...

New York, cents per fine ounce; London, pence per standard ounce.

COPPER

	New York Electrolytic 1908	New York Electrolytic 1909	New York Lake 1908	New York Lake 1909	London 1908	London 1909
January	13.726	13.893	13.901	14.280	62.386	57.688
February	12.905	12.949	13.098	13.295	58.786	61.198
March	12.704	12.387	12.875	12.826	58.761	56.231
April	12.743	12.56[illegible]	12.928	12.93[illegible]	58.331	57.363
May	[illegible]	12.893	12.788	13.238	57.387	59.338
June	12.[illegible]	13.214	12.877	13.548	57.842	59.627
July	12.[illegible]	13.[illegible]	12.933	13.[illegible]	57.989	58.556
August	13.[illegible]	13.[illegible]	13.[illegible]	13.[illegible]	60.500	59.393
September	13.[illegible]	12.[illegible]	13.600	13.210	60.338	59.021
October	13.[illegible]		13.646		60.139	.....
November	14.[illegible]		14.386		63.417	......
December	14.111		14.411		62.343	.....
Year	13.208	...	13.424		59.902	

New York, cents per pound. Electrolytic is for cakes, ingots or wirebars. London, pounds sterling per long ton, standard copper.

TIN AT NEW YORK

Month.	1908.	1909.	Month.	1908.	1909.
January	27.380	28.060	July	29.207	29.125
February	28.978	28.290	August	29.942	29.966
March	30.577	28.727	September	28.815	30.293
April	31.702	29.445	October	29.444	.....
May	30.015	29.225	November	30.348	....
June	28.024	29.322	December	29.154	....
			Av. year	29.465	....

Prices are in cents per pound.

LEAD

Month.	New York. 1909.	New York. 1909.	St. Louis 1909.	London. 1908.	London. 1909.
January	3.691	4.175	4.025	14.469	13.113
February	3.725	4.018	3.868	14.250	13.313
March	3.838	3.986	3.835	13.975	13.438
April	3.993	4.168	4.051	13.469	13.297
May	4.253	4.287	4.214	12.938	13.225
June	4.466	4.350	4.291	12.600	13.031
July	4.744	4.321	4.188	13.000	12.563
August	4.580	4.363	4.227	13.375	12.475
September	4.515	4.342	4.215	13.125	12.781
October	4.351	......	......	13.375	...
November	4.330	......	......	13.538	....
December	4.213	......	......	13.156	..
Year	4.200	......	......	13.439	..

New York and St. Louis, cents per pound. London, pounds sterling per long ton.

SPELTER

Month.	New York. 1908.	New York. 1909.	St. Louis. 1908.	St. Louis. 1909.	London. 1908.	London. 1909.
January	4.513	5.141	4.363	4.991	20.563	21.425
February	4.788	4.889	4.638	4.739	20.875	21.563
March	4.665	4.757	4.527	4.607	21.075	21.438
April	4.645	4.965	4.495	4.815	21.344	21.531
May	4.608	5.124	4.458	4.974	19.906	21.975
June	4.543	5.402	4.393	5.252	19.000	22.000
July	4.485	5.402	4.338	5.252	19.031	21.969
August	4.702	5.729	4.556	5.579	19.350	22.125
September	4.769	5.796	4.619	5.646	19.563	22.906
October	4.801	......	4.651	......	19.750	.
November	5.059	......	4.909	......	20.875	...
December	5.137	......	4.987	......	20.625	..
Year	4.726	......	4.578	......	20.163	....

New York and St. Louis, cents per pound. London, pounds sterling per long ton.

STOCK QUOTATIONS

NEW YORK Oct. 27

Name of Comp.	Clg.
Alaska Mine	‡.11
Amalgamated	80½
Anaconda	45¼
Balaklala	‡2$\frac{1}{16}$
British Col. Cop.	6½
Buffalo Mines	3⅝
Butte Coalition	27
Colonial Silver	‡$\frac{1}{16}$
Cum. Ely Mining	7¼
Davis-Daly	5
Dominion Cop.	7
Douglas Copper	1
El Rayo	2½
Florence	2[illegible]
Foster Cobalt	‡.32
Furnace Creek	‡.05
Giroux	8[illegible]
Gold Hill	[illegible]
Goldfield Con.	6[illegible]
Granby	‡95
Greene Gold	‡[illegible]
Greene G. & S.	‡9
Guanajuato	2
Guggen. Exp.	215
Hanapah	‡15
Kerr Lake	8¼
McKinley Dar.	.8[illegible]
Miami Copper	15
Micmac	[illegible]
Mines Co. of Am.	[illegible]
Montezuma of C. R.	17
Mont. Sho. C.	1
Nev. Utah M. & S.	1[illegible]
Newhouse M. & S.	2[illegible]
Nipissing Mines	11
Old Hundred	[illegible]
Silver Queen	[illegible]
Stewart	[illegible]
Tennessee Cop'r	[illegible]
Tri Bullion	[illegible]
United Copper	[illegible]
Utah Apex	[illegible]
Utah Copper	[illegible]
Yukon Gold	[illegible]

‡Last quotation.

BOSTON Oct. 27

Name of Comp.	Clg.
Adventure	5
Allouez	54
Am. Zinc	34¾
Arcadian	4
Arizona Com.	43¼
Atlantic	10
Boston Con	13½
Calumet & Ariz.	97
Calumet & Hecla	640
Centennial	37
Copper Range	78[illegible]
Daly West	8
East Butte	10½
Franklin	16
Greene-Can.	10¼
Hancock	11
Isle Royal	24¼
Keweenaw	2½
La Salle	14¼
Mass.	5[illegible]
Michigan	6
Mohawk	5[illegible]
Nevada	23[illegible]
North Butte	5[illegible]
Ojibway	[illegible]
Old Colony	30
Old Dominion	49
Osceola	150
Parrot	29
Quincy	85
Rhode Island	‡4[illegible]
Shannon	15[illegible]
Superior	57
Superior & Bost.	13[illegible]
Superior & Pitts.	15[illegible]
Tamarack	67
Trinity	10
U. S. Smelt. & Ref.	53
U. S. Sm. & Re. pd.	52⅛
Utah Con.	42
Victoria	3⅝
Winona	6[illegible]
Wolverine	‡148
Wyandotte	2

‡Last quotation.

N. Y. INDUSTRIAL

Am. Agri. Chem.	45¼
Am. Smelt. & Ref.	94⅝
Am. Sm. & Ref. pf.	111[illegible]
Colo. Fuel & Iron.	44½
Federal M. & S. pf.	‡80
National Lead	86¼
National Lead, pf.	110[illegible]
Pittsburg Coal	21[illegible]
Republic I. & S.	44½
Republic I. & S. pf.	104
Sloss-Sheffield	‡92¼
Standard Oil	‡685
U. S. Steel	87
U. S. Steel, pf.	126¼
Va. Car. Chem.	46

BOSTON CURB	Low.
Ahmeek	200
Chemung	16½
Chino	7¼
Gila	7½
Indiana	6½
Mason Valley	1⅞
Ray Central	2¼
Ray Con	17⅝
San Antonio	8
Yuma	1¼

Furnished by Hornblower & Weeks, N. Y.

ST. LOUIS Oct. 23

N. of Com.	High.	Low.
Adams	40	.30
Am. Nettie	.09	.07
Center Cr'k	1.75	1.50
Cent. C. & C.	85.00	84.00
C. C. & C. pf.	84.00	83.00
Cent. Oil	110.00	100.00
Columbia	9.00	7.00
Con. Coal	18.00	17.00
Doe Run	115.00	105.00
Gra. Bimet.	.25	.23
St. Joe	12.50	11.00

LONDON Oct. 27

Name of Com.	Clg.
Dolores	£1 5s 0d
Stratton's Ind.	0 3 3
Camp Bird	1 7 9
Esperanza	2 18 0
Tomboy	0 19 6
El Oro	1 6 0
Oroville	0 11 9

Cabled through Wm. P. Bonbright & Co., N. Y.

NEVADA STOCKS. Oct. 27.
Furnished by Weir Bros. & Co., New York.

Name of Comp.	Bid.
COMSTOCK STOCKS	
Belcher	1.45
Best & Belcher	.83
Caledonia	.65
Chollar	.27
Comstock	‡.33
Con. Cal. & Va.	1.70
Crown Point	1.15
Exchequer	.43
Gould & Curry	.30
Hale & Norcross	.65
Mexican	1.90
Ophir	2.20
Overman	.64
Potosi	.63
Savage	.58
Sierra Nevada	.73
Union	.95
Utah	.14
Yellow Jacket	1.50
TONOPAH STOCKS	
Belmont	.68
Extension	.48
Golden Anchor	...
Jim Butler	.11
MacNamara	.27
Midway	.16
Montana	.82
North Star	.02
Tonop'h Mine of N.	6.62
West End Con.	.22
GOLDFI'D STOCKS	
Adams	.01
Atlanta	.11
Blue Bell	.02
Booth	.10
C.O.D. Con.	.06
Columbia Mt.	.06
Comb. Frac.	.60
Cracker Jack	.01
Dia'dfield B. B. C.	.01
Florence	2.62
Goldfield Belmont	.04
Goldfield Daisy	.08
Great Bend	.03
Jumbo Extension	.13
Kendall	.02
Lone Star	.02
May Queen	.04
Oro	.03
Red Hill	.0[illegible]
Sandstorm	.05

Name of Comp.	Bid.
Silver Pick	.10
St. Ives	.04
Triangle	01
BULLFROG STOCKS	
Gibraltar	02
Homestake King.	‡01
Mont. Shoshone C.	1.25
Tramp Cons.	.04
MISCELLANEOUS	
Cumberland Ely.	7.12½
Giroux	8.62½
Greenwa'r Copper	05
Nevada Con.	24.00
Nevada Hills	.65
Navada Smelting.	.75
Nevada Wonder	55
Nevada-Utah	1.50
Penn-Wyoming	...
Pittsburgh S. Pk.	60
Ray Central	2.43
Ray Con.	17.25
Round Mt. Sphinx	05

COLO. SPRINGS Oct. 22

Name of Comp.	Clg.
Acacia	.07¼
C. C. Con.	‡.03
Doctor	.08
Elkton	.71⅛
El Paso	.62½
Findlay	.10½
Gold Dollar	.10⅞
Gold Sovereign	.04½
Isabella	.17½
Jack Pot	‡.08¼
Jennie Sample	.07⅛
Jerry Johnson	.07¼
Lexington	‡.01¾
Mary McKinney	.48
Old Gold	.04
Pharmacist	.03½
Portland	.85
U. G. M.	.07⅛
Vindicator	.88¼
Work	.06½

Assessments

Company	Delinq.	Sale.	Amt.
Alameda M. & M., Ida.	Oct. 7	Nov. 4	$0.005
Alpha, Nev.	Nov. 11	Dec. 7	0.05
Best & Belcher, Nev.	Nov. 9	Nov. 30	0.10
[illegible], Nev.	Oct. 21	Nov. 11	0.10
Chollar, Nev.	Nov. 8	Dec. 1	0.10
Good Mt., Utah	Sept. 15	Nov. 15	0.0025
Gould & Curry, Nev.	Oct. 28	Nov. 17	0.10
Hypotheek, Ida.	Sept. 30	Dec. 1	0.005
Idaho North Star, Ida.	Oct. 25	Nov. 15	0.01
Julia Con., Nev.	Oct. 14	Nov. 8	0.03
Missoula Copper, Ida.	Oct. 4	Dec. 6	0.01
Overman, Nev.	Nov. 9	Nov. 30	0.10
Powhattan, Ida.	Oct. 7	Nov. 8	0.001
Potosi, Nev.	Nov. 12	Dec. 6	0.10
San Antonio Copper, Mex.	Dec. 1		1.00
Savage, Nev.	Nov. 10	Dec. 1	0.10
Sierra Nevada, Nev.	Oct. 12	Nov. 3	0.10
Silver Queen, Utah	Oct. 7	Nov. 15	0.0025
United Silver-Lead, Ida.	Sept. 21	Nov. 20	0.001
St. Louis, Nev.	Oct. 22	Nov. 12	0.01
Utah, Nev.	Oct. 26	Nov. 16	0.05

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Smelting Practice of the Tyee Copper Company

Fluid Slag and Clean Separation of Matte Obtained While Treating Heavy-spar Ores. Slags Contain up to 30 Per Cent. BaO

BY GEORGE W. MAYNARD*

Good metallurgical practice is not confined to our great smelting plants, as will be seen from the results obtained at the works of the Tyee company at Ladysmith, British Columbia. Since my visit to the works, over a year ago, important changes and additions have been made mainly for facilitating the delivery of ore and coke and the handling of material at the plant. W. J. Watson, the smeltery manager, has very kindly furnished me the data of the late improvements and has also permitted me to publish the analyses of the smelting products made previous to and at the time of my visit.

The smelting works of the Tyee Copper Company, Ltd., are situated on Oyster harbor, an inlet of the Gulf of Georgia, on the eastern coast of Vancouver island, and are adjacent to the town of Ladysmith. Ore can be received either by sea or by rail but the bulk of the material smelted is delivered by water, the company's wharf being situated about half a mile further up Oyster harbor than the wharf and bunkers of the Wellington Colliery Company.

TYEE SMELTERY, LADYSMITH, BRITISH COLUMBIA

Wharf and Transportation Facilities

The Tyee company's wharf is about 250 ft. in length and is connected with smeltery bins by an incline 1000 ft. long. On the wharf there are two bunkers, one with a capacity of 300 tons and the other with a capacity of 100 tons. The smaller bunker is built on wheels and can be moved the whole length of the dock.

By means of this arrangement the bunkers can in a few minutes be adjusted so as to discharge from any two hatches of a vessel at the same time. These two bunkers are fitted with electric hoists and movable arms, which are projected to the required length by a small winch. The ore is hoisted in buckets at the rate of from 20 to 30 tons per hour for each hoist, dependent of course upon the rate of shoveling by the longshoremen. The unloading apparatus, which is shown in the accompanying illustration, has been designed with much care and has been found to work admirably in every respect. A counterweight is provided by means of which the buckets can only descend at a certain speed, thus avoiding any danger of accident to the men in the ship's hold.

The ore from the wharf bunkers is run into side-discharging cars of two tons capacity and is hoisted up the incline by means of a steam hoist. The cars are operated on this incline in three

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trains of five cars each in such a manner that while one train is being weighed and emptied into the smeltery bins the second is on its way down the incline to the dock and the third is being loaded at the wharf bunkers; in this way 1000 tons of ore can be handled in 10 hours. After a train of cars reaches the top of the incline an electric locomotive takes charge of it and it is run upon a 40-ft. platform Fairbanks scale with a self-registering beam, the five cars being weighed at once. After weighing the cars are drawn over the smeltery bins and dumped, but after leaving the scales, one or more cars are switched to the sampling mill and dumped into the sample bunkers, the ore from which feeds directly to the crusher. The empty cars are then run back upon a side track, by which time another train of cars will have arrived at the top of the incline. As the full train is pulled upon the scales the empty train is let down to the bunkers at the dock.

WHARF BUNKERS, SHOWING MOVABLE ARMS

Arrangement of Bunkers

The wharf bunkers are built with one row of posts in the center with chutes on either side, so that while one train of cars is being loaded the third train passes to the other side and is ready to be loaded in its turn as soon as the second train starts on its way up. In this way the three trains are in use continuously.

There are four sets of bunkers at the smeltery with a capacity of about 7000 tons; there are also several hundred feet of trestling, giving a large capacity for stock ore. Ore arriving by rail from Vancouver Island mines or via the Canadian Pacific railway is switched to the ore yard where there is bunkerage for 1000 tons. Ore is trammed down to 5 sets of bunkers at the furnace. The electric locomotive handles the ore cars over the bunkers and trestling in the smeltery [illegible]

The Sampling Mill

The sampling mill covers an area 29x34 ft. and has a pit 14 ft. deep for the No. 4 gyratory Gates crusher. The ore is fed directly to the crusher and broken to pass a 2-in. ring; it is then elevated to the top of the mill and passes, on its downward course, first a Snyder disk sampler, then a Blake crusher, a second Snyder sampler; then passes through two sets of rolls, so that the sample which reaches the steel floor is the size of wheat. This sample is quartered down and run through a small grinder in the ordinary way and finally goes through a Braun disk pulverizer; with high-grade ores the pulp has to finally pass through a 200-mesh sieve, but with low-grade ores a 100- or 150-mesh sieve is used. The discard from the sample is elevated to the discard bin from which it is drawn off into 2-ton cars and dumped into the bin with the original shipment. The mill is operated by a 75 h.p. slide-valve engine.

Power Equipment

Steam for the different engines is supplied by four return tubular boilers totaling 400 h.p. The engine room contains a 100-kw. direct-current generator, directly connected to a high speed Corliss engine; this supplies electric current to the dock hoists and electric locomotive and was manufactured by the Allis-Chalmers-Bullock company. There is also a 35-kw. direct-current turbine which is used as an alternative engine for supplying current to a single hoist or the locomotive alone, when required.

The blast for the furnace is supplied by a Connersville blower capable of delivering 8800 cu.ft. per min. at a pressure of from 24 to 30 oz.; this is belted to a Reliance Corliss engine.

There is now on the ground and about to be installed a second blower for the new furnace now in course of erection; this will deliver about 14,000 cu.ft. of air per min. at 2 lb. pressure and will be belted to a cross-compound Reliance Corliss engine.

Smelting

There is in operation at the present time a 40x120-in. water-jacketed furnace built by the Allis-Chalmers Company. The capacity of this furnace is between 225 and 275 tons per day, although with easily smelted ores over 300 tons have often been put through in the 24 hours. The company is now installing a second furnace, 48 in. at the tuyeres by 160 in., built by the Allis-Chalmers-Bullock company. This furnace has the jackets sloping from the base plate to the feed floor, the size inside at the top of the jackets being 62x160 in. and the hight of the jackets 9 ft. 9 in.; there are 22 tuyere openings, inside diameter 6 in., arranged 11 on each side.

The molten material from the furnace flows into a forehearth 4 ft. wide by 12 ft. long, attached to which is a matte pocket through which the matte flows continuously if a sufficient amount is being made, but it can also be operated at intervals of an hour or so. The slag is granulated and carried out into the bay.

The grade of matte made is between 40 and 45 per cent.; it is run into pots and when cool is dumped out, broken up, sampled and shipped to refiners for converting. Arrangements are completed for a converting plant to be installed as soon as conditions warrant it.

A typical run of the furnace taken during this month, May, was as follows: Tons smelted, 289 per 24 hours; sulphur in the charge, 13.6 per cent.; average copper in the charge, 3.1 per cent.; matte assayed about 41 per cent. copper, making a concentration of 13 into 1. The slag was of the following composition: SiO_2, 45.72 per cent.; FeO, 19.8; CaO, 21.1; ZnO, 0.59; Al_2O_3, 6.55; MgO, 7.07. An analysis of the coke used is: Fixed carbon, 67.3 per cent.; volatile matter, 9.77; sulphur, 0.94; ash, 21.99.

The flue dust is caught in a chamber 8x10 ft. by 156 ft. long, from which it is drawn through small doors on the side into a ditch 1 ft. deep by 3 ft. wide; it is then dampened and fed back into the furnace direct, consequently there is seldom more than 50 tons of dust in the chamber.

Coke is delivered at the smeltery in hopper-bottomed cars by the Wellington Colliery Company. In order to avoid the erection of expensive trestling a pit was dug in the ground and in this runs an elevator belt carrying iron steps, which lifts the coke as fast as it is discharged from the cars and raises it to a hight of about 40 ft., whence it falls into a large pile adjacent to the feed floor; by means of movable chutes the coke can be piled either to the right or left at will. The

elevator is driven by a 15-kw. shunt-wound motor.

A Problem in Smelting

At present the smeltery is largely if not entirely dependent upon custom ore, and the furnace practice does not differ from that of other plants treating the same class of material, but when the ore supply was obtained mainly from the company's mine, an unexpected metallurgical problem presented itself on account of the high percentage of barytes and zinc in the ore. The skill and perseverance of Thomas Kiddie, then manager of the smelting works, resulted in an absolute refutation of the predictions that if the ore was worked at all it would have to be introduced into the charge in minute quantities.

Before going into the details of the Tyee work, it will be well to refer to what has appeared in the metallurgical literature on the action of baryta in furnace charges.

Influence of Barytes in Charge

"Barytes[1] and gypsum are reduced to sulphides and react like sulphide of iron with the oxidized copper compounds. Sulphide of barium may also pass into the matte. Barytes, sulphide of iron and silica interact at high temperatures, the silica displacing the sulphur trioxide of the first named, which splitting into sulphur dioxide and oxygen, oxidizes the sulphide of iron, forming ferrous oxide and sulphur dioxide. The double silicate of baryta and iron thus formed is readily fusible; this same silicate is formed by the action of silica and metallic iron upon barytes."

"Barium[2] sulphate in the blast furnace is partly converted into barium sulphide and partly into barium silicate. In both forms it causes an imperfect separation of matte and slag. The reaction is usually expressed by the following formula (Balling, "Metallurgische Chemie"):

$$2\,BaSO_4 + 8\,Fe + 4\,SiO_2 = (BaS, FeS) + 7\,FeO.BaO.4\,SiO_2.$$

"This would account for the formation of barium sulphide even if no barium sulphate were reduced by means of carbon. It would also lead one to suppose that all barium sulphide entered the matte, but the fact is that, while a very little can be discovered in the matte, most of it is dissolved by the slag. That barium sulphide can enter the matte under suitable conditions is proved by the mattes made in the Altai mountains, which contain, according to Jossa and Kurnakoff, 4 to 22 per cent. barium.

"According to Schweder there is another and more important reaction:

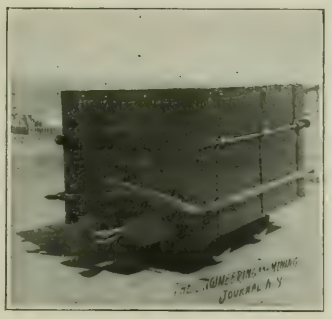
$$3\,BaSO_4 + 4\,SiO_2 + FeS = 3\,BaSiO_3 + FeSiO_3 + 4\,SO_2$$

$$BaSO_4 + 2\,SiO_2 + Fe = BaSiO_3 + FeSiO_3 + So_2.$$

"This means that in the presence of a metallic sulphide or a metal, barium sulphate is readily decomposed by silica; the liberated sulphur trioxide is decomposed at the elevated temperature into sulphur dioxide and oxygen, and this has an oxidizing effect on the iron sulphide or the metallic iron. Schweder found in his experiments that calcium sulphate and sodium sulphate act in the same way. Silicates of iron and baryta form very liquid slags. In computing a charge the baryta is figured as replacing part of the lime.

"From what has been said, it will be clear that all the sulphur contained in the baryta cannot be figured into the charge. In fact if 10 per cent. of the sulphur is figured as combining with iron to form iron sulphide, the amount will be covered."

Referring to heavy spar (barite, $BaSO_4$),



SIDE-DISCHARGING ORE CAR

Peters says[3]: "It is a remarkably stable compound, and is not affected in its passage through the roasting furnace. It is an unwelcome substance to the blast-furnace smelter, as may be inferred from the behavior of its feebler kindred compound, calcium sulphate."

"Heavy spar[4] is a substance which was formerly much dreaded by blast-furnace smelters when present in any considerable proportion. It is an exceedingly stable mineral, is not affected by the roasting process, and is apparently partly dissolved in the slag in its undecomposed condition, and party reduced to BaS, which substance enters both slag and matte, decreasing the specific gravity of the latter, and increasing that of the former, besides rendering the slag thick and infusible, and forming accretions

"More active conditions and higher temperatures have lessened the evil as exemplified in smelting roasted heavy-spar ores at Tyee, B. C. It has been the opinion of most of the pyrite smelters that this process was particularly suited to the treatment of heavy-spar ores, and that the $BaSO_4$ would be decomposed and slagged; and the soundness of this view seems to be confirmed by the results sent to me by Mr. Sticht, which were given him by a Japanese metallurgist conducting pyrite smelting at Kosaka, Japan. At this place they are smelting about 1000 tons daily of ores, of which 600 tons contain about 45 per cent. heavy spar, the total ore mixture averaging about 30 per cent. of that mineral. They use 3 per cent. coke and no CaO, the BaO answering as a substitute."

"The gradual replacement[5] of CaO with BaO, causes a steady lowering of the formation temperature, until three-fourths of the CaO is thus replaced. Even when the entire 32 per cent. CaO is replaced by BaO, the formation temperature is only 1010 deg. C. The actual melting point of these slags is, however, considerably higher than their formation temperature would indicate. Still BaO slags are quite satisfactory, except that their specific gravity is high, and unusual pains have to be taken to affect a proper settling of the matte from them."

"Viewed purely as a flux for SiO_2, BaO would be a very disadvantageous base, owing to the high atomic weight of Ba (137) and its consequent low replacement value. A still greater practical objection to the presence of barium in ordinary blast-furnace work arises from the fact that this element almost always occurs, in ores, in the shape of heavy spar, $BaSO_4$. This mineral is infusible and extremely difficult to decompose and in ordinary blast-furnace work is largely reduced to BaS, forming a mushy half-fused substance which enters both matte and slag, causing metal losses and choking the furnace hearth. In the more oxidizing atmosphere of the pyrite and reverberatory furnaces, the barium sulphate is decomposed, and in moderate amount is not objectionable."

Barium enters slag as the silicate, and matte (slightly) as sulphide, rendering the former heavy though liquid, the latter light, and diminishing the chances of a good separation."

"Heavy spar[6] which has been hitherto a great bugbear to all blast-furnace managers, is found now to be a valuable flux, almost as desirable as lime, excepting for its lower saturating power and greater specific gravity. It is very easily eliminated in the pyrite furnaces, where with proper management it can, as I believe, be largely driven unchanged into the slag, mixing therewith, but without decomposing.

"Under other conditions of temperature, basicity of slag, etc., sulphur trioxide is

[1] "Handbook of Metallurgy." Schnabel. 1898 edition.

[2] "Metallurgy of Lead." H. O. Hofman. Fourth edition. Pp. 144, 145.

[3] "Principles of Copper Smelting." E. D. Peters; edition, 1907; p. 13

[4] *Ibid.*; p. 316

[5] *Ibid.*; p. 396

[6] "Matte Smelting." H. Lang; pp. 38-39

volatilized and the baryta unites with silica as in the reverberatory process.

"Still another result but as a rule a less useful one, is brought about in the German process and in lead smelting, where heavy spar being reduced to sulphide of barium, by double decomposition with metallic bases, adds largely to the matte fall."

Apart from Peters' reference to the work at Tyee, it will be noted that the conclusion as to the effect of baryta is largely theoretical.

Practice at the Tyee Plant

The first published account of the Tyee practice is that of E. Jacobs on the "Tyee Copper Smeltery," in the *B. C. Min. Rec.*, 1904, p. 343. Mr. Jacobs says:

"The ore consists of chalcopyrite carrying gold, silver and zinc as well as copper, and contained in a matrix of quartz and baryta with some alumina. General average assay and analysis of 48,623 tons (wet weight): Cu (wet, by electrolytic assay), 4.56 per cent.; Ag, 2.87 oz.; Au, 0.14 oz.; Fe, 11.94 per cent.; Zn, 6.60; SiO_2, 13.50; Al_2O_3, 3.95; $BaSO_4$, 37.30; CaO, 2.20; MgO, tr.; S (as sulphide), 16.62.

"As the proportion of barium sulphate is 37 to 38 per cent. and of zinc 6.5, the smelting of the ore, in the absence of any previous experience or recorded results as a guide, presented a problem which, however, Mr. Kiddie soon solved, the outcome of his experiments and experience with this ore being that the smelting practice was so materially improved that eventually the furnace work compared very favorably with earlier results, the treatment capacity of the furnace having been increased from an average of 177 tons per day to 249.6 tons."

In the *Trans.* of the A. I. M. E., Vol. XXXVI, p. LXXXI-LXXXIII, there is a general description of the Tyee plant, together with an abstract of an oral statement made by Mr. Kiddie to the visiting members of the institute. "From the analysis exhibited, metallurgists could easily infer that the problem to be solved was a peculiarly difficult one, namely, the smelting of an ore containing 4.68 per cent. of copper, and 10.49 of iron, 37.63 barium sulphate, 7.36 of zinc, and 13.48 of silica; while the success of the metallurgical solution of this problem was evident in the production of a slag containing only 0.41 per cent. of copper, 0.14 (out of an original 2.67) oz. of silver, and a trace (out of 0.131 oz.) of gold per ton."

An average sample of the slags for the year, 1904, showed: Cu (colorimetric assay), 0.36 per cent.; (electrolytic assay), 0.40; FeO, 17.48; SiO_2, 38.25; BaO, 27.63; CaO, 2.; ZnO, 6.15; Al_2O_3, 10.88; MgO, trace; S, 0.82; Ag, 0.74 oz.; and Au, 0.004.

The composition and behavior of the fused matte are one of the strong features of the Tyee practice, the result being a hard compact brick which stands rough handling.

The average analysis of the burnt ore for the year was: Fe, 10.50 per cent.; SiO_2, 17.90; $BaSO_4$, 38.90; Zn, 7.50; MgO, trace; S (as sulphide), 7.09. In the smelting the ratio of coke to ore was, 1 ton coke to 8.25 tons of ore. The concentration was 10.28 tons of ore to 1 ton of matte. The year's output in matte was: Cu (dry), 40.767 per cent.; Ag, 26.277 oz.; Au, 1.609 oz.; BaS, 7.47 per cent.; ZnS, 12.66. This is equivalent to a yield of copper (dry) of 3.96 per cent., silver, 2.55 oz. and gold 0.156 ounce.

Representative Ores, Mattes and Slags

At the time of my visit I was furnished with the following typical analyses of ores, mattes, and slags, representative of the average results of the previous year:

SLAG COMPOSITIONS.

	Tyee Ore.	Custom Ore. Night Slag.	Custom Ore. Day Slag.
Cu.....	0.33%	0.36%	0.39%
Ag.....	12 Oz.		0.12 Oz.
Au.....	trace		trace
FeO....	17.70%	19.26%	17.20%
SiO_2....	34.70%	36.25%	32.70%
BaO....	28.50%	23.70%	30.20%
CaO....	4.90%	3.47%	3.50%
ZnO....	(Zn)6.10%	7.41%	6.00%
Al_2O_3...	8.20%	10.03%	10.00%

The composition of the low-grade matte made from a low-grade ore carrying an excess of silica and over 10 per cent. zinc fluxed with limestone was: Cu_2S, 33.34 per cent.; FeS, 25.45; BaS, 15.83; ZnS, 23.53; sp.gr., 4.232. The slag produced while making foregoing matte analyzed: Cu, 0.37 per cent.; FeO, 12.21; SiO_2, 31.57; BaO, 27.14; CaO, 14.36; ZnO, 7.92; Al_2O_3, 6.75; sp.gr., 4.232.

The Tyee ore, analyses of which are given in the accompanying table, was smelted with 11 per cent. of carbonate ore containing: Cu, 3.5 per cent.; insoluble, 80; Ag, 6 oz.; Au, trace. The amount of coke used was 12½ per cent. of the charge; blast pressure, 29 ounces.

The night matte obtained from smelting the ore designated as "custom ore" in the accompanying table had this composition: Cu_2S, 50.37 per cent.; ZnS, 16.10; FeS, 29.13; BaS, 3.58. That of the flue dust was: Cu, 3.77 per cent.; Fe, 11.77; SiO_2, 18.50; $BaSO_4$, 28.30; CaO, 1.5; Zn, 6.79; MgO, trace; S (as sulphides), 5.82; Ag, 2.74 oz. and Au, 0.14.

Conclusions

At the time of my visit the baryta ores still formed a large percentage of the charge, and the fluidity of the slag and its separation from the matte was a marked feature. This bears out Schnabel's statement that "a double silicate of baryta and iron (which is readily fusible) is formed," and I note that "heavy spar, hitherto a great bugbear, is found now to be a valuable flux, almost as desirable as lime." Hoffman, on the other hand, claims that there would be "an imperfect separation of matte and slag." Peters, after speaking of its "rendering the slag thick and infusible and forming accretions," states in a concluding sentence that the evil has been lessened at Tyee and also refers to the Japanese practice.

ORE ANALYSIS.

	Tyee Ore.	Custom Ore.
Cu...	4.36%	4.39%
Ag	2.60 Oz.	2.85 Oz.
Au	0.13 Oz.	0.14 Oz.
Fe	11.70%	10.70%
SiO_2	13.40%	12.70%
$BaSO_4$	38.60%	42.10%
Zn	8.00%	8.02%

If this account of the Tyee practice and results calls forth a statement of the metallurgical practice with similar ores at other works it will have accomplished its object.

Iron Mining in Cuba

The iron ores which have been mined in Cuba up to the present time consist largely of hematite and magnetite and are obtained near Santiago, in the province of Oriente (Santiago). Recently large deposits of brown ore have been attracting considerable attention, especially those of the Mayari and Moa fields in Oriente province and those of the Cubitas field in Camaguey province. No ores of this type have been mined however.

The accompanying table, taken from a report by E. C. Harder, of the U. S. Geological Survey, shows the shipments of iron ore from Cuba since the opening of the mines in 1884.

Shipments of iron ore from mines in the province of Oriente (Santiago), 1884-1908, in long tons.

1884	25,293
1885	80,716
1886	112,074
1887	94,240
1888	206,001
1889	260,291
1890	363,842
1891	264,262
1892	341,654
1893	351,175
1894	156,826
1895	382,194
1896	412,995
1897	454,285
1898	168,339
1899	377,189
1900	446,872
1901	552,248
1902	699,734
1903	623,621
1904	387,273
1905	561,159
1906	640,574
1907	684,393
1908	819,434

By far the larger proportion of this ore came to the United States, the imports from Cuba in 1908 being 579,008 long tons. This was about three fourths of the total imports of iron ore; in 1907 Cuba supplied a little more than half the ore imported.

Annual Report of the El Oro Mining Company

Recovery of 89.65 Per Cent; Working Costs $5.42 per Ton for 285,181 Tons, Yielding an Average of $8.56 per Ton. Reserves 383,269 Tons

TABLES OF COSTS AND EXTRACTION

The 10th annual report of El Oro Mining and Railway Company, Ltd., for the fiscal year ended July 30, 1909, contains interesting data concerning the operations of that important company owning El Oro mine and other properties in El Oro district in Mexico, in the state of the same name. The report of the directors, R. T. Bayliss and Alfred Naylor sets forth that the capital of the company remains unchanged at £1,147,500. The total dividends disbursed to date amounts to £1,181,187. Since incorporation in 1898, there has been expended for permanent improvements and railway extensions, £417,401, of which £362,027 has been provided out of the revenue.

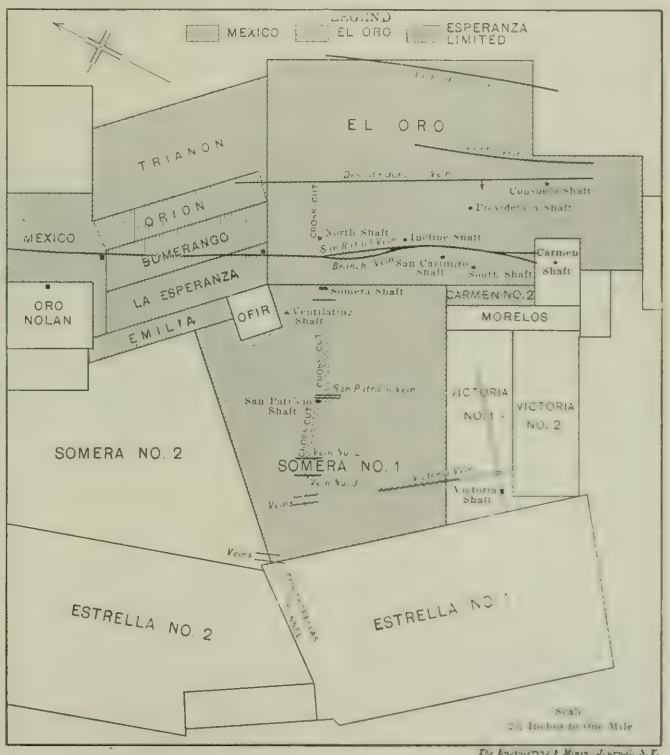
Gross Recovery and Costs

The report states that during the year various improvements in the reduction work has added to the efficiency and economy of operation. For the period, the No. 1 and No. 2 mills, comprising together 200 stamps, crushed 285,181 tons of ore, which yielded $2,442,374 from treatment in the cyanide works, being an average recovery of $8.56 per ton. This represents an all-around extraction of the gross gold and silver contents of the ore treated of 89.65 per cent.; and compares with the recovery of 89.41 per cent. in 1908, 86.63 per cent. in 1907, 84.93 per cent. in 1906, and 73.80 per cent. in 1905. The total average working costs per ton of ore treated during the year, including every expenditure in Mexico, was $5.42, which compares with $5.27 in 1908 and $5.01 in 1907. These working expenses include a sum of $0.88 per ton for development and $0.32 per ton for state and federal taxes.

Recent experiments conducted at the mine indicate that by employing a coarser screen in the stamp battery, and throwing more work on the tube mills, the duty per stamp, expressed in tons of ore crushed, can be materially increased; and it is anticipated that the installation of four additional tube mills, at a cost of about $30,000, will enable the No. 2 mill to crush as much, if not more ore than has previously been crushed by the two mills combined. Should this prove to be the case it will be possible to suspend the operation of the old No. 1 mill, and at the same time to effect an economy of not less than $3500 in the monthly expenditure.

Important Development Under Way

Concerning development in the mine, the report says: Developments in the southern section of the mine and upon the San Patricio vein in the Somera claim have been satisfactory. The development of the high-grade branch vein previously in the 1000-ft. and 1150-ft. levels has shown it to continue of payable value for a much greater distance above. Further development in depth has been rendered almost impossible, owing to the difficulties of ventilation. It became evident at the commencement of this year that the only method of overcoming this difficulty, and continuing the development of this high-grade ore in depth, in a practical and economical manner, was to put down a new ventilating shaft at the extreme north end of the property which will reach the 1000-ft. level at 1700 ft. from the surface. Work upon this shaft was commenced in February, 1908, and to the 30th of June it had been sunk to a depth of 460 ft., which the directors regard as very satisfactory progress. Unless unforeseen delay occurs this shaft will reach the 1000-ft. level in about fifteen months from June, 1909. When it is connected in its course downward with the 486-ft. and other levels below, very substantial relief will be obtained in the ventilation in the lower levels of the mine.



PLAN OF EL ORO, MEXICO AND ESPERANZA PROPERTIES

Report of General Manager

The report of A. F. Mann, general manager, is included in the annual statement. This shows that the company owns 775 acres. The tonnage for the year

was much larger than for the previous year, being 288,577 tons as compared with 269,122 tons.

The statement of receipts for the year ending June 30, 1909 is as follows:—

Bullion recovered	£498,244
Railway department receipts......	46,308
Sundry receipts	3,479
Profits on sales of shares and dividends on shares held...........	21,361
	£569,392

Concerning the development the report says: The northern orebody of the San Rafael vein continued to be the largest producer, and the southern orebody again occupied a good second place The San Patricio No. 1 vein, in the center of the Somera claim, gave a very considerable tonnage, while the quantity extracted from the richer stopes on the lower levels of the San Rafael vein was relatively small. In the northern orebody, near the north end of the 286-ft. level, new stopes have been opened; also itself decidedly commendable for its specificness, clearness and completeness.

Summary of Ore Reserves

The ore reserves are summarized as follows:—

	Tonnage.	Value per Ton
Northern orebody........	125,298	$7.36
Southern orebody........	95,348	7.31
Total	220,646	$7.34
Lower levels..........	53,728	18.00
San Patricio	108,895	8.30
Grand total...........	383,269	$9.10

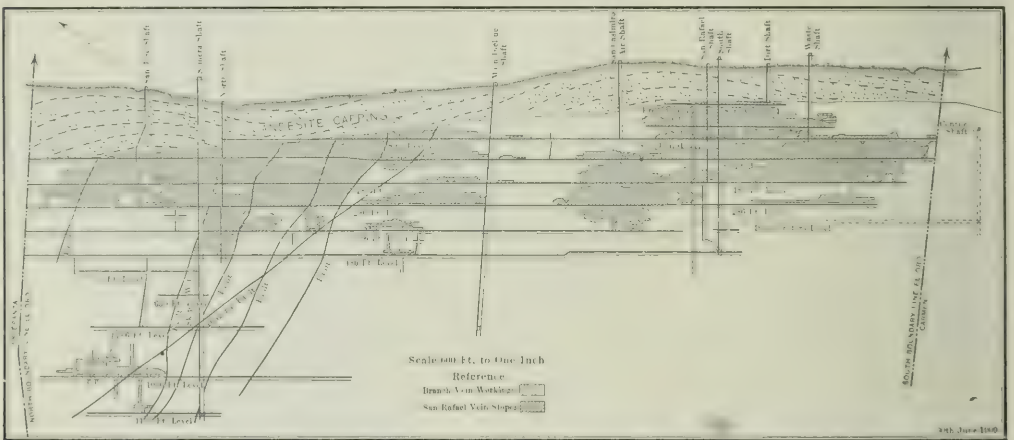
In addition to the above values in gold the ore contains 4 oz. silver per ton.

Ore Treatment

In reference to the mill and cyanide departments the report says: The total amount crushed, 285,181 tons, was a good deal more than that of last year. This yielded bullion to the value of $2,442,374. For the first ten months the mills ran 96.3 property and on the new ventilation works increased the cost of development by $54,068 and the cost per ton from 69c. to 88c. There are further expenses which increase the total cost 8c., bringing it up to $5.42 per ton. The highest monthly tonnage was in March, 26,231, and lowest in June, 20,363 tons.

Working Costs

The total costs per ton remain at practically the same figure as last year, but mining has increased somewhat, this being offset by reduction in other departments. A large proportion of this increased mining cost is accounted for under the single item of pumping. The increased flow of water on the lower levels, and the preparations for later handling of still more from deeper development, has called for a considerable expenditure on new plant, in addition to the regular monthly expense in handling



LONGITUDINAL SECTION OF SAN RAFAEL VEIN, EL ORO MINE

on the 186-ft. and 486-ft. levels north of the incline shaft. Preparations for stoping below the 486-ft. level are under way. In the southern orebody, on the San Juan level between the incline shaft and the southern boundary, in addition to stopes previously opened, new ones are being prepared, and ore-breaking is going on over practically the entire length of this orebody. On the 286-ft. level new stopes have been started on the farther end of the orebody, including the new and promising hanging-wall portion of the vein.

The quantity of ore mined is as follows:—

Northern orebody, 125,595, southern orebody, 93,396, lower levels, 10,850, San Patricio, 58,736, total, 288,577 tons

A detailed explicit statement of the development of the different veins and levels is included in the report, and is in per cent. of the full time. During May and June interruptions in the service of the electric power company reduced this percentage as well as the output of those months. The addition of two tube mills has helped very much in sliming the ore, with a consequent slight increase in the total extraction. The percentage of bullion recovery on the heavy sulphides from the lower levels is quite as good as obtained on the oxidized ore.

STATEMENT OF COSTS.

June, 1908 to July, 1909.

	Per Ton.
Mining	$2.50
Development	0.69
Milling	0.40
Cyaniding	0.90
Water supply	0.02
Taxes	0.32
General expenses	0.32
Total	$5.15
Total tonnage	285,181
Total costs	$1,469,168

Exceptional expenditure on the Somera

MILL AND CYANIDE STATEMENT.

Total tons crushed............	285,181
Mill days (No. 1 and No. 2 mills)	677.36
Stamp duty per 24 hours in tons	4.518+
Assay Value per Ton:	
Gold	$8.23
Silver	1.32
Theoretical Extraction:	
Gold, per cent..............	92.06
Silver, per cent.............	73.50
Total, per cent...........	89.49
Actual Extraction:	
Gold, per cent..............	91.55
Silver, per cent............	77.77
Total, per cent............	89.65
Bullion Realized:	
Gold	$2,149,091
Silver	293,283
Total	$2,442,374

the present flow The total cost of development was increased, and a still further expenditure will probably be made during the coming year. It may be mentioned that mining costs also bore a certain amount of expense that possibly

might, with equal propriety, have been charged against development. Taxes show a reduction, owing to the fact that no gold was exported, all bullion being sold to the Mexico refinery.

Two tables herewith show the costs for the fiscal year and the mill and cyanide statement.

The company operates the railroad from the line of the National to the camp and also controls the Suchi Timber Company, both of which have contributed to the general profit of the corporation.

The Mexico Mines of El Oro, Ltd.

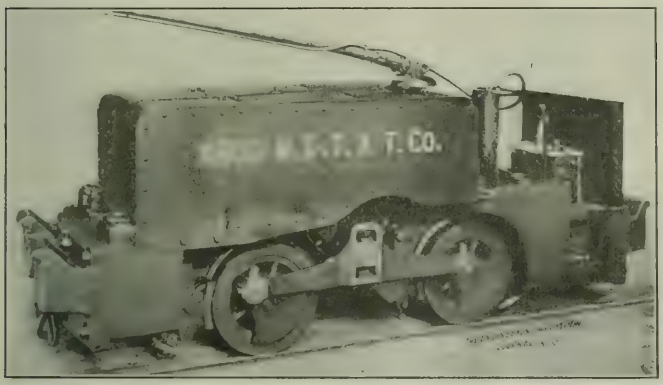
The report of the Mexico Mines of El Oro, Ltd., covering the fiscal year ended June 30, 1909, shows the continued success of this comparatively new operation in the El Oro district of Mexico. The directors' report, signed by R. T. Bayliss and L. Breitmeyer sets forth that the total realized profit for the year on the unaltered capital of £180,000, was £155,166 of which £135,101 was from the ore milled and £18,694 from the sale of 500 tons of high-grade ore.

During the year the 40-stamp mill crushed 101,105 tons of ore, from which bullion to the value of $1,257,559 was recovered, being an average yield of $12.44 per ton. This represents an all-round recovery of the gross gold and silver contents of the ore treated of 92.35 per cent., and compares with a recovery of 89.6 per cent. in 1908. The total average working costs for the year, including expenditure of every nature in Mexico, was $5.67 per ton, which compares with $6.33 in 1908. These working costs include a sum of 0.09c. per ton for development, and 0.65c. per ton for state and federal taxes.

Attention is called to the important development in the No. 7 level in which a vein of sulphide ore 15 ft. wide was cut, carrying 2 oz. 10 dwt. gold and 20 oz. silver. This is the northerly extension of the west vein of the adjoining Esperanza mine. The ore reserves available are estimated at 101,055 tons having an average value of gold of $10.90 and 7 oz. of silver, equal to $14.40 in all. The report of the general manager, A. F. Main, included, shows a total development for the year of 3791 ft. of which 1033 ft. was in ore, averaging $12.60 gold and 9.7 oz. silver, The main shaft has been sunk 40 ft. below the 7th level.

For the first eight months of the year the mill ran 97 per cent. of the full time. After that, interruptions from the retimbering of the shaft, and during May and June, the shortage of electric power furnished from Necaxa, combined to cut this average down. To offset this, during the last two months the daily stamp duty was very largely increased, and for June it exceeded 9.5 tons per stamp-day of actual running time, or a total daily output of 380 tons, which was successfully slimed by the tube mills. Treatment results were improved, and the Burt filter presses continued to do good work. Higher percentages of extraction on both gold and silver were obtained, and a saving of total values of 92.35 per cent. was effected. The total amount crushed was 101,105 tons, producing bullion to the value of $1,257,559.

The assay value of the ore treated was $9.48 in gold, $3.99 in silver, and the theoretical extraction was 94.05 per cent. of the gold and 86.60 per cent. of the silver; total 91.85 per cent. The bullion realized was 94.46 per cent. of the gold and 87.35 per cent. of the silver and the total actual extraction 92.35 per cent. The statement of costs per ton of ore crushed shows mining, $2.13; development, $0.99; milling, $0.30; cyaniding, $1.26; water supply, $0.02; taxes, $0.65; general expenses, $0.32; total, $5.67 per ton. This company is controlled by the Exploration Company, Ltd., of London, which also owns the El Oro Mining and Railway Company, Limited



ELECTRIC LOCOMOTIVE USED AT THE ARGO MINE

Electric Locomotive for the Argo Mine and Tunnel

The accompanying illustration represents an electric locomotive recently built by the Baldwin Locomotive Works for the Argo Mining, Drainage, Transportation and Tunnel Company, of Idaho Springs, Colo. The electrical equipment of this engine was supplied by the Westinghouse company. The locomotive is in mining and tunnel service, and was built to fulfil most exacting requirements. The track gage is 18 in., and the clearance limits require maximum width not exceeding 32 in. The problem of constructing a six-ton locomotive to fulfil these conditions necessitated special treatment in order to produce a satisfactory design.

This locomotive has cast-iron frames placed between the wheels. The transverse distance between the journal centers is 11⅜ in.; the bumpers are also of cast iron, 32 in. in length. The frames are supported on coiled springs which are placed directly over the journal boxes. The locomotive is propelled by two K-6 motors, using 500-volt direct current. The motors are mounted above the frames and between the wheels, with 26-in. centers. They are both geared to a jack shaft whose bearings are placed directly on top of the frame.

The jack shaft is geared with a second shaft, which is journaled in boxes rigidly held between frame pedestals. This second shaft has balanced cranks keyed to its outer ends, and from these cranks the driving wheels are rotated by means of combined side rods and scotch yokes. This arrangement was adopted because the motors and shafts are spring supported, and the crank pins are, therefore, allowed sufficient play in the yokes to compensate for the movement of the frames on the springs. The driving wheels have cast-iron centers and steel tires, and are counterbalanced.

The motors are covered by a suitable casing, which can be readily opened when required. The diverters are also placed under this casing. A trolley-pole socket is placed on each side of the locomotive near the front end. The equipment includes an efficient brake which is operated by a vertical shaft and handwheel The brake shoes bear on the backs of the driving wheels. Sand boxes are provided at each end of the locomotive and are cast in the frames. The fittings include a gong and two electric headlights.

This is an exceedingly compact locomotive, with a maximum proportion of its weight supported by springs. The working parts are easily accessible. The principal dimensions are as follows: Wheel base, 3 ft. 6 in.; drivers, diameter, 20 in.; journals, 3¼x4½ in.; width, 32 in.; hight, 3 ft. 9 in.; length, 9 ft. 10 in.; weight, 12,000 pounds.

Transportation by Electrical Suspended Railway

Installation at Copenhagen in Which Five Systems of Suspended Railway Satisfactorily Handle All Transportation at Moderate Cost

BY A. GRADENWITZ*

The main tendency in the construction of modern transporting plants is to reduce as far as possible the number of men employed. In this connection an efficient system is that of Albert Bleichert & Co.'s electrical suspended railways, comprising an automatic suspended track, the cars of which are propelled by motors fitted into the traveling gear. The electro-motors fitted laterally into the traveling gear have been constructed specially for this purpose with a number of turns, so that a single toothed-wheel gear between the motor and the traveling wheel is sufficient. Into the wheel is fitted a brake engaging automatically as the current is interrupted. The whole traveling gear is substantial and is protected against dust and atmospheric influences so as to insure a year-long life to the trucks even in the case of greatest strain.

The current is supplied to the traveling gear through connecting wires strung out in parallel to the traveling rail, which serves as a back conductor. Owing to the simplicity and readiness of current supply the electrical suspended railway adapts itself to any local conditions, negotiating shunts and curves of a minimum radius of 2.5 m. with safety and without any supervision. There is no necessity for the trucks to be moved along, the operator having only to insert a switch in order to start a truck. At the station desired the truck, after the corresponding section of the trolley wire has been made dead, stops of its own accord.

Control of the System

As the trucks thus travel without any supervision, means should be provided for controlling their mutual distance and preventing collision. This is effected by Bleichert & Co.'s patented block system.

The controlling wire is divided into sections insulated from one another, the length of each of which corresponds to half the truck distance. Simple switches allow the current to be cut out from those sections and to be thrown in again, so that each two trucks comprise between them a conductor section made dead by which the subsequent truck will be arrested as soon as it approaches beyond an admissible limit. The trucks themselves effect mechanically this operation by throwing in and out, avoiding any sensitive parts and thus excluding any disturbance of the block system. A likewise patented automatic locking system prevents any derailment owing to the passage of open shunts.

The railway line is designed either as closed loop traversed by the trucks in a constant direction or as a simple open track with pendulum operation. The reversal of trucks at the terminal stations in the latter case can be effected automatically. The cars are also discharged automatically as a rule by the locking lever of the car body striking the cam fixed to the truck. By adjusting the position of this cam the operator is free to effect the unloading at any point desired.

The trucks of the railway are frequently equipped with an electrical capstan for raising and lowering the transporting trough, as shown in an accompanying illustration. A magnetically controlled mechanism allows any kind of motion—lifting, lowering, traveling, reversing, etc. No special operator is generally required in this connection, the few manipulations being effected by the man in charge of the loading.

Equipment in Which Five Suspended Railways Are in Operation.

The Ny Kalkbraenderi of Copenhagen recently decided to equip the whole of its works with this system of suspended railway. The operations to be performed at the works comprise: Unloading the limestone from the ships and storing it in an elevated storehouse; putting up a winter store in a covered shed; supplying the annular furnace with coal; transporting the burned lime to the discharging stations and to the slacking trough; and coaling the boilers. No less than five electric suspended railways are at present in operation for dealing with these difficult operations, according to the plan reproduced in the accompanying sketch.

Railway No. 1 is intended for unloading the vessels and consists of an I rail mounted on a transportable iron frame, the front part of which projects beyond the water's edge; it can be folded up so as to be readily withdrawn in warping ships carrying high masts. On the rail travels a capstan truck, the case of which can be lowered into the vessel, there to be exchanged for a filled bucket. After then being lifted, the truck bucket travels over the limestone silo situated alongside the water's edge, on which runs the unloading frame. After there being dis-

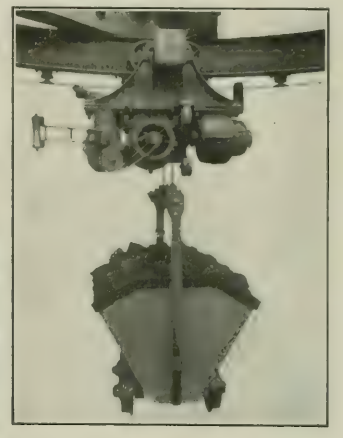
TWO VIEWS OF RAILWAY NO. 1 FOR UNLOADING VESSELS

*2 Regensburgerstr. Berlin W., Germany.

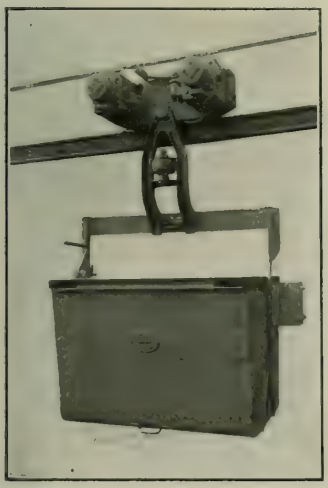
charged, it is reversed automatically and returns to the ship. From the silo, the limestone is discharged through locks of special construction, which allow large pieces to pass into light railway trucks. The locks consist of two cylindrical slides of which the lowermost is destined for the passage of fine material, whereas the upper one is open only to the passage of coarse pieces. The stream of material accordingly can be controlled with great accuracy. However, the main advantage of this design is that the slides on being locked, so far from penetrating violently through the material, simply cause it to accumulate at its natural sloping angle so as to come to rest. In fact, in order to interrupt the discharge of material, the upper slide is at first lowered down on the store of material, seizing the upper layer and thus causing the material to accumulate. The slight residual stream of material is then arrested by the small slide cutting vertically upward without encountering any considerable resistance.

The running trucks are shoved either directly to the annular furnace or to the limestone shed serving as the winter storehouse. Below the roof of this shed is situated the traveling rail of railway No. 2, on which likewise travels a capstan truck for lifting the filled buckets and transporting them. In order to prevent the limestone from dropping, the case is lowered at the unloading station to an existing store, there to be discharged by a magnetic disengaging device. All the operations are controlled by a man at the loading station, at *a* in the sketch, by means of a simple long-distance switch above described.

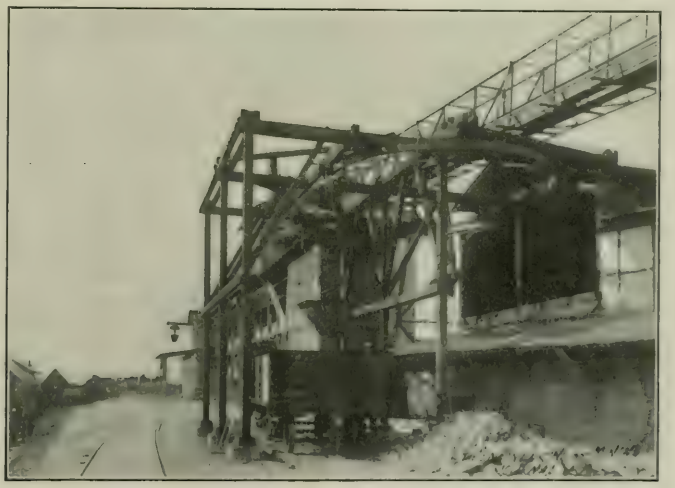
WINTER STOREHOUSE, SHOWING RAILWAY NO. 2



TRUCK EQUIPPED WITH ELECTRICAL CAPSTAN FOR RAISING AND LOWERING CAR



CAR PROPELLED BY MOTOR IN TRAVELING GEAR



RAILWAY NO. 3 FOR CARRYING COAL FROM RAILWAY CARS TO ANNULAR FURNACE

Operation of Railway No. 2

The operation of the railway is as follows: After hanging the bucket that arrives on the narrow-gage track, into the capstan suspension, the workman throws in the controller, after which the case is lifted in order to stop automatically in the uppermost position. The second con-

nection results in the suspended-railway truck traveling over the store, there to stop at any desired place by interrupting the current. By next completing the circuit, the capstan is made to start the loaded bucket over the store-yard, while after the fourth connection the tilting magnet fitted to the suspension is made to disengage the lock of the bucket which then is discharged by tilting, erecting itself of its own accord. On the fifth operation of the switch, the capstan lifts the empty bucket. With the sixth operation, the truck returns to the starting point *a*, and with the seventh operation, the capstan starts the empty bucket over the narrow-gage track after which it is uncoupled from the lifting ropes.

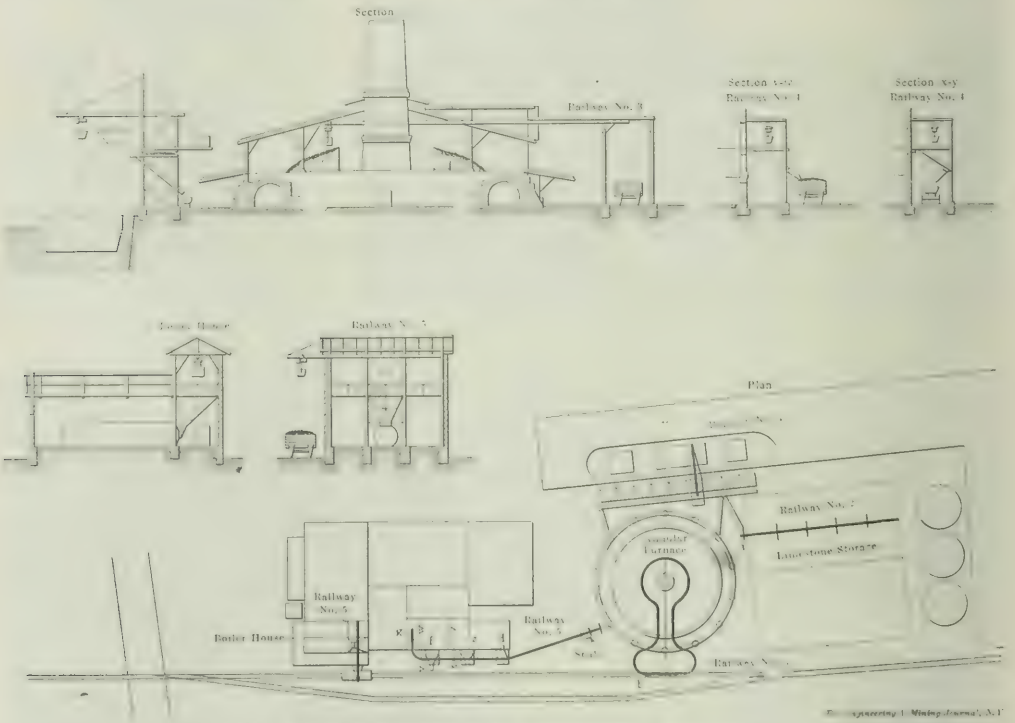
RAILWAYS NOS. 3 AND 4

Railway No. 3, which has been designed as a closed cycle, is intended for conveying coal from the railway cars to the circular furnace. On the track *b-c*, are lifted the buckets that have been loaded in the railway car, to be taken over the furnace and there automatically discharged at one of the unloading stations. The buckets have been given a [illegible] so as always to tilt on the [illegible] toward the stoking holes. The operation of the railway can be effected by the men in charge of the shoveling of coal from the railway cars into the buckets.

Railway No. 4 conveys the burnt lime from the furnace to the slaking trough and to the ball mill and unloads it into cars. It leads beyond the store-yard to a covered bridge so as to prevent the lime being moistened, after which it arrives at the bunker *d*, conveying the lime to the slaking trough, then to the bunker *e*, which serves to load teams, or to the bunker *f*, from which the railway cars are unloaded. The lime is then discharged at *g*, to be conveyed to the ball mill. The track comprises a weighing machine operated by the man on the working platform. This weighing machine is provided with a printing outfit that registers the weight of the useful load contained in the bucket.

There is finally a fifth electrical suspended-railway which serves for coaling the boiler house. Its rail projects outside of the building, beyond the railway track, and in the interior travels over the bunker carried by special iron supports on which the coal slides down immediately into the automatic fireplace of the steam boilers. The capacity of each of the railways 1 and 4 is 20 tons per hour and that of the remaining only 5 to 6 tons.

Owing to the simplicity of construction, the first cost is so low as to make even small-sized plants profitable in spite of a sometimes imperfect utilization. The cost of maintenance is low, the electrical suspended-railway dispensing with any special superintendence, while the cost of current consumption is immaterial. About 0.006 kw.-hour is required to convey 1000 kg. effective load a distance of 300 ft. on a horizontal track. In the event of the current being purchased at the rate of about 5c. per kilowatt-hour, the cost of current consumption for this duty would be about one-thirtieth of a cent, and far cheaper still in the case of a special plant. The transport of one ton, inclusive of the cost of maintenance, in the case of moderate distances, hardly exceeds 1c. The amount corresponding to interest and amortization is partly compensated for by an increase in the safety of operation.



PLAN AND SECTION OF EQUIPMENT AT NY KALKBRAENDERI, COPENHAGEN

An aluminum solder, mentioned in the *Journ. Soc. Chem. Ind.* Sept. 30, 1909, is made by fusing 130 grams of antimony, [illegible] and 44 grams salicylic acid.

Improvements in Compressor Valves

Many who are familiar with practice in steam- and gas-engine speeds often question why it is that air compressors are operated at such relatively slow speed. Also why it is that the usual air compressor is so noisy and runs with so much vibration. These two questions are closely related and, in fact, the expert on compressors will tell you that the cause of the speed limitation in all sizes of air compressors, except the very large ones, is due to the sluggish action of the discharge valves. When you consider that the discharge valve must have a full and unrestricted opening and must also close instantly within a hundreth of a second or less, it is apparent why this should be so.

Various methods have been employed to make the action of the discharge valves more rapid, the principal one being to reduce the weight as far as possible. This has sometimes been carried to extremes with the result that the valve becomes too weak to stand the strain upon it. Another method which has been used with good results is to cushion the opening of the valve by means of a dashpot action, using air to bring the opening motion to a stop, and the compression of this air then assists in moving the valve back to its seat. These two methods have been carried to the practical limit permitted by the common type of mushroom valve.

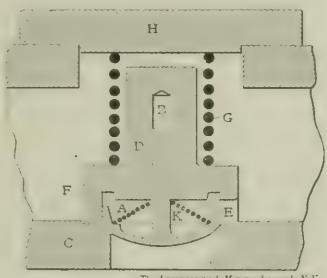
The Improved Valve

A new type of valve, illustrated herewith, has been devised for carrying these methods still further. "*A*" represents the valve proper; "*B*" is a small guiding stem which serves merely to steer the valve in its motion; "*C*" is the seat or portion of the cylinder in which the valve rests; "*D*" is the guide for the valve and stem and also serves as a stop for the outward motion of the valve; "*E*" is one of a series of ports in the circumference of the guide; "*F*" is one of a series of legs which comes between these ports and centers the guide upon the seat; "*G*" is a heavy spring which is intended only for holding the guide down in its place without the necessity of making a rigid connection between the guide and the cover "*H*".

It will be observed that the diameter of the grinding portion of the valve is considerably in excess of the diameter of the opening which is the nominal size of the valve. It will also be noted that the valve is very light in weight because of the fact that the guiding portion is short. This guiding portion does not need to be of any greater length because the valve is held to its proper direction by the stem "*B*." In operation the top edge of the valve guide passes back and covers the edge of the ports "*E*" in the guide. Whatever air is between the valve and guide at this point is thus inclosed and acts as a cushion to bring the valve gradually to a stop, and this in turn builds up a pressure back of the valve which assists in returning it to the seat The spring may consequently be light and the resistance to the flow of the air through the valve is very little. This valve operates almost noiselessly and is capable of a high rotative speed.

A comparison showing the exact relation of the weight, cushion area, etc., is shown in the accompanying table Valves designated as A and B are two well known types of cushioned mushroom discharge valves which represent the best previous practice in this line; and valve C is of the type described.

The usual speed of compressors ranging all the way from 4 to 24 in. stroke, does not exceed 150 r. p. m. With this



IMPROVED COMPRESSOR VALVE

valve, however, there is no reason why compressors should not be operated up to piston speeds corresponding to those used in steam engines. These valves have been tried out under severe conditions and have proved themselves highly satisfactory. The valve is the invention of C. A. Dawley, formerly engineer of tests for

COMPARISON OF VALVES.

Discharge Valve Type.	A	B	C
Diameter of opening in inches	2⅛	2⅜	2¼
Area of nominal opening in square inches	3.55	4.43	3.55
Diameter of cushioning portion in inches	1⅜	2.0	2½
Area of cushion in square inches	1.48	3.14	4.91
Initial spring tension in pounds	6.0	5.0	3.0
Valve weight per square inch of opening area	0.20	0.165	0.107
Cushion area as per cent. of valve area	42.0	71.0	138.0

the Ingersoll-Sergeant Drill Company. The advantages of this type of valve may be summarized as follows:

Operating Features (1) Lightness in weight without reduction of strength. (2) Large area of cushion compared to the opening area. (3) Valve guided close to seat. (4) Opening cushioned, making the action of valve free from vibration and pounding (5) Rapidity of action.

Features of Construction—(1) Valve can be made from a drop forging and submitted to proper heat treatment, then the stem hot-riveted in, and the entire valve finished by grinding. This makes the best as well as the cheapest method of manufacturing. (2) No necessity for perfect alinement between valve cover and seat. (3) Valve cannot be displaced from its seat by distortion due to heat or pressure.

The Selukwe Gold Mine

Special Correspondence

The Selukwe Gold Mining Company, Ltd., is one of the oldest of the gold-mining companies of Rhodesia, crushing having been commenced as far back as 1898. During its career the mine has produced to date, according to the "Mining Yearbook," 623,000 tons of ore, from which £1,250,000 has been recovered. Yet in spite of its riches, the operations have given very little satisfaction to the shareholders. Dividends amounting to 6s. per £1 share are all that have been paid to the owners. Nor are the future prospects at all bright; indeed, they are quite the reverse. The report for the year ending March 31, 1909, records a loss of £28,707. The actual working expenses and revenue approximately balance, but this result is obtained by omitting expenditure on development, a necessary preliminary to stoping, and an expenditure which belongs to a statement of working account quite as much as stoping and milling. When development and depreciation of plant are taken into account there is a deficit of £28,707 as already stated.

During the year under review the 40-stamp mill treated 61,392 tons, from which gold amounting to £63,372 was won, or a recovery of 20s. 8d. per ton. The ore reserves have fallen from the figure given in the last annual report and are now valued at a total of 117,404 tons, made up of 33,084 tons assaying 7.4 dwt., and 83,420 tons valued at 4.32 dwt. per ton. Of these ore reserves the manager classes only 15,291 tons valued at 8.6 dwt. per ton as payable. It is evident from these figures that milling cannot long be continued. The directors report that they are having an examination of the mine made by a prominent engineer, whose name is not given, and it will, no doubt, depend on the advice received whether further expenditure will be incurred in the development of the mine in the hope of finding something better than has been met with in the past. Judging from the balance sheet, a reconstruction of the company appears inevitable unless winding up is decided on Quite recently some cables from the mine have been published announcing encouraging developments, but whether the discoveries are of importance or a mere flash in the pan remains to be seen.

Wastes of Heat and Materials in Smelting Works

Proposed Heating of the Blast by Slag While Annealing the Latter for Building Material. Utilization of Heat of Jacket Water Considered

BY HERBERT LANG*

The illuminating address of Dr. James Douglas upon the subject of the conservation of our natural resources, in the JOURNAL of June 12, 1909, may well be the inspiration of much thought and labor directed toward the prevention of waste in our mines and manufactories. As to the latter, it is proper to call attention to subjects which appeal to many metallurgists and engineers with peculiar force, namely, the loss of heat and substance in the slag and jacket water of smelting furnaces. The subject of the slag and its included heat has been much discussed and various methods of utilizing not only the slag, but its heat as well, have been described and the question in its various phases must be fairly well understood; but there are certain relations which render it worth while to explore the matter farther, at the risk of reiterating what has already been said.

According to present practice the slag is mainly thrown away, or at best used for railway ballast or for filling in sunken lands. A small proportion is used for the manufacture of blocks or slabs for rough building purposes, such as the foundation of houses, for retaining walls and for dams. Besides such uses there are the more important ones wherein slag of phosphatic character is converted into fertilizer, and wherein basic calcareous slags are made into hydraulic cement. The latter uses are restricted by the chemical character of the slag required, while its use for casting directly into building blocks is hampered and limited by the backward state of the manufacture, and the apparatus and methods employed. It is in this direction that progress may be anticipated and achieved.

Heat Contained in Slag.

It is well understood that the outflowing slag (cinder) of iron, copper and lead furnaces contains something near 400 calories of heat, sensible and latent, which makes the slag at the moment of its exit from the furnace equal in heat contents to about one-seventeenth of its weight of good coal, that is to say, a ton of such coal will produce on being completely burned 17 times as much heat as will be given out by one ton of slag during its period of cooling. The question of the conservation of this heat, taken in connection with the vast and increasing output of slag, which is now measured in tens of millions of tons annually, is therefore of considerable economic importance.

In regions where fuel is scarce or costly the money value of the heat thus wasted would evidently be very great. I have in mind certain isolated localities where, owing to the excessive cost of fuel for the smelting works, a ton of hot slag would have a value for the heat within it of fully 80c.; in other localities, owing to the extensive scale of operations, as much as $500 worth of heat is daily lost in the air. Such facts should be sufficient incentive to engineers to induce them to give attention to methods of obviating a present waste of no small magnitude.

I have hitherto dwelt upon methods of conserving this heat and have detailed the apparatus which I have found useful in such connection, the process consisting in employing traveling molds, cars or pans, filled with the hot slag at the furnace, and moving outwardly therefrom to a convenient dumping place, which may be above, below, or upon the furnace level. The method is one of gradual cooling and conveying, and as the blocks are automatically removed from the molds, the process is accomplished at a minimum of cost. In fact by no other means, excepting possibly by granulation in running water, can the slag be taken away from the furnace in so cheap a way.

The objects sought are three, namely: The removal of the slag from the furnace; the production of masses of regular and useful shape; and finally, the conservation of the heat of the slag. To effect these ends it becomes necessary to subject the slag to protracted cooling within a confined space from which the liberated heat cannot escape into the atmosphere. The pans or molds are connected together in trains, mechanically propelled, and travel lengthwise through a tunnel of brickwork or of metal covered with some nonconducting material, as asbestos board or the like. The slag dispensing its heat to the air within the tunnel and raising it to a high temperature, furnishes a means for heat utilization by employing it for aiding the combustion in a boiler firebox, or for heating the blast of the furnace, or in other ways that may suggest themselves.

By connecting the hot end of the tunnel with the firebox a draft is set up which brings the heated air into contact with the fuel, fresh air being drawn in at the cooler end and heated in turn. Apparatus of this character gave an efficieny of 50 per cent., measured on the proportion of the heat actually delivered, and a higher efficiency might reasonably be expected from apparatus of improved design. It is perfectly practicable to preheat the air for boiler use to 1000 deg. F., and to save two-thirds of the fuel in ordinary cases.

Slag as a Structural Material

My proposals to employ the cakes or blocks of slag thus obtained for economic purposes, such as mine "timbering" and the like, have been met by the objection that the slag is often brittle, and insofar unfit for such purpose. Such criticism leaves out of account the improvement that may be wrought upon even the most brittle of slags by the process of slow cooling and annealing, and ignores the question as to the particular use which is proposed for the material. To reiterate that because some slags are brittle, slag in general has no industrial value for building purposes is highly irrational. In order to reach a conclusion as to its usefulness we must first consider what uses it is to be put to, and the improvements necessary to adapt it to such uses.

Even the most brittle of slags may by slow annealing be made to reach a considerable degree of toughness, such as would suit it to a variety of purposes, and there are methods of reinforcing the blocks by which they may become as durable under shocks as ordinary kinds of stone or brickwork. Two centuries ago it was suggested by an English inventor to incorporate within the mass of yet molten slag fragments of rock or of already cooled slag, with the object of providing centers around which the liquid might solidify, obviating its tendency when in large quantity to form "pipes" at the center by which the mass is much weakened and sometimes rendered quite useless. The expedient is a valuable one and has been invented and reinvented by myself and other experimenters, and I have added the suggestion to preheat the solid fragments, in order that a more perfect junction may be formed with the slag, adding strength to the block.

By this means the perfected block, after its slow cooling and annealing, is found to possess great strength and solidity, not inferior, perhaps, to the best specimens of sandstone and granite. It

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is obvious, however, that such a method is inconsistent with the manufacture of small blocks, and that it is more adaptable to the formation of large monolithic masses, upon the spot where they are to be used. Considering the comparative facility with which such masses may be produced, it would seem that their use for the coarser forms of construction might be extensive. I have not considered it feasible to attempt the formation of these large slag-concrete monoliths by means of the apparatus before mentioned, owing to their weight and the impracticability of adding the solid matters at the furnace side.

I have used the slag *in situ* in the construction of a small bridge and several culverts and find no difficulty in it. As has been remarked by others who have experimented in this way, it would not do to use rock decomposable by heat in forming the concrete, as the gases which would be given off at the high temperature reached within the mass would surely disrupt the block. This would be the case with limestone, or any other carbonate, and also with any hydrous material, etc. Probably those stones, like basalt, andesite, porphyry, diabase, diorite, etc., which have a chemical composition like that of slag itself, would serve the purpose of a filling the best, because they have a fusing point not very much above that of slag, and hence would be most apt to superficially fuse and attach themselves firmly to the groundmass of slag, when the mixture would simulate closely the tufaceous family of natural rocks.

Casting Slag Mechanically

Without some especial means of casting and transporting slag bricks and blocks during the operation of the furnace we cannot claim an advanced state of the art which, during its reliance on the old methods of casting in sand and removal from the moulds by hand, was of small repute; but I venture to think that my patented method of forming the blocks as well as of removing them without incurring additional expense over the ordinary method of emptying slag by means of hand pots, is a distinct advance that must in time be recognized.

In some respects we are not greatly ahead of the practice of half a century ago; but doubtless we are now able to appreciate better the scope and value of mechanical methods of handling these masses, and their utility in certain forms of construction.

Probably the greatest drawback to their extensive employment lies in the fact that builders expect and demand too much from such a cheap and comparatively crude substance. If engineers would consider the limitations of its usefulness and endeavor to devote it to purposes for which it is known to be fitted, I believe that use could be found for every pound of slag produced in situations where the cost of transport did not debar it.

Using Slag Blocks in Mines

I have devised methods for utilizing slag blocks or slabs in various connections, and in particular for mine "timbering" (more properly, filling). In localities where trees are scarce or sawed lumber costly, or where security against fire counts for much, the matter has great interest and importance. In mines which are so situated that the transport and placing of the blocks can be done by mechanical means, and without inconvenience to the progress of the mining work in general, the matter is worthy of consideration. It must be borne in mind that the material must be prepared and handled in large quantities to be of practical use, and that the individual blocks must be of considerable size, both from the circumstances of their manufacture and from the fact that truly economical methods of handling, inside and outside of the mine, demand the employment of mechanical means instead of human muscle.

It would probably not pay to use masses of less than two or three cubic feet for such purposes and it is likely a much larger size would be found advisable. The problem then of transporting and placing them becomes one of considerable complexity, demanding special arrangements and much foresight. The conditions under which the method could best be operated would be as follows: The tunnel or the collar of the shaft of the mine should not be above the furnace level; there should be railway communication between them; the underground openings should be within the vein itself, so that transport of the blocks should be facilitated as much as possible; and finally, the vein should be vertical or have at least a considerable dip. I shall take another opportunity of laying before mining engineers the means by which I proposed to carry out the method of slag filling at a large mine in California.

Waste of Hot Water

Another noticeable waste in smelting practice is that of the hot or warm water issuing from the jackets of the smelting furnaces. Two distinct losses, that of the water and that of the heat contained, are involved but may be regarded as one when we consider the efforts that have been made to eliminate them. The obvious means of supplying steam boilers with the jacket water is indifferently practised in this connection with, no doubt, some measurable advantage in many cases. To obtain the greatest good from such a practice the water should be discharged from the jackets at the highest practicable temperature, which would be the boiling point pertaining to that altitude above sea-level. But so elevated a temperature, while compatible with the demands of smelting practice, cannot be generally attained owing to the forms of construction adopted by most furnace builders. Nevertheless, economy both of heat and water demands that the quantity of the latter be restricted as much as possible, experience having amply shown, at least with respect to furnaces driven at moderate rates, that the running of the jacket water at or near the boiling point sensibly enhances the rate of smelting.

Any project for utilizing the heat of the jacket water should begin with the proviso that the water must be very hot, in order that the withdrawal of the heat may be rapid and fairly complete; and I have constructed sets of jackets to be arranged in cascade form, by which the uppermost tier receives the cool liquid, which is delivered successively to lower and lower ones, the heat augmenting as the water descends, until it issues boiling from the lowest. This is as it should be; for if the increased temperature of the liquid is at all beneficial to the smelting process the greatest benefit will be attained when the lowest and hottest part of the smelting zone is embraced by the hottest jackets. By this means the quantity of water (which is in an inverse ratio to its temperature) reaches a minimum, and the conservation of the heat may be undertaken with the best prospects of success.

When run in this way the jackets may be made to take the place of the water-heating appliances which are so generally a part, and an important one, of the steam installation. Perhaps we may add to this the further notion that they may also serve as a water purifier to a small extent, since they may be so constructed that the deposition of sediment within them may be less troublesome and less difficult to deal with than when it collects within a boiler. Jackets of this description are, of course, open at the top, both to facilitate the introduction of tools and to allow the escape of steam, which forms to some extent and must be allowed free vent.

It has more than once been proposed to utilize the jackets of a blast furnace as steam boilers, wherein the vapor was to be generated under pressure; but the voice of experience strongly disapproves it as a dangerous innovation and of doubtful utility. Yet there is a reason, and a weighty one, for the practice of evaporating the water in the jackets wholly or partially, as by so doing we may reduce the consumption of that fluid more than fourfold, and however much we may condemn the act of generating

and confining the steam within the jackets to the peril of life, we must applaud the idea of absorbing the surplus heat through the production of vapor rather than through the medium of torrents of water, which at times is barely warmed. For not only are we able to apply means whereby the heat may be abstracted from the steam, and preserved to the process, but the amount of water which must be provided is much diminished.

Various Proposed Methods

We may disperse the contained heat of the water by exposing it to radiation, as in a tank, after the manner advocated by Bartlett; or by passing it through a cooling tower; or through pipes exposed to the atmosphere. Such methods do no more than waste the heat, although they conserve the water supply to some extent. Another group of inventions, which has been exploited to some extent, proposes to use the contained heat for elevating the temperature of the air blast. This is divisible into two sub-groups, the one of which seeks to abstract the heat while the water still remains within the jacket, while the second removes the hot water to a more distant and more convenient place, whence, after parting with its caloric, it may be returned to the furnace.

The patents of Douglas and of Canavan possess interest as types of the former class. Both propose the use of deep and roomy jackets, containing within their water space a system of air pipes so arranged as to convey the blast from the bustle pipe to the tuyeres, and to transmit the heat from the surrounding water to the inclosed air. Thus these pipes and the blast within them are raised in temperature, while the water is correspondingly cooled to the advantage of the process and the conservation of water. We may observe of all such inventions that the space within which the apparatus is installed would prove insufficient for great efficacy, and that the process of heat transference must take place disadvantageously, since the water in the upper part of the jacket, where the air blast enters, is necessarily hottest, and that therefore the apparatus would to a certain extent serve to transfer the heat from the hot water at the top to the cold water at the bottom of the jacket. The natural and most advantageous way of heating the air would be to bring it first into contact with the coolest water, and then progressively to the hottest, whereby the greatest efficiency is secured and the greatest amount of heat transmitted.

The Colorado Iron Works engineers have solved the problem more neatly and practically by encircling their furnace below the feed floor, but above the jackets, with a tubular receptacle connected to [illegible] with the top of the jackets, which are closed. Ebullition takes place wholly within the receptacle and the heat, or a portion of it, is absorbed by the blast which is led through pipes placed within the receptacle and surrounded by steam or hot water. Such an apparatus must necessarily be more efficient than the other form, but it is still open to the criticism that the progressive heating of the air and cooling of the water are insufficiently provided for. There must, however, be a considerable gain in the economy of the furnace, taken as a whole.

Separate Cooling Apparatus

Those inventions which, by removing the cooling apparatus to a distance from the furnace, seek to gain a higher efficiency than can be obtained in the limited space within the jackets or upon the sides of the furnace, consist for the most part of coils of piping contained within a casing, through which the hot water is made to circulate by means of a force pump. The blast plays around or upon the pipes in its progress from blower to furnace, taking up the heat. Ample space may be had, and a high degree of efficiency may be got by extending the area of the heated piping exposed to the blast. I have employed pipes of an aggregate length of several hundred feet, inclosed in a metallic casing, simulating a boiler in form, but, of course, the reverse of a boiler in functions, since it is the water which heats the air, instead of the gases which heat the water.

The blast, in such an installation takes the contrary direction from the hot water in conformity with the principles of such heating. The transference of heat depends largely upon the difference in temperature between the hot water and the blast, and it is obvious that it would not be possible in such a plant to raise the latter to a higher temperature than the boiling point of the former, or 212 deg. F. as the maximum, and the practical results would no doubt invariably be much lower; hence we cannot regard this apparatus in the light of a hot blast stove by any means. But although the advantages of a hot blast can be secured only in a minor degree, the saving of water may be almost complete, and in consequence the invention must be of prime importance to those who contemplate smelting in situations where water is scarce or where it is desirable to use it over again.

The arrangement will be seen to be precisely like the familiar radiator of the motor car, excepting that the powerful influence of the blast is relied upon to cool the coil which contains the hot water instead of the more equal currents of air set in motion by the passage of the car or by the fan within the bonnet. As with the motor radiator it has been proposed to substitute for the water a solution possessing a higher boiling point, allowing the liquid to absorb more heat and attain a higher temperature before evaporating, whereby the air blast may attain a higher temperature by the contact.

Calcium chloride is usually regarded as the most available salt for this purpose, it being well known that its saturated solution has a boiling point of about 350 deg. F. Whether the introduction of such a refinement into practice would possess advantages under ordinary smelting conditions may be doubted; but like all such suggestions it is worth trying, especially as the cost of the test would be so small as to be negligible. A further suggestion that the water be wholly vaporized in the jackets and condensed in contact with the blast-heating pipes may be dismissed as impracticable, or at least disadvantageous, from the necessity of inclosing the jackets and thus endangering the structure, as well as the operatives.

The practical installation of a cooling plant on such a system demands that the furnace, or its jackets at least, be of special construction in order that the overflow may be at or near the boiling point, but there is no doubt that by these proposals the amount of water for a given installation may be much reduced and an added degree of efficiency bestowed on the furnace operations through the gain in temperature of the blast. On the whole, the advantages are sufficient to justify moderate expenditure in many cases.

The Tomboy Mines

The profit made by the Tomboy Gold Mines Company, Ltd,, during the year ended June 30, 1909, amounted to £59,861, out of which two dividends of 2s. per share each, absorbing £60,000, have been paid. The tonnage milled has been 102,844 tons, from which bullion to the value of $820,457 has been realized at a cost of $480,527, yielding a profit of $339,930. Improvements in the concentrating and magnetic departments of the mill have resulted in a reduction of the working expenses to $4.67 per ton, compared with $5.13 per ton during the previous year.

The ore reserves have been maintained at practically the same figure as last year and are estimated at 400,000 tons. The net result of the development work on the Argentine group has been to considerably augment the ore reserves of the lower levels and to slightly diminish last year's estimates of the upper portion of the mine. The Tomboy group has been worked by leasers and the company has realized in royalties the sum of $1400. In the company's mill the ore has averaged a yield of $7.98 per ton.

Temperatures During Cupellation

R. H. Bradford (*Journ. Ind. and Eng. Chem.* I. pp. 181-184) has made some investigations of the temperatures during cupellation. A Le Chatelier thermo-electric pyrometer with a couple of a platinum wire and a 90 per cent. platinum 10 per cent. rhodium wire was used in the experiments. The cold ends were kept at a known temperature by immersing in water along with a thermometer and were connected to a galvanometer of high resistance by copper leads. The couple was carefully calibrated and the calibrations plotted. To prevent the destruction of the wires when the junction was immersed in the molten lead, a thin coating of fire-clay was applied. The coating was made on the spot from moistened raw material and applied in a thin enough coat to offer but little interference with the surface oxidation of the lead button.

Lead buttons were introduced into cupels placed at varying distances from the front of the muffle and hence at varying temperatures to determine the minimum temperature of the lead button requisite for starting cupellation. Pyrometer readings of the heating metal and the cupel interior were taken in each instance. It was determined that the molten metal must attain a temperature of 900 deg. C. or above before driving commences, or approximately the temperature of melting litharge.

Horizontal holes ⅛ in. in diameter, were drilled to points beyond the centers of the cupels and at different levels in the different cupels, from directly beneath the bottom of the cup-shaped depression, to the bottom of the cupel directly above the muffle floor. The temperatures of the interiors of the cupels were then readily ascertained by inserting the junction of the couple. The temperature directly under the button, in every case in which the cupel had been properly pre-heated although lowering as the lead melted, rose to 900 deg. C. or above before cupellation commenced. The temperature of the lower layers was usually a few degrees higher when the button opened, the melting metal apparently having taken its heat from the upper layers.

The temperature within the cupel and near the molten lead remained at 906 deg. C. or above so long as the button continued to drive. A rapid lowering of the temperature of the interior was noticed if the button froze, showing that its heat was mostly derived from the heat of the oxidation of the lead. If a button was introduced into a cupel whose interior was well below 906 deg. C. and the cupel and its contents pushed backed into the muffle, the button began to drive when the heat radiated from the muffle roof, raising the litharge coating of the lead to a temperature of 906 deg. C. The temperature of the button raised rapidly if allowed to remain in the same position, which temperature of course would cause excessive silver and gold losses. The formation temperature of "feather" litharge was found to be below 906 deg Centigrade.

The experiments established that when the driving is well started, the lead attained a higher temperature due to the heat of combustion, enough heat being developed to keep the button driving even though the cupel and its contents was drawn forward to a cooler position in the muffle. A temperature of 625 to 650 deg. C. may be maintained ¼ in. above and near the front of the muffle, with a gentle draught through the muffle, without danger of freezing, although the danger of freezing is lessened if the temperature is from 650 to 750 degrees.

Cupellation will continue as long as the heat of combustion maintains the lead above the temperature of melting litharge. Feather litharge will form as long as the surrounding air is kept well below the temperature of melting litharge and will not disappear unless the temperature is raised above that point, although a slight volatilization takes place.

A Hot Blast Furnace for the Small Operator

A letter has been received from Hugh G. Elwes, metallurgical engineer, of Mexico City and El Paso, in which he calls attention to the fact that the New Model smelter described in an article in the JOURNAL of Oct. 2, written by Percy Andrus Babb, does not give full credit to the inventor, Allen R. Partridge. The failure to mention Mr. Partridge's name in connection with the article was an obvious oversight, and the JOURNAL takes pleasure in printing this reference to the matter in order to place the subject correctly before its readers.

Notes on the Milling System of Mining

By ALBERT H. EVY

In point of low mining cost the milling system of mining comes next to the steam-shovel work. The conditions under which it can be used, however, are limited. One requisite is that the ore should extend to the surface or near enough so that the ground may be stripped. All surface water must be kept away. The ore must be of such a character that it will slide or roll well and not pack in the mill holes. A fine granular ore is preferable to one containing clay; hard ore will also work well. Weather conditions interfere with this system, for rains wet the ore and it is liable to pack in the chute, while snow and ice make it almost impossible for men to work on the steep sides of the open pit.

In the Mesabi district the steam shovel has almost supplanted the milling system. However, there are a few places where it is still being carried on successfully. It can be used to advantage on orebodies that are too small for steam-shovel installation, or in places where it is impossible to use steam shovels and railroad cars on account of topographic features.

A MINE USING THE MILLING SYSTEM OF MINING, MESABI RANGE, MINN.

The general scheme is first to strip the overburden off the ore; from a shaft or adit level a drift is run about 100 ft. below the top of the ore, in circular or elliptical form, so that when using electric motors they may make a complete circuit. The main haulage way, shown in an accompanying sketch, is connected at intervals of 50 ft. with crossents from which raises 50 ft. apart are sent to the surface. These raises are not timbered and are usually 4 feet square. Hitches are cut in the walls in order to secure the scaffold upon which the miners work, in the raise. A chute is built at the bottom so that the ore may be delivered easily to the car. When the raises are completed the work of breaking ore at the surface is begun at the edge of the raise. All the ore goes to the bottom of the chute. A half dozen of these raises

may be worked at once, thus giving ample room for several groups of laborers. As the work progresses more room is available for additional men. In some of the mines electric haulage is used while in others, especially the Crete mine, mules are used.

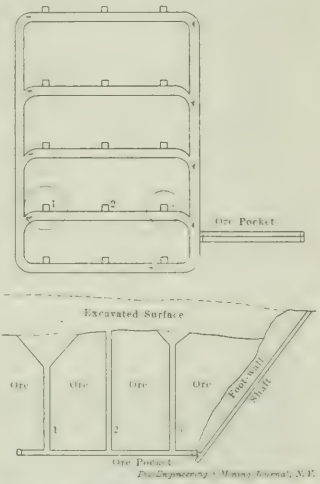
MILLING SYSTEM AT TRADER'S MINE

An accompanying sketch shows the general arrangement of the drift and mill holes at the Trader's mine, Iron Mountain, Mich., where hard ore is being mined. The footwall is well defined and dips of about 70 deg. toward the southwest. The orebody is approximately 200 ft. wide; its position is shown in the upper part of the sketch. At this mine the overburden to be stripped is glacial drift from 3 to 10 ft. thick. The main haulage drift is 50 to 75 ft. from the footwall and at intervals of 100 ft. crosscuts are driven to the footwall, from the end of which a raise is made to the surface, 130 ft. above; this strikes the top of the orebody near its center. The raise starts from the side of the crosscut so that the weight of the column of ore is not on the timber forming the chute. The ore is trammed by hand

PLAN OF WORKINGS AT THE TRADER'S MINE

in [illegible] tons ears to the shaft where it is hoisted in skips of like capacity.

In working hard ore great care has to be exercised in keeping all the loose rock barred down to prevent it from falling on the men. This is done by one or two men working on the [illegible] with a rope tied around [illegible] to prevent falling, especially on the footwall side where [illegible]. When all the loose rocks are knocked down, places are selected near the mill-holes to set the air drill, and usually two 10-ft. holes are put in and loaded with 8 sticks of 27 per cent. dynamite. The superintendent found that this is most economical as the men seem to think it requires 8 sticks of powder to break the ground, regardless of its strength. A section about 10 ft. thick is thus broken and work pro-



GENERAL ARRANGEMENT OF HAULAGE WAY AND CHUTES

gresses up the slope until the top is reached, when the machines are again taken down to the mouth of the mill-hole and another cut started. At this mine from 7 to 10 tons of ore per man are broken per shift. From 10 to 16 mill holes are now being worked. When pieces of ore break off that are too large for the mill hole they are broken by exploding dynamite upon them. It is seldom that holes are ever drilled in them for breaking purposes. The haulage drifts are double tracked. No timbering is necessary except at the chute.

Broken Hill South Company

The half-yearly report of the Broken Hill South Silver Mining Company, for the period ended June 30, 1909, shows a balance to credit of profit and loss account of £120,638, with net liquid assets amounting to £[illegible]. Two dividends aggregating £[illegible] were paid, and £10,416 were written off for depreciation on plants. The property is situated near Broken Hill, New South Wales. The whole of this year's production of concentrates has been sold and contracts have been entered into for a portion of the [illegible] production.

Negotiations have been concluded with the DeBavay's Treatment Company, for the treatment of zinc tailings on a joint account basis for seven years. This contract goes into effect on Jan. 1, 1910, and the Treatment company has sold its production of zinc concentrate for the period of the contract. The mining company is to receive a cash payment of 3s. 6d. per ton when the tailings are delivered, and after a similar sum has been credited to the Treatment company and actual costs ascertained, the available balance will be divided. A supplementary agreement has been entered into providing for the treatment of tailings during the current year, the mining company receiving a flat rate of 3s. 9d. per ton.

From the treatment of old mill tailings by the Zinc Corporation, Limited, the company received £4032, and from other mine products £155,922. The working expenses for the period were £109,441, the balance to profit and loss account being £50,513. The products on hand include an estimated tonnage of tailings and slimes, as follows: Old mill tailings (Zinc Corporation, Ltd.), 1,078,743 tons; new mill tailings (De Bavay), 74,602; old mill slimes, 140,432; new mill slimes, 35,366. The tailings carry from 16 to 18 per cent. zinc, 4 to 6 per cent. lead, and a small amount of silver. The slimes average about 14 per cent. lead, 6 oz. silver, and 12 to 16 per cent. zinc.

The total tonnage of ore raised during the half year was 137,846 tons, this being a record production for any six-month period. The ore averaged 14.9 per cent. lead, 5.5 oz. silver, and 12.1 per cent. zinc. Nearly 90 per cent. of the ore produced was obtained between the 725-ft. and the 970-ft. levels. All of the ore mined was loaded and trammed by contract and 97 per cent. of the ore raised was stoped by contract, the average earnings of the miners stoping by contract being 12s. 6.6d. per shift.

The working costs per ton of crude ore were 13s. 10.6d., distributed as follows: Mining 9s. 2.5d.; development, 9.1d.; concentrating, 3s. 11d.; while the working costs for the six months show a decrease as compared with those of the previous period, the full effect of the new plant was not felt until late in the half year when larger tonnages were dealt with.

The recovery of metals in the concentrates was: Lead, 74.2 per cent.; silver, 52.7; zinc, 5.6, as against 73.5, 53.4 and 6.8 per cent. respectively, during the preceding half year. Approximately 1360 ft. of development was done during the current period and the ore reserves were estimated at 3,250,000 tons. The average number of employees was 801. Since the inception of the company in 1885, 2,043,769 tons of ore have been raised.

The Coosa Coalfield of Alabama

The Most Southeastern Coalfield in the United States Contains 80,000,000 Tons of High-grade Coal. Why the Field Has Not Been Developed

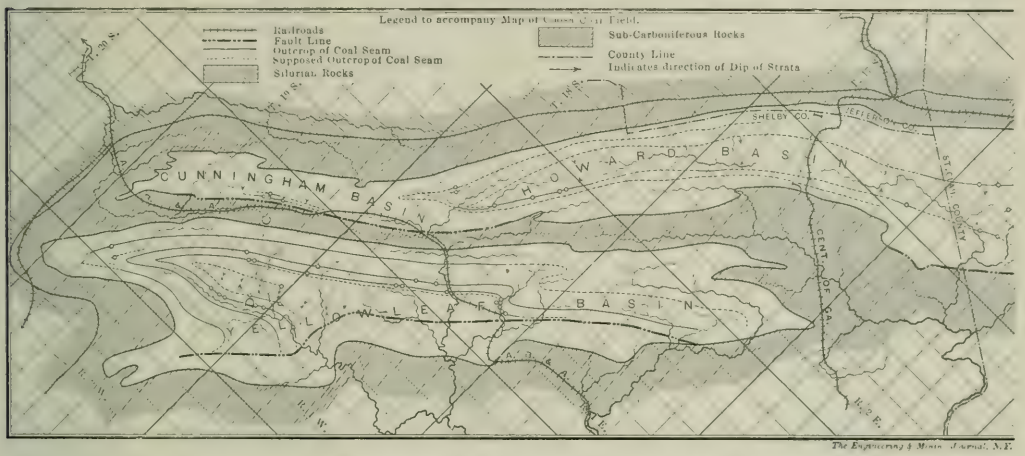
BY WILLIAM F. PROUTY*

The Coosa coalfield is the most southeastern of the coalfields of the United States, a distinction which helps to explain some of its extremes of character. The field occupies an area of about 200 square miles lying in a narrow strip, varying from three to seven miles in width, and extending in a northeast southwest direction for a distance of about 60 miles mainly through Shelby and St. Clair counties, in the north-central part of the State. The field derives its name from the Coosa river which flows close to its eastern border and whose branches drain its area.

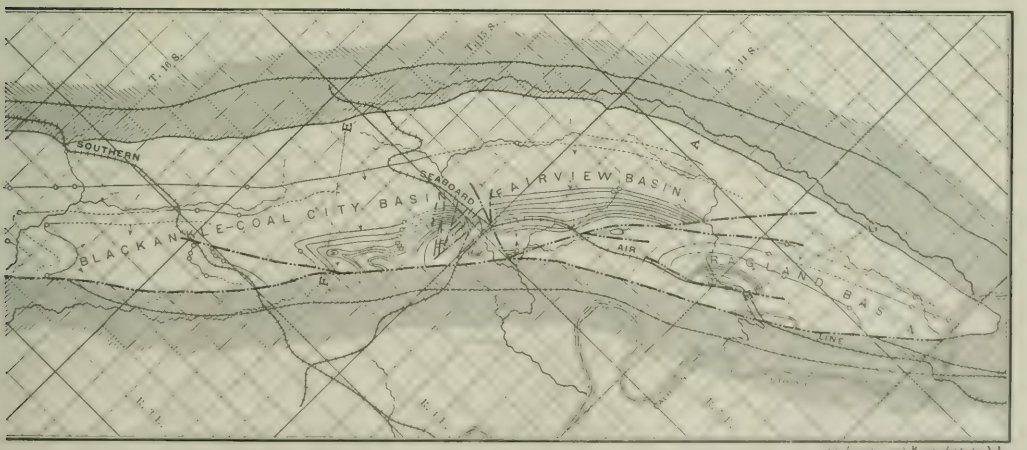
The Coosa is by far the smallest and least important of the coalfields of Alabama; the productive portion of the Cahaba covers about twice, and that of the Warrior about 12 times as much area; both of these latter fields have larger coal reserves.

As early as 1847, the Coosa field was being developed in the Ragland basin. The high grade of its coal for foundry and forge work was early recognized, and during the war it was extensively mined for this purpose, the coal being shipped by barge down the Coosa river. The development of the field since that time has been slow because the other coalfields of the State have offered, with their much larger number and thicker seams of coal, cheaper mining.

Because of the more rapid development

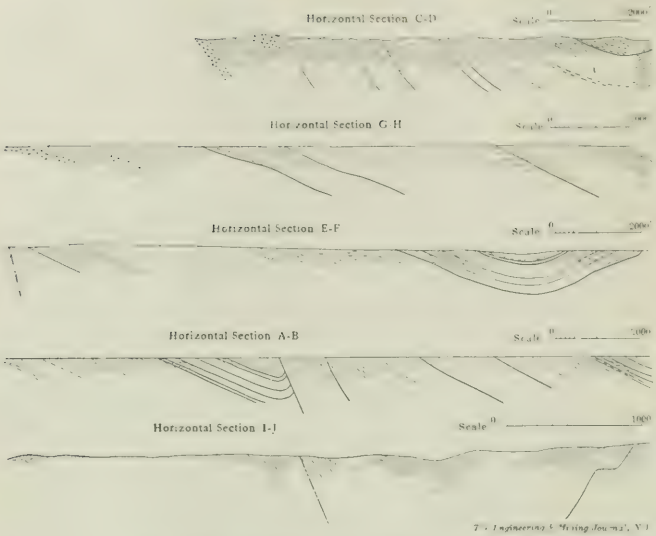


WESTERN HALF OF THE COOSA COALFIELD OF ALABAMA

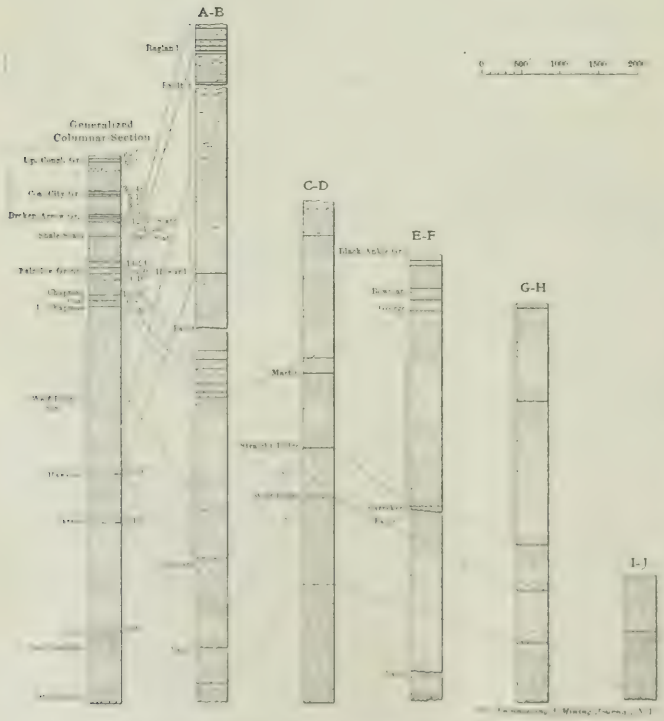


THE COOSA COALFIELD OF ALABAMA— EASTERN HALF

*Assistant to State geologist, University, Alabama.



HORIZONTAL SECTIONS—COOSA COALFIELD OF ALABAMA



COLUMNAR SECTIONS IN THE COOSA COALFIELD, ALABAMA

of the other fields and the greater demand for information concerning them, the State Survey has felt it necessary to first study and map these more important districts, and in consequence a map showing the outcrop of the seams in the Coosa field has been delayed until now, although a preliminary report of general observations was published some time ago[1].

The present map is necessarily somewhat preliminary in its nature because of the lack of development to show up more fully the true nature of the seams. It represents, however, in a concise and usable form the more important facts as to the outcrop of the coal beds, their thickness and the general structure of the field. With the exception of the southern third of the map, which has as a basis a recent and most excellent topographic sheet, the mapping has been done largely by the use of sections. It is hoped that the map will be useful in the guidance of those who are contemplating mineral development in this territory.

Thickness of the Coal-bearing Measures

The thickness of the coal-bearing measures in the Coosa exceeds that found in any other field of the State, being 7000 ft. in the Coal City basin, in which locality are found the thickest seams in the district. Were these same seams present in the southeastern part of the field we would expect a much greater thickness of the measures there, arguing from the much greater thickness of the basal rocks there represented.

Although the thickness of the Coosa coalfield is greater than that of any other field in Alabama (the Cahaba having a maximum of 5230 ft. and the Warrior a maximum of 3000 ft.) yet its highest coal seams correspond to some of the lower seams in the other two fields of the State. From this fact, it is evident that the coal-measure rocks are rapidly thickening toward the southeast where the sediments are of a much coarser nature than those in the Cahaba and Warrior fields to the west. Thick beds of conglomerates, coarse-grained sandstones and arenaceous shales are the predominating rocks and, as is usual in such coarse sediments deposited near shore, the thickness of the beds along the strike suffers sudden changes.

As the Paleozoic sediments thicken toward the southeast in the Appalachian district, there is also an attendant growing complexity in the nature of its folding and faulting so that the structure of the Coosa field is more complex than that of any of its neighboring fields to the north and west. Five of the six basins are separated from their neighboring basins by a well marked fault or series of faults. Practically the whole eastern border of the field is cut off by a large displacement

[1] "Report upon the Coosa Coalfields," by A. M. Gibson, 1895.

Some of the basins are, moreover, very intricately faulted. Practically all of the larger faults, those bounding the field and those separating the different basins, are of the reverse thrust type and in some cases the throw is very great, as for instance the east boundary fault of the three northern basins. Here the Trenton limestone is brought up in contact with the top of the coal-measure rocks, indicating a vertical throw of some 10,000 feet.

The District Is Divided into Six Basins

The Coosa field is properly divided into six basins, each of which, with one exception, is separated, as before stated, from its neighbor by a marked fault which in one case brings to the surface a considerable thickness of the sub-carboniferous measures between.

Named in the probable order of their importance, the basins are as follows:

THE SIX COOSA BASINS.

Name of Basin.	Approximate Area in Square Miles.	No. of Seams.	No. of Seams Workable throughout Their Area.	No. of Seams Workable in Places.
1. The Black Ankle-Coal City basin...	75	20	4	4
2. The Fairview basin.....	32	10	0	4
3. The Ragland basin.....	31	8	0	4
4. The Yellow Leaf basin.....	67	5	0	3
5. The Howard basin.....	45	3	0	1
6. The Cunningham basin.....	7	2	0	0

I have made an estimate of the probable amount of coal that is available in the Coosa coalfield. In those seams where the coal is of the most excellent grade and not too deeply covered, an 18-in. seam has been considered as workable in this summary. The available amount of coal, according to this estimate, is much less than that represented by previous ones, which is accounted for through the facts that those previously made were based on fewer observations, and as a rule at places where the seams were much above the average thicknesses.

The estimated totals for the different basins are:

	Tons.
Black Ankle-Coal City basin.....	25,691,000
Ragland basin.....	13,230,000
Fairview basin.....	19,600,000
Yellowleaf basin.....	17,600,000
Howard basin.....	4,800,000
Total for Cossa field.....	80,921,000

The Ragland basin while it has less coal than either the Yellow Leaf or the Fairview basins is considered second in importance because of the most excellent character of its available coal.

It is semi-officially announced that the representatives of Germany, France, England and Spain will meet in Paris shortly to consider a mining law for Morocco to be promulgated under the acts of the Algeciras convention. The mineral resources of this country are attracting attention, and are likely to become of importance in connection with the extension of European interests in that direction.

Liquid Oxygen for Rescue Work in Coal Mines

By Alfred Gradenwitz*

Owing to the enormous accumulation produced by liquefaction, it will be readily understood that attempts should have been made to use liquid air for the feeding of respiration apparatus for salvage purposes. A drawback encountered in this direction was that the liquefied medium could not always be prepared with such rapidity as would have been desirable.

The fact that the use of liquid oxygen for the same purpose has not so far been considered, may be mainly ascribed to prejudice prevailing in regard to the effects of pure oxygen on respiration. When Jules Verne represents Dr. Ox—one of his most famous heroes—as instigating at will the whole population of a town to revolution, merely by saturating the atmosphere with oxygen, he obviously only expresses the prevalent opinion that the respiration of pure oxygen stimulates the organism to extremes. That this opinion has so far been generally held, even by scientists, is possibly due to the exceptional influence exerted for a long time by Verne's scientific fancies.

As it is, recent experiments have shown the result of respiration to be invariably the same whether ordinary air or oxygen is used. The process taking place in the lungs, that is, the conversion of the hemoglobin of our blood into oxyhemoglobin, in fact, is a purely chemical reaction and accordingly requires a strictly given amount of oxygen, any surplus being ineffective. Excellent results have, it is true, been obtained with oxygen inhalation in medicine, but only in cases when the ventilating capacity of the lungs having become insufficient, the amount of oxygen in the air was unable to entertain that vital process. On the normal organism, oxygen respiration exerts absolutely the same effects as the respiration of air

A Respiration Apparatus Fed by Liquid Oxygen

M. George Claude, of Paris, the well known worker in the field of air liquefaction, accordingly conceived the idea of constructing a respiration apparatus fed by liquid oxygen, thus avoiding, for instance, the so harmful variations in composition occurring in the case of liquid air, and insuring the highest efficiency attainable in this connection.

The liquid oxygen is contained in a metal tank (Fig. 1) and locked efficiently by incombustible glass wool, so that the operator may, without any inconvenience, assume any posture entailed by his work. The tank is surrounded by an incombustible heat insulator (likewise glass wool) the high efficiency of which has been borne out by practice. This heat insulating material is placed in another substantial metal tank. All the parts of the apparatus are so strong that they readily resist any mechanical strain, which is an undoubted advantage over previous designs.

The heat insulation obtained by this arrangement insures an evaporation lasting from 2 to 2½ hours. The apparatus is free from any double-walled vessel with vacuum between the walls, as these organs—while being far too delicate to handle—by cutting off any outside heat, just prevent the very purpose of the apparatus that is, the production of a lively evaporation of liquefied gas.

The oxygen supply is plentiful, the 12 liters of liquid oxygen being reduced in two hours to 1200 liters of gaseous oxygen, corresponding to a rate of 600 liters per hour, which is five times the amount necessitated by a hard manual worker. However, this abundance does not mean any waste of material; on the contrary, it affords another advantage: In the apparatus most in favor at the present time, which are based on the use of compressed oxygen, the very considerable weight of the oxygen bottles entails the utilization of absolutely the whole of the oxygen carried by the operator. So far from discharging into the open, the products of respiration, which still contain much oxygen, are made to pass over cartridges of regenerating matter, in which the water and carbonic acid are absorbed. In the Claude apparatus this costly and inconvenient complication is avoided, only the most exhausted gases (viz., those obtained at the end of each expiration) being discharged, while the breathed-out gases, not discharged, which still contain enormous amounts of oxygen, are kept surrounded by an atmosphere of fresh oxygen.

The Claude Apparatus

The vaporized oxygen does not go directly to the mask; as evaporation is a continuous and relatively slow phenomenon, while inspiration, on the contrary, is a practically instantaneous process requiring a considerable gas volume, some intermediary is obviously required. The vaporized oxygen is, to this effect, thrown out, first, into a caoutchouc bag, of 5 to 6 liters capacity and inclosed in another substantial metal reservoir, and thence is supplied to the mask through a tube of sufficient cross-section. The mask

*Berlin W. 50, Regensburgerstrasse 3

is applied on the face by a pneumatic form, insuring a sufficiently tight closure, in spite of the variations in the form of face.

A special advantage of this arrangement is that the slight depression produced during inspiration applies the mask more tightly against the face, thus absolutely preventing the entrance of any traces of vitiated outside air, whereas during expiration, the mask allows the expired air to escape into the open, when, at the end of expiration, the caoutchouc bag is filled

FIG. 1. LIQUID OXYGEN TANK

both with the products of expiration and the oxygen vaporized between two successive inspirations. The most vitiated gases are thus expelled automatically, without the aid of any special mechanism, and this is why the proportion of expired gases in the bag is never inconvenient, in spite of the absence of regenerators and the use of such small amounts of liquid oxygen. This strikingly illustrates the extreme simplicity of the apparatus, which, strictly speaking, does not comprise any mechanism and thus is free from any risk of breakdown.

The following figures, therefore, will show exact to the advantages claimed for this apparatus.

The [illegible] apparatus, which [illegible] contains the [illegible] liters of oxygen with a weight of 14 kg. The liquid oxygen apparatus has a weight of only 7.5 kg., carries 1200 liters of oxygen, i.e., four times more, and half the weight. It allows the operators to stay at least two hours in an [illegible] atmosphere. When combining with some exercises [illegible] perform [illegible] at a temperature [illegible] to 50 to 60 deg. C. [illegible] in the weight carried as well as the [illegible] design will be found [illegible].

Furthermore, [illegible] is needed in the present case with gas of a pleasant freshness, whereas in the case of the compressed-oxygen respiration, the moist and warmed products of respiration greatly inconvenience the operator.

As regards, next, the liquid-air apparatus recently suggested, its weight is 11 kg. (as against 7.5 kg.), and it requires 5 liters of liquid instead of 1.5 liters. Now, apart from the inconvenience due to the weight and the increased cost, the evaporation of this considerable amount of liquid is bound to produce an enormous cooling effect which it is difficult to eliminate.

The Difficulty Lay in Producing a Sufficient Amount of Liquid Oxygen

The only difficulty in connection with the Claude apparatus lay in the way of producing sufficient amounts of liquid oxygen. With liquid-air apparatus, a very considerable amount of liquid had to be kept ready and a whole battery of filled reservoirs had to be provided for cases of emergency. According to a report from the salvage station of the Belgian state, 420 liters of liquid air distributed to 80 reservoirs would be required for each installation.

While the use of liquid oxygen in the

FIG. 2. CLAUDE RESPIRATORY APPARATUS

place of air already reduces the amount of liquid required to one third, the inventor endeavored further to improve its working conditions by designing a more economical process of producing liquid oxygen. The ordinary processes, in fact, yield a much larger waste of material. Furthermore, the apparatus used for the separating of oxygen and nitrogen require from three to four hours to get into working order, and their efficiency in regard to the production of gaseous oxygen is quite remarkable, their output in liquid oxygen is extremely low. Now, what is required in connection with the Claude apparatus is to produce the liquid oxygen abundantly, at a moment's notice.

The very simple solution of the problem designed by the inventor in conjunction with M. Le Rouge consists of starting from commercial compressed oxygen and liquefying it under pressure by means of expanded air, yielding external work. As oxygen, owing to its relatively high critical temperature (—118 deg. C. as against —140 deg. C. in the case of air) is especially adapted for liquefaction, the device is ready for operation very quickly, liquefaction starting already after 15 minutes. Fruthermore (likewise owing to the high critical temperature) the thermodynamical efficiency of expansion is excellent, the yield of oxygen being as high as a dozen liters for 20 h.p., in spite of the low space requirements. Again, the apparatus, consisting of a simple liquefier, is far less complicated and costly than an oxygen-nitrogen separator.

In connection with the training exercises of the salvage crew, it will, it is true, be found more economical to produce liquid air and to convert it by evaporation into liquid oxygen with an output of 3 to 4 liters per hour. The same process should be used to refill once or twice per week the five or six silvered balloons which constitute the modest reserve for cases of emergency.

From an economical point of view, it will be advisable to provide a central station with apparatus as described for supplying four or five mines, which may be distributed over a range of several kilograms. The first cost of a complete installation, owing to the relative cheapness of the Claude apparatus, will be reduced to about $200.

Mr. Claude finally suggests storing the liquid air from the moment of its production to the moment of its use in simple sheet-metal cylinders insulated with glass wool. His experiments have shown the losses with a reservoir holding 20 liters to be not more than 0.7 liter per hour, which is quite negligible in the present case. There is, therefore, no objection to taking the respiration liquid in such reservoirs down to the mine.

Blaugas

The manufacture of "blaugas," a condensed gas made from waste oil, has been begun in the new plant of the Blaugas Company of America in Long Island City, near the Standard Oil works. The new American company, capitalized at $5,000,000 under New Jersey laws, has F. C. Beaubier as president, and the following directors: Theodore N. Vail, Elbert H. Gary, H. Rodgers P. Shonts, Gen. Charles Miller, Frank S. Hastings, H. B. Baruch, Howard Page and Kenneth K. McLaren.

The state of Matto Grosso, Brazil, is said to possess large deposits of manganese near Cuyaba.

Ray Consolidated Copper Company

The first annual report of the Ray Consolidated Copper Company gives a resumé of the work done to date at the property in Pinal county, Arizona. The following is an abstract of General Manager D. C. Jackling's report dated Oct. 5, 1909:

When these mines were first purchased, it was thought that a satisfactory mill site could be acquired near the town of Kelvin. However, as the mines were developed it became apparent that as a result of the large tonnage of ore disclosed it would be necessary to plan operations on a much greater scale than that at first contemplated. The Gila river affords the only sure and adequate water supply for such large operations, and it was therefore desirable to find a site as near as possible to that stream. The country on both sides of the river, and for a distance of about 50 miles along it, both above and below Kelvin, was thoroughly inspected and it was decided that a point about 12 miles up the river and to the southeast of Kelvin was the most desirable site for the mill and smeltery and the company purchased approximately 4000 acres of land for this purpose. The site selected lies principally on the north bank of the Gila river, directly opposite the point where the San Pedro river empties into it.

The actual mill site is about half a mile from the Phœnix & Eastern Railroad, and the smeltery site is near this line. The Phœnix & Eastern is now extending its line from Winkleman, the present terminus, up the Gila river to a connection with the Gila Valley, Globe & Northern Railroad, at San Carlos, and when this connection is completed, which is promised at an early date, the company will have a direct outlet east to the Southern Pacific instead of by way of Phœnix, as at present.

Geology and Development of Mines

Since the last statement to stockholders the company has received from Spurr & Cox a geological report which finds that the orebodies consist, generally speaking, of secondarily mineralized bodies of altered schist, associated with lesser masses of granite porphyry, more or less altered, and mineralized similarly to the schist. Of the 1000 acres of mining ground owned by the Ray company, about 470 acres show indications of thorough primary mineralization, and that there is a less mineralized area of about 131 acres. The area of maximum primary mineralization corresponds in general with that of the secondary ore formation, but the parallel is not complete.

The developments have been prosecuted for the greater part of the past year by the use of 11 churn drills, in connection with a considerable amount of underground work, both in the Ray and Sharkey orebodies, although most of the underground work has been confined to the Ray section. The continuance of underground work was for the double purpose of securing ore for the experimental mill and checking the results of drilling by driving raises alongside a considerable number of drill holes.

Engineer Henry Krumb's report covering drilling operations for the month of September, 1909, shows fully developed ore in the five groups of holes being drilled to an amount somewhat exceeding 38,000,000 tons, having an average value of 2.26 per cent. copper. The total area containing this amount of ore was 95.9 acres, the average thickness of ore 114.7 ft., and the average thickness of capping 240.1 feet.

In addition to the above-mentioned quantity of ore which is fully developed, or as thoroughly as it can be by the system of drilling in 200-ft. squares, there is such a quantity of partially developed and indicated ore as warrants the assurance that the areas now being drilled will be shown to contain at least 50,000,000 tons of ore without any extensions of their existing limits. Active developments are being continued at a somewhat reduced rate underground, in preparation for mining when the new concentrator is completed.

Equipment and Operations Proposed

It has been decided to construct a concentrating plant on the site near Winkleman, of a daily capacity of 5000 tons. Designs have been practically completed for this plant, and the grading for the plant, and for the three miles of railroad necessary to connect it to the Phœnix & Eastern Railroad, are now in progress.

The topography of the ground selected for the mill site is well suited to the requirements, and the area having a desirable slope is sufficient to accommodate a plant of about 12,000 tons daily capacity. The character of the smeltery to be built has not yet been fully determined upon.

A steam-driven electric power plant, of suitable size to accommodate both mill and smeltery, will be situated about half a mile from the mill on the Phœnix & Eastern tracks. Power will also be transmitted from this plant to operate all machinery at the mine.

At the mine, preparations are being made in the way of opening up main levels and blocking out the ground for mining. A two-compartment vertical shaft is being sunk on the edge of the Ray-Parsons orebody, from which this orebody will be mined in three levels, the first one corresponding to the old 50-ft level of the Ray mine, where several thousand feet of existing workings can be used to advantage. The inclination of this orebody is such that the three levels, which are about 100 ft. apart, and driven in different directions, will each be under the orebodies it is intended to serve, so that mining operations along the lines of any one of the modifications of what is known as the caving system may be carried on simultaneously on each of the levels without interfering with the others.

The maximum distance any of the ore from the Ray-Parsons body will have to be hoisted is approximately 300 ft., and the hoisting plant is being designed for skips of 12½ tons capacity, running in balance, and will have a capacity of hoisting 5000 tons in not to exceed 16 hours. A coarse-crushing plant will be located at the shaft, and the ores crushed to about 1-in. size before being sent to the mill.

The Railroad

The standard-gage railroad connecting Ray with the Phœnix & Eastern tracks at Kelvin, six miles in length, should be completed in about sixty days. The grading is now approximately two-thirds finished. As was stated in a former report to stockholders, a favorable arrangement has been made with the Phœnix & Eastern Railroad to transport ore from Kelvin to the mill and smeltery. This service will include hauling the ores over the company's three-mile connection at the plants, and also includes all switching, so that it will not be necessary to run the Ray Consolidated locomotives off the company's six-mile branch from Kelvin to Ray.

The experimental mill was closed down early in August, after having been in operation for about ten months at a tonnage rate varying from 100 to 150 tons per day. The results of its operation are very valuable, as indicating clearly the best design and arrangement of apparatus for the new plant. During the last period of its operation it ran on an ore of the normal grade shown by all developments, and the results during that time show a saving of about 70 per cent. of the copper contents, accompanied by the production of a 27 per cent. concentrate.

There were many features in this plant that were not well designed or arranged to effect the best saving possible, and its operations being of an experimental nature were necessarily intermittent and irregular, so that it may be expected that the percentage of recovery in the new plant will be higher than that shown in the experimental work. The grade of concentrates will be about the same.

The stock of the company has been increased 200,000 shares to a total of 1,000,000 shares, par value of $10 each, all issued or subscribed for excepting 35,350 shares, which are held for the conversion of the remaining outstanding bonds. The balance sheet of June 30, 1909, places a valuation of $5,170,800 on the property; development and construction, $807,808; and $1,285,536 as available cost.

Miami Copper Company

According to J. Parke Channing about 40 acres of the mineral ground owned by this company have been developed to date, and the estimate of ore reserves exposed by shafts, drifts, crosscuts and raises is something over 13,000,000 tons. There is not the slightest doubt that within this area there is considerably more ore actually in existence, and it is probably safe to assume that this 40 acres will produce 14,000,000 tons of ore, after allowing for losses in mining. The property of the Miami Copper Company was taken under option by the General Development Company and work begun upon it in January, 1907.

One point of great interest in the deposit of the Miami Copper Company is its compactness, ore being proved according to the report to extend from a depth of 220 ft. to a depth of 620 ft., or 400 ft. vertically; and it seems likely that this depth by no means limits the bottom of the ore. Taking into consideration this compactness of the orebody, its grade, adaptability to water concentration, and its physical character, which particularly adapts it to the cheap caving system, the property promises to be among the successful mines operating the so-called "disseminated orebodies."

As near as can be determined, the grade of this ore will be 2.75 per cent. copper, from which there can be extracted 40 lb. of copper per ton. This would give a total of 560,000,000 lb. of copper. Estimates of cost indicate that this copper can be produced for 9c. per lb., delivered at New York.

Of the 668 acres owned by the company 250 acres are strictly mineral, of which only 40 have been developed. Probably 60 acres contain nothing, leaving 150 acres with good prospects. At present the mine facilities are being taxed to their utmost in developing, and but little work in new territory is being carried on under ground. When the permanent plant is erected drifts can be extended laterally over a large portion of the undeveloped 150 acres.

Development

The mine is being developed and mill equipment erected for a capacity to treat 700,000 tons of ore per year, which should yield 28,000,000 pounds. At 13 cents this would show an annual profit of $1,120,000, or $1.87 per share. At 15 cents for copper the profit would be increased to $1,680,000 or $2.80 per share. On ore blocked out this rate could continue for 20 years.

A large working shaft has been sunk midway between the orebody and mill site to a depth of 420 ft., and a new ore extraction level has been established at that depth in the mine, midway between the 570 and 570 levels. As soon as the 420 level is in working condition the shaft will be sunk to the 570 level. The shaft itself will probably have to go about 100 ft. below the 570 level, so as to allow for the large 1000-ton pocket from which the skips will be loaded.

The ore will be mined by the caving system. The company has secured and developed two valuable water rights, one on Pinal creek and the other at the lower end of Miami wash, and in addition has secured from the Old Dominion 1,000,000 gal. of water a day.

An experimental mill has been installed and kept in continuous operation with results so satisfactory that it was decided to build a concentrating plant capable of treating 2000 tons of ore per day. The favorable topography at the mine determined the best location for this mill to be on a hill-side near the orebody. The excavation for the mill has been completed and the construction of the concrete foundations is now in progress.

The Gila Valley, Globe & Northern Railroad extension was opened for traffic Oct. 4. A smeltery will not be erected for the present. Early tests showed that the ore would concentrate 15:1, but later work seems to show as good a recovery with a concentration of 20:1. There will probably be produced daily about 100 tons of concentrates running 40 per cent. copper, which will be treated by one of the several local smelters.

Power Plant

For the purpose of operating the mine and the mill a power plant is being erected in which crude oil will be used as fuel to generate steam in three 600-h.p. boilers, with steam at 185 lb. pressure and 100 deg. superheat, used in three four-cylinder triple-expansion engines, each direct connected with a 1000-kw alternating-current generator, producing three-phase current at 6500 volts, 25 cycles. The power house will also contain two four-cylinder, triple expansion, two-stage air compressors, each with a capacity of 4000 cu.ft. of air. The current generated in the power house will be used for pumping water and driving the mill, together with the various shops and underground haulage. The compressed air will not only be used for operating the air drills underground, but also for operating the hoisting engines at the main shaft, the power house being distant one half mile from the mine and mill. By the use of oil for preheating this air just before its use in the hoisting engines, it is estimated that economical results will be achieved and that the generation of power will be concentrated in one house, under the most favorable conditions for economical operation.

The number of men engaged in all classes of mining in Victoria during the year 1908 was 17,266, according to the *Queensland Gov. Min. Journ.*, Sept. 15, 1909.

The Potash Salts Situation

The fight between the Kali-Syndikat and the producers of potash salts who have been outside that combination since its reorganization, is to be taken up by the German government, according to a despatch from Berlin, which says:

The completion of contracts between the German potash mines and the American fertilizer companies at prices lower than those of the syndicate has influenced the Imperial Ministry of the Interior to prepare bills for submission to the Reichstag with the object of creating a Government control over the potash industry.

The legislation proposed would prevent the filling of orders at the prices contracted for by the Americans, who have placed orders covering a greater part of their requirements up to 1917.

The Government is taking this step, it is understood, on the suggestion of the States of Prussia, Anhalt and Schwartzburg-Sondershausen, where the potash mines are owned. The mine owners are supported in their attitude by a majority of the syndicate mines, which, during the embittered controversy among themselves over a renewal of the syndicate agreement, lost their chance to charge American buyers about 20 per cent. more for potash than German buyers pay.

The legislation in course of preparation will provide for Government control in perpetuity of potash production and sale. The Government will regulate export prices by placing a tax upon potash exported equal to the difference between the Government schedule and the prices as fixed by the mine owners when free of Government control. In order to prevent sales abroad or at home at prices below the Government figures, the legislation would place a producing tax upon potash production when it has exceeded the Government allotment.

If these measures should be adopted America, which takes about 60 per cent of the potash exported, would be obliged to pay monopoly prices. The legislation must be approved by the Federal Council before it is submitted to the Reichstag. It will quite likely receive the support of the entire landed interest for the reason that it will tend to benefit German agriculture at the expense of a foreign country, which in this case happens to be the United States.

The American interests here are concerned over the situation and will probably make representations concerning it to the State Department at Washington. Such a course has been suggested by local representatives of the American fertilizer companies.

In the 300-stamp mill at the Alaska Treadwell a duty of 5.34 tons per stamp per 24 hours was averaged during the year ended May 15. A duty of 4.70 tons was averaged in the 240 mill.

Views, Suggestions and Experiences of Readers

Comments on Questions Arising in Technical Practice and Debatable Points Suggested by Articles in the Journal

CORRESPONDENCE AND DISCUSSION

Mining Conditions in Nicaragua

I have read with interest the article which appeared in the JOURNAL, July 31, 1909, under "Special Correspondence" from Nicaragua. Permit me to state that there are several English syndicates now willing to invest in the Prinzapulka mining district in the vicinity of Matgalpa and La Libertad. Many good properties are for sale. Unfortunately in this country good and cheap properties are often overlooked in the preference for the dearer ones. It does not need days, but months and possibly a year, to look over a mining district and pick out the bargains. As things stand in Nicaragua, one-half of the mines and three-fourths of the prospects are for sale. Foreign investors who buy through agents, promoters or merchant firms, here, pay nearly double the price at which they could have bought directly.

In the Rama mining district there is only one working company, the Topaz Mining Company, which owns a number of mines, an electric power plant and a cyanide plant. It is now running twenty stamps. The output is approximately $9000 per month, with a good prospect for an increase to between $12,000 and $15,000. If the other properties owned by this company were opened and operated and the number of stamps increased, the output could be largely increased. The Quisilala Mining Company is also in the Rama district. This company is installing a five-foot Huntington mill, which will soon be ready for operation. The mines are about 18 miles from the Rio Rama, which is a long distance in an ever-wet country, without roads and without people who know how to make good roads.

There are many good properties in the Rama district, and the geological formation is much superior to any other district in the country. The Rama district, by far the nearest to sources of supplies, has ample labor, and cheaper provisions than can be obtained in the Prinzapulka district. The discovery of gold dates back to long before Columbus discovered the country, and at the time of this visit the Indians showed him gold which they brought from the interior.

Another promising district on the Atlantic coast of Nicaragua is the Wawa district, where there are a large number of partially developed prospects with good ore exposed but which cannot be worked on account of lack of ample capital. The Wawa district is less accessible than the Rama mining district, but still much easier to be reached than the mines in the Prinzapulka district. Accessibility and large water power are two of the cardinal conditions to make a good mine in Nicaragua.

Spring crops have been bad this year all over the Atlantic coast of Nicaragua, and owing to the high duty and excessive profits of the importing merchants, foreign provisions are at prohibitive prices. There has been much starving and consequent sickness among the poorer classes. In the old mining town of La Libertad the death rate has been enormously high.

A mining possibility which has been overlooked, or at least underestimated by those who are looking for investments, is the black sands from Walpasixa, along Cape Gracias, a distance of over 120 miles, and whoever will take the trouble to look well into these will certainly find many very promising locations. Many of the sands derive their mineral content from the rivers which flow down from the mountain countries.

The greatest mistake an investor can make is to come out "booked," so to say, to look at one or two special mines. He will be disappointed sooner or later. Miners or prospectors without plenty of money would do well to stay away from here. They are sure to come to grief, and to save them from this I repeat this warning.

One cannot talk business in this country without asking the question, "How does the government stand toward the mining industry?" In answer to this, in most cases, the laws are very favorable. It is true that the import duties charged on provisions and other necessities are high, as well as the profit charged by the merchant. But on the other hand, machinery, cyanide, quicksilver and similar supplies are free of duty for the mines, and many provisions can be successfully grown here to save transportation and duties on merchandise imported. The mining laws are liberal and liberally interpreted by the authorities along the Atlantic coast. The only trouble is that they are not guaranteed and that the government might change them any day. But this dark cloud has its silver lining. The president and a number of the high officials of the country have recently invested heavily in mines themselves, and it is to their interest to foster the mining industry, so that an unfavorable change of the mining laws does not seem probable in the near future.

I cannot close these lines without warning investors to keep aloof from all concessions. Buy only in legitimately organized mining companies. Concessions have been the scourge of the country and have brought it to the verge of financial and moral ruin. Concessions are not worth the stamped paper on which they are written. They can be canceled any day and under any pretext. They are nothing more than a worthless sheet of paper given to a promoter, who uses it to fleece the guileless public in the United States and Europe. A. B. W.

Rama, Nicaragua, Sept. 18, 1909.

Sources, Treatment and Prevention of Malaria

The paper on malaria by Messrs. Chester and Semple, in the JOURNAL of Oct. 9, 1909, should be learned by heart by everyone who travels. It is particularly valuable to those who mine. It is to the point and is well and clearly written. In my own case, I had a dictionary handy and consulted it frequently. The editor should be reproached for not providing footnote definitions of the technical medical terms. For the benefit of the miner who is in the malarial country and whose only book may be a Kent or Trautwine but certainly not a dictionary, I offer the following:

When speaking of the blood as "anemic" and filled with "toxin" the doctor is trying to say that it titrates low and carries soluble sulphides. When he says the patients breathing becomes "loud and stertorious," he simply means that it sounds like that of the man in the upper berth across the aisle. Saying that "no diaphoresis is induced by antipyretics" sounds bad, but only means that the patient does not sweat.

Cinchonism has nothing to do with a diamond hitch or a cinch (it is pronounced sin' kon ism) and stands for the bees in your bonnet, which are sinchronous with each heavy dose of quinine. The doctor says: "Five hours after exhibiting the last dose of calomel, etc.," but he really does not mean that. It does no good to just see the dose, you must take it and show the doctor.

The suggested use of "ice, or cloths wrung out in cold water held in the hand and mouth" should be called to the attention of the entire camp the day after pay day. In fact, it is worthy of being framed and hung over the pay window in any

country, and the absence of fever will not do the least detriment to its value.

Chicago, Oct. 13, 1909. COGNOS.

The First Job

Upon reading the letter of Stanley S. Roberts in the JOURNAL of Oct. 23, 1909, I was struck by his advice to the recently graduated mining student as to securing a job. This advice is sound and Mr. Roberts recommendation is good, but to my mind the young man's first mining job or jobs should be secured before, not after, his graduation. The profession of mining engineering requires many things of the man who would follow it, and the percentage of youths entering our mining schools who are fitted by disposition or "gray matter" to practice that profession is, I believe, low.

There is an atmosphere of romance that surrounds the very word, mining engineer. It hints of adventure and travels in wild places, with the lure of treasure to be found during a care-free life. It is this that makes mining the choice (often an unfortunate one) for young men who are totally unfit for the life of the mining man, both as a manner of living and in a business way. My advice to boys asking about the best mining school has always been: "Go to some mine in the West and get a job for a year. At the end of that time, if you still want to mine, it makes little difference which school you choose."

Further, how can a man study mining intelligently who does not know or realize the import of what he studies? A set of timber or a piece of bad ground looks entirely different in place from its pictured representation. A little such experience would prevent, too, the sad spectacle of a graduating class receiving as gospel truth the solemn declaration of a joking superintendent who informed the class that the steam pipes (to the pumps) were to supply steam heat to the men at the working faces. Much of the prestige of the Western mining schools is due to the fact that their students one and all spend their vacations as workmen in the mines and smelteries and thus not only lay a practical foundation, but also see for them selves the things about which they study.

GRADUATE.

Denver, Colo., Oct. 18, 1909.

Utilizing Blast Furnace Gases at Gary

In the issue of Jan. 2, 1909, is an interesting account of the utilization of blast furnace gas at Gary, and I beg to call attention to an error of computing power. The author, in giving the horsepower of the gas, H.P. correctly, underrated the horsepower. The author says: "The gas from each furnace passes into a gas [illegible] which [illegible] a reservoir called the 'dry-dust catcher,' from which the gas passes into another large pipe which leads upward some distance to increase the quantity of dust dropped."

When the gas is rising vertically it will retain all particles so small that their rate of fall, in still gas, would not exceed the rate at which the gas is rising. The best result would, therefore, be obtained by having the gas flow horizontally, preferably in a flue with rectangular section, at the bottom of which should be a grating through which the fine-dust particles could fall into a perfectly still atmosphere. From this dust reservoir below the flue the dust could be removed intermittently by means of a screw conveyer without permitting any escape of the gas, as the screw conveyer would be at all times buried beneath the dust and the dust itself would make a sufficiently good seal to prevent the escape of gas.

In this way all particles of dust of such size that they could fall a distance equal to the diameter of the flue during the time that would elapse while any given dust particle was being carried by the stream of gas from one end of the flue to the other, would have a chance to fall into these dust bins beneath and a greater degree of separation would thus be obtained than could be obtained in an equal length of flue in which the gas was rising. Mechanically speaking, the problem is the same as that of removing traces of moisture from natural gas. The old fashioned vertical water catches give the minimum result in proportion to the expense. The horizontal water catches, which I have used for 20 years, give a maximum separation of water, in a minimum of space and time and with a minimum expense.

GODFREY L. CABOT.

Boston, Mass., Oct. 27, 1909.

Copper Refining in Australia

Referring to the operations of the Electrolytic Refining and Smelting Company, of Australia, and the illustration of one of its furnaces in the JOURNAL of Sept. 11, 1909, the item in question was in error in stating that the starting of the Port Kembla works inaugurated electrolytic refining of copper in Australia. The first electrolytic refinery was erected at the Wallaroo smelting works, South Australia, by myself and was working in the year 1891. The second was erected and worked at Lithgow about the year 1900, by Mr. McMurtrie, previously my assistant at Wallaroo.

T. C. CLOUP.

London, Sept. 27, 1909.

The Bernal Kong mine in Sonora, Mexico, has a large deposit of complex ore carrying a good value in bismuth. At tempts to flotate the ore had made the bismuth from [illegible] [illegible]

"Rush of '49" Celebration

The "Rush of '49" celebration, which began at Stockton, Cal., on Oct. 26, is a unique revival of the old days. Roaring Camp is a city of log houses that has been erected in the public square as typical of the camps which dotted the California gold fields when the overland trails were filled with caravans of prairie schooners. It is at the foot of a range of painted mountains down the sides of which Gold Gulch creek foams through a stage cañon. In the background are the shacks and tents where the miners live, the dance hall, the saloon, the jail, the office of the *Gold Gulch Gazette*, the gambling den, and the theater with its Mexican fandango.

In the creek miners wash real gold from real pay dirt. The opening day was filled with a long program of exciting incidents, including a hold-up, an attack by Indians, a rush for a new discovery of gold, and a riot in the Red Dog saloon. The dress of the people has changed to that of the "Forty-niners." All are wearing "guns." Pioneers are arriving from all parts of the State. Joaquin Miller will visit the city during the "Rush."

Alaska-Yukon Boundary Line

The work of delimiting the international boundary line between Alaska and the Canadian Yukon has been continued throughout the fieldwork season of the current year and good, though necessarily slow, progress made. The line southward from the crossing of the Yukon river has been marked by permanent aluminum-bronze monuments.

The work accomplished in 1909 includes the projection of the line northward from Yukon river, and southward to the Natazhat river from White river, the terminal point of the 1908 operations; also the continuance of the triangulation and the topographic survey, and the placing of permanent monuments northward from White river.

This boundary work is being done by United States and Canadian survey parties working independently, but each is accompanied by a surveyor from the other party whenever identification of particular points has to be made.

The deposits of mica in the Big Bend of the Columbia section of British Columbia, are at an elevation of 7000 to 8000 ft. The bands of mica schists are described as containing segregations of [illegible] ft. in width and these [illegible] of mica up to 2 ft. in length. Near the surface the mica crystals are [illegible] but below the zone of weathering [illegible] and clear. Mica crystals were [illegible] by a recent exploring party along a [illegible] of [illegible] miles. Access to the [illegible] is yet only by trail.

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*Illustrated

Tin Mining in Malaya

The statistical position of the tin industry of the Federated Malay States (Perak, Negri Sembilan, Selangor and Pahang) is unsatisfactory as compared with that for the same period of last year; the anticipation of increased production has not been realized. For the half year ending June 30, 1909, the production was 22,930 long tons against 24,650 in the corresponding semester of 1908. It was thought that the amalgamation into the British Empire of the Siamese Protected States would have caused increased returns, but up to the present, the expectations have not been fulfilled. The newly acquired territories do not appear to be rich in minerals and transport difficulties have to be faced, the principal means of communication with the interior or supposed mineral area being by means of rivers which are not always navigable. The sources of the principal rivers are in the mountains which intersect the peninsula and in the dry season there is seldom more than a few feet of water, while a few days rain causes them to rise to flood levels; the rise and fall have been known to be as much as 20 feet.

Tin mining in Malaya has for the past been carried on principally by Chinese, who even now, are responsible for about 85 per cent. of the output, but the alluvial deposits on which they have been mining are fast being depleted and the future of the tin industry will depend upon dredging low-grade ground or hydraulicking, both of which methods are being introduced by European and Australian miners with a certain amount of success. Lode mining is still in its infancy.

The price at which tin can be profitably produced is about £150 per ton, but as prices are governed by the demands of London and New York, the miners have little or no voice in fixing quotations. There was some sort of an attempt, just before the "Great Tin Slump," made by Chinese to manipulate the tin prices, but it ended in complete failure and led to a disturbance of trade from which it has not as yet recovered.

An erroneous idea prevails that the Chinese are wealthy and can in consequence rig up the market; but in fact their principal source of finance is the Indian money-lenders (chittiies) whose charges for accommodation are so heavy that whatever profits are made in mining or trade are absorbed by them. The European banks do not encourage mining enterprise by accommodation or otherwise. The alleged profits made on mining can, therefore, be considered to benefit the Indian money-lender more than the bona fide miner.

The labor question has not lately given any trouble, for although there has been a shortage of 30,000 native miners, it has not told materially on the output for the past year, but rather has increased the output by about 40,000 piculs (one picul is equivalent to 133⅓ lb.)

The opinion in Malaya is that the future of the tin industry will depend upon the American market and the production of other parts of the world. The price will evidently be regulated to a large extent from New York, inasmuch as the United States consumes upward of 35 per cent. of the world's production of tin. The bogey of fabulous eastern speculators may be exploded for there is not sufficient capital out there to make any firm stand against the interests of the West and the actual producers are living a hand-to-mouth existence, being forced by circumstances to sell their products at the daily market price. From past experience the Chinese will not hold stocks for speculation and, therefore, there will be no great likelihood of stocks accumulating in the East.

The product of the tin mines is sold in the form of ore to Europeans who have large smelting works at Singapore and Penang and the refined tin is put into the market from there. The Chinese do little or no smelting and in the few instances where smelting is done by them, the ingots have to undergo refining in the Colony. The charge for smelting amounts to about $25 per 2240 lb., the dollar being worth 2s. 4d. The export duty on tin or tin ore works out to about 13 per cent. *ad valorem* and is based according to a sliding scale on the price ruling on day of export. No tin ore may be exported out of the Federated Malay States except to the neighboring Colony and any quantity sent outside is subject to a surtax of $30 a picul in addition to payment of the ordinary duty. It was the imposition of this surtax that prevented the importation of tin ore from Malaya into the United States, where the smelting of the International Tin Company, at Bayonne, N. J., remains idle, having never [illegible] operation.

The Proposed Mineral Taxes in Great Britain

The new mineral rights and duties included in the British budget have been again under discussion in parliament recently. The original proposals of the chancellor of the exchequer have been considerably changed or modified since the introduction of the budget in the early part of the year. The taxing of "ungotten" minerals has been happily dropped as an unworkable system of taxation and a tax on royalties and mineral wayleaves substituted. The amount of this tax is to be at the rate of 1s. for every 20s. rental value. In the case of mines worked under a mining lease, the amount of the tax can be determined without difficulty, but where minerals are worked by the owner the valuation of the tax is not so simple. In this case the tax will be claimed on the estimated rent that the proprietor would have received if his property had been let on lease. The assessment will be made by government commissioners.

The principal arguments brought against the tax were that the burden would ultimately fall on the industry, which in many cases was not able to stand it, and not on the landlord; and further, that as no definition was given of the term "minerals," there would be a great deal of interference with mining business without adequate return to the exchequer.

In order to narrow down the application of the tax it has been agreed that common minerals such as clay, gravel, sand and chalk are to be excluded from the general term "minerals." Stone is at present dutiable, though the chancellor has stated that if he finds it possible to draw a distinction between ordinary road stone and more valuable stone like granite, he would be prepared to consider the exclusion of the less valuable material. A proposal to exclude all minerals worth less than 4s. a ton was rejected by the government. Besides the mineral-rights duty there is to be an increment-value duty, that is, a duty on any increased value that a mineral property may acquire in the future. The chancellor of the exchequer himself admitted that the budget was complicated, and said that while the increment tax would be easy to calculate in the case of a sale, it would be almost impossible to do so in the case of a lease. It was for this reason that the increment duty was imposed in the shape of an annual tax, the charge being one-fifth upon the difference of the original site value and the rents or the royalties in any given year.

An example as to how the calculation of the tax would work in practice was given as follows: Suppose a mineral property were valued at £12,500; that would be divided by 12½, the number of years purchase, giving £1000 a year as the annual value. Again, assume that the owner leased the property for a royalty of 6d. per ton and a dead rent of £2000. The first year he simply drew his dead rent, the royalties not reaching £2000. Accordingly £1000 was deducted from the £2000 and the increment of that year was arrived at, upon which the government duty was one-fifth. The next year the royalties became, say, £3000 and £1000 is deducted. The increment is therefore £2000, of which the government takes one-fifth. If the royalties went to £10,000, the government would take one-fifth of £9000. As pointed out in the debate, this increment duty, in spite of the official explanation given, bristles with difficulties and seems likely to bring those who are the owners of minerals, as well as the unfortunate officials whose duty it will be to collect the tax, into the lunatic asylums.

The Broken Hill Proprietary

In its report for the first half year of 1909 the Broken Hill Proprietary Company congratulates itself that because of the labor strike it was able to operate only one month of the semester. The ore reserves of the mines remained practically intact during a period of low metal prices, and at the present time it is not the intention of the directors to reopen the mines until justified by an improvement in prices for the metals which will enable the company to pay the wages set out in the award of the arbitration court. The directors reckon that the men sacrificed over £265,000 in actual wages, while the cost to the company, including arbitration court expenses, was £33,000. The transportation companies lost £160,000, of which the larger proportion means wages, while moreover the miners' union raised by levy and contributions over £45,000.

"All of this loss could have been avoided," say the directors, "had the men agreed to the proposal of the company to continue work at the wages prevailing in 1906, and if the Federal Court awarded a higher rate, such would be paid to them as from Jan. 1, 1909, the amount involved being held in trust for their account. This offer was declined. The directors of the Proprietary company feel that their experience with the arbitration court has not been such as to inspire confidence in that tribunal. When the company's operations were suspended last January, the number of men employed was 4427. At the present time the number is less than 2000. It appears that whatever may be the humane considerations of the principle of a "living wage," the employer of labor cannot be compelled to pay more than he can afford to. Natural laws, harsh as may be their operation, are always bound to prevail."

Commercial and Official Scrap

There is often a difference between official and commercial definitions, which may lead to curious results when enacted into law. In the new tariff law a duty of $1 per ton is provided on scrap iron and steel, but the law goes on and defines scrap iron and steel as that "only fit to be manufactured by melting." Now, in the commercial sense scrap includes a wide range of material, including wrought scrap, which is worked up into blooms, bars, plates and other material. Questions at once arose under the new law, which were referred to the Treasury Department. The decision is in accordance with the letter of the law; that is, nothing is scrap unless it is to be remanufactured by actual "melting," or reduction to a liquid form. If it is only subjected to heat and remanufactured by rolling or hammering, it is not legally scrap.

This limits scrap in the tariff to what is known in trade as cast scrap and to the steel scrap used in making open-hearth steel, as those materials are actually melted. The large class of materials known to trade as wrought scrap and by various other names, may be technically and commercially scrap, but not officially. Congress has left it without a name, and has made no provision for it anywhere that we can find in the tariff law—unless, indeed, it comes under the head of "junk," which is on the free list. Another decision may be needed to settle the status of this officially deserted and abandoned "scrap." If it be neither scrap (officially) nor junk, we wonder what it can be.

A New Scheme to Hook Suckers

An Ex-Convict Conducting an Elaborate Campaign to Sell Mining Stock at Greatly Inflated Value and Enormous Profit to Himself

ELY CENTRAL COPPER CO.

A shameful attempt to inveigle the public into a mining gamble against long odds is being carried on from New York. This is the attempt to sell the stock of the Ely Central Copper Company, which is being advertised upon an extraordinary scale. The leader of the ring that is conducting this operation is a man of unsavory record; of a record so unsavory that he has previously served time in prison. The ring comprises other persons who expect to profit from the deception of the public, and a variety of puppets, stalking horses and stool pigeons who are manipulated by the ringleader. The operation is a blow to honest mining. We speak in behalf of honest mining. It is time that a halt be called to these bloodsuckings of the public.

In the JOURNAL of Oct. 12, 1907, W. R. Ingalls, the editor, in writing about the mines of Ely, said: "The Ely Central was widely advertised as possessing a large area of land directly adjoining and between the two great mines of the Nevada Consolidated. The orebodies of the latter lie flat and are of unknown extent. What was more plausible than the argument that they might connect through the Ely Central property? Doubtless the promoters advanced that argument in good faith, but with ignorance as to the geological conditions. As a matter of fact, the area of the Ely Central company between the Eureka and Ruth mines is limestone and rhyolite, chiefly a large flow of the latter. . . . The Ely Central has done a good deal of drilling in the rhyolite, but has not yet discovered ore so far as there is common information. . . . . The three big companies are the only ones at Ely which have "developed" orebodies. There is nothing else at Ely which is more than a prospect. Among them there is little evidence of activity in exploration, although the orebodies of the kind they are especially seeking are capable of location by the cheap and effective method of churn drilling."

Since the writing of the above there has been no substantial change in the condition at Ely then referred to. We called attention to the absurdity of the claims of the present promoters of the Ely Central Copper Company in an editorial in the JOURNAL of Oct. 9, 1909. This warned our own readers, but the great mass of the gambling public has continued to furnish sport to the leeches.

INAUGURATION OF THE PRESENT SCHEME

George Graham Rice, alias Simon Jacob Herzig, after an unsavory record in the East and a stormy career in Nevada, casting about for a new game, hit upon Ely Central. With the keen perception of an artist in his line, he grasped the great possibilities of advertising to suckers ignorant of the facts the shares of this company owning property between and adjacent to the two groups of the Nevada Consolidated, a company that was just making good in most brilliant fashion.

Rice, or his agents obtained options upon some remaining treasury stock of the Ely Central at about 50c. per share, and also obtained options on certain private holdings at various prices, in all cases for small sums in comparison with the recent quotations. In the aggregate Rice is believed to hold options on about 880,000 shares. He also purchased some scattered lots.

THE RING

About a year ago B. H. Scheftels came to New York and organized B. H. Scheftels & Co., with offices in the Edison building. In 1902 he established a brokerage business in Chicago and fell in with Rice by marketing stock of some of the Nevada wildcats of the latter. He removed to New York early in 1909. Rice himself is of such evil reputation that he cannot appear openly in any "business" that he is conducting, and consequently requires a figure-head like B. H. Scheftels. The latter made his debut in New York in connection with the operation in Rawhide Coalition, one of Rice's former affairs, which was a notorious and unsavory feature of the curb market last winter. After that fiasco the Ely Central business was taken up.

Along with Rice and Scheftels is Nat. Goodwin, the actor. This worthy appears on the letterhead of B. H. Scheftels & Co., as vice-president of that corporation. Previously, Goodwin was associated with Rice in the Nat. C. Goodwin Brokerage Company, of Reno, Nev., and in the Rawhide Coalition concern.

The ring has a tailing of followers among the disreputable brokerage firms of New York, who speak favorably of Ely Central in their "market letters" for reasons that can be left to the imagination.

RICE'S PAST RECORD

The life story of George Graham Rice by reason of frequent, successive and explicit exposures published in numerous of the reputable newspapers of Nevada, Denver and New York, has become very well known. It is of public record that as Simon Jacob Herzig, the name which his honorable parents gave him, Rice was in April, 1890, at a very early age, convicted of larceny in New York and sentenced to the Reformatory at Elmira, N. Y., where he was detained, under the official designation of "No. 4018," until September, 1892. In 1895, only three years after completing the sentence for larceny, he was convicted before Recorder Goff in the city of New York of forgery and sentenced to six years in the State prison at Sing Sing, where he was designated "B-516." This second penal sentence was finished in 1899, owing to the customary commutations, and Herzig, afterward by his own choice to be known as "George Graham," or "George Graham Rice," began his career in higher (?) finance.

He became identified with the horse-racing game in and about New York. He advertised as a "tipster," and later was president and general manager of the notorious Maxim & Gay Company, race-track tipsters, whose operations were investigated by the U. S. post-office authorities with the result that a fraud order was issued against the company. He published a racing paper, and was actively interested in the race-tip business under various names and connections in several cities.

Rice appeared in Nevada in the early stages of the mining-stocks campaign which followed the Tonopah and Goldfield discoveries. Here he became busy, usually behind the scenes, and was connected with the L. M. Sullivan Trust Company, of unsavory memory.

"THE MINING FINANCIAL NEWS"

Rice brought with him from Nevada the remnants of a newspaper organization. When his headquarters were at Reno he conducted the "Nevada Mining News" apparently for the purpose of furthering the schemes that he then had in hand. Associated with him as editor was one Merrill A. Teague. In New York there was established the "Mining Financial News," which purports to be published by the Mining Share News Bureau, Incorporated, of which W. T. Seagrave is president and treasurer, Harry Hedrick, vice-president, Julius Levy, secretary, Merrill A. Teague, editor, and Harry Hedrick, associate editor. This paper carries under its title on the editorial page the legend, "The Wall Street Authority on

New York and Boston Curb Stocks," and states "this newspaper does not accept advertisements." It is published every Thursday. The issue of Oct. 28, 1909, bears the notation, "Vol. I, No. 35."

The "Mining Financial News" publishes eight pages of matter weekly. This matter consists chiefly of articles booming Ely Central. Many of these articles are signed by the names of inconsequential persons. Others are signed by names which are believed to have no personal existence. Under some of the latter George Graham Rice himself is believed to write. B. H. Scheftels formerly contributed the weekly articles about the New York curb market, but lately the "Mining Financial News" has simply quoted the market letters of B. H. Scheftels & Co.

Among the other features of the "Mining Financial News" is a dope sheet, printed in display type, entitled "New York Curb Stocks," giving tips, "What to buy and what not to buy." At the top of the list, in the largest type has appeared weekly the "One best buy: Ely Central." Among the "best buys" are Boyard Consolidated and Rawhide Coalition!!

Throughout this precious paper is scattered news about legitimate mining companies—an old, threadbare scheme to entrap the unwary. In this case the most emphasis is naturally placed upon what is being done by the Nevada Consolidated, and the mineral possibilities of the Ely district are painted in the most glowing colors. By more or less direct statements it is sought to convey the impression that the highest officials of Nevada Consolidated endorse the mining prospects of Ely Central. This, however, is quite contrary to fact. Great effort is made to cause "Mining Financial News" to appear as a real newspaper, and so successful has it been in this as to develop a bona fide subscription list of considerable magnitude, but the number of copies circulated to subscribers is less than a tithe of what is printed for gratuitous distribution to possible suckers.

In spite of the pains to disguise the character of the publication, however, it requires far less than the perception of a trained journalist or of a mining engineer to discover that its one purpose of existence is to boost the affairs of B. H. Scheftels & Co. in general and the Ely Central deal in particular.

It is the common belief that the "Mining Financial News" is actually published by the Mining Share News Bureau, Inc., is really published by B. H. Scheftels & Co. Its office is in the Lefferts building on the same floor and adjacent to the office of B. H. Scheftels & Co. Harry Hedrick, who appears as managing editor of the "Mining Financial News," is located in the office of B. H. Scheftels & Co.

The Promotion of the Ely Central

The "Mining Financial News" [illegible] the Ely Central campaign. B. H. Scheftels & Co. publish daily and weekly market letters that are sent regularly to a large list of "come-ons." These letters are of the same general character as the market reports that appear in the "Mining Financial News." Sufficient is said about the reputable mining companies to give the letter a guise of plausibility, but the biggest part of the space is devoted to Ely Central and the slogan that is reiterated in capital letters is "Buy Ely Central!"

The news letters of B. H. Scheftels & Co. have been printed in two of the New York daily papers that have been willing to prostitute themselves in this way. These papers are the *Commercial* and the *Tribune*. In the *Tribune* and the *Commercial* these letters have been run in in connection with news matter in such a way as easily to mislead an unwary reader as to their real character. The worse offender by long odds, has been the *Commercial*, which has not only published the market letters of B. H. Scheftels & Co., but also has printed in its real reading columns a variety of squibs about the Ely Central Copper Company that have been calculated to excite interest in that concern. The "Mining Financial News" is printed in the *Commercial's* shop. The *Herald* and *Press* have accepted advertisements of B. H. Scheftels & Co., but so far as we are aware these have been published in undisguised form. Other papers have declined this advertising. We know specifically of one reputable paper, to which perhaps the money would have been more of an object than to some of the greater, that declined a $15,000 advertising contract offered by B. H. Scheftels & Co., because it would not prostitute itself even in that way.

On the Curb Market

Having framed this elaborate system the next step was naturally to create an active, or an ostensibly active, market for Ely Central on the Curb. This could be done, of course, by the usual methods. It was important that the transactions in this stock should be mentioned in the market reports of the daily papers and herein several were of assistance. In about a month the price for the stock was run up to $3[illegible] per share, which is about the quotation at present, and during the last week or two the reported sales have amounted to something like [illegible] shares per day. The equities [illegible] which the price has been boosted [illegible] with the agreements and promotion [illegible] that we quoted on [illegible] Oct. [illegible]. We understand, however, that the Rice Scheftels syndicate [illegible] in part in [illegible] and in full [illegible] later, [illegible] the [illegible] [illegible] share. Also the [illegible] The issue of the "Mining Financial News" [illegible] [illegible] and [illegible] performed quarter as $2000 per week, and of the Scheftels letters as $600 per week.

What proportion of the sales on the Curb are "wash" is known probably to no one but the ring. That matter may be left to the imagination of those who are versed in Curb-market affairs. Undoubtedly there have been a good many sales of *bona fide* character. In the first place the ring had to take up a good deal of real stock from Philadelphia, Baltimore and perhaps from Ely where the tired holders of what they considered a "dead one" welcomed the creation of a market as nothing less than a wind-fall. Later on there has been execution of orders from the suckers entrained by the wash sales. Of course, this is what wash sales are for. We understand that the suckers have been biting freely and that checks by mail have been showering into the office of B. H. Scheftels & Co. like snowflakes in winter. However, under the circumstances that we have recited it does not necessarily follow that these orders have been executed in the Curb market. The ring has had some of its own stock and some treasury stock that it could deliver, and some of the optioned stock is said to have been released, but not the whole of it.

The Bond Issue

When the Rice crowd got the contracts on Ely Central stock there was in the treasury of the company only a few thousand dollars and about 75,000 shares of the stock. This treasury stock was optioned to Rice for 50c per share, thus providing for only $37,500 for the company. Obviously this amount was not sufficient to explore and develop the property and the plan of an issue of bonds and additional stock was brought up. This plan provided for a new stock issue of 400,000 shares and a bond issue of $600,000, the bonds to be convertible into the new stock at $1.50 a share for the stock. This stock and bond issue is still pending. Even if money were supplied to the company through this bond issue the amount would be utterly inadequate to finance such a mine as the promoters represent Ely Central to be.

A Professional Report

The idea of a bond issue furnished a pretext for sending out a mining engineer to make a report that could be widely advertised. William A. Farish was selected for this job. Immediately the "Mining Financial News" began to sing paeans about Mr. Farish. During the time of his journey to Nevada, his sojourn on the ground, the composition of his report and its consideration by the board of directors the readers were kept in tenter hooks. The entire staff of the "Mining Financial News" and all of its contributors, real and imaginary, united in wondering what would be the nature of this coveted report and in whispering, nay

shouting, that if it proved to be favorable the stock would immediately go up, up, up. The Ely correspondent used to telegraph daily that Colonel Farish had walked over the ground and expressed his pleasure, etc. When the report was made public it was characterized as "deliriously favorable." Here is the report as published in the "Mining Financial News" of Sept. 23, 1909:

REPORT BY COL. WILLIAM A. FARISH ON THE PROPERTY OF THE ELY CENTRAL COPPER COMPANY

To the President and Stockholders of
Ely Central Copper Company.

Gentlemen:

In accordance with directions, I have examined your property, namely, the Ely Central Copper Company's group of mines, and annexed you will please find my report.

Yours very respectfully,
(Signed) WM. A. FARISH.

ELY, Nevada, Sept. 6th, 1909.

THE ELY CENTRAL COPPER COMPANY'S PROPERTIES, consisting of thirty mining claims, containing 489.96 acres, are located in the Robinson Mining District, White Pine county, Nevada, about seven miles from the town of Ely, covering a portion of the celebrated Copper Flat.

For the relative position of the claims to each other, and to contiguous mining claims, I beg to refer you to the ground plan map of the district, and also the ground plan map of these mines showing such mining property as lie adjacent to them, accompanying my report and forming a part thereof.

It will be observed by an examination of the map referred to that the property extends across a portion of the mineral belt in a northwesterly and southeasterly direction in an irregular shape.

GEOLOGY

The geology of this district is so well understood that it is not necessary in this report to give a detailed description of it. Suffice it to say that the country rock consists of porphyry and limestone, which is traversed by numerous ore-bearing dykes having strikes in a general easterly and westerly direction. The greater number of these dykes and veins are south of the developed portion of the district. There are also numerous fault fissures and veins, some small, and others of considerable size, traversing the district in a northerly and southerly direction, showing conclusively that the country has been subjected to great dynamic disturbances of deep seated origin, the effect of which has been to crush and brecciate the intervening country rock between the different dykes and fissures referred to, thus making it possible for the copper solution to penetrate them and precipitate their values where the conditions were favorable for such a result, thereby making the flat or horizontal deposits which are now being worked so extensively by several of the operating mines.

There is also an enormous flow of rhyolite which covers a good portion of the territory owned by this company, the extent of which is shown on the ground plan map. This rhyolite is of a more recent age than the general formation of the coutnry and is non-mineral bearing, except the lower or deeper portion of it, which comes in direct contact with the underlying mineral-bearing porphyry, where it contains native and red oxide of copper, which must have been caused or precipitated from the gases and fumes which must necessarily have been generated by the overflow of rhyolite in its molten state over the pre-existing mineral bearing porphyry.

Judging from the dip of the rhyolite in an easterly direction as is shown in the steam shovel pit, the greatest depth or thickness of this overflow covering your ground is probably about four hundred feet in its deepest place.

DEVELOPMENTS

Near the southern portion of your property, or, more properly speaking, that portion of it lying in a direct line between the steam shovel pit of the Nevada Consolidated Copper company on the west and the Star Pointer shaft and workings of the same company on the east, has been partially developed by these workings. That is to say, that whereas there has been no development work upon your property within the area between the above works, we take but little risk in assuming that the deposit will extend through your ground. As a mineral-bearing porphyry is known to be very thick, there is reason to believe, or to expect, a thinner layer of commercial ore under the rhyolite than exists in either of the workings of the Nevada Consolidated Copper company mentioned.

As near as can be judged, the width of this horizontal deposit in a northerly and southerly direction, the strike being east and west, is about twelve hundred feet as far as developed by the steam shovel pit, and the average length through your ground is about eighteen hundred feet. The thickness of the deposit of commercial ore is two hundred feet, as has been demonstrated by the workings referred to of the Nevada Consolidated Copper Company. That would give a block of ground (should it prove to be of the same width on the east side of your property as it is in the steam shovel pit) of eighteen hundred feet in length by twelve hundred feet in width and two hundred feet thick.

On the two "Tutwiler" claims there are several small, shallow shafts and a large open cut within a distance of a few hundred feet of each other, all of which show some rich copper ore. The rich copper ore streaks seem to have a strike a little south of west. Good ore is also found in the "Intervention," "Jumper" and "Rex" claims in the small shafts and openings made upon them. None of them have reached the sulphide ores. The country rock in which this ore is found is broken and crushed, and that portion of the property commencing with the "Tutwiler No. 1" and extending in a westerly direction to the "Puritan" claim, belonging to the Cumberland-Ely Copper company, is well worthy of prospecting by means of drilling. On the "Puritan" claim two drill holes were sunk about five hundred feet apart. The overburden, or waste, is about thirty feet thick when a deposit of ore was penetrated by the drills, which proved to be about two hundred feet thick and which gave an average value of about two per cent. in copper, besides the gold and silver, and as the territory which I recommend to be prospected by drills lies in a direct line between the "Puritan" and that portion of the Coppermines company's property which has been prospected by drilling, and is said to have developed a large body of ore about two hundred feet in thickness and of an average value of three per cent. copper, besides gold and silver, makes this territory prospectively very valuable, for should the overburden prove to be of no greater thickness than is shown by the drill holes on the "Puritan" ground already mentioned, the ore could be mined by steam shovels cheaper than any other property in the district now opened; consequently, a lower average grade of ore than is now being mined would give very large net returns if mined and reduced on a large scale.

My information regarding the results obtained in the Coppermines company's property, or that portion of it referred to above, I consider reliable.

A vein or fissure traverses the full length of the "Clipper" claim. This fissure is exposed in the railroad cut as shown on the map, at which point it is one hundred and ninety-five feet in width. It carries a great deal of iron and shows in places considerable copper oxide of high grade. This vein dips to the southwest at an angle of about sixty degrees from horizontal as near as can be determined. It has been developed in the "Clipper" claim by several old shafts from which very rich ore was taken and shipped by the early owners. This vein is traced to the south end of the "Clipper" claim, at which point it is overlaid by limestone. The limestone overlying it has been fractured and seamed in many places, and more or less copper can be found upon it extending as far northwest as the "Peyton" claim from which considerable surface ore was extracted. Ge-

ing in a southerly direction the limestone becomes very thick. I consider this vein prospectively very valuable and would recommend the sinking of a vertical shaft at a point shown on the map about three hundred feet west of it. This shaft would serve to prospect the country rock to a depth of five or six hundred feet before it would enter the vein. My reason for believing this vein very valuable is that all exposures made upon it, as stated, show very rich carbonate copper ore in bunches and seams. The mass of the vein, however, has been leeched of its copper contents by percolating water; consequently its value will not be determined until water level has been reached.

The "Josie" and "Monarch Fraction" veins are shown upon the ground plan map. They form a junction upon the "Monarch Fraction" claim, at which place there is considerable old workings from all of which quite a quantity of high-grade ore was extracted and shipped by former owners. On the "Josie" claim, belonging to the Nevada Consolidated Copper Company, there is an old incline shaft from which a good deal of high-grade ore was taken. The same general description of the "Clipper" vein can be applied to this vein also as well as the "Monarch" vein. On this last named vein a good deal of ore was taken from the old works and shafts made by former owners. I consider both these veins—that is, the "Josie" vein and the "Monarch" vein—as very valuable, and would recommend the sinking of vertical shafts for their development to water level to be located as shown on the map, namely about three hundred feet west of the veins. These shafts, like that of the "Clipper" vein, would prospect the country rock before entering the veins on their dip. All these veins should, and will, in my opinion, carry very high-grade ore after reaching the sulphide belt at water level. The ore will be self-fluxing and, consequently, will be sent direct to the smelters without any preliminary treatment in concentrating mills.

On the "Chisps," "Quartette," "Wabash" and "Tip Top No. 2" claims there are several very large dykes crossing them in an easterly and westerly direction. They are all mineral bearing, and it is not improbable that in depth many valuable ore chutes may be developed in them.

Amount of Ore Reserves

The only actual ore reserves at all developed upon the property is contained in that portion lying between the steam shovel pit and the eastern line going toward the Star Pointer shaft, which, as already stated, is eighteen hundred feet long by twenty hundred feet in width and one hundred feet deep. Should these dimensions be maintained in full development these dimensions would give us the following results:

1,800x1,200x200=432,000,000 cubic feet, divided by 13 cubic feet for a ton of ore gives 33,230,769 tons.

Whether on full development the above dimensions will be maintained or not (and I am impressed that they will be), there is no doubt whatever that the area under discussion will contain a great many million tons of commercial ore.

Prospective Values

The prospective value of the property consists of the following:

The possibilities of discovering a large area of steam shovel mining ground extending from the "Tutwiler" claims on the east to your western side-lines, of the existence of which there are many indications, as cited in the body of this report, and also in a southeasterly direction from the "Tutwiler" claim toward the Star Pointer shaft.

The three fissure veins, namely, the "Clipper," "Josie" and "Monarch," should, and I believe will, all develop at water level into big producers of high-grade direct smelting ore.

The great dykes or veins which cross the southern end of the properties may develop at depth into valuable mines.

Cost of Producing Copper

I consider it of vital importance, in order to obtain the greatest possible net results from your mines, that your company own your own reduction works and equipments, including your own railroad, for handling the overburdens and the ore from mines to reduction works. With such ownership you will be absolutely independent of all local mine railroads and reduction works, and be able to mine and produce copper from a lower grade ore than is now being produced in the district. Basing my estimate on such ownership, the cost of producing copper from mine to bank should range from six to eight cents a pound, and, should the area between the "Tutwiler No. 1" claim and the western line of your property and from the "Tutwiler No. 1" claim going toward the Star Pointer shaft, develop into a steam shovel proposition, of which, as stated, there is a possibility, the cost from this portion of the property should not exceed five cents a pound.

Conclusions

There is enough ore practically assured from present developments to make of this a large mine, and the prospective values are such that in full development they should, and in no common will place this property in the rank, at the largest and best dividend payers of the same acreage now being worked, if ably managed and properly equipped as stated above.

(Signed) WM. A. FARISH

ELY, Nevada, Sept. 6th, 1909.

We pass over the geological part of this report, that subject having already been treated very well by Professor Lawson. It is to be noted that Mr. Farish says explicitly that there has been no development work in that portion of the Ely Central that lies between the two groups of the Nevada Consolidated; however, he says there is but little risk in assuming that the deposit will extend through the Ely Central ground. No mincing words about that! Nor is there much of any hedging about the remarkable estimate of the "actual ore reserves" in a stretch of ground 1800 ft. long in which "no development work" has been done. Bosh! We do not need to tell our readers, but may say it for the benefit of the public, that *mines* are not measured in that way. As for the remainder of the property treated in this report description is confined to meaningless generalities, such as "some rich copper ore," and "a vein 195 ft. wide" which "shows in places considerable copper oxide of high grade," etc. It is unnecessary to comment further, for to the intelligent reader this report speaks for itself.

Facts About Ely Central

The southern portion of the Ely Central property lies between and adjoins the two groups of Nevada Consolidated. The northern portion bends around to the north of the Eureka group of Nevada Consolidated. Broadly speaking the northern portion shows the Arcturus limestone of the district. In this limestone at various places in the district there is a small mineralization as has been known and tested during the 40 years of the history of the district, never with any profitable result. This mineralization consists of small sheets of ore, for the most part distributed along the planes of bedding in the limestone, connected with narrow and irregular vertical veins, at no great distance from which the sheets pinch out. *These ore deposits are not commercially valuable.* The Ely Central has some deposits of this character in its limestone area and within the last two or three weeks it has begun to dig on certain of them, its alleged discoveries of extraordinarily rich ore being widely heralded. According to our advices efforts are being made to collect enough of this ore to make a shipment, when, of course, Ely Central will be trumpeted as having entered the list of shippers and as having made the quickest record of developing into a mine of any in the Ely district. This sort of thing is, of course, downright deception. This class of ore deposit in the Ely district was abandoned years and years ago. The porphyry deposits are something very different.

The immense tonnage of ore that Mr. Farish estimates and which the ring makes its bait for the suckers is figured as existing in the southern part of the Ely Central property. *There is not yet any*

knowledge that such ore actually exists there. Broadly speaking this area is covered by rhyolite, a nonmineral-bearing rock in this district. The mineral-bearing rock is the monzonite porphyry. This is not everywhere mineralized, but only in certain portions. The mineralization is, moreover, valuable only where there has been secondary enrichment of the primary ore by downward leaching from the surface. The primary ore is of so low grade as to be worthless.

Going eastward from the steam-shovel pit of the Eureka group the monzonite is known to pass under the rhyolite, but (1) it is unknown to what extent monzonite exists under the great area of rhyolite, intervening between that and the next eastward exposure of monzonite, and covering the Ely Central property. (Some of the drill holes through this rhyolite have gone into the Arcturus limestone). Assuming that monzonite exists under the rhyolite in Ely Central (2) it is not known that it has any primary mineralization. And assuming that it does so exist and has primary mineralization (3) it is not known that there has been any secondary enrichment which is required to make pay ore. Secondary enrichment, if any, would have had to take place before the overflow of rhyolite and this is an improbable occurrence. The best geological and engineering opinion has been for years adverse to the Ely Central property and is so today.

To the east of Ely Central the nearest drill hole that has shown ore is upward of 1500 ft. distant. The great bulk of the Ruth orebody lies much further east. To the west the edge of the Eureka steam-shovel pit is 600 ft. distant and practically the whole of the first Eureka orebody lies westward of that line, while the second orebody is still further west. On the eastern side of the steam-shovel pit there is some primary ore passing under the rhyolite and beneath that is some secondary ore also passing under. The enriching solution evidently soaked outward under the rhyolite to some extent as it might into a sponge, but not far inasmuch as the secondary mineralization gradually fades out. The Nevada Consolidated has lately put down two drill holes about 200 ft apart and each about 200 ft. east of the steam-shovel pit, consequently about 400 ft from the Ely Central line. Both of these showed the primary ore, proving the existence of the latter under the rhyolite at least so far. From one of these holes the highest assay was 0.9 per cent. copper. From the other, 0.5 per cent. This is nothing like pay ore. Consequently, we have along a line east and west through the Ely Central property a distance of about 3700 ft. between points of prospecting that have shown any mineralization and about 3000 ft. between points where pay ore is known to exist.

The ring that is rigging the stock market probably have not known all the data that we have given here, but they have known that the existence of ore has never been shown along the 1800 ft. across the southern part of their property and in representing that it does so exist or is likely to exist they are practising deception. We do not pretend to say that some ore may not exist in that rhyolite area. The best geologist cannot actually look into the ground. That rhyolite or the rock under it *may* contain diamonds, or even radium, but we do not think they do, and we agree with the geologists that the chances for finding any pay copper ore are slim. The fact that the unsuspected Chrysolite orebody at Leadville, 30 years ago, was found only 10 ft. below where "Chicken Bill' salted a barren shaft did not alter the fact that "Chicken" was a swindler.

We have told these facts about the scheme to market the Ely Central stock at greatly inflated value out of no malice or self interest, but simply in defense of honest mining, a great industry which we represent. Every attempt to sell mining stock to the public under conditions that do not afford a fair speculative chance is a blow to the industry, and we want to see the industry freed from such schemes as bring discredit upon it.

Breaker Fires in the Anthracite Country

SPECIAL CORRESPONDENCE

The large breakers in the anthracite region, from the nature of their construction are specially liable to destruction or damage by fire; and such fires frequently occur, notwithstanding constant watchfulness. In a few of the more recent constructions of this class concrete has been used, to avoid the fire risk.

The Sterrick Creek breaker at Jessup, a few miles from Scranton, was burned on Oct. 26, involving an estimated loss of $125,000. The colliery is one of the largest in the anthracite regions and the largest in the Lackawanna valley. The destruction of the breaker will throw 1200 men out of work and will prevent for an indefinite period the production of coal from the colliery. The mine belongs to the Temple Iron Company. The fire started shortly after midnight on Tuesday morning; the watchman in the course of his rounds discovered flames issuing from the upper part of the structure and turned in an alarm, but by the time that the fire companies with their primitive appliances had arrived on the scene the breaker and its valuable machinery were doomed. It is probable that if they had arrived earlier than they did nothing could have been done to save the building, owing to the dryness of the timber and the coal dust by which it was saturated.

There were 300 men and boys working in the mine at the time the building was on fire, but all made their way out of the mine in safety through an opening in the mountain side. Later on some of these men reëntered the mine and saved over 100 mules.

While the origin of the fire is not specifically known, the officials of the company say that a gang of men were at work the previous evening repairing the breaker, and it is assumed that one of these men allowed a lighted mine lamp to stand near the sidewalls of the breaker, and when leaving forgot to quench it. There are a number of offices and dwelling houses near the breaker and six of these were destroyed. The breaker will be rebuilt as soon as practicable, but it will necessitate a postponement of mining operations at the colliery either until the breaker is rebuilt or some arrangement is made to transfer the coal to some other breaker.

A fire which occurred on Oct. 25 came within measurable distance of destroying the breaker of Jermyn colliery No. 1 at Old Forge. The engine-house of the colliery took fire and threatened the breaker which is in its immediate vicinity. Energetic work on the part of employees, with the assistance of the local firemen, saved the breaker, there being comparatively little wind. Although some men and boys will be temporarily thrown out of employment, since the breaker was saved, the operations at this mine will be resumed in a short time. The Jermyn breaker was burned down a few years ago almost under identical circumstances.

The Federal Mining and Smelting Company

The report of the Federal Mining and Smelting Company, operating mines in the Cœur d'Alene district, Idaho, for the year ended Aug. 31, 1909, states that the gross tonnage of ore mined was 832,508, yielding 122,764 tons (net) of concentrates and shipping ore which contained 3,111,931 oz. of silver and 50,004 tons of lead. The net earnings were $1,185,046, from which

FEDERAL BALANCE SHEET

ASSETS	
Property	$18,895,125.36
Material and supplies	128,132.64
Accounts receivable	265,957.71
Cash	921,106.31
	$20,210,302.02
LIABILITIES	
Capital stock outstanding	$18,000,000.00
Payroll, taxes and current accounts payable	239,129.63
Dividends payable on September 15, 1909	209,756.75
Surplus	1,761,415.64
	$20,210,302.02

$285,056 was deducted for depreciation and development account, leaving $900,990. Dividends amounting to $843,027 on the preferred stock and $85,811 on the common, a total of $928,921, were declared, thus reducing the surplus to $1,761,415, as compared to $1,790,006 of a year ago. The balance sheet as of Aug. 31, 1909, is shown in an accompanying table.

Batopilas Mining Company

A circular just issued by Lyman H. Stevens, president of the Batopilas Mining Company, gives the details of the plans for interesting British capital in the property. It says:

"The board of directors has approved a contract between this company and the Batopilas Mining, Smelting and Refining Company, Ltd., of London. The latter company is an English corporation organized under the companies' act of 1908. It has an authorized capital of £300,000 divided into 300,000 shares of £1 each. Under the contract, the Batopilas Mining Company receives and will hold permanently in its treasury 25,000 of the 300,000 shares of the English company. Of the remaining 750,000 shares, 50,000 shares will be issued for cash at the rate of not less than $7.50 per share, and the balance of 25,000 shares will for the present be retained in the treasury of the English company. It is provided that the English company shall lease the present plants, including the mills and haciendas and the following groups of mines: Todos Santos, Cinco de Mayo, Ballinas and San Miguel, the working of which will continue as at present, with operations increased by the acquisition of a large amount of additional working capital.

"The contract provides that the English company shall pay, principal and interest, the entire bonded indebtedness of the Batopilas Mining Company. The lease will be for a period of 25 years with privilege of renewal on the same terms. Under the proposed arrangements the physical operation of the properties will remain under the control of the board of directors of the Batopilas Mining Company and operations will be conducted by the same officers and agents who are now conducting them. The more extensive operation of the mines covered by the lease will assure to the shareholders of the Batopilas Mining Company an increased return from these mines. The directors plan to make similar arrangements with other operating companies for working the other mines of the company and also for starting new mines at favorable points throughout the territory covered by the concession."

It is further announced that Gilbert Cunningham, an English mining engineer, has reported favorably on the properties and recommended improvements in the reduction mill and the introduction of the cyanide process.

The Batopilas company owns concessions in western Chihuahua, Mexico, including the Batopilas mine, developed by Alexander P. Shepherd and the concession is the capital of territory in Chihuahua. Plans are now being matured for the immediate opening of the mines, a mill being erected, and also for the formation of subsidiary companies to fully develop the concession, and to aid in the mineral conversion.

October Dividends

In the accompanying table are shown the amount per share and total amount of the dividends paid during October, 1909, by a number of mining and industrial companies in the United States, Canada and South and Central America.

U. S. Mining Companies	Location	Amt per Share	Amt. Paid
Alaska Mex., g	Alaska	$0.60	108,000
Alaska Treadwell, g	Alaska	0.00	200,000
Alaska United, g	Alaska	0.40	72,080
Anaconda, c	Mont.	0.50	600,000
Belcher Lead, l	Wis.		4,000
Boston & Montana, c	Mont.	3.00	450,000
Bunker Hill & Sull., s l	Ida.	0.50	45,000
Camp Bird, g	Colo.	0.24	198,850
Colorado, l g s	Utah	0.08	80,000
Copper Range, c	Mich.	1.00	384,185
Gold Dollar Con., g	Colo.	0.01½	12,500
Goldfield Con., g	Nev.	0.30	1,067,510
Daly West, g s l	Utah	0.30	54,000
Elkton Con., g	Colo.	0.01½	37,500
Florence, g	Utah	0.10	105,000
New Idria Quicksilver, q	Cal.	0.30	30,000
Homestake, g	S. Dak.	0.50	109,500
Silver King Coal'n, s l	Utah	0.15	18,500
Stowe Con., s l g	Utah	0.07	52,780
Tonopah of Nev., s g	Nev.	0.35	350,000
U. S. Smelting & Ref., com	U. S.	0.50	175,505
U. S. Smelting & Ref., pf	U. S.	0.87½	125,250
Uncle Sam, g s l	Utah	0.02	10,000
Utah Con., c	Utah	0.50	150,000

U. S. Industrial Companies	Location.	Amt. per Share	Amt. Paid
Am. Agr. Chem., pf	U. S.	$3.00	514,590
American Coal Prod.	U. S.	1.37½	143,256
Am. Sm. & Ref., pf	U. S.	1.75	875,000
Am. Sm. & Ref., com	U. S.	1.00	500,000
Col. & Hock. C. and I., pf	Ohio	1.50	103,866
General Chemical, pf	U. S.	1.50	150,000
Lehigh Coal & Nav.	Penn.	2.50	960,450
Republic I. & S., pf	Ill.	1.75	357,295
Va. Carolina Chem., pf	U. S.	2.00	360,000

Foreign Mining Companies	Location	Amt per Share	Amt. Paid
Buffalo, s	Ont.	$0.05	15,000
Crown Reserve, s	Ont.	0.15	262,500
La Rose, s	Ont.	0.20	228,673
Lucky Tiger-Com., g	Mex.	0.60	39,000
New York & Hon.	Hond.	0.10	15,000
Nipissing, s	Ont.	0.37½	450,000
Pinguico, s	Mex.	3.00	60,000
Rio Tinto, pfd., c	Spain	0.60	195,000
Rio Tinto, prd., c	Spain	7.20	2,700,000

Smelting in Bond

SPECIAL CORRESPONDENCE.

Work has now been begun in the customs division of the Treasury for the purpose of carrying into effect the provisions of section 25 of the tariff act of Aug. 5, 1909, relating to smelting in bond. Investigators have been sent into the field to study the amount of wastage actually incurred at the smelters, and it is stated that the new regulations may be issued in Oct. and take effect a month or very shortly thereafter. In the meantime producers are not being deprived of the advantage of the act, but have been allowed to proceed with their operations under tentative regulations. The text of these latter has not been made public, and, so far as possible, their main terms have been kept private; but they are understood to be satisfactory to the producers. The investigations now in hand relate solely to lead, and the new regulations will deal exclusively with the smelting of that metal. This is in pursuance of the interpretation already adopted by the Treasury Department that the act of Aug. 5 in its provision for smelting in bond had reference to lead and to that metal alone.

Chronology of Mining for October, 1909

Oct. 1—Batopilas Mining Company announces plans to interest British capital in Chihuahua property owned by the company. Copper converting plant started at the Barroon smelter in Coahuila.

Oct. 3—Fifteen men killed in explosion in Northwestern Improvement Company's coal mine at Roslyn, Washington.

Oct. 5—Explosion in Extension coal mine at Nanaimo, B. C., resulted in loss of 30 men.

Oct. 6—Doyle-Burns suit involving an interest in the Portland mine, Cripple Creek, Colo., settled out of court.

Oct. 8—Announcement of the purchase of the Burro Mountain mine in New Mexico by Phelps, Dodge & Co., Inc.

Oct. 15—Smeltery of the Arizona United Mines Company at Johnson, Ariz., blown in.

Oct. 15—The directors of the Nevada Consolidated Copper Company propose a consolidation with the Cumberland-Ely company on the basis of 3¼ shares of the latter for one of the former company.

Oct. 19—Receiver appointed for the Frances Mohawk Mining and Leasing Company, of Goldfield, Nevada.

Oct. 20—The supreme court of Massachusetts denied the petition for a rehearing in the suit of the Old Dominion Company of Globe, Ariz., against A. S. Bigelow, in which $2,000,000 was awarded the company.

Oct. 21—Explosion in the Rock Island Coal mine at Hartshorne, Okla., several men being killed.

Oct. 23—Explosion in Rhymney Iron Company's colliery at Glamorganshire Wales, killing 20 men.

Oct. 30—Twelve men killed in explosion in Cambria Steel Company's coal mine near Johnstown, Pennsylvania.

According to the *Journal* of the Chamber of Mines of Western Australia, Aug. 31, 1909, the dividends paid by 17 of the principal mines amounted to £603,235 for the first eight months of 1909. During this period the Golden Horseshoe paid £105,000, Great Boulder Proprietary, £131,250; Ivanhoe, £100,000, Kalgurlie, £112,500, and the Great Boulder Perseverance, £70,000. The total to date for these 17 mines is £16,577,158.

Details of Practical Mining

Notes of Interest to the Operators of Small Mines as Well as of Large Mines. The Things That Have to Be Done in Everyday Mining

REPORTS FROM EXPERIENCE

Readers of the JOURNAL are invited to contribute to this department. Articles should be brief, thoroughly practical, and preferably illustrated by drawings or sketches. Our draftsmen will prepare properly any kind of a pencil sketch that is intelligible. Something that is an old story in one district may be quite unknown in another. Articles accepted and published are suitably paid for.

Device for Distributing Ore in Bins

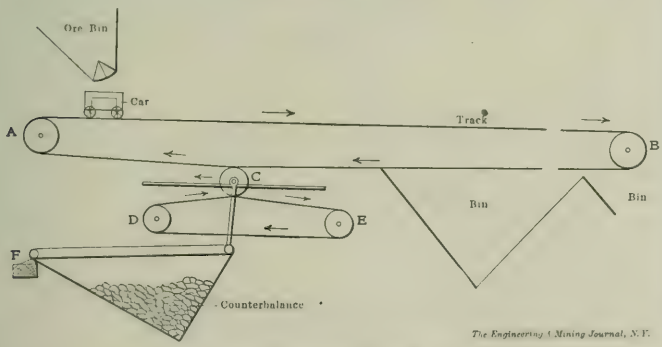
BY FRED W. MONOHAN*

The following simple contrivance should be of interest to all mining men who have ore to bed or to distribute in bins for shipment. It consists of an inclined track running over the ore bins, and a car with a side discharge attached to an endless ½-in. wire rope. This cable passes over stationary sheaves *a, b, d* and *e*, and a double sheave *c*, the extended axle of which runs on a track or frame. As the loaded car goes down its track, the sheave *c* also moves along its track and raises the counterbalance to which it is attached.

The counterbalance consists of a triangular wooden box filled with rocks or scrap iron and hinged at *f*. When the loaded car has reached its dumping place it engages a tripper which opens the latch on the car and allows the load to drop out. As soon as the weight is relieved the counterbalance pulls the car back to the starting place for the next load.

The place of dumping can be changed by the man in charge by moving the tripper which is fastened to an endless wire and can be changed at will from the loading station. The car does not have to run to the end of the track each time, as in most gravity systems, but returns as soon as unloaded and stops in its proper position.

The mechanism having few wearing parts is always in repair and can be easily adjusted to the highest speed by changing the amount of ballast in the counterbalance box, which also takes up very little hight. By this means one man can handle as much ore as four by the ordinary hammering system.



GRAVITY DUMPING SYSTEM

*1155 East Sixth street, Salt Lake City, Utah.

Driving Vertical Raises with Stoping Drills

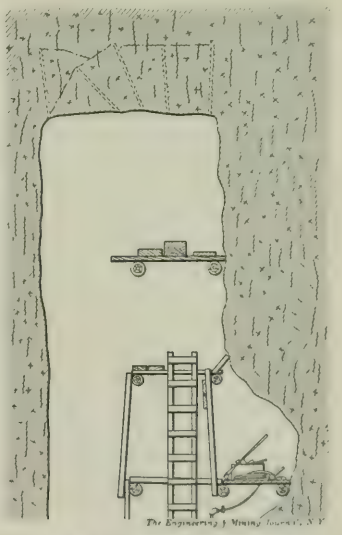
BY ARTHUR O. CHRISTENSEN*

In driving a vertical raise, especially on a narrow vein, I find that greater speed can be made in the long run, greater safety maintained, more vein material broken in proportion to waste, and the raise can be run up indefinitely with but little increased labor as the raise progresses if the system described herein is used.

Such a raise is made quite narrow, i.e., 3 or not over 4 ft. wide, but 6 or 8 ft. long. This shape allows of easily putting in a round with the "buzzer" machine. The smallest-sized machine should be used.

Stulls are placed in pairs 4 or 5 ft. apart, one being put across the middle, and the other across the end of the raise. The stulls placed in the middle must be directly over one another, or at least in line, for they are to form the partition between the manway and chute. It is well to let the raise incline slightly toward the chute side so that the broken rock in falling down will wear against the rock at the chute end of the raise rather than against the lagging between the compartments. Except for the last two pairs of stulls the middle ones are lagged up as the raise progresses and ladder and pipe line are carried along, as shown in the accompanying illustration. The condition of the raise after the round has been put in and the holes are ready to be loaded is here shown.

At the beginning of the shift it is first necessary to clean the muck from the platform at the top, and to pick down. This done, a few planks are placed across the chute from the middle stull of the next to the top set. This keeps any tools or steel from falling into the chute. I find it well to spread a piece of canvas over these planks to make them tight. Two long planks are then laid across the top platform, extending to the chute end of the raise. These are securely spiked down at the manway end. To prevent accident from the nails pulling out it is well to bind the ends of the planks down to the



STATION AND TIMBERING IN VERTICAL RAISE

*Mining engineer, Dorchester P. O., Colo.

still with baling wire. An opening is left between these planks on the chute end through which the miner can climb.

The machine, steel and tools are next brought up to the top from where they are kept in a pocket or station cut in the side of the manway below. Short planks, blocks and such, necessary for rigging up the machine, are kept on the top platform. They serve to strengthen it from being broken by the rock shot down onto it.

This whole operation takes about 1½ hours. A round of about 10 holes takes two or two and one-half hours, so that by dinner time the round is in and the tools and machine again put away. After dinner hitches must be cut or stulls put in. It is well to cut the hitches one day and the next day put in the stulls and move up the platform and ladder if needed. Every 30 or 40 ft. it is necessary to cut a pocket in which to keep the machine, tools, etc. To cut this pocket usually requires two rounds, which are shot at the same time as the regular round. An hour or an hour and a half is required to timber this up. The pipe line must also be run up from the former pocket. To keep the raise timbered up, make these pockets and put in the pipe line and ladderway keeps one man pretty busy. Yet it makes a desirable job for a good miner and does not require him to unduly strain himself.

The scheme of placing the round of holes depends on the ground, the shape of the breast and the sort of vein being followed. In general it is well to put in two rows of holes, one on each side of the vein. These holes should be staggered rather than in pairs. Sometimes it is best to put from 5 to 8 holes on one side of the vein, and then to bring down the vein with 3 or 4 holes placed back of it. In each case the round must be suited to the shape of the breast and character of the rock. By having the raise with its long axis with the vein a deep round can be put in. If it were possible to keep up with the timbering a 4-ft. round could be put in at each shift. When one man is doing it all, however, he must limit the depth of his round to the amount of timbering, etc., which must be done the next shift.

Not including cost of timber, tramming out of dirt, sharpening steel and compressing air, the cost of driving a raise of this dimension when run by a good [illegible] should not be over $3 per foot, and under favorable conditions, considerably less.

During [illegible] of work in connection with [illegible] I have driven 67 ft. a month, shooting each shift. During [illegible] there were only one [illegible] and one [illegible] holes going out [illegible] I [illegible] to the [illegible] in loading the holes and in the [illegible] them, which [illegible] in the [illegible] for April 17, 1909, page 813.

An Underground Haulage System

By Albert H. Fay.

The problem of handling a large tonnage of ore underground is usually a serious one, especially in the matter of cost. The system that is now being installed between the 700 and 800 levels by Witherbee, Sherman & Co. promises to be one of great importance in handling the magnetite ore in their mines at Mineville, N. Y. The installation is expensive and could be used only in mines handling a large tonnage for a number of years. Up to the present the mining has been carried on by working on large faces of ore 50 to 75 ft. high and several hundred feet wide. The ore was shot down to the foot of this face and then shoveled by hand into the mine cars which were pushed to the shaft by hand. The ore is heavy and in most cases it requires at least 3 to 5 men to handle a single car.

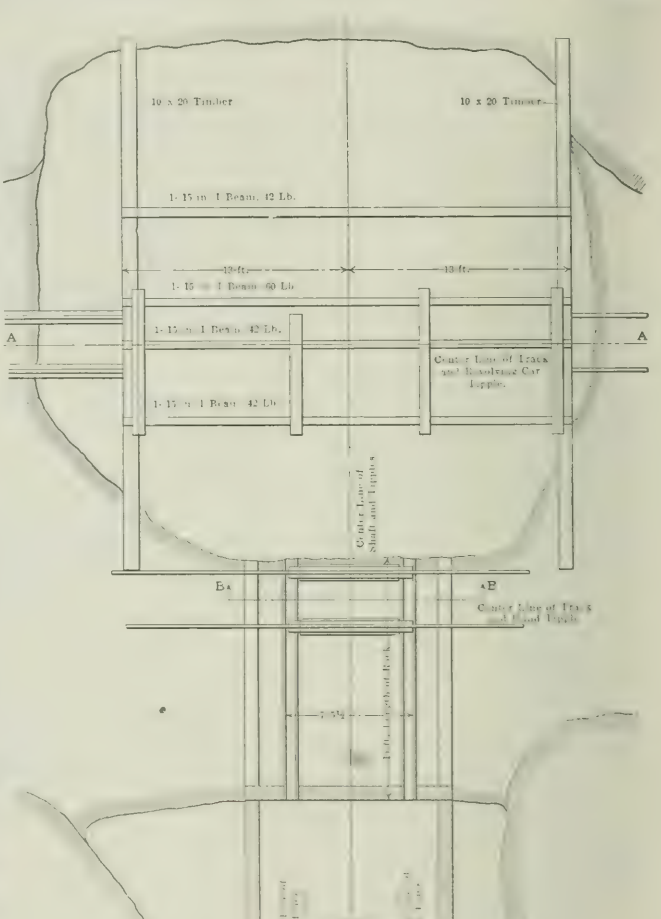


FIG. 1. PLAN OF CHUTE BIN AND SHAFT

The scheme now under way consists of a haulage way installed 60 ft. below the present working level. This underground passage is in the form of an ellipse, with a circumference of about 1000 ft. and opens an orebody 500 ft.

wide, 60 ft. deep, with an indefinite length. At least 1,000,000 tons of ore are now blocked out to be handled by this installation. Along this drift are at least a half-dozen raises, inclined at about 45 deg., which will be used as mill holes. The mining will be carried on by stoping down, setting the machine drills near the raises and shooting the ore down to the loading platforms. The large number of raises will give ample space for a number of machines and as the work progresses it will give still more room.

Concrete Platform.

As the ore passes down through the raise, it falls upon a loading platform built of concrete. This platform is 4½ ft. high, 10 or 12 ft. long, 8 or 10 ft. wide according to the condition of the ground, with a loading chute 3 ft. above the top of rail, as shown in Fig. 1. It is built with a slope from the back to the front as well as a slope from each end to the center. The chute will be covered with sheet iron.

Storage Bin.

At the shaft an 800-ton storage bin has been built, the bottom of which is 46.5 ft. below the top of the car tracks. Figs. 2 and 3 show the construction of the bin, together with the arrangement of tipple and the skip loading chute. The tipple at the right of the drawing is 26 ft. long and will dump 3 cars at once. It is operated by an electric motor and revolves upon trunnions. The bin gate and the loading chute are operated by air hoists as shown. The auxiliary tipple at the left will dump only one car at a time and is to be used only when tramming by hand in case the electric motor haulage system is out of commission. This is also to be used as a waste pocket when it is necessary to dispose of waste from the same loading station. Between the shaft and the bin is a rock pentice which serves as a support for the auxiliary tipple and at the same time forms the front wall of the ore pocket.

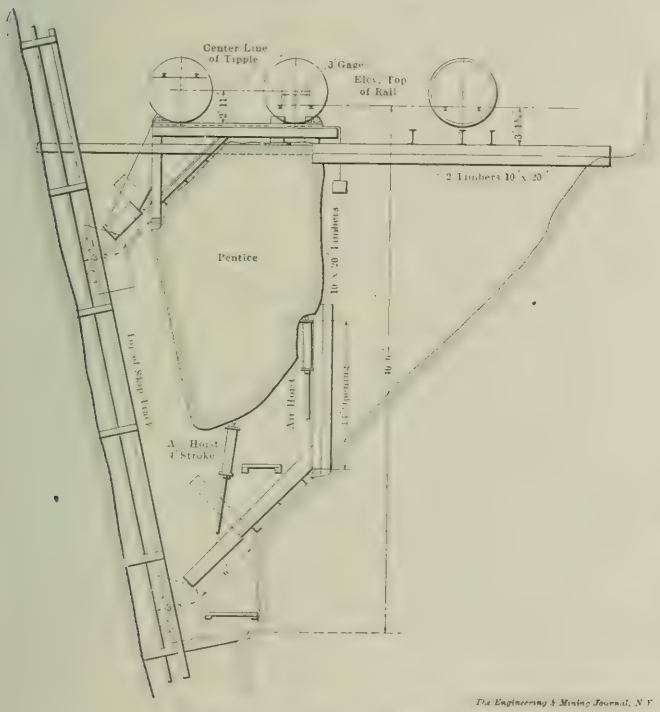


FIG. 2. SECTIONAL VIEW OF TIPPLE AND BIN

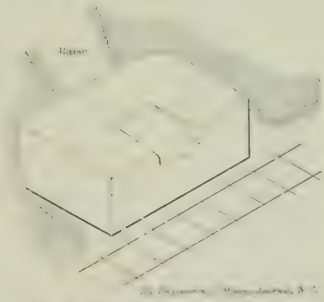


FIG. 3. CONCRETE LOADING PLATFORM

Operation.

The cars are of 3 tons capacity and will be handled in trains of 9 cars each. The motor truck has two 25-h.p. motors operated on 220-volt direct current. The haulage track is 45-lb. rails. While lighter rails could be used practice has demonstrated that the heavy rails are better as they are not easily broken by heavy pieces of ore falling upon them. They are also more solid, require less ties and give a better track. The motor in passing around the track gathers up the loaded cars and pushes them in front. When the tipple is reached, three cars are dumped. These are then pushed through the tipple and three more dumped until all are empty. The motor then goes around the tipple on a side track and couples the nine empty cars on behind. When the first loading station is reached, the loaded cars are picked up, and one, two or three empty cars left in their place as may be desired. In this way the motor will be in operation all the time and with an 800-ton storage bin it is possible to keep the hoist working up to its full capacity with no loss of time as was the case when the cars were operated by hand power. When this equipment is completed, it is expected to be able to handle 1000 tons per 10-hour shift. The ore is hoisted in self-dumping skips. I am indebted to S. LeFevre, chief engineer, Witherbee, Sherman & Co., for the above information.

Timber Shafts in the Hibbing District

In the majority of the mines in the Hibbing district, Mesabi range, all of the timber used for the mines is lowered through a separate shaft constructed for this purpose. This shaft also serves as an air passage. The shaft is lined with plank, placed vertically, so there is no chance for the timber to catch on the walls. This shaft is placed as near as possible to the underground work so that the material may be readily distributed.

The timber is lowered by a windlass which is controlled by a brake of the prony type. A four-post headframe is used. The drum used for winding is 1 ft. in diameter, while the portion upon which the brake is operated is 18 to 24 in. in diameter. Several pieces of timber are bundled together with a chain, and as the load nears the bottom a timber truck is run under and the bundle deposited upon it, thus avoiding rehandling. In this way no delay is caused in the ore hoisting shaft.

The Broken Hill Proprietary Company reports continued satisfactory results from the turbo blowers at its Port Pirie smeltery.

Personal

Mining and metallurgical engineers are invited to keep THE ENGINEERING AND MINING JOURNAL informed of their movements and appointments.

F. F. Sharpless has returned to New York.

J. Parke Channing returned to New York this week.

Dr. Ludwig Mond, of the Mond Nickel Company, Sudbury, Ont., was in Toronto recently.

Frederick H. Minard has returned to New York from an extended visit to Central America.

Thomas Willis, of Norway, Mich., has been appointed mining captain of the Berresford mine at Spring Valley.

Richard K. Park, of Philadelphia, president of the Tonopah-Belmont Development Company, has gone to Nevada.

Charles Davenport has been appointed engineer of the mines of the Colonial Mines Company in Sierra Juarez district, Oaxaca, Mexico.

Quincy A. Shaw, of Boston, vice-president of the Calumet & Hecla Company is in the Lake Superior country on one of his periodical visits to the mines.

E. J. Sweetland has been in Guanajuato, Mexico, in the interest of the Sweetland Filter Press Company. He expects to visit El Oro, Pachuca, and other districts.

Alexander Agassiz, president of the Calumet & Hecla Mining Company, accompanied by his son Adolph, one of the vice-presidents, is at the mine on a semi annual visit.

R. B. Hegardt has resigned his position as superintendent of the Old Dominion Copper Mining and Smelting Company at Globe, Ariz. He is at present in California.

Fred T. Williams has returned to Park City, Utah, after a professional trip to the mines of the Mount Wilson Gold and Silver Mining Company near Newmire, Colorado.

S. E. Bretherton, San Francisco, Cal., has just returned from Lodi, Nev., where he started and operated successfully before leaving, the Lodi Mines Company lead smelter.

S. H. Brockunier has returned to Wheeling, W. Va., after examining a large tract of land in Lincoln and Wayne counties in that State for coal, oil and gas development.

Dr. William P. Blake, Territorial geologist, has been actively at work in several parts of Arizona. He recently returned to Tucson after inspecting the Sallie mine in Santa Cruz county.

Dwight L. Woodbridge, of Duluth, Minn., recently completed an examination of the Orinoco iron mine in Cuba, which is owned by the Finnish American Mining Company, of Calumet, Michigan.

F. A. Ross, late manager of the Daly Reduction Company, Ltd., Hedley, B. C., has gone to Hostotipaquillo, Jalisco, Mexico, in the interests of the estate of Marcus Daly, which has the Cinco Minas group under option.

John Riggins has been appointed superintendent of the Ocean mine of the Consolidation Coal Company, near Clarksburg, W. Va. He succeeds K. D. Bailey, who is transferred to the Gypsy mine of the company.

Chief of the Department of Mines of West Virginia, John Laing, Oct. 30 announced the resignation of A. J. King, his chief assistant. Mr. King will assume the management of the Mann mines on the Norfolk & Western railroad.

Percy A. Babb, assisted by Henry Valle y Cambre, has completed an investigation of several mines in the Magistral camp near Ameca, Mexico. D. De Long, of Guadalajara, Mexico, is on a visit to Boston in connection with professional matters.

J. Stevenson Brown, who for 10 years acted as treasurer of the Canadian Mining Institute and recently retired from the position, was on Oct. 22 presented at Montreal by a number of the members with a handsome silver service as a mark of their appreciation of his work.

Charles M. Schwab, president of the Bethlehem Steel Company, during the past week paid a visit to George G. Crawford, president of the Tennessee Coal, Iron and Railroad Company, a subsidiary company of the United States Steel Corporation. The visit was of short duration, but during the time Mr. Schwab inspected the steel plant of the Tennessee company, at Ensley, Ala., and also went over the prospective developments by the Steel Corporation in the Birmingham district. No statement was made as to the objects of the visit, but the general understanding is that advice was given or recommendations made by the prominent steel man.

Obituary

John Crabell, analytical chemist at the plant of the Utah Copper Company at Bingham, Utah, was accidentally killed, Oct. 18, becoming entangled in a shaft in the mill. He was a young man, and went to Utah from Virginia.

Edmund Hendricks died at his residence in New York, Oct. 27. He was senior member of the firm of Hendricks Brothers, owners of the oldest copper rolling mill in America, and had been in the metal trade in New York for the whole of his active life. He was much respected for his business ability and integrity, and for his broad views.

James W. Brown, president of the Colonial Steel Company, Pittsburg, and a prominent member of the iron and steel fraternity of the Pittsburg district, died, Oct. 23, at Pont Mouille, Mich. Mr. Brown was born in Pittsburg 65 years ago and was the son of William R. Brown, a pioneer iron and steel manufacturer of that city. After completing his education in Pittsburg he entered the iron business with his father. Four years later, in 1866, he became associated with the Wayne Iron Works, of Pittsburg; he accepted in 1876 the position of assistant mill manager of Hussey, Wells & Co. He filled various responsible positions with that firm and was finally admitted to partnership, the firm becoming Hussey, Brown & Co., and later Howe, Brown & Co. When the Crucible Steel Company of America was formed, the interests of Howe, Brown & Co. were absorbed and Mr. Brown became one of the vice-presidents. He retired from the company eight years ago and formed the Colonial Steel Company, establishing a plant at the new town of Colona opposite Monaca on the Monongahela river. He continued as president of this company until his death.

Societies and Technical Schools

Illinois State Mining Investigation Commission—The recently appointed members met at Springfield, Oct. 18, and effected organization by electing Richard Newsam chairman and John H. Walker secretary. After a discussion of the proposed scope of the work to be done by the commission, it adjourned to meet, Oct. 25, in Chicago.

Western Kentucky Coal Operators' Association—This association has elected the following officers for the ensuing year: George C. Atkinson, secretary of the St. Bernard Coal Company, president; Capt. L. P. Bernard, of Louisville, president of the Williams Coal Company and the Taylor Coal Company, vice-president, and D. Stewart Miller, of Owensboro, secretary and treasurer.

Coal Mining Institute of America—Dec. 16 and 17 are the dates decided upon for the winter meeting. S. A. Taylor, president of the Crescent Coal Company, and W. E. Fohl, Pittsburg, are a local committee to arrange for the meeting. Inspector T. K. Adams, chairman of the committee on constitution and by-laws, has called a meeting for Nov. 20 at 915 Lewis block, Pittsburg.

New River Operators' Mutual Association—This association has been formed by coal operators along the line of the Chesapeake & Ohio in West Virginia. The officers will be: J. Fred Effinger, Staunton, Va., president; William McKell, vice-president, and W. J. R. Zimmerman, secretary and treasurer. A large executive committee, embracing most of the important interests in the field, will be appointed.

Special Correspondence from Mining Centers

News of the Industry Reported by Special Representatives at Butte, Denver, Salt Lake City, Goldfield, Cobalt and Toronto

REVIEWS OF IMPORTANT EVENTS

San Francisco

Oct. 28—The San Francisco Sulphur Company is examining the old Supan sulphur deposit 55 miles from Red Bluff, Tehama county, on the west slope of Mt. Lassen, about five miles from Morgan's springs. This deposit of sulphur was located over 30 years ago by Dr. Milton Supan and a road was built to it, but there was no output. The Deer creek survey for the Goose Lake Southern railroad passes within eight miles of the deposit. The quality of the sulphur is good but the expense of getting it to market has heretofore prevented the mine from being worked.

Oroville, Butte county, has become a competitor with Marysville, Yuba county, for the proposed connecting road with Downieville, Sierra county. This latter county is isolated with no railroads and few good wagon roads, and its mining industry is becoming of increasing importance. The Yuba county supervisors proposed to join with Sierra in bringing a new road to Marysville to connect with rail, but nothing has been done as yet. Meantime the Chamber of Commerce of Oroville has come to the front and proposes that if Sierra county will build to its county line, Butte county will be willing to pay for the few miles of road that would connect with the Oroville-La Porte road. The proposed route to Oroville will be 14 miles shorter than that to Marysville and with lighter grades.

A strike has been made in the Twenty-One mine at Alleghany, Sierra county, which bids fair to rival that in the famous Sixteen-to-One mine at the same place. Some of the ore from the new shoot is as rich and handsome as any that has yet been found in the district. The Twenty-One is owned by H. H. Noble, of San Francisco. The vein is supposed to be an extension of the Tightner. The mine has the deepest workings of any mine on Alleghany ridge; the tunnel in the Twenty-one is 250 ft. lower than that on the Tightner and 500 ft. lower than the Sixteen-to-One. The vein is about 5 ft. wide and carries specimen ore where found. The rich portion is about 1½ ft. wide. Some of the ore runs up into the thousands per ton.

The Rainbow Extension, in this same district, owned by Mrs. James Clinton, is under bond to San Jose men, with O. A. Harlan as manager. This mine, too, has developed an exceedingly rich shoot. There is from 1 ft. to 18 in. of very rich rock, 147 ft. from the mouth of the tunnel. The mine belongs to the Tightner system of veins and is between the Rainbow and Twenty-One on the south side of Kanaka creek. The vein found is a blind one and was not seen on the surface. Beautiful specimens are being taken out, much like those from the other rich mines of the district.

The tunnel of the Trinity River Mining Company at Lewiston, Trinity county, has been completed and part of the river has been turned through in order to sluice out a certain channel. The full stream to be carried by the tunnel is 25,000 in. of water. The tunnel is 8x10 ft. in the clear and 1350 ft. long. Its cost was $125,000. Over a mile of the bed of the river will be laid bare for mining purposes when the waters of the river are diverted through the new tunnel.

The Middle Yuba Electric company will not get its lines to Alleghany, Sierra county, before the winter sets in.

The Manley Lumber Company at Greenview, Siskiyou county, has secured options on lands on the Klamath river near Oak Bar and intends to "drift" it, the gravel being only 30 ft. to bedrock. Prospecting operations, however, show a great deal of water and the idea of putting in a dredge is now being considered.

The Horse Mountain copper deposits, of Humboldt county, are just now attracting some attention. The claims are in a high mountain section reached best at present by trail from the main road at Berry's. The ore of the district is considered to average about 6 per cent. copper. Several claims are being developed and there is considerable ore in sight, but thus far there has been no production as there are no reduction works locally situated, and it costs considerable to ship to Korbel, though some of the properties are making small shipments in that direction, ultimately intended to reach the smelters at Tacoma. It will cost about $20 per ton to get the ore to Tacoma.

Butte

Oct. 28—The production of the Amalgamated properties continues to be normal, but the cost of production is low. It is estimated that the Anaconda, and Butte & Boston companies are producing for 10c. and the Boston & Montana Company for 9c. a pound. The Parrot company is just about breaking even. It is thought that under the leadership of John D. Ryan, the policy of secrecy, so long cherished by the company, will be discarded and the company stockholders will be given more information regarding the inner workings. It is also thought that Mr. Ryan will pursue a more active policy than has formerly been pursued, and that the company will increase its holdings and property in other parts of the country. Persistent rumors of a copper combination headed by J. P. Morgan are received from the East. The rumor has it that the Amalgamated, Guggenheim and Phelps-Dodge interests will enter into the deal.

President Amster of the Boston & Corbin Copper Company has made his annual report to stockholders for the year ended July 31. From the report it appears that 4000 ft. of development work has been done during the year. The mine is connected with the main power line of the Missouri River Power Company, and as soon as the power is turned on, the surface plant will be operated by electricity. The principal development work has been done on the 500-ft. level opening up the Bertha and Fair View veins. On this level the drift has been run on the vein about 1600 ft., and is still in ore. The report states that the company has $185,000 in its treasury, with $8000 liabilities, exclusive of its capital stock. It is the president's opinion that when the 700-ft. level is opened up, which should be within three months, the mine will supply the concentrator with 300 tons of ore daily.

Rumors of threatened litigation between North Butte and Tuolumne companies over the ownership of a portion of the Tuolumne claim continue to grow, and the stock of the latter company has reflected the depressing effect of this gossip. It has recently come to light that John G. Morony, president of the Daly Bank and Trust Company, of this city, and one of the leading Amalgamated officials in the camp, purchased a fractional interest of the Tuolumne claim over a month ago from Patrick Meagher and Rachael Meagher. This fraction has been deeded to the North Butte company by Morony. While the ground purchased is relatively small, yet it makes possible some interesting complications.

The Tuolumne management states that it is not at all concerned over the purchase since the president, Mr. Hickey, secured a deed for the same fraction from the same people several years ago, but never had the deed recorded. While the position of the Tuolumne company would appear to be secure at the first glance, yet the law of Montana is to the effect that though an unrecorded deed

is good as between the parties to the deed, such deed is void as against any subsequent purchaser in good faith and for valuable consideration whose deed is first duly recorded. In other words, the Morony deed would take precedence over the Hickey deed unless it could be shown that Morony had knowledge of the previous deed to Hickey.

Denver

Oct. 29—In the Doctor-Jack Pot suit against the Work Mining and Milling Company to recover $2,000,000 worth of ore alleged to have been extracted without right, from the Little Clara mine, the following question was put to Judge Lewis, in the United States circuit court, in a demurrer filed by the latter company: If the owner of a mining claim fails to discover an apex vein on his property, which the owner of the adjoining claim does discover, is he barred from exercising extra-lateral rights to the vein, and has the owner of the adjoining claim the right to extract ore from it? This question may sound like a word puzzle, but on the deciding of it hinges $2,000,000, and the settlement of a point of mining law that will have far-reaching effect.

Sir Henry Seton-Karr and Ernest Foster, as trustees of the Caledonia Gold Mining Company, Ltd., have commenced suit in the United States circuit court to recover $15,000 damages and also possession of the Caledonia mine from Frank Boach, of Los Angeles, who paid taxes on it for six years, and obtained the property under tax title, and then leased it to local parties. The mine was formerly owned by W. S. Stratton, and leased to the late J. Maurice Finn, who cleaned up about $50,000 from it in 1894-5. It has not produced pay ore since. The mine is on a low spur of Gold hill, near Mound City, below Cripple Creek town.

In the San Juan region, Charles A. Kuenzel has agreed to erect a 100-ton smeltery at Ouray, and to keep the same in operation for at least five years upon being first guaranteed 100 tons of ore per day for that period, the smelting charges not to exceed $4 per ton.

Three new mills at Silverton are nearing completion, the Vermillion, Peerless, San Juan and Intersection. The washout of the Rio Grande railroad, which cut off Silverton from its ore market and base of supplies 46 days in July and August, was put in shape by Otto Mears in 17 days. On Sept. 3 a washout occurred at Telluride, which treated that camp in a similar manner. Otto Mears was called in to repair, and he has just raised that bridge also, and business has been restored to its normal active state in both camps. Notwithstanding the drawback, three smelters, and the railway being put out of commission, the carload shipments for one month from Silverton are given at 2,154 tons of concentrates, and 480 tons of crude ore.

A gold stampede is reported to Woodland park, on the Colorado Midland railroad, not far from Colorado Springs, and another north of Newcastle, in Garfield county, engineered by Denver and Cripple Creek people. Here, however, it is stated that a tunnel has been driven 100 ft. on the course of a vein of auriferous pyrite, which will average $30 per ton in gold.

Cobalt

Oct. 30—Work is being rushed on the installation of the new water and sewage system for Cobalt, and stream drills are being worked night and day cutting trenches from lake Sasaganiga, along Prospect avenue. It is impossible, however, to put in this system this fall, as the frost has already made itself felt, and in some few cases the water pipes of the present system, which are merely laid along the surface, have been frozen. The work on the foundations for the new steel tank in connection with the system has been temporarily suspended, owing to a misunderstanding between the town and some of the mines. The question of a pure-water supply is of vital importance, as the fever epidemic amply testifies.

Development in South Lorrrain is being steadily carried on, and the results so far have amply justified the faith in the camp felt by the operating companies. At the Wetlauffer the shaft is down 100 ft., and at that depth not only do the veins hold good, but have every appearance of increasing in richness. This mine will be ready soon to make a second shipment of high-grade ore, and steady shipments may be looked for. The Newman property reported a second rich discovery.

Improvement in the train service to Cobalt has been brought about recently. For some time the Mine Managers' association made representations to the railway officials for better service, and the recent addition of a dining car to the daily train from Toronto is much appreciated. In spite of every effort made by the railway to handle the large quantities of freight at this point as expeditiously as possible, the congestion nevertheless continues, and the mines are still experiencing considerable difficulty in the matter of a sufficient fuel supply, many of them being obliged to run very close to a shut down. It would seem that the only solution to the problem is the speedy arrival of the various power lines in camp. Only two mines, the King Edward and Coleman, are as yet using this power, but it is confidently stated by the power companies that they will have their power ready for distribution by the first of the new year.

In connection with the typhoid epidemic it is worthy of note that the railway companies are granting free return passes to the nurses brought in by the hospitals, to the points from which they originally came. This step is highly appreciated here, as the unusual tax on the resources of the Red Cross hospital as well as the town hospital, will be greatly relieved thereby. For the past few days the number of cases reported has greatly decreased, and from now on a steady falling off is looked for. However, the health officers are not relaxing their vigilance in any respect, as can be seen by the fines imposed for unsanitary conditions.

Mexico

Oct. 30—The bill before the chamber of deputies providing for a rebate of duties on raw materials that are to be put into finished products and reshipped out of the Republic is causing considerable agitation among the oil interests here. The bill is said to especially favor the Pearson company, which purposes to export oil to Europe, although at present it imports crude oil from the United States as the supply from the fields in Mexico is not sufficient to meet the demands of the local trade which is taking advantage of the low prices resulting from the rate war with the Waters-Pierce company. It is claimed that if this bill is passed it will have the effect of retarding development by the independent producers and exploration companies.

The American Smelting and Refining Company has secured an option on the Angangueo mine, Michoacan, controlled by M. Elsasser, T. Ryder and others. Alexander W. Edelen, former superintendent of the smelting company's property at Bonanza, Zacatecas, has been placed in charge at Angangueo.

Engineers representing John Hays Hammond and associates are examining the Babylonia gold mine near Carrizal, Michoacan. This property was originally denounced in the state of Guerrero, but later was proved to belong to the state of Michoacan and subsequently denounced there by other parties. The original claimants, of whom Major Creller of the President's staff is the principal, are generally conceded to have the prior rights.

Work on the Tlaxiaco branch of the Mexican Southern Railway is progressing and it is expected that the line will be in operation by Jan. 1. When this line is completed the construction force will be transferred to the Tlacolula branch which is already located as far as the smeltery at Magdalena.

A circular was issued recently by the joint management of the Douglas Copper Company and the Mexican Exploration and Mining Company for the consolidation of the two companies and the forming of a new company, the Pacific Smelting and Mining Company, capital $6,000,000 common and $2,000,000 preferred stock, all shares par $5. The preferred stock is 7 per cent. cumulative and preferred, both as to dividend and principal, and convertible, at the option of the holder into common stock at par after Jan. 1, 1911, and redeemable at 110 per cent and accrued dividends March 1, 1911, or on

any other dividend date thereafter. This preferred stock is offered to the bondholders of both companies at the ratio of $1.25 of preferred stock for each dollar in bonds exchanged, and the balance to be used for treasury purposes if needed. The common stock to be offered for the stock of the Douglas Copper Company in exchange, share for share, and for the stock of the Mexican Exploration and Mining Company at the ratio of three shares of the Mexican Exploration and Mining Company's stock for one share of stock in the new company. This plan will still leave in the treasury of the Pacific Smelting and Mining Company over $600,000 of preferred stock and $1,500,000 of common stock. The properties that are owned, or partially owned by the Douglas Copper Company in Sonora are the Anita Copper Mines Company, Ltd., and the Compañia Metalurgica y Refinadora del Pacifico, S. A., with a 350-ton smelting plant at Fundicion, and a number of timber grants. The consolidation also includes the Yaqui Mining Company and its concessions in Sonora, owned largely by the Mexican Exploration and Mining Company.

Monterey, Mexico

Oct. 30—The last year has been one of extreme dullness in mining. Only a few of the larger mines have been working and little or no new work has been started. The Cruz del Aire mine at Sabines Hidalgo is installing an aërial tram to transport the ores from the mine patios to the loading station of the ox-teams, and the mine will ship 2000 tons per month. The lead ores (about one-half) will go to the American Smelting and Refining Company at Monterey and the zinc ores to the United States. The Fraternal at Lampazos continues to ship lead ore, but discontinued shipping zinc ore about July 1. The mine has a stock of about 4000 metric tons on hand which it will begin to ship shortly.

The San Pedro mines, of the Mexican Lead Company, close to Monterey, had been shipping regularly about 1200 or 1500 tons of lead ores to the San Luis Potosi smeltery, but the railroad to these mines was washed out by the floods of August and is not yet repaired. The mines expect to be able to resume shipments Nov. 1. The Cabrillas, at Cabrillas, has been shipping steadily and the Paloma, at the same place, has been shipping about 1000 tons per month to Monterey. A new body of ore that carries about 17 per cent. lead has been opened at this mine. The ore is low in silver (about 150 to 180 grams per metric ton), but carries an excess of iron. The Minas Viejas at Villa Aldama is working steadily. The product (zinc ore) is calcined for shipment to Europe. In an old mine on Mitre mountain near Monterey an important strike was made a short time ago. It is a silver-lead ore of good grade.

In regard to zinc, the rise in the price of spelter has allowed the buyers to offer nearly as good prices as they were giving previous to the imposition of duty by the United States, so that there is a healthy activity in this metal. As all the large producers have sold their ores, the ore buyers are trying to lease or buy promising prospects and mines. There has been considerable talk about shipping ore to Europe, but I do not know of any ore that had been shipped to the United States that has been diverted to Europe. A. E. Houser, local representative of L. Vogelstein & Co., of New York, has been successful in getting contracts and is shipping all ores to the United States, as usual. He predicts a boom in zinc for the coming year, and by the signs seen at present, I should say that the movement has already begun.

London

Oct. 25—The Institution of Mining and Metallurgy has been in winter session. Two papers were presented for discussion, one by Dr. James Douglas, on the "Influence of the Railroads of the United States and Canada on the Mineral Industry," and the other by W. A. Caldecott, on the "Development of Heavy Gravitation Stamps." The selection made by the council for the annual awards of the institution was announced. The institution gold medal, the highest award, is awarded to Prof. William Gowland, in recognition of his services to education and to metallurgy. The gold medal founded by the Consolidated Goldfields of South Africa, Ltd., was awarded to W. G. Caldecott, a metallurgist in the employment of the founders for his work in connection with the treatment of gold ores. A prize was also awarded to C. O. Bannister and W. N. Stanley for their paper entitled, "Cupellation Experiments," and "The Thermal Properties of Cupels."

At a general meeting of the shareholders in the Spassky Copper Mine, Ltd., accounts to Sept. 30, 1908, were presented, and the chairman anounced that the affairs of this company in Russia, after years of trouble, had taken a turn for the better. Construction costs had exceeded the estimates and had impaired the resources and credit of the company. A strike of workmen, both in 1907 and 1908, contributed to the failure of the company to secure the production of copper that was originally estimated might be obtained. The construction program has now been completed.

During the year under review the production of copper was 1322 tons, which realized an average of £77 13s. 8d. per ton. E. T. McCarthy, engineer to the company, reported that satisfactory progress was being made both as regards reduction in costs and improvements in methods, and expected that the production of copper during the next six months would be about 1100 tons, after which a substantial increase might be expected. One of the principal difficulties that the company has had to face has been that of transport between the mines and the smelting works. The construction of a railway, at one time considered necessary, has been abandoned as cart transport for the ore is now easily secured. Some difficulty was experienced in getting coal by the railway from the Kavagandy colliery, owing to the poor condition of the line, but this has now been remedied. The present output is between 5000 and 6000 tons monthly.

Regarding the Guspenssky mine of the company, Manager H. C. Woolmer, in a report dated August, 1909, says that the main shaft has been sunk to the 60-sajeen level (420 ft., one sajeen equaling 7 ft.), where a large chamber has been excavated and a crosscut started to cut the orebody which, judging by the satisfactory assays of cores of diamond drills, should open up high-grade ore. The shaft has been sunk 30 ft. below the 60-sajeen level, and it is hoped to reach the 70-sajeen level (490 ft.) in the course of another two months. For the first seven months of the present financial year 9900 tons have been raised, but the production will be considerably increased as soon as the new levels are opened out. The average cost of production of copper in Russia was, during 1907-8, 10.22 rubles per pood. During March, April and May of this year the cost has averaged just under 6 rubles per pood, showing a great reduction for which the company has to thank its new smelting superintendent, F. C. Knight.

In studying the affairs of a company like Spassky, it is impossible not to be struck by the multifarious duties that a mining engineer is called upon to perform. To manage a property in Russia mere technical knowledge is not enough. He must have other qualities than those to make a successful general manager. He must be an organizer, a diplomat and a financier as well. He must be an organizer, a as well. When one reads of the dispersal to their homes of a considerable population who had congregated in the building of the company, of two strikes of workmen, of an outbreak of cattle disease at a place where the furnaces are dependent on cattle transport, of a railway line which supplied the fuel being blocked with snow and worked with antiquated rolling stock, one realizes that with such problems as these to face the daily life of a mining engineer is no bed of roses. The Spassky is perhaps an exceptional case, but there are many mines all over the world where the duties of the manager extend over many matters outside of mining engineering, the inability to grapple with which would mean financial disaster to the mine. It is to the credit of the profession that competent men are forthcoming when wanted and Spassky is a good example—fully qualified to fill responsible and arduous positions. It is safe to say that no other profession calls for such varied accomplishments as that of a mining engineer.

Mining News from All Parts of the World

New Enterprises, Installations of New Machinery, Development of Mines and Transfers of Property Reported by Special Correspondents

THE CURRENT HISTORY OF MINING

Alaska

Nome—A strike is reported on Nolan creek and a new town called Wright City has been established.

Fairbanks—On the property of the Jupiter Mars Consolidated Mining Company, three shafts are down on a vein which shows 6 ft. of free milling quartz.

Kasta Bay—The Goodroe mine made its first large shipment of ore consisting of 2500 tons. The ore is copper and gold.

Ketchikan—The Salzer, Mount Andrew and It mines are making regular shipments.

California

AMADOR COUNTY

Bunker Hill—The clean-up of the mill of this company for September was $1300 per stamp for the 20-stamp mill.

BUTTE COUNTY

Bells—This mine on the north side of Little Kanaka Peak, near Enterprise, will be reopened by W. F. Burke.

Phoenix—This mine near Hurleton, owned by W. F. Burke, continues to yield about $1000 per day.

CALAVERAS COUNTY

Rentz—The blue gravel channel has been found under 30 ft. of cement and the old works on the mine drained.

Red Gold—This mine, west of Murphy, is to be reopened.

Cuneo—This mine, near Murphy, is running full handed and the mill is nearly completed.

MARIPOSA COUNTY

Hite Cove—This company, John Mason, superintendent, has started work on a new road from the mouth of the South Fork to the mine. Thirty-two men are at work in the mine and mill and 20 of the 40 stamps are running.

NEVADA COUNTY

Gaston—This property in Grass Valley has been shut down two years, but H. G. A. Brunner expects shortly to start up again.

Gaston No. 4—The new three-compartment shaft on the Matteson ranch, which is to be 1200 ft. deep, is under way. It will take two years to finish.

PLACER COUNTY

Yuba—J. Riddle, lessee of this drift claim, is taking out some good gravel, but has not yet found the main channel.

Gold Hunter—Over a long stretch the Hathaway mine has been started up again. The Crater mine is installing new machinery, and the Crandall mine has been sold to Colorado men.

SHASTA COUNTY

Sisson Exploration and Development Company—In the north drift of tunnel No. 3 this company is now crosscutting the orebody. The vein contains ribbon quartz.

SIERRA COUNTY

Dreadnaught and Seneca—These two mines at Alleghany have been bonded to C. D. McGonigal, of Custer, S. D. Both of the mines were at one time producers. Mr. McGonigal has also bonded the Rose mine at Pike City in the same district as the Alaska mine.

Phoenix—W. A. Wood, in behalf of an English company, is about to purchase this mine at Sierra City. It is low grade.

Brush Creek—An Eastern company now holds the bond on this property near Mountain House. The property was a producer many years ago, but excess of water caused a shut-down.

Alleghany District—A combination has been effected of the Gold Canyon, Gold King, Happy Jack, St. Elmo, Steamboat, Golden Crown and the Sherman properties. Jerry Culbertson, of Kansas City, is president, and R. H. Case the consulting engineer. The Gold Canyon mill has commenced crushing ore.

SISKIYOU COUNTY

Czarina—At this property, Salmon river district, H. Severman, superintendent, 25 men are at work, and the 10-stamp mill is operating steadily. Ten more stamps will be added.

TRINITY COUNTY

Bullychoop—Work has been resumed after a shut-down of some months. The mill will not be started up now.

TULARE COUNTY

Brushy Ridge—This mine on Mill creek, M. Finnegan, manager, is showing a satisfactory body of free gold ore, the highest grade of which will be shipped. There is no mill on the property.

Colorado

CLEAR CREEK AND GILPIN COUNTIES

Stanley—The entire plant and mine has been put in working order by Manager Bowden. The pumps are handling 500,000 gal. of water daily.

Bellevue Hudson—The property has been sold to the Southwestern Mines Corporation, of Boston, for $150,000. M. W. Mouat, Georgetown, is manager. Among the plans is the erection of a 100-ton mill.

Mammoth—This group has been sold to the Argentine Exploration Company. B. J. Martelon, Georgetown, manager. The aërial tramway will be repaired and a 25-ton mill built.

Gilpin-Eureka—The stockholders have decided to erect a mill, to cost $25,000. G. W. Mabee, Central City, manager.

Freedom—C. E. Major, of Central City, has taken a bond and plans for liberal developments of this property in Gilpin county are under way.

Chase—An examination of this mine is being made by Forbes Rickard, of Denver, in the interests of Eastern capitalists.

Grand Union—A transfer of the property has been made to J. H. Elspass, of Denver, and machinery is to be installed.

LAKE COUNTY—LEADVILLE

Chemung—Work has been resumed on this property on Breece hill and drifting north and south from the bottom of the shaft, 500 ft., is in progress.

Garbutt—Shipments of a fair grade of sulphide ore are being sent daily, all from the lower levels, 750 ft. A large body of low-grade ore is being developed close to the Little Johnny line.

Highland Mary—Drifting is being carried on both ways from the shaft to determine the length of the orebody. The ore that is being extracted is said to run 2½ oz. gold per ton.

Minnie—The shaft will be sunk from 430 ft to 700 ft. A compressor and electric hoist have been installed.

OURAY COUNTY

Dom Paul—The property has resumed shipments and is carrying on extensive development.

ROUTT COUNTY

Battle Era Mining Company—The company at Craig, Colo., intends to install machinery, as well as build an electric line from coal mines to the railroad. Slack will be used to generate electricity for power for mines and railroad.

SAN JUAN DISTRICT

Bullion King—High-grade gold and silver ore is reported to have been encountered at a point 3500 ft from the portal of the main tunnel on the Lake View lode. The gold is in white quartz, and the vein is 4 ft thick.

Revenue—The mill is being put in shape and extensive underground work is being done preparatory to running the mine on company account. From the Montana vein about 100 tons daily is coming for the 60-stamp mill which is operated half capacity. A. E. Reynolds, manager.

TELLER COUNTY—CRIPPLE CREEK

El Paso Consolidated—Allen Burris, president states that 40 sets of lessees are at work on the property. During July, August and September, 4775 tons of $15 ore were shipped.

Keener—The company has blocked out its ground on Battle and Squaw mountains for leasing.

American Eagle—A 30-ton shipment of ore running from four to six oz. in gold has been made from the lease of the Colorado Investment Company.

Georgia

LUMPKIN COUNTY

Barlow—John Jackson is sinking a shaft to open the Ogle vein on this land, near Dahlonega.

Chestatee—M. Seawell has begun work on a dredge to operate on the Chestatee river below the Calhoun dam. The dredge will be completed early next year.

Lockhart—R. and J. McDonald are putting in a hydraulic elevator to work the placer ground on the Lockhart, near Dahlonega. They have prospected the ground thoroughly.

Idaho

SHOSHONE COUNTY

Black Horse—Grading for the 100-ton mill at the mine near Murray is almost completed. The machinery has been ordered, but will probably not be installed until spring. On the lower level of the mine an orebody has been exposed for 200 feet.

Donlan—The antimony mine, 15 miles east of Burke, will resume shortly, after a shutdown of 17 years. There is a smelting plant on the property, but no satisfactory results have ever been obtained from it, and experiments are now being made which, if successful, will result in the bonding of the mine.

Snowshoe—The company is about to give a lease for the opening of this property.

Hercules—The company has leased the Tiger mill at Burke for one year. The company will have to furnish its own power since the lease does not include the water rights. Large capacity ore bins will be constructed at the mill.

Coeur d'Alene-Northfork—The ore bins at the Monarch mine, near Murray, have been completed and the flume repaired. The capacity of the mill is being increased to 200 tons daily, and it is planned to start operations within a month. From the 800-ft. level a raise is being driven to the surface.

Last Chance—The tailings plant recently built will be started soon, and it is expected that two tons of concentrates will be produced daily. The tailings will be taken down the river to a dock recently built. The machinery has been roofed over and it is planned to continue operations throughout the winter.

Coeur d'Alene-Vulcan—A strike has been made 1100 ft. from the tunnel portal at a depth of 800 ft. The vein is from 12 to 14 in. wide, and contains copper, lead, silver and gold.

Illinois

The new mining investigation commission, which was created for the purpose of investigating the methods and conditions under which coal is mined in Illinois with special reference to the safety of human lives and the conservation of the coal deposits, and for the further purpose of submitting to the next general assembly a revision of the coal-mining laws has been appointed as follows, three members being coal-mine owners, three coal miners, and three unidentified with the interests of either owners or miners: Dr. J. A. Holmes, technological branch Geological Survey, Washington; H. H. Stoek, University of Illinois; Prof. Graham Taylor, Chicago; John H. Walker, Springfield; Bernard Murphy, Pana; Charles Burch, Eldorado; Richard Newsam, Peoria; Glenn W. Graer, Chicago; J. W. Miller, Gillespie.

Indiana

GREENE COUNTY

Island Valley—A record of running every day since last April has been made. The company has many orders to fill and is making an effort to keep up with them. The new rule prohibiting the closing of a mine to attend a funeral has been put into effect at this mine.

KNOX COUNTY

With the financial support of 75 citizens behind it, the recently incorporated Palmyra Coal and Development Company of Frichton, intends to develop new coalfields in southwestern Indiana. The first shaft will be sunk near Frichton. The company is capitalized at $500,000. The company already holds coal leases on 7000 acres of land underlaid with coal. At a recent meeting the following directors were elected: J. L. Robinson, Charles Nicholson, W. M. Myers, H. M. Simpson, Edward Ruble, Brazil Gaither, E. C. Gilmore, Frank Thorne, Willus Russell and Nowland McClure.

PIKE COUNTY

In drilling an oil well on the Hurt farm, five miles east of Oakland City, the drill passed through three veins of excellent coal. The first vein was found at 64 ft., and is 6 ft. thick; the second at 160 ft. and is 9 ft. thick, while the third is a 7-ft. vein at a depth of 205 ft. Steps have been taken to develop the find.

VANDERBURG COUNTY

Coal shipments to the northwest from the mines in the southern district along the Evansville & Terre Haute railroad have reached over 300 carloads a day, and there is a scarcity of all kinds of cars on that road. Much of the coal is being shipped out in box cars. There is not an idle coal miner in the county except from choice.

Kansas

Big Six—This company is developing deep ore on the 17-acre lease on the Murphy land north of Galena. The ground has been proved with drills to 280 ft. and the shaft is being sunk. A 250-ton mill will be erected.

Michigan

COPPER

Section 12—The diamond drill has encountered a conglomerate formation carrying small particles of copper at a depth of about 600 ft. This drill is sinking to expose the Baltic lode which it is expected it will cut within the next 200 feet.

Ojibway—The drift from the 800-ft. level of No. 1 shaft has passed out of the copper-bearing portion of the lode and has been slightly turned to again pick it up. This drift is now in a faulted zone. No. 2 shaft drift from the same level continues in the same grade of ground, about half of the ground opened carrying commercial copper. Both shafts are sinking below the 1200-ft. level, and at a depth of 1250 ft. levels will be established and sinking temporarily suspended. The ground down to that depth will be fully opened and, in all probability, a mill run will be made.

Atlantic—The stamp mill is being remodeled under the supervision of the Calumet & Hecla management to eliminate as far as possible the tailing losses in the treating of Superior rock. A Harding mill is to be installed for regrinding purposes and a Woodbury classifier. This type of classifier was originally worked out at the Calumet & Hecla mills and materially reduces the quantity of water used. With these changes in commission a much better mineral return should be made.

Quincy—This mine has started the remodeling of the concentrating department of its stamp mills to take care of the increased tonnage brought about by the enlargement of the stamp-head cylinders from 18 to 24 inches. Five heads have been equipped with these enlarged cylinders and are working satisfactorily.

Indiana—The diamond drill has encountered a copper-bearing amygdaloid formation at a depth of about 575 ft. This was reached after passing through a conglomerate in which the drill has been working since it entered the ledge. This

[illegible] carried small lenses of sandstone which were impregnated with small particles of copper. The identity of the new strike cannot be determined from the present data, and drilling will be carried on to ascertain what may be expected from it. The property is well located and has the advantage of a shallow overburden so that little difficulty will be experienced in shaft sinking.

Lake—The crosscut from the 5th level has been extended about 150 ft. and has entered the formation for over 50 ft. without reaching the hanging-wall. The crosscut will be continued until this is reached, when drifting on the lode will be started. The first few feet opened in this crosscut showed an exceptionally rich state of mineralization and the balance has been in a good grade of stamp rock with some small masses. The shaft is sinking in the footwall trap at a depth of about 780 ft. Openings from the levels above continue in good ground and show a lode averaging about 60 ft. in width.

White Pines—This property, which is being opened by the Calumet & Hecla, has reached a depth of about 150 ft. and has started lateral openings. The formation is carrying copper in encouraging quantities.

Wyandot—The crosscut that is being driven from the 700-ft. level of the exploratory shaft has passed through a copper-bearing amygdaloid formation. This formation is about 28 ft. wide and shows a good grade of copper ground on both hanging and footwall side, while in the middle results are not so good. As this strike is in close proximity to the point where it is believed that the extension of the lake will traverse these lands, results of drifting on this lode, which will be undertaken at once, will be awaited with interest.

Missouri

JOPLIN ZINC-LEAD DISTRICT

Delta—This mine at Spring City has been leased and will be reopened by Creech & Co., of Joplin.

Hazard & Robson—Drilling on these lands south of Webb City has opened new ore and extended the known sheet ground area southward.

Montana

BEAVERHEAD COUNTY

Polaris—The property in the Polaris district is running a 180-ft. tunnel to cut the vein at 215 ft. A 20-ton chilean mill and necessary equipment are stored in Dillon.

BUTTE DISTRICT

Diamondfield—The Great Northern Railway has completed the Butte tunnel for passengers to run a spur from its main line to the Colorado shaft of the Davis-Daly Company in the heart of the city. Operations in the mine have been made. The Great Northern runs through Butte, Mont., where is the Heinze concentrator to which the Davis-Daly ore will probably be shipped.

JEFFERSON COUNTY

Elkhorn Silver—One hundred and fifty men are employed at the property and the 20-stamp mill is operating full capacity. Shipments are being made to East Helena.

LEWIS & CLARK COUNTY

Bald Mountain—Sixty men are employed and the 20-stamp mill is treating about 125 tons daily.

LINCOLN COUNTY

Fisher Creek—The company owns six quartz and three placer claims at Bramlett creek 35 miles south of Libby. The present 20-stamp mill will have its capacity increased to 100 tons per day and a 200-h.p. electric plant will soon be installed.

Nevada

ESMERALDA COUNTY—BLAIR

Mitchell & Fairfield—The firm has an option on a group of claims known as the Blair No. 4, Four Timer, Daisy, Gold Bar and Alamo, owned by W. A. Ingalls *et al.* They have also taken an option on a group of four claims owned by T. L. Oddie. Development will be started to ascertain the value of the ground before exercising the option.

Pittsburg-Silver Peak—Twenty stamps are to be added to the mill. This gives the mill 120 stamps. Edmund Jussen is manager. The improvements will be finished in 90 days.

Spring Hill—DeWitte & Thomas, operating this property, have made a test shipment of 25 tons of ore to the mill of the Pittsburg Silver Peak Company. The ore was taken from several different openings, the test being made to determine what grade of ore could be shipped at a profit.

ESMERALDA COUNTY—GOLDFIELD

Goldfield Consolidated—The preliminary work incidental to the installation of the six chilean mills is progressing rapidly at the Consolidated mill. The machinery is due Dec. 1. With this change the capacity of the mill will be increased from 950 to 900 tons per day. The Grizzly Bear company leasing upon the Grizzly Bear claim of the Consolidated has reached 750 feet. Sinking will be continued to the 1000-ft. level. The Mohawk and Jumbo vein systems are expected to be encountered at depth.

Jack Tarbox—The Goldfield Annex company, leasing upon this estate, has attained a depth of 250 ft. It is the intention to sink to 1000 feet.

Great Bend—The Dridem lease upon this property is stoping ore from a new vein recently encountered.

Goldfield Daisy—Millard & Jones have been granted a one-year extension upon their lease. They are installing a new hoist and intend to direct their energies toward picking up the ore shoot formerly worked by Detch & Brewer on the same block. A new body of ore has been discovered on the 115-ft. level of the Goldfield Daisy shaft. Assays run as high as $200.

Nancy Donaldson—A depth of 125 feet has been reached in this shaft and a station is being cut preparatory to starting crosscuts toward the vein. John T. Hawkins is manager.

Crackerjack—Mitchell and Fairfield, leasing upon this property, have been given an extension of 6 years upon their lease, making it expire Nov., 1915. The size of the block has also been increased, and they now have a block 600x1200 ft. Assays running from $3 to $12 per ton are frequently obtained.

Pittsburg-Nevada—This company is crosscutting at 400 ft. The entire length of the level is in vein matter and some gratifying assays have been obtained.

Atlanta—The shaft upon the Garrison or Precious Metals company's lease has attained a depth of 575 ft. and sinking is still being continued. The bottom of the shaft is in dacite.

Florence Goldfield—As soon as the additions are completed the mill will have a capacity of 200 tons per day. Brussels carpets have succeeded the use of amalgamation on plates, and are now making as good a saving of the free gold as the latter, and at a much less expense and trouble. The disposition of tailings has been a difficult problem and the company is now installing pumps and pipe line to transport the tailings to a point south of the mill where room is available. Willis Lawrence, superintendent.

HUMBOLDT COUNTY

Glass, [illegible] and Western Exploration Company—The company is developing its property extensively and operating the mill at Golconda. P. S. Macquisten is manager.

LANDER COUNTY

Easter Manhattan—The Panamint vein has been cut in the Frost shaft at 85 ft. below the tunnel level, or 700 ft. from the surface.

NYE COUNTY

Round Mountain—The output for the first two weeks of October amounted to $5,300. A new vertical vein has been cut in the westerly portion of the property, and where it forms an intersection with the old flat vein at the 700- and 800-ft. levels some good ore was encountered.

Tonopah Mining and Milling Company—In order to increase the capacity of the mill a 10-ft. Chilian mill has been ordered and room is now being made for its installation. This addition will increase the mill from 90 to 120 tons per day.

STOREY COUNTY

Cosmopolitan—This property in the Brunswick district has been sold to George Drysdale for $12,000. The claim is east of the Baker.

WHITE PINE COUNTY—ELY

Boston-Ely—The old officers were re-elected at the recent annual meeting. The Emma shaft is down 990 ft. Commercial ore is not expected before 1200 feet.

Ohio

Columbus & Hocking Coal and Iron Company—In Columbus, Oct. 23, the directors elected Henry Stanley Haskins president to succeed N. L. C. Kachelmacher, who is retiring because of ill-health. President Haskins will make his headquarters in New York and the operation is to be divided among three departments to handle separately the coal, brick, and oil business. The new arrangement will go into effect Nov. 1. Other changes in the officers were the promotion of former secretary and treasurer A. L. Thurman to the vice-presidency and the election of F. J. Shaffer director.

Oregon

BAKER COUNTY

Independence—Rich ore has been found in this mine. One oreshoot is 380 ft. long

JOSEPHINE COUNTY

In the Galice district, 25 miles from Grants Pass, developments are under way on the Alameda, Oriole, Gold Road and Sugar Pine properties. Additional mill capacity is being provided for the camp. The smeltery for the Alameda is now being erected. An important deal involving the Old Channel placer property, more than 1000 acres, has been concluded. The price to be paid is reported to be $150,000. This property is completely equipped, using "giants" under 510-ft. head. Much prospecting is being done on Peavine mountain in this section

Pennsylvania

ANTHRACITE

Hammond—The Philadelphia & Reading Coal and Iron Company, which works the Hammond colliery under lease from the Girard estate, has let a contract to Dolan Brothers, of Pottsville, to sink a shaft 1250 ft. deep, to reach the lower vein, which has not heretofore been worked. This will be the deepest shaft in that part of the anthracite field.

BITUMINOUS COAL

Pittsburg Coal Company—The financial statement for the nine months ended Sept. 30 is as follows:

	1908.	1909.	Changes.
Net earnings...	$2,106,791	$2,187,306	I. $ 80,515
Charges	1,971,562	1,955,705	D. 15,857
Surplus.....	$ 135,229	$ 231,601	I. $ 96,372

The charges this year were made up as follows: Depreciation of coal lands, $497,788; depreciation of plant and equipment, $695,942; interest on bonds, $761,975.

South Dakota

Golden Reward—The Union shaft has been unwatered. The work was the joint undertaking with the Mogul and has been under way since June, when the workings were flooded by the rains.

Utah

JUAB COUNTY

Ajax and Gold Chain—These properties have been consolidated under the control of C. E. Loose.

SALT LAKE COUNTY

Rainbow Mining Company—The tunnel on this property in the Alta camp at 400 ft. has cut a vein of lead-silver ore. This in a part of the district in which no ore has previously been found.

SUMMIT COUNTY

Daly-West—The company has expended in the quarter ended Sept. 30, $152,575, including $28,316 for drain tunnel while the receipts were $128,316. Connection has been made from the tunnel level to the shaft and a station cut at the 1900-ft. level. The exploratory work has been satisfactory and it will soon be practicable to increase the milling operations.

Virginia

LOUISA COUNTY—MINERAL

Armenius—The new shaft has reached a depth of 150 ft. Ore is being mined from the 200, 860 and 960 levels. About 300 men are employed and from three to four carloads of pyrites shipped per day. Joseph B. Clearihius, manager.

Sulphur Mining and Railway Company—Development work is in progress and the vertical shaft has been sunk 250 ft. About 300 men are employed and somewhat reduced shipments maintained. J. H. Haskell is manager.

Allie Cooper—Capt. Boyd Smith has a small crew developing this old lead-silver property. The shaft is down 50 ft and the vein has been drifted on for 100 feet.

PRINCE WILLIAM COUNTY—DUMFRIES

About six miles north of Dumfries the Plainfield Mining Company is opening up a pyrites property. The Austin Run Mining Company also has a force developing a pyrites orebody five miles to the south of Dumfries, in Stafford county.

Cabin Branch—The new 150-ton mill has been running since Sept. 16 and regular shipments of pyrites are being made. Sinking has reached 1500 ft. on the incline and a new hoist is to be installed. About 70 men are employed. John U. Detrick is manager.

Washington

CHELAN COUNTY

Lion Lode—This property on Mary Ann creek has been leased and a shaft will be sunk to bedrock.

FERRY COUNTY

Belcher—The company is planning the installation of a 400-ton smelter.

Duluth-Toroda—The mill at this property has been started. A. H. Perkins is in charge.

Copper Butte—An air compressor and pump have been installed at the mine and winter buildings erected.

STEVENS COUNTY

United Copper—A new vein has been cut at 400 feet.

Zodiac—The tunnel is in 1000 feet and in good copper-gold ore.

Canada

BRITISH COLUMBIA

Yankee Girl—Arrangements are being made for the construction of an aërial tramway from the mine in the Ymir district to the railway. About 2000 tons of ore have already been shipped to the smeltery. H. L. Rodgers is manager.

Fraser River District—Louis Pratt, of Vancouver, manager of a syndicate preparing for gold dredging on Fraser river, has completed arrangements for haulage from Ashcroft on the Canadian Pacific railway to the operations, between Big Bar and Dog creek, of about 400 tons of material for the construction of a dredge.

Skeena District—James Cronin, of Spokane, Wash., has sent in supplies for several men who will continue through the winter the underground prospecting of a silver-lead property under bond in the Babine range.

Cariboo—H. W. Dubois, representing Philadelphia capital, has let a contract for a long ditch and flume in connection with the supply of water for hydraulicking gold-bearing gravel near Quesnel forks.

Portland Canal—This company is erecting a concentrator four miles from tidewater. Construction of a railway from the head of the canal up Bear river, past the concentrator, has been arranged to be commenced in the spring. An aerial tramway from the mine, on Glacier creek, to the concentrator is being put in. Three tunnels are being driven in an orebody averaging 10 ft. in width. Where cut in No. 3 tunnel the ore shoot is 330 ft. below the surface. About 100,000 tons of silver-lead ore are already available for concentration. C. H. Dickie, Duncans, B. C., is managing director.

Red Cliff—In a big mineral zone there appear surface outcrops of three lenses of ore, into which workings have been driven from crosscuts. The last entered shows 27 ft. of copper ore at a depth of about 150 ft. The Canadian Rand Company has

contracted to supply a complete power plant, including four 35-h.p. vertical steam boilers, 12-drill compound air compressor, six machine drills with mountings, electric-lighting plant, etc. Delivery is to be made within three months. A. D. McPhee, Stewart, B. C., is superintendent.

ONTARIO—COBALT

Ore Shipments—Shipments of ore from Cobalt for the week ended Oct. 23 were as follows: Buffalo, 56,200; Coniagas, 60,900; Crown Reserve, 124,780; Kerr Lake, 120,215; La Rose, 513,701; Nipissing, 191,800; O'Brien, 128,100; Right of Way, 124,101 lb.; total, 1,319,887 pounds.

Temiskaming—The management has decided to sink to the 400-ft. level, the main shaft being now down 350 ft. The veins opened up at the 300-ft. level have proved equal to those above. Rapid progress is being made with the installation of the new concentrating mill and only high-grade ore has been shipped for some time.

Waldman—The shaft is down 85 ft. and a station has been started at the 75-ft. level. It is expected that the station will cut into the vein that dipped at 60 ft. in the shaft. Eight tons of ore are now sacked.

Nipissing—The new vein No. 114 on being further uncovered has shown great improvement, being 6 in. wide and rich in native silver. It will be reached underground by crosscutting from vein No. 26, which is within 100 ft. and is likely to be a heavy producer.

Eastern Cobalt—This company will commence putting in machinery preparatory to commencing operations in the spring.

Otisse-Currie—A new vein, not located on the surface, is reported to have been cut on the second level. It is said to average 3 to 4 in. in width, carrying cobalt and silver.

Silver Queen Mining Company—A shaft will be sunk on this company's property near the tracks. It is understood that the diamond drilling carried on during the year has resulted in discoveries which have decided the management to follow this course.

ONTARIO—GOWGANDA

Much ore is reported to be ready to ship from Gowganda, the chief producers being the Regal Garden, Reeves Dobie, Blackburn and Mann properties. The new government road to this camp is now complete and will greatly facilitate transportation during the winter.

ONTARIO

Northern Pacific Company—This company has commenced shipping ore over the Grand Trunk Pacific Railway from Vermilion Lake to Fort William, from where most of it is exported by water to the plant of the General Chemical Company, Detroit. The company has a contract with the railroad to handle 40,000 tons before the close of navigation. About $200,000 has been spent this season in the development. C. C. Whittier is engineer.

Mexico

CHIHUAHUA

Las Vegas—Engineers, supposedly in the interest of the Phelps, Dodge & Co., are making an extensive examination of this copper property along the Orient railway in the eastern part of Chihuahua.

Chucia de Oro—The company has purchased a hydroelectric plant. The Fuerte river will be dammed to provide a 40-ft. head for the turbine and the power will be transmitted electrically five miles to the mill. H. R. Conklin is manager.

COAHUILA

Jimulco—This mine is shipping about 1000 tons a month to Aguascalientes. The ore is found in limestone cave deposits and extensive development is necessary in order to keep a proper reserve. Plans are underway to prospect the grounds northeast of the main workings which have been cut by a fault. The company has built a narrow-gage railroad from the mine to the Mexican Central at Otto, using a Shay locomotive and running on grades up to 8 per cent. and an average of over 6 per cent. Arthur C. Tuttle is general superintendent and J. B. Moore, local superintendent.

Coahuila Mining and Smelting Company—The report that the smeltery at Viesca was planning to resume is authoritatively denied.

DURANGO

San Fernando—This property controlled by J. T. Canfield, Cullican, Sinaloa, will install a mill with concentration and cyanide plant. Hydroelectric power will be used.

Guanacevi—Four milling plants are now operating. The large operations are those of the Mexico Consolidated company, Ayton & Chevrillon and the Durango Milling Company.

GUERRERO

Suciama Mining and Smelting Company—This company owns the Achotla mines, 54 miles down the river from Balsas. A lead furnace, 30x60 in., is being erected to treat the oxidized gold-silver ore developed. Ore over $100 a ton is shipped. J. Gordon Hardy is engineer.

MEXICO

Las Dos—Work has been suspended on this mine at Zacualpan.

SONORA

Green Cananea—The company has completed the hydraulic fill dam made from tailings for the impounding of water for the concentrator.

Bella Union—The lease has been transferred to W. A. Tucker at Nacozari and several cars of high-grade copper ore is being sent to the Douglas each month. The mine is owned by the Moctezuma Copper Company and is eight miles from Nacozari.

San Jose—About 50 tons a month of converter lining is being sent from the Oris mine six miles east of Nacozari.

Churunibabi—This mine of the Moctezuma company is shipping about eight cars a month of converter-lining ore to Douglas.

SINALOA

Panuco—Dividends are now being paid at a rate of 50,000 pesos monthly. The company has been operating in the Concordia district for 30 years, and has distributed to stockholders 10,000,000 pesos.

Santa Cruz—A 10-stamp mill is in operation at the mines 50 miles from Mazatlan.

Butters Copala—The new reduction plant is handling 250 tons daily. The tonnage will be increased until the capacity of 400 tons is reached. Accidents to mill machinery have retarded operations.

South America

BRITISH GUIANA

Gold exports from the colony for the nine months ended Sept. 30, were 48,769 oz. bullion in 1908, and 46,915 oz. in 1909; a decrease of 1854 oz. The bullion reported this year was equal to $814,677, or 39,414 oz. fine gold. Exports of diamonds for the nine months were 4343 carats, valued at $28,197; an increase of 974 carats over last year.

PERU

Cerro de Pasco—The company is producing about 2000 tons of copper monthly, all of which is shipped to the United States for refining. The Haggin-Hearst interests control the company.

Africa

RHODESIA

Gold production in Rhodesia in September is reported at 50,631 oz. fine, making a total of 458,891 oz. for the nine months ended Sept. 30. Last year the reports were partly in bullion. By values the comparison is $0,375,001 in 1908, and $0,485,277 in 1909; an increase of $109,376 this year. The production of other metals and minerals in September was: Silver, 23,150 oz.; copper, 5 tons; lead, 91 tons; tungsten ore, 11 tons; chrome ore, 5264 tons; asbestos, 30 tons. The output of coal was 16,691 tons.

WEST AFRICA

Gold production of Ashanti and the Gold Coast in September is reported at 18,135 oz. bullion, an increase of 359 oz. over August. For the nine months ended Sept. 30, the total output was 224,524 oz. in 1908 and 184,563 oz. in 1909; a decrease of 39,961 oz. The bullion reported this year was equal to $3,624,041, or 175,329 oz. fine gold.

Metal, Mineral, Coal and Stock Markets

Current Prices, Market Conditions and Commercial Statistics of the Metals, Minerals and Mining Stocks

QUOTATIONS FROM IMPORTANT CENTERS

Coal Trade Review

New York, Nov. 3—The coal trade in the West continues active, the demand for domestic coal for the winter having fairly started in most of the larger towns and consuming centers. Steam coal is also in very good demand. Prices still continue to be held down by heavy stocks and heavy shipments from mines. The shipments, however, are being curtailed to some extent by the scarcity of railroad cars which is beginning to be felt quite severely in many parts of the West, especially in Ohio and Indiana.

The bituminous trade in the East also continues to improve. Steam-coal demand is better. Car shortage is felt here though the railroads claim that they are making some improvements in conditions.

The anthracite trade is steady and without special incident. Shipments to the Lake Erie ports are being rushed just now in view of the approach of the close of navigation.

Lake Coal Trade—A rush is on in the Lake coal trade, and shippers in the Lake Erie ports are almost overwhelmed. Dock room is scarce, delaying shipments, and to add to the trouble, cars are becoming scarce. It looks as if November would be a month of rush under various difficulties.

Coal Traffic Notes

Coal and coke tonnages originating on Pennsylvania railroad lines east of Pittsburg and Erie, year from Jan. 1 to Oct. 23, short tons:

	1908.	1909.	Changes.
Anthracite.....	4,163,779	3,938,421	D. 225,358
Bituminous.....	27,070,636	29,647,927	I. 2,577,291
Coke.....	5,620,934	8,929,385	I. 3,308,451
Total	36,855,349	42,515,733	I. 5,660,384

The total increase this year to date was 15.4 per cent.

The Pittsburg Coal Company reports tonnages of coal and coke for the nine months ended Sept. 30 as follows:

	1908.	1909.	Changes.
Pittsburg district.	9,726,587	9,718,334	D. 8,053
Hocking district..	773,588	681,465	D. 92,123
Total coal.....	10,499,975	10,399,799	D. 100,176
Coke made.....	5,370	344,079	I. 338,709

The company's coke ovens were practically closed down for the greater part of last year.

New York

Anthracite

Nov. 3—The cold snap has passed, but it has still left some traces in an increased demand for coal from dealers and in larger deliveries to consumers. Otherwise the trade is quiet and steady as usual.

Schedule prices for large sizes are unchanged at $4.75 for lump and $5 for egg, stove and chestnut, all f.o.b. New York harbor. For steam sizes quotations are: Pea, $3.10@3.25; buckwheat, $2.25@2.50; No. 2 buckwheat or rice, $1.75@2; barley, $1.35@1.50; all f.o.b. New York harbor.

Bituminous

The taking of coal seems to be again on the increase. In considerable part this is due to the call for quick shipments from the shoalwater ports, which are beginning to realize that time is short. In all New England territory, however, the mills seem to be requiring more coal, and even New York harbor is more active. All-rail trade continues steady.

Prices are firmer without any actual rise, except in the case of a few coals for which there is special demand. Sellers, however, are not disposed to cut prices as much as they were.

Car supply is still troubling producers' minds. On some roads it is better than on others, but none seem to have cars to spare. Transportation is not particularly good, coal coming through slowly.

Coastwise rates still continue low, vessels being easy to get. An advance was expected on account of the season, but has not yet been made. New York quotes on small vessels 50c. to points around Cape Cod, with 5c. or 10c. more for a few special points. Philadelphia reports 60@65c. for large boats to Boston, Salem and Portland.

Birmingham

Nov. 1—The scarcity of labor and the shortage of cars are the principal matters under discussion in the Southern coal market. There is a good demand for coal. The mines in operation are doing well, but there is need of labor and the railroads cannot furnish all the cars wanted.

Coke is strong, the demand being heavy and the production not quite sufficient. The Tennessee company, during the past week, lighted up 350 coke ovens in this State, which have been idle for several years. Every effort is to be made to increase the production of coke.

Chicago

Nov. 1. The coal market continues in good condition for the wholesaler, although there is growing complaint about the lack of cars and the weakness of fine coals. Demand, however, is good for both steam and domestic coals and there continues to be a wholesome absence of overshipments of the coals most in demand. The tendency on lump coals is toward higher prices and the greater part of Illinois and Indiana lump is selling for 10 or 15c. higher than a week or two ago. Screenings from these States, on the contrary, are perhaps 10c. lower on the average.

Lump and egg from Illinois and Indiana bring $1.90@2.75; run-of-mine sells for $1.65@1.75, and screenings are not easily sold at 95c.@$1.10, in car lots.

Hocking remains strongest of coals from east of Indiana, being much in demand at $3.15. Smokeless is in better demand than for many weeks, and is selling at $3.60@3.80 for lump and egg, and $3.05@3.15 for run-of-mine. Youghiogheny ¾-in. gas at $3.15 and Pittsburg No. 8 at $2.55 for the same size are quiet. Anthracite is selling well, with a steady demand in both city and country and small sizes much in demand.

Cleveland

Nov. 2—There is almost a deadlock in the Lake trade. Rush orders are coming in, but cannot be filled, partly owing to scarcity of cars and partly to the want of dock room to load. It looks very much as if the coal supply of the Northwest would be short when navigation closes. All is rush here now, with some confusion.

Local trade is active, but with little change of prices, except an advance of 25c. on Massillon coal for domestic use.

Indianapolis

Nov. 1—The conditions in the Indiana mining districts are gradually assuming a good state. The mines are all working full time except when a car shortage occasions a cessation.

There is complete harmony now, where a year ago there was bitter warfare between the National and State administrations of the United Mine Workers, and to celebrate the coming together of the factions 72 miners under suspension were reinstated and granted cards enabling them to work. These men were suspended for appealing to the courts when their organization officials decided against them and collected fines according to the wage contract.

Pittsburg

Nov. 2—The coal market became highly excited last week, the car shortage suddenly growing acute, and prices made the sharpest jump for a long time, fully 15c. a ton. Pittsburg district is now quotable at $1.25@1.30 for mine-run at mine, and 75c. for slack, Freeport being quotable at 95c.@$1. The general supply of cars is decreased, while there is a special rush to get coal to the Lakes before the close of navigation, making the scarcity of cars for the general trade acute. The market will probably ease off somewhat when the Lake trade is over.

Connellsville Coke—The market remains firm, but has not been active as to contracts. Demand for prompt furnace coke has increased. There is no difficulty in obtaining $2.75 for prompt furnace coke and $2.85 is sometimes secured, the market for prompt and balance of year being quotable at $2.75@285. The only contract for next year reported during the week was at a cut price, 5000 tons a month over the first half for a small eastern consumer, at $2.85 at ovens. Producers are firm in their former quotations of $2.90@3 for first half or all of next year. Occasional sales of foundry coke are being made, but the market is not very active. Quotations remain at a minimum of $2.75@3 for prompt, with contract coke firm at $3.25@3.50 per ton.

The *Courier* reports the production in the Connellsville and lower Connellsville regions in the week ending Oct. 23 at 412,326 tons, a gain of 15,000 tons over the previous week; and shipments at 5162 cars to Pittsburg, 8513 cars to points west of Pittsburg and 908 cars to points east of Connellsville, a total of 14,583 cars, a gain of nearly 800 cars over the preceding week.

St. Louis

Nov. 1—The continued warm weather this week has resulted in a slight weakening in demand for low-grade coals. The price as yet has not been affected, as prospects are that cool will be on the jump again next week, as a cold wave is in sight. The demand from the country has been good. The demand for 6-in. lump is strong and the lower-grade mines are having a little difficulty in disposing of their coal. In fact, it is so difficult to dispose of low grade coal that a number of mines have been forced to stop making it altogether and are now only shipping 3-in. lump. Screenings are still as low as ever and are a drug on the market. Standard [illegible] are being given away for [illegible] and Carterville screenings are going for about [illegible] per ton f.o.b. mine. [illegible] and being of fused at [illegible] prices.

The [illegible] in southern Illinois [illegible] and [illegible] to getting [illegible]. A number of [illegible] did not [illegible] last week. On this account high-grade coal is very scarce and high. A touch of real cold weather would swamp all of these mines with orders. The central Illinois field seems to have a fair supply of cars, which is undoubtedly due to their having such a short haul to the market.

Carterville 6-in. lump or egg is bringing $1.75 at mine, or $2.42 St. Louis. No. 1 nut has advanced 25c., bringing $1.50 at mine, or $2.17 St. Louis. Screenings are 25@30c. at mine, 92@97c. St. Louis. Franklin county 6-in. lump and egg is strong at $1.90 at mine, or $2.57 St. Louis; 3-in. nut is worth $1.55 at mine, or $2.22 St. Louis. Coal on the Burlington road is worth a premium.

Staunton, Mt. Olive or Springfield district 6-in. lump is $1.50 per ton at mine, or $2.02 St. Louis; 3-in. lump $1.25, or $1.77 St. Louis; nut is 85c., or $1.37 St. Louis.

Standard 6-in. lump is $1.20 mine, or $1.72 St. Louis; 2-in. lump, $1 mine, or $1.52 St. Louis. Screenings from nothing to 5c. per ton mine, or 57c. St. Louis. Steam nut coal has been offered as low as 35c. mine, or 87c. St. Louis. Carterville No. 1 washed is $1.75 mine, or $2.32 St. Louis.

Anthracite is strong and chestnut is exceedingly scarce. A premium over circular could readily be obtained for spot chestnut coal.

Scranton

Nov. 2—Practically all the mines throughout the anthracite regions are now working on full time. There are a few mines here and there idle, but this is due to repairs or improvements in progress. Local superintendents say that orders for anthracite coal are pouring in upon them with unprecedented rapidity and magnitude for this season. The stocks accumulated by the companies last spring have been used up, and wholesale dealers have permitted their reserves to fall so low that they cannot be considered. The mines generally are in first-class condition; the miners are contented, so far as their working conditions go. What with the revival of trade and the anticipation of a normal winter succeeding two unprecedently mild ones, the industrial outlook from one end of the anthracite regions to the other is exceptionally promising just now.

Foreign Coal Trade

Belgium Coal Trade—Imports and exports of coal in Belgium nine months ended Sept. 30, in metric tons:

	Imports	Exports	Excess
[illegible]	[illegible]	[illegible]	Imp. [illegible]
[illegible]	[illegible]	[illegible]	Exp. [illegible]
Briquets	[illegible]	[illegible]	Exp. [illegible]
Total	[illegible]	[illegible]	Exp. [illegible]
Total 1908	[illegible]	[illegible]	Exp. [illegible]

Increase in total imports, 381,147 tons, or 6.9 per cent. Increase in exports, 481,[illegible]700 tons, or 10.7 per cent.

Railroad Coal in Russia—The Russian Imperial Railway administration recently contracted with coal companies in the Donetz basin for 138,000,000 poods—about 2,500,000 tons—of coal, deliveries to run over three years. The contract prices range from 7.25 to 8.25 kopeks per pood—$2.07 to $2.35 per short ton, f.o.b. cars.

Welsh Coal Market—Messrs. Hull, Blyth & Co., London and Cardiff, Wales, report prices of coal as follows on Oct. 23: Best Welsh steam, $4.14; seconds, $3.90; thirds, $3.72; dry coals, $4.02; best Monmouthshire, $3.48; seconds, $3.36; best small steam, $2.16; seconds, $1.68. All prices are per long ton, f.o.b. shipping port, for cash in 30 days, less 2½ per cent. discount.

Iron Trade Review

New York, Nov. 3—The iron and steel market activities continue with little variation. Business is active and there is special animation in certain lines which promises to keep up during the coming month.

In pig iron considerable purchases of bessemer from merchant furnaces by several steel companies are reported in the Central West. In the East foundry iron is still being taken and prices remain firm and even higher, $19.75 having been asked for No. 1 foundry, New York delivery. More basic iron is being taken and the prospects are for a steady demand for that kind of pig.

The call for billets and other semi-finished material is very good. In fact, steel billets are scarce, and it is understood that some negotiations are in progress looking to the importation of a considerable quantity of basic billets from Germany.

In finished material there is quite an excitement in plates, the large demand being due to the recent placing of extraordinary orders for steel cars by a number of railroads. Other material is quiet and structural steel is almost dull in comparison with what it has been.

The American Sheet and Tin Plate Company has closed down two of its large tin plants at Bridgeport, O., and Martin's Ferry, O., and is moving the machinery to other points. These two were the largest unionized plants of the company, and were those chiefly affected by the Amalgamated Association strike.

Foreign Iron Ores—It is stated that furnaces in eastern Pennsylvania have recently placed orders for about 300,000 tons of Swedish iron ore from the Kirunavaara mines for 1910 delivery. The price at which these ores were offered was $[illegible] per unit ex ship, Philadelphia, which would be $1.25 per ton for a 55 per cent. ore.

Baltimore

Nov. 2—Imports for the week included [illegible] tons spiegeleisen and 2666 tons fer-

romanganese from Great Britain; 635 tons manganese ore from Beira; 10,750 tons iron ore from Cuba.

Birmingham

Nov. 1—Firm at $15 per ton, No. 2 foundry, is the Southern pig-iron market. The selling has been halted a little lately, though inquiries continue to come in. What selling that is being done in this part of the country is for the first half of the coming year. Reported imports of foreign pig have had the effect of stopping to a certain extent much of the inclination toward a runaway market. The home consumption continues to show improvement and the shipments are equal to the make and a little better. The probable make for the first quarter of the coming year has been covered. Charcoal iron has become very active recently, the buying on the part of car-wheel makers of a couple of months back, now being followed by railroad interests and others. The price of charcoal iron is inclined upward, $21.50 being the regular quotations.

Chicago

Nov. 2—The iron market continues quiet, with sales of pig iron widely distributed but in small lots generally. Sales hold in general to $15 Birmingham ($19.35 Chicago) for Southern and $19@19.50 for Northern No. 2, on iron for delivery in the next three months. Most sales are for first-quarter delivery, with some scattering trade remaining on 1909 deliveries and a gradual extension into the second quarter by melters who have held out as long as possible to see how things would go. The lull in buying is simply that the melters have at last caught up to the immediately prospective needs of their customers.

Sales of iron and steel products are in general quiet but of good aggregate volume, with railroad supplies most in demand. Coke is selling at $5.10@5.25—an advance of 25c. or more—because of the short supply.

Cleveland

Nov. 2—The iron-ore situation is unchanged. The movement is so heavy that there is trouble in handling at the docks. There is a rush to get down as much as possible before navigation closes.

Pig Iron—New sales are fewer, but the market is firm, and no concessions are to be had. Quotations are for bessemer, $19@19.50; No. 2 foundry, $18.25@18.50; gray forge $17.25@17.50; Lake Superior charcoal, $20; all Cleveland delivery.

Finished Material—Less is heard of new contracts, but specifications are coming with a rush. The only line showing many new orders is bar iron.

Philadelphia

Nov. 3—The explanation of the moderate amount of business done in pig iron this week is that the furnaces are well sold up, buyers are pretty well supplied for the present and makers are unwilling to compromise themselves by entering into contracts for late deliveries when they can see no particular necessity for it. There are concerns here which would like to have more iron and one contract for 3000 tons of bessemer was put through for what is regarded as early delivery at $19. A great deal more basic iron will be needed in this territory and the manufacturers are solicitous, but for the present must rest assured with promises that they will be taken care of. Further sales of malleable have been made and forge contracts have been placed. More interest has been taken in Virginia and Alabama iron than usual. Both Northern and Southern No. 2 are quoted strong at $19, and forge is $17.50@18.

Steel Billets—Both bessemer and open-hearth billets have advanced another 50c. and there are still hanging in the balance a few orders which hinge on delivery. Forging billets are urgently wanted for early delivery.

Scrap—Scrap dealers report everything salable as sold up and urgent inquiries crowding in for larger supplies for the winter. Heavy steel scrap is practically exhausted and the holders of railroad scrap are not selling or accepting offers.

Pittsburg

Nov. 2—The iron and steel situation continues strong on account of heavy pressure on the mills all along the line for deliveries. Specifications are still coming in on old contracts for finished products, while buyers are urging better deliveries on specifications already filed. While the general feeling has been that some important part of the finished steel currently shipped is going into stocks of manufacturers and jobbers, it is certain from the pressure exerted on mills that a very large part is required for current consumption. The pressure for steel-bar deliveries to the agricultural trade is particularly strong. Some of the mills report steel-bar specifications actually on books sufficient for full production over from four to five months.

The general tendency of the mills is to discourage new buying, as they think they see evidences of a speculative tendency. Orders are accepted only after careful scrutiny, and in many cases the tonnages offered are scaled down.

Pig Iron—The Youngstown Sheet and Tube Company has bought 40,000 tons of bessemer pig at $19, Valley, taking 30,000 tons from the Bessemer Pig Iron Association for delivery November to June, inclusive, and 10,000 tons from W. P. Snyder & Co., for November and December. A sale of 3000 tons of prompt bessemer has been made to an eastern steel interest at $19, Valley, and a local merchant furnace interest has bought a total of 5000 tons, paying $19 for the major part, but paying $19.10 for two 1000-ton lots. The Massillon Iron and Steel Company has bought 36,000 tons of Nos. 3 and 4 foundry iron, for delivery over the first half, at $17, Valley, for No. 3 and a shade less for No. 4. Outside of this business the pig-iron market has been quiet. The bessemer average for October was $18.78, Valley, sales of 165,000 tons being recorded, while the basic average was $16.94, Valley. These represent advances over September of $1.34 on bessemer and $1.04 on basic. The market remains quotable as follows, Valley furnace: Bessemer, $19; basic, $17.25@17.50; foundry, $17.25@17.75; malleable, $17.50@18; gray forge, $16.25@16.75 per ton.

Steel—The scarcity of steel has become still more acute, there being scarcely any available for this year, while producers are not naming for next year. Nominally bessemer billets are about $27 at mill, Pittsburg, with open-hearth billets at $28, sheet-bars at $28 and rods at $32 per ton.

Sheets—The market is strong and mills are conservative as to sales for next year, while they are practically sold up for this year. Regular prices remain at 2.30c. for black and 3.35c. for galvanized, 28 gage, corrugated roofing being $1.60 a square for painted and $2.85 for galvanized.

St. Louis

Nov. 1—The demand for pig iron still continues heavy and buyers are snapping up everything that is being offered for the first quarter of next year, which is very little. Business for the first half is active and furnaces are very nearly sold out for that period. The market is the same as it has been, $15@15.25 per ton. Birmingham or $18.75@19 St. Louis for No. 2 foundry.

Metal Markets

New York, Nov. 3—More activity has been displayed in the metal markets, and there seems to be more buying interest in copper developing.

Gold, Silver and Platinum

UNITED STATES GOLD AND SILVER MOVEMENT

Metal.	Exports.	Imports.	Excess.
Gold			
Sept. 1909	$ 7,546,442	$ [illegible] Exp.	$ 5,195,184
" 1908	4,971,091	4,[illegible] Imp.	792,960
Year 1909	97,232,[illegible]	[illegible] Imp.	66,167,641
" 1908	48,[illegible]	28,[illegible]	20,[illegible],407
Silver			
Sept. 1909	1,[illegible]	[illegible] Exp.	1,124,155
" 1908	1,198,[illegible]	[illegible]	827,[illegible]
Year 1909	43,[illegible]	[illegible]	19,148,[illegible]
" 1908	38,781,[illegible]	46,[illegible]	7,988,676

Exports from the port of New York week ended Oct. 30: Gold, $1,640,000, to Brazil, Panama and Hoch; silver, $54,000, to London and Paris. Imports: Gold, $107,737; silver, $236,215, from the West Indies, Mexico and South America.

A Johannesburg telegram estimates the output of gold in the Transvaal at 600,000 oz., or $12,400,000; making a total of $125,570,000 for the 10 months ending with October.

Gold—There was a demand for gold on the open market in London, and prices remained at 77s. 11¼d. per oz. for bars, and 76s. 5¼d. for American coin. Paris and Berlin took some of the gold arriving, a good share going to the Bank of England. In New York some more gold was taken for South America.

Platinum—The market continues very strong, demand being good, especially for the jewelry trade. Dealers ask $28.50 per oz. for refined platinum, and $32.25 for hard metal.

Silver—The market continues steady without any special feature. Demand the last few days appears to be from China, and the market has been sustained by purchases on account of that country rather than by orders from India, where the price equivalent for the moment is somewhat lower.

SILVER AND STERLING EXCHANGE

Oct.-Nov.	28	29	30	1	2	3
New York....	50⅝	50¼	50	50¼	.....	50⅜
London.....	23⅞	23⅝	23 7/16	23⅛	23¼	23 9/16
Sterling Ex..	4.8720	4.8720	4.8725	4.8730	.....	4.8725

New York quotations, cents per ounce troy, fine silver; London, pence per ounce sterling silver, 0.925 fine.

Exports of silver from London to the East, Jan. 1 to Oct. 21, as reported by Messrs. Pixley & Abell:

	1908.	1909.	Changes.
India.....	£ 7,477,463	£5,168,600	D. £2,308,863
China.....	516,400	1,555,200	I. 1,038,800
Straits.....	112,385	82,800	D. 29,585
Total.....	£ 8,106,248	£6,806,600	D. £1,299,648

Copper, Tin, Lead and Zinc

Oct.-Nov.	Copper: Lake, Cts. per lb.	Copper: Electrolytic, Cts. per lb.	Copper: London, £ per ton.	Tin: Cts. per lb.	Lead: New York, Cts. per lb.	Lead: St. Louis, Cts. per lb.	Zinc: St. Louis, Cts. per lb.
	12⅞ @13¼	12½ @12¾	57	30⅛ @30⅜	4.32½ @4.37½	4.20 @4.25	6.22½ @6.27½
28	12⅞ @13¼	12⅝ @12¾	57⅛	30⅛ @30⅜	4.32½ @4.37½	4.20 @4.25	6.22½ @6.27½
29	12⅞ @13¼	12½ @12¾	....	30⅛ @30⅜	4.32½ @4.37½	4.20 @4.25	6.22½ @6.27½
30	12⅞ @13¼	12½ @12¾	57⅛	30⅛ @30⅜	4.35 @4.37½	4.22½ @4.27½	6.22½ @6.27½
1						4.22½ @4.27½	6.22½ @6.27½
2	12⅞ @13¼	12¼ @12¾	57⅛	30⅛ @30⅜	4.35 @4.37½	4.22½ @4.27½	6.22½ @6.27½

London quotations are per long ton (2240 lb.) standard copper. The New York quotations for electrolytic copper are for cakes, ingots and wirebars and represent the bulk of the transactions made with consumers, f.o.b. New York, cash. The prices of casting copper and of electrolytic cathodes are 0.125c. below that of electrolytic. The quotations for lead represent wholesale transactions in the open market. The quotations for spelter are for ordinary Western brands; special brands command a premium.

Copper—The air has been full of rumors regarding the plans pending to better the condition of the copper industry, either by amalgamation of leading producers or curtailment of production. It is recognized generally that the present offers exceptional opportunity for carrying out a scheme of this kind, but there has been no tangible evidence of such an undertaking excepting in a violent advance of copper shares, particularly those of the Amalgamated Copper Company. However, these developments have brought home to consumers that irrespective of everything else the present price of copper is low, and a buying movement of considerable proportions took place during the week, both here and in Europe, which resulted in a stiffening of prices. At the close the market is firm at 12⅞@13⅛c. for Lake copper, and 12¾@12⅞c. for electrolytic copper in cakes, wirebars and ingots. Casting copper is quoted nominally at 12½@12¾ cents.

Copper sheets are 17@18c., base for large lots. Full extras are charged, and higher prices for small quantities. Copper wire is 14½c. base, carload lots at mill. Business continues on a good scale.

The standard market in London has in even a greater degree been affected by the aforesaid speculative possibilities, and the close is firm and higher at £57 15s. for spot and £58 17s. 6d. for three months.

Refined and manufactured sorts we quote: English tough, £62; best selected, £61@62; strong sheets, £73@74 per ton.

Exports of copper for the week from New York and Philadelphia were 4968 long tons. Our special correspondent gives the exports from Baltimore at 1392 tons of copper.

Copper in October—During October the copper market was quite uninteresting, there having been no large buying movement at any time. The chief feature of the month was the rise in the rate for money which compelled some speculators to liquidate, while moreover some of the foreign bankers sought to discourage the speculation in copper. These factors resulted in the disadvantageous marketing of a good deal of copper. The statistics published on the tenth of the month contributed to the unfavorable sentiment. During the month one of the large sellers remained practically out of the market, but others freely took such business as was offered upon a declining scale, the price for electrolytic toward the close of the month sagging nearly to 12½c. At the very end there was a slight improvement in tone. During the month the business of American manufacturers was excellent in all branches with the exception of heavy wire for transmission and trolley purposes. On the other hand, business in the brass and sheet trades was extremely active and the mills at Waterbury were reported as working overtime.

Tin—The publishing of the domestic statistics, which showed almost record deliveries for the month of October, brought about active business in this market toward the end of last week. The London market, however, did not readily respond to the advance in the domestic market, but showed rather an easier tendency. The market over there closes at £138 2s. 6d. for spot, and £140 2s. 6d. for futures, while tin in this market can be secured at about 30½ cents.

Lead—The demand for this metal is broadening, and prices are again somewhat firmer at 4.35@4.37½c. New York, and 4.22½@4.27½c. St. Louis.

The London market is easier, and the close is cabled at £13 for Spanish, and £13 2s. 6d. for English lead.

Spelter—Consumers having supplied their requirements, the demand has considerably decreased, but as smelters are liberally supplied with orders, prices have remained steady at 6.22½@6.27½c. St. Louis, and 6⅛@6.42½c. New York.

New York quotations for spelter, Oct. 28 to 30, inclusive, were 6.37½@6.42½c.; Nov. 1 and 3, also, 6.37½@6.42½ cents.

Up to Oct. 30, inclusive, there were some very large sales of spelter on the basis of 6.25c. St. Louis. Since then the transactions have been small, and sentiment as to the market seems to be mixed, some sellers considering the tone to be a little stronger while others regard it as a little weaker. Evidently the market is near the top of the recent rise, if the top has not already been passed.

The London market is unchanged at £23 2s. 6d. for good ordinaries, and £23 7s. 6d. for specials.

Base price of sheet zinc is now 8c. per lb., f.o.b. La Salle-Peru, Ill., less 8 per cent. discount.

Other Metals

Antimony—Business is good, but prices are unchanged. Cookson's is quoted at 8⅛@8⅜c. per lb.; Hallett's, 8¼@8⅜c.; U. S., 7⅞@8c.; outside brands, 7⅝@7¾c per pound.

Aluminum—No change is noted. No 1 ingots are still quoted 20@23c. per lb. in large lots, the higher figure being that named by the American maker.

Quicksilver—Business has been active, and there has been a further sharp advance. In New York the quotation is now $50@51 per flask of 75 lb. for large lots, while jobbers ask 68@70c. per lb. for small orders. San Francisco quotations are $48.50 per flask for domestic business and $5 less for export. The London price has also been sharply advanced, and is now £9 per flask, with £8 17s. 6d. asked by jobbers.

Magnesium—The price of pure metal is $1.50 per lb. for 100-lb. lots f.o.b. New York.

Nickel—Large lots, contract business, 40@45c. per lb. Retail spot, from 50c. for 2000-lb. lots, up to 55c. for 500-lb. lots. The price for electrolytic is 5c. higher.

Cadmium—Current quotations, 65@70c. per lb. in 100-lb. lots at Cleveland, Ohio. In Germany 450@475 marks per 100 kg., at factory in Silesia.

Spanish Metal Exports

Exports of metals and minerals from Spain, eight months ended Aug. 31; reported by *Revista Minera*, in metric tons:

Metals.	1908.	1909.	Changes.	
Pig and manuf. iron	23,977	40,320	I.	16,343
Copper	8,600	12,569	I.	3,969
Copper precipitate	14,568	11,193	D.	3,375
Lead	124,329	121,071	D.	3,258
Zinc	815	883	I.	68
Quicksilver	1,495	1,488	D.	7
Minerals.				
Iron ore	5,216,901	5,170,256	D.	46,645
Manganese ore	16,105	9,612	D.	6,493
Copper ore	794,499	752,517	D.	41,982
Lead ore	2,269	2,461	I.	192
Zinc ore	73,529	84,402	I.	10,873
Pyrites	975,828	888,251	D.	87,577
Salt	431,527	418,780	D.	12,747

Imports of phosphate rock, 62,396 tons in 1908, and 57,400 in 1909; decrease, 4996 tons.

Zinc and Lead Ore Markets

Platteville, Wis., Oct. 30—The highest price paid this week for zinc ore was $51 per ton; the base price, 60 per cent. zinc, was $50 per ton. The base price paid for lead ore was $55@56 per ton.

SHIPMENTS, WEEK ENDED OCT. 30.

Camps.	Zinc ore, lb.	Lead ore, lb.	Sulphur ore, lb.
Platteville	673,220	79,390	328,950
Benton	697,780	.....	126,000
Hazel Green	490,800	.....	53,800
Highland	429,900	75,000	.....
Cuba City	492,160	.....	108,100
Galena	400,000	.....	.....
Days Siding	160,000	.....	.....
Rewey	159,000	.....	.....
Livingston	140,000	.....	.....
Linden	126,290	.....	59,030
Hanker	111,180	110,900	.....
Shullsburg	88,000	88,000	.....
Montfort	66,000	.....	.....
Total	3,935,930	353,290	676,180
Year to Oct. 30	115,727,135	7,766,185	12,078,910

In addition to the above there was shipped to the American Zinc Ore Separating Company, 260,770 lb. and to the Joplin Separator Works, 370,575 lb. zinc ore.

Joplin, Mo., Oct. 30—The highest price paid for zinc sulphide ore was $54 per ton, the base being $50@52.50 per ton of 60 per cent. zinc, for the choicest grades, and as high as $53 base for several bins of ore heavy in iron. Zinc-silicate ore sold up to $32.50, the base ranging from $27.50 to $28.50 per ton of 40 per cent. zinc. Average price, all grades $48.14 per ton. There was no advance in the general lead market, yet a few large bins of ore were advanced to $58, with the general market at $57 per ton, and medium grades selling at $55@56. Average price, all grades $55.82 per ton.

The continued cry for cars on the part of the purchasing agents brought an extra supply this week, and the largest zinc shipment ever known in one week was the outcome. There were over 8100 tons shipped. This will materially relieve the reserve stock, leaving unsold approximately 3500 tons, and reducing the bin stock to 6500 tons.

SHIPMENTS, WEEK ENDED OCT. 30.

	Zinc, lb.	Lead, lb.	Value.
Webb City-Carterville	5,648,780	1,566,540	$185,083
Joplin	2,293,390	233,370	64,627
Miami	1,098,000	420,650	37,045
Duenweg	946,390	161,820	26,758
Prosperity	884,820	322,680	26,154
Galena	786,350	95,930	21,588
Aurora	658,850	.....	13,375
Granby	633,320	9,570	11,680
Oronogo	472,110	.....	11,429
Jackson	465,750	.....	11,178
Alba-Neck	394,170	8,590	10,085
Spurgeon	354,840	81,990	9,712
Zincite	308,530	.....	8,021
Badger	271,970	.....	6,544
Carthage	261,740	6,400	6,716
Quapaw	244,570	.....	5,869
Sarcoxie	158,840	.....	5,186
Saginaw	174,010	3,080	3,973
Cave Springs	125,280	.....	3,068
Carl Junction	66,140	.....	1,752
Wentworth	65,540	.....	1,506
Stott City	54,040	.....	1,351
Totals	16,277,030	2,899,940	$472,917
10 months	499,294,380	75,302,080	$12,004,040

Zinc value, the week, $391,955. 10 mos., $9,948,294
Lead value, the week, 80,962: 10 mos., 2,055,746

MONTHLY AVERAGE PRICES.

Month.	Zinc Ore. Base Price. 1908.	1909.	Zinc Ore. All Ores. 1908.	1909.	Lead Ore. All Ores. 1908.	1909.
January	$37.60	$41.25	$35.56	$38.46	$46.88	$52.17
February	36.63	36.94	34.92	34.37	49.72	50.50
March	36.19	37.40	34.19	34.71	49.90	50.82
April	35.40	38.63	34.08	37.01	52.47	55.63
May	34.19	40.06	33.39	37.42	56.05	56.59
June	33.06	44.15	32.07	40.35	60.48	57.52
July	34.55	43.06	31.67	41.11	59.90	53.74
August	36.53	48.25	33.42	44.54	60.34	57.60
September	37.63	47.70	34.44	44.87	54.59	56.11
October	35.95	49.50	33.28	45.75	52.63	55.02
November	39.13	.....	35.02	.....	54.53	.....
December	42.75	.....	39.63	.....	49.68	.....
Year	$36.63	.....	$34.31	.....	$53.93	.....

NOTE. Under zinc ore the first two columns give base prices for 60 per cent. zinc ore; the second two the average for all ores sold. Lead ore prices are the average for all ores sold.

Chemicals

New York, Nov. 3—The general market continues to show some degree of improvement. Contract deliveries continue good and there is a little more spot business in some lines.

Copper Sulphate—There is not much change in the volume of business, but the market is steady. Quotations are unchanged at $3.95 per 100 lb. for carload lots and $4.25 per 100 lb. for smaller orders.

Arsenic—Trade remains quiet and in the absence of large transactions prices are unchanged. White arsenic is quoted at 2.70@2.75c. for spot and 2.87½c. for next year's delivery.

Nitrate of Soda—The market this week has been quiet, with only small transactions. Supplies are good and quotations continue at 2.10c. per lb. for both spot and future positions.

Mining Stocks

New York, Nov. 3—Election day and the various activities preceding and following it interfered with the Stock Exchange in New York perhaps a little more than the actual holiday would seem to warrant. In the early part of the week there was a degree of firmness displayed, with some advance in stocks: but later this gain was dissipated and the market weakened slightly. Money continues rather high and this has discouraged speculation. Moreover there was less buying of securities from abroad, the 5 per cent. rate in London and high rates in Berlin weighing somewhat heavily on speculators over the time.

On the Curb copper stocks were rather firmer in the early part of the week, and there was considerable dealing, the rumors of some arrangement pending among the copper producers having helped that class of stocks. Dealings in the Cobalt stocks were rather large, but were accompanied with some weakness. The Nevada gold stocks were not especially active.

There was one sale of Homestake of South Dakota during the week, 154 shares changing hands at $88 per share.

Boston, Nov. 2—Copper shares had quite a sharp rise late last week on reports of a combination of some sort. The persistent advance in the price of Amalgamated from $80.50 to $87.12½ in less than a week, lends strength to this assertion, while the technical denial of President Ryan, of the Amalgamated Company, does not carry much weight. Local interests believe that the long delayed copper-stock boom is not far distant now.

Sympathetically North Butte had a sharp rise of $4.37½ to $60.87½, although there is considerable bearish talk on it from Lawson quarters. Butte Coalition has been active and strong with a $1.75 advance to $28.50. The assumption of dividends at this time would indicate that something unusual was happening.

Calumet & Hecla felt the effect of bullish sentiment and rose $40 to $670, while Calumet & Arizona rose to $7 to $104, although the latter reacted to $100 on free profit taking. Bonanza mining had a spurt to $8, on knowledge that the company had disposed of land which would admit of a small dividend. Copper Range also

[illegible] to the extent of $2.75 by touching $81.25. American Zinc made its high for the year at $37. Lake rose $3 to $37.25, but the market for this stock is less aggressive.

Curb trading has been active and many of the stocks have recorded good advances. Union Copper and Consolidated Arizona have been favorites.

STATISTICS OF COPPER.

Month.	United States Production.	Deliveries, Domestic.	Deliveries for Export.
I	112,135,200	51,862,624	38,499,797
II	103,700,817	43,578,118	30,968,496
III	117,058,661	48,871,964	59,191,045
IV	115,574,292	47,546,010	65,110,111
V	118,356,146	61,163,325	70,542,753
VI	116,367,493	69,591,116	70,966,457
VII	118,277,603	75,520,083	75,018,974
VIII	120,597,234	59,614,207	48,382,704
IX	118,025,130	52,105,955	50,077,777
X			
XI			
XII			

VISIBLE STOCKS.

	United States.	Europe.	Total.
I	122,357,266	124,716,480	247,073,746
II	144,130,045	118,574,400	262,704,445
III	173,284,248	117,140,800	290,425,048
IV	182,279,902	115,024,000	297,303,902
V	183,198,073	114,050,320	297,248,393
VI	169,848,141	127,352,960	297,201,101
VII	154,858,061	150,928,960	305,787,021
VIII	122,596,607	171,492,160	294,088,767
IX	135,196,930	197,993,600	333,190,530
X	151,037,137	210,224,000	361,261,137
XI		222,566,400	
XII			

Figures are in pounds of fine copper. U. S. production includes all copper refined in this country, both from domestic and imported material. Visible stocks are those reported on the first day of each month, as brought over from the preceding month.

Monthly Average Prices of Metals

SILVER

Month.	New York 1908.	New York 1909.	London 1908.	London 1909.
January	55.678	51.750	25.738	23.834
February	56.000	51.472	25.855	23.706
March	55.365	50.468	25.570	23.227
April	55.505	51.428	25.133	23.708
May	52.795	52.905	24.377	24.343
June	53.663	52.538	24.760	24.166
July	53.115	51.043	24.514	23.519
August	51.683	51.125	23.858	23.588
September	51.720	51.440	23.877	23.743
October	51.431	50.[illegible]	23.725	23.[illegible]
November	49.647	.....	22.933	.....
December	48.766	.....	22.493	.....
Year	52.864		24.402	.....

New York, cents per fine ounce. London, pence per standard ounce.

COPPER

Month	New York Electrolytic 1908.	New York Electrolytic 1909.	New York Lake 1908.	New York Lake 1909.	London 1908.	London 1909.
January	[illegible]	[illegible]	13.901	14.280	62.386	57.688
February	12.[illegible]	12.[illegible]	13.098	13.295	58.786	61.198
March	12.[illegible]	12.[illegible]	12.[illegible]	12.826	58.761	[illegible]
April	12.[illegible]	12.[illegible]	12.[illegible]	12.93[illegible]	58.331	[illegible]
May	12.[illegible]	12.[illegible]	12.[illegible]	13.238	57.387	59.[illegible]
June	12.[illegible]	13.234	12.[illegible]	13.548	57.842	59.627
July	12.[illegible]	12.[illegible]	12.933	13.363	57.989	58.556
August	13.[illegible]	[illegible]	13.[illegible]	13.[illegible]	60.500	59.393
September	13.[illegible]	[illegible]	13.[illegible]	[illegible]	60.338	[illegible]
October	13.[illegible]	[illegible]	13.[illegible]	[illegible]	60.1[illegible]	[illegible]
November	14.1[illegible]		14.[illegible]		63.417	..
December	14.111		14.411		62.943	
Year	13.2[illegible]		13.424		59.902	

New York, cents per pound. Electrolytic is for cakes, ingots or wirebars. London, pounds sterling, per long ton, standard copper.

TIN AT NEW YORK

Month.	1908.	1909.	Month.	1908.	1909.
January	27.380	28.060	July	29.207	29.125
February	28.978	28.290	August	29.942	29.966
March	30.577	28.727	September	28.815	30.293
April	31.702	29.445	October	29.444	30.475
May	30.015	29.225	November	30.348	....
June	28.024	29.322	December	29.154	...
			Av. year	29.465	....

Prices are in cents per pound.

LEAD

Month.	New York. 1909.	New York. 1909.	St. Louis 1909.	London. 1908.	London. 1909.
January	3.691	4.175	4.025	14.469	13.113
February	3.725	4.018	3.868	14.250	13.313
March	3.838	3.986	3.835	13.975	13.438
April	3.993	4.168	4.051	13.469	13.297
May	4.253	4.287	4.214	12.938	13.225
June	4.466	4.350	4.291	12.600	13.031
July	4.744	4.321	4.188	13.000	12.563
August	4.580	4.363	4.227	13.375	12.475
September	4.515	4.342	4.215	13.125	12.781
October	4.351	4.341	4.215	13.375	13.175
November	4.330	......	......	13.538	...
December	4.213	......	......	13.156	......
Year	4.200	......	......	13.439	......

New York and St. Louis, cents per pound. London, pounds sterling per long ton.

SPELTER

Month.	New York. 1908.	New York. 1909.	St. Louis. 1908.	St. Louis. 1909.	London. 1908.	London. 1909.
January	4.513	5.141	4.363	4.991	20.563	21.425
February	4.788	4.889	4.638	4.739	20.875	21.563
March	4.665	4.757	4.527	4.607	21.075	21.438
April	4.645	4.965	4.495	4.815	21.344	21.531
May	4.608	5.124	4.458	4.974	19.906	21.975
June	4.543	5.402	4.393	5.252	19.000	22.000
July	4.485	5.402	4.338	5.252	19.031	21.969
August	4.702	5.729	4.556	5.579	19.350	22.125
September	4.769	5.796	4.619	5.646	19.563	22.906
October	4.801	6.199	4.651	6.043	19.750	23.200
November	5.069	......	4.909	......	20.875	..
December	5.137	......	4.987	......	20.625	..
Year	4.726	......	4.578	......	20.163	....

New York and St. Louis, cents per pound. London, pounds sterling per long ton.

STOCK QUOTATIONS

NEW YORK Nov. 3 Name of Comp.	Clg.
Alaska Mine	‡.11
Amalgamated	‡80
Anaconda	‡45
Balaklala	‡2[illegible]
British Col. Cop.	7
Buffalo Mines	3
Butte Coalition	28
Colonial Silver	‡[illegible]
Cum. Ely Mining	7[illegible]
Davis Daly	5[illegible]
Dominion Cop.	7
Douglas Copper	1
El Rayo	2[illegible]
Florence	2
Foster Cobalt	‡.32
Furnace Creek	‡.05
[illegible]	[illegible]
Gold Hill	[illegible]
Goldfield Con	7[illegible]
Granby	95
Greene Gold	[illegible]
Greene G. & S.	[illegible]
Guanajuato	2
Guggen. Exp.	21[illegible]
[illegible]	‡15
Kerr Lake	8
McKinley Dar	[illegible]
Miami Copper	16[illegible]
[illegible]	[illegible]
Mines Co. of Am.	[illegible]
[illegible] of C. B.	1[illegible]
[illegible]	1
Nev. Utah M. & S.	1
Newhouse M. & S.	[illegible]
Nipissing Mines	11
Old Hundred	[illegible]
Silver Queen	34
[illegible]	[illegible]
Tennessee Copper	[illegible]
Tri-Bullion	1
[illegible] Copper	[illegible]
Utah Apex	[illegible]
Utah Copper	[illegible]
Yukon Gold	[illegible]

‡Last quotation.

BOSTON Nov. 3 Name of Comp.	Clg.
Adventure	[illegible]
Allouez	[illegible]
Am. Zinc	[illegible]
Arcadian	4[illegible]
Arizona Com.	45[illegible]
Atlantic	11
Boston Con.	14
Calumet & Ariz.	101
Calumet & Hecla	665
Centennial	39
Copper Range	81
Daly West	7[illegible]
East Butte	11
Franklin	16[illegible]
Greene Can.	11
Hancock	11
Isle Royal	2[illegible]
Keweenaw	2[illegible]
La Salle	14
Mass.	[illegible]
Michigan	[illegible]
Mohawk	[illegible]
Nevada	[illegible]
North Butte	[illegible]
Ojibway	[illegible]
Old Colony	[illegible]
Old Dominion	[illegible]
Osceola	15[illegible]
Parrot	[illegible]
Quincy	[illegible]
Rhode Island	[illegible]
[illegible]	[illegible]
[illegible]	[illegible]
Superior & Boston	14
Superior & Pitts.	[illegible]
Tamarack	[illegible]
Trinity	10
U. S. Smg. & Ref.	[illegible]
U. S. Sm. & Re. pd.	[illegible]
Utah Con.	[illegible]
Victoria	[illegible]
Winona	7
Wolverine	150
Wyandotte	2

‡Last quotation.

N. Y. INDUSTRIAL	
Am. Agri. Chem.	46
Am. Smelt. & Ref.	98[illegible]
Am. Sm. & Ref., pf.	111
Colo. Fuel & Iron.	46[illegible]
Federal M. & S., pf.	‡80
National Lead	88[illegible]
National Lead, pf.	‡110[illegible]
Pittsburg Coal	21[illegible]
Republic I. & S.	47[illegible]
Republic I. & S., pf.	10[illegible]
Sloss-Sheffield	92
Standard Oil	‡685
U. S. Steel	90[illegible]
U. S. Steel, pf.	12[illegible]
Va. Car. Chem.	47

BOSTON CURB	Low.
Ahmeek	210
Chemung	16½
Chino	7[illegible]
Gila	7¼
Indiana	6[illegible]
Mason Valley	1[illegible]
Ray Central	2[illegible]
Ray Con.	19
San Antonio	8[illegible]
Yuma	1[illegible]

Furnished by Hornblower & Weeks, N. Y.

ST. LOUIS Oct. 30 N. of Com.	High.	Low.
Adams	.40	.30
Am. Nettie.	.09	.07
Center Cr'k	1.80	1.60
Cent. C. & C.	86.00	85.00
C. C. & C. pf.	85.00	83.00
Cent. Oil	110.00	100.00
Columbia	9.00	7.00
Con. Coal	18.00	17.00
Doe Run	120.00	110.00
Gra. Bimet.	.25	.20
St. Joe.	12.50	11.00

LONDON Nov. 3 Name of Com.	Clg.
Dolores	£1 10s 0d
Stratton's Ind.	0 3 3
Camp Bird	1 9 0
Esperanza	3 0 0
Tomboy	0 19 6
El Oro	1 6 0
Oroville	0 11 9

Cabled through Wm. P. Bonbright & Co., N. Y.

NEVADA STOCKS. Nov. 3

Furnished by Weir Bros. & Co., New York.

Name of Comp.	Bid.
COMSTOCK STOCKS	
Belcher	1.00
Best & Belcher	60
Caledonia	.27
Chollar	.16
Comstock	‡.33
Con. Cal. & Va.	1.05
Crown Point	‡1.15
Exchequer	‡.43
Gould & Curry	30
Hale & Norcross	.41
Mexican	1.27
Ophir	1.67
Overman	.26
Potosi	40
Savage	.39
Sierra Nevada	.45
Union	66
Utah	08
Yellow Jacket	1.00
TONOPAH STOCKS	
Belmont	.70
Extension	.47
Golden Anchor	..
Jim Butler	.11
MacNamara	.24
Midway	.15
Montana	.82
North Star	.02
Tonopah Mine of N.	6.62
West End Con.	.22
GOLDFIELD STOCKS	
Adams	.01
Atlanta	.11
Blue Bell	.02
Booth	.10
C.O.D. Con.	.06
Columbia Mt.	.06
Comb. Frac.	.60
Cracker Jack	.01
Dia'dfield B. B. C.	.01
Florence	2.62
Goldfield Belmont	.04
Goldfield Daisy	.06
Great Bend	.04
Jumbo Extension	.13
Kendall	.02
Lone Star	.02
May Queen	.04
Oro	.03
Red Hill	.03
Sandstorm	.04

Name of Comp.	Bid.
Silver Pick	09
St. Ives	05
Triangle	01
BULLFROG STOCKS	
Gibraltar	02
Homestake King.	‡.01
Mont. Shoshone C.	1.06
Tramp Cons.	04
MISCELLANEOUS	
Cumberland Ely	7.62½
Giroux	9.62
Greenwa'r Copper	09
Nevada Con.	25.25
Nevada Hills	60
Navada Smelting.	.75
Nevada Wonder	50
Nevada-Utah	1.25
Penn-Wyoming	...
Pittsburgh S. Pk.	60
Ray Central	2.56¼
Ray Con.	18.62
Round Mt. Sphinx	05

COLO. SPRINGS Oct. 29 Name of Comp.	Clg.
Acacia	.07¼
C. C. Con.	03
Doctor	08
Elkton	.72
El Paso	.59
Findlay	10
Gold Dollar	14
Gold Sovereign	.04
Isabella	.17
Jack Pot	‡.08¼
Jennie Sample	.07¼
Jerry Johnson	[illegible]
Lexington	‡.01¼
Mary McKinney	47
Old Gold	‡.04
Pharmacist	03
Portland	82
U. G. M.	.08
Vindicator	.67½
Work	.06

Assessments

Company	Delinq.	Sale	Amt.
Alpha, Nev.	Nov. 11	Dec. 7	$0.05
Belcher, Nev.	Nov. 9	Nov. 30	0.10
Caledonia, Nev.	Oct. 21	Nov. 11	0.10
Challenge, Nev.	Nov. 8	Dec. 1	0.10
Gold Mt., Utah	Sept. 15	Nov. 15	0.0025
Gould & Curry, Nev.	Oct. 28	Nov. 17	0.10
Hypotheek, Ida.	Sept. 30	Dec. 1	0.005
Idaho North Star, Ida.	Oct. 25	Nov. 15	0.01
[illegible], Nev.	Oct. 14	Nov. 8	0.03
[illegible] Copper, Ida.	Oct. 4	Dec. 6	0.01
[illegible], Nev.	Nov. 9	Nov. 30	0.10
[illegible], Ida.	Oct. 7	Nov. 8	0.001
[illegible], Nev.	Nov. 12	Dec. 6	0.10
[illegible] Copper, Mex.	Dec. 1		1.00
Savage, Nev.	Nov. 10	Dec. 1	0.10
Sierra Nevada, Nev.	Oct. 12	Nov. 3	0.10
Silver Queen, Utah	Oct. 7	Nov. 15	0.025
[illegible]	Sept. 21	Nov. 20	0.001
St. [illegible], Nev.	Oct. 22	Nov. 12	0.01
Utah, Nev.	Oct. 26	Nov. 16	0.05
Yellow Jacket, Nev.	Nov. 18	Dec. 22	0.10

CHEMICALS, MINERALS, RARE EARTHS, ETC.—CURRENT WHOLESALE PRICES.

ABRASIVES—
Carbons, good drill quality, carat $50.00@75.00
Carborundum, f.o.b. Niagara Falls, powd ... lb. .08
Grains ... " 10@.17
Corundum ... " .07@.10
Crushed Steel, f.o.b. Pittsburg ... " .05¼@.06
Emery, in kegs, Turkish flour ... " .01¼@.02
Grains ... " .03½@.04
Naxos flour ... " .01¼@.02
Grains ... " .03½@.04
Chester flour ... " .01¼@.02
Grains ... " .03½@.04
Peekskill flour, f.o.b. Easton, Pa ... " .01¼@.01¾
Grains, in kegs ... " .02¼@.03
Garnet, per quality sh. ton, 25.00@35.00
Pumice Stone, Am Powd, 100 lb. 1.60@2.00
Italian, powdered per lb. .01¾@.01¾
Lump, per quality ... " .05@.30
Rottenstone, ground ... " .02@.04
Lump, per quality ... " .05@.30
Rouge, per quality ... " .05@.30
Steel Emery, f.o.b. Pittsburg ... " .07¼@.07¾

ACIDS—
Acetic 28% ... lb .02½
Boric ... " .07
Hydrofluoric, 30% ... " .02¼@.03½
" 48% ... " .06
" 52% ... " .06½
" 60% ... " .10
Hydrochloric acid, 20° per 100 lb. 1.15@1.50
Nitric acid, 38° ... per lb. .04½@.04½
Sulphuric acid, 50°, bulk per ton. $12 up
60°, 100 lb. in carboys. .85@1.12½
60°, bulk, ton 16.00@18.00
66°, 100 lb. in carboys. 1.00@1.10
66°, bulk, ton 18.00
Oxalic ... per lb. .07¾@.08

ALCOHOL—Grain 95% ... gal. 2.61
Denatured ... " .43@.45
Refined wood, 95@97% ... " .52@.57

ALUM—Lump ... 100 lb. 81.75
Ground ... " 1.85
Chrome Alum ... " .03¾@.04½

ALUMINUM—Sulphate, com'l. lb. 1.50@1.75

AMMONIA—24 deg. lb. ... " .04½@.05½
" 26 deg. lb ... " .04¼@.05¼

AMMONIUM—
Bromide ... lb. .28
Carbonate ... " .07¼@.09½
Muriate gram ... " .05¾@.06½
Lump ... " .09½@.09¾
Sulphate, 100 lb. ... " 2.60@2.65
Sulpho-cyanide com. ... " .30
" " chem. pure ... " .40

ANTIMONY—metallic, lump ... lb. .04@.04½

ARSENIC—white ... " .02½@.03½
Red, Outside brands ... " .06@.07
Saxony ... " .07½@.08

ASPHALTUM—
Barbadoes ... per ton. 50.00@80.00
West Indies ... " 20.00@60.00
Egyptian ... lb. .11@.16
Gilsonite, Utah ordinary per ton 32.00@40.00
Trinidad ... " 20.00@25.00
California ... per ton. 25.00@30.00

BARIUM—
Carb. Lump, 80@90% lg. ton. 30.00@35.00
Precipitated, 96@98% " 34.00@36.00
Powdered, 80@90% ... lb. .02@.02½
Chloride com'l ... ton. 35.00@38.00
Nitrate powdered, in casks lb. .05@.06½
Blanc Fixe, dry, bbl ... per lb. .02¼@.03½

BARYTES—
Am. Ground ... sh. ton. 12.00@15.00
Floated ... " 17.00@19.00
Foreign floated ... " 20.00@23.00

BLEACHING POWDER—35% 100 lb ... 1.40@1.60

BLUE VITRIOL—(copper sulphate), carload, per 100 lb. 3.95@4.20

BONE ASH ... lb .02¼@.04

BORAX, sacks ... " .04¾@.05

CALCIUM—Acetate, gray, 100 lb. 1.85@1.92½
Carbide, ton lots f.o.b. Niagara Falls, N. Y., for Jersey City, N. J ... sh. ton. 65.00
Chloride, f.o.b. N. Y ... " 11.00@14.10

CEMENT—
Portland, Am. 500 lb ... bbl. 1.50@1.60
Foreign ... " 2.25@2.90
"Rosendale," 300 lb ... " .85
in sacks ... " .65
Slag cement ... " 75@1.25

CHROME ORE—
New Caledonia 50% ex ship N. Y ... per lg. ton 11.00@16.00
Bricks, f.o.b. Pittsburg, per M 175.00

CLAY, CHINA—Am. common ex-dock, N. Y ... ton 7.00@10.00
Foreign ... " 10.00@17.50

COBALT—Oxide ... lb. 1.10@1.75

COPPERAS—Bulk ... 100 lb. $0.55
In bbls ... " .65@.80
In bags ... " .60@.75

CRYOLITE (carload ... lb. .06@.07

FELDSPAR—Ground ... sh. ton. 12.50@14.00

FIRE BRICK—
American ... per M. 30.00@40.00
Imported ... " 30.00@45.00
St. Louis ... " 16.00
Extra ... " 20.00@25.00
Special extra ... " 30.00@35.00

FIRE CLAY—F.o.b. St. Louis.
St. Louis, extra quality per ton. 5.00
ordinary ... " 2.50

FLUORSPAR—
Domestic f.o.b. shipping port:
Lump ... lg. ton. 8.00@10.00
Ground ... " 12.00@14.00
Foreign crude ex. dock ... " 8.00@10.00

FULLER'S EARTH—Lump, 100 lb. .80@.85
Powdered ... " .80@.85

GRAPHITE—Ceylon.
Flying dust, finest to best ... lb. .02½@.04
Dust ... " .02½@.05
Chip ... " .04@.08
Lump ... " .05@.12
Large lump ... " .08¾@.10½

GYPSUM—
Fertilizer ... sh. ton. 5.00
Ground ... " 4.00@7.00

INFUSORIAL EARTH—
Ground Am. Best ... lb. .01¼@.02½
German ... " .02¼@.02¾

LEAD—Acetate (sugar of) brown, ... lb. .07¼@.08
Nitrate, com'l ... " .07¾@.08½

MAGNESITE—Greece.
Crude (95%) ... lg. ton. 7.50@8.50
Calcined, powdered ... sh. ton. 26.00@37.00
Brick, domes, per qual. f.o.b. Pittsburg ... M. 160@200

MAGNESIUM—
Chloride, com'l ... 100 lb. .90@1.25
Sulphate (Epsom salts) ... 100 lb. .90@1.00

MANGANESE—
Foreign, crude, powdered:
70@75% binoxide ... lb. .01@.01¼
75@85% binoxide ... " .01¼@.01½
85@90% binoxide ... " .01½@.01¾
90@95% binoxide ... " .03¼
Ore, 80@85% ... sh. ton. 16.00@32.50

MARBLE—Flour ... sh. ton. 8.50@9.00

MINERAL WOOL—
Slag, ordinary ... sh. ton. 19.00
Selected ... " 25.00
Rock, ordinary ... " 32.00

MONAZITE SAND—
Guar. 97%, with 5% Thorium oxide, normal ... lb. .08 and up

NICKEL—
Oxide, crude, lb. (77%) for fine metal contained ... .47
Sulphate, single ... lb .09@.11
Sulphate, double ... " .06½@.08

NITRATE OF SODA—*
100 lb. 95% ... 2.10
95%, for 1910 ... 2.10
96%, is 2½@7½c. higher per 100 lb.

OZOKERITE—best ... lb. .14@.17

PAINTS AND COLORS—
Litharge, Am. powdered lb .05¼@.06¼
English glassmakers' ... " .08¾@.09¼
Lithopone ... " .05½@.07
Metallic, brown ... sh. ton 16.50@22.00
Red ... " 14.00@18.00
Ocher, Am. common ... " 8.50@9.00
Best ... " 16.00
Dutch, washed ... lb. .02¼@.03
French, washed ... " .01¼@.02
Paris green, pure, bulk ... " .17½@.20½
Red lead, American ... " .06@.06½
Foreign ... " .08¼@.09½
Turpentine, spirits bbl., per gal. .60@.61½
White lead, Am., dry lb .05¼@.05¾
American, in oil ... " .06½@.07
Foreign, in oil ... " .09½@.09¾
Zinc white, Am. extra dry ... " .05½@.05¾
French, processed seal, dry ... " .06¾@.07½
French, process green seal, dry ... " .07¼@.10¼

PHOSPHATES—Acid ... .55@.60c per unit
*Fla., hard rock 77% land pebble 68 ... 6.50@9.00
3.75@4.00
†Tenn., 78@80% ... 5.00@5.50
75% ... 4.75@5.00
68@72% ... 4.25@4.50
‡So. Car land rock 60% ... 3.50@4.00

*f.o.b. Florida or Georgia ports. †f.o.b. Mt Pleasant. ‡On vessel Ashley River, S. C.

POTASSIUM—
Bicarbonate crystal ... lb. $.07½
Powdered or granulated ... " .08
Bichromate, Am. ... " .07¼@.08
Sweden ... " .10¾
Bromide ... " .20
Carbonate 80@85% ... " .03¾@.04
Caustic, ordinary ... " .06½@.06¾
Electro 90% Kcl ... " .06
Chlorate, granular 100 lb. 1.90
Chloride, precipitated ... lb. .09¼@.09¾
Crystals ... " .09@.09¾
Cyanide 98@99% ... " .35
Carloads 30,000 lb ... " .18
5-ton lots ... " .18½
Less than 5 tons ... " .20@.22½
Kainite, long ton, bulk, 8.50; bags, 9.50
Permanganate ... lb. .09¼@.10½
Prussiate, yellow ... " .13@.13½
Red ... " .30@.33
Sulphate (basis 90%) ... 100 lb. 2.18@2.21

PYRITE—
Domestic, non-arsenical, furnace size, f.o.b. mines ... per unit .11@.11½
Domestic, non-arsenical fines, per unit, f.o.b. mines ... .10@.10½
Imported, non-arsenical, furnace size, ex-ship, per unit ... .12@.12½
Imported, arsenical, furnace size, ex-ship, per unit ... .11½@.12
Imported fines, arsenical, ex-ship, per unit ... .09
Imported fines, non-arsenical, ex-ship, per unit ... .10½@.11
Pyrite prices are per unit of sulphur. A deduction of 25c. per ton is made when ore for furnace is delivered in large lumps.

SALT—N. Y. com. fine 280 lb. bbl. .72@1.15
N. Y. agricultural ... sh. ton 3.80@4.50

SALTPETER—Crude ... 100 lb. 1.00@4.50
Refined, crystals ... " 5.50@7.00

SILICA—
Ground quartz, ordinary lg. ton 10.00@15.00
Silex, ground ... " 13.00@15.00
Silex, floated ... " 35.00@40.00
Lump quartz ... " 5.00@5.50
Glass sand ... " 2.75

SILVER—Nitrate, crystals ... oz 33½@36¼

SODIUM—Acetate ... lb .04¾@.05
"Alkali," per 100 lb., 58 % 80@.87½
Bicarb. soda, per 100 lb 1.00@1.30
Soda, caustic, per 100 lb., 78@60 1.80@2.00
Soda, caustic, powdered ... .02½@.03
Salt cake, per 100 lb., bulk .40 up
Salt cake, bbl ... .65@.85
Soda, monohydrate, per lb. 1.40@1.75
Bichromate ... lb. .05¾@.06¼
Bromide ... " .20
Chlorate, com'l ... " .08½@.09
Cyanide (100%) KCN ... " .18
Carloads 30,000 lb ... " .18½
5-ton lots ... " .19
Less than 5 tons ... " .19
Hyposulphite, Am. ... " 1.30@1.50
Phosphate ... 100 lb. 2.00@2.50
Prussiate ... " .08@.09
Sal soda, f.o.b. N. Y ... " .65@.75
Foreign, f.o.b. N. Y ... " .80@1.00
Silicate, com'l ... " .65@1.00
Sulphate, com'l (Glauber's salt) 100 lb. .60@.80
Sulphate, com'l, calcined ... " .65@.85

STRONTIUM—Nitrate ... lb. .07¼@.08

SULPHUR—Louisiana prime to New York ... lg. ton 22.00 up
To Boston, Philadelphia or Baltimore ... " 22.50 up
Roll ... 100 lb. 1.85@2.15
Flour ... " 2.00@2.10
Flowers, sublimed ... " 2.00@2.60
Sicilian, extra qual., unmixed seconds, crude brimstone to New York ... lg. ton $22.00
Other ports ... " 22.50

TERRA ALBA—Italian 100 lb. .80@1.00

TALC—Domestic ... sh. ton 15.00@20.00
French ... " 18.00@25.00
Italian, best ... " 30.00@40.00

TIN—Bichloride, 50% ... lb .09
Crystals ... " .21¼@.22½
Oxide, lb ... " .32@.35

URANIUM—Oxide ... " 3.50@4.25

ZINC—Chloride sol., com. 20 ... " .02¼
Chloride granular ... " .04½
Dust ... " .06¼
Sulphate ... " .02¼@.02½

NOTE. These quotations are for ordinary wholesale lots in New York, unless otherwise specified, and are generally subject to the usual trade discounts. In the case of some of the important material, such as phosphate rock, potash, and sulphur, the prices here given are established by producers, the quotations represent what dealers are offering at, and what producers can secure in market. Sales are put as matters of private contract.

THE MINING INDEX

The editors of this paper read all the important publications of the world that relate to mining and the treatment of minerals. This index is published as a reference for all interested and to make it impossible for readers of the ENGINEERING AND MINING JOURNAL to miss any important article published anywhere

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Notes on Caving System in Northern Iron Mines

Roofs Are Caved, Permitting Extraction of 95 Per Cent. or More of the Ore; Sub-levels Every 15 Feet. Much Cheap Timber Is Used

BY ALBERT H. FAY

The caving system, like all other systems of mining, requires certain conditions to make it successful. Among these are: A large orebody; a roof that will break readily; and the absence of surface water. The roof, however, will break and fall after a large amount of ore has been taken out, and when once broken, will follow down without any difficulty. Among the advantages of the system are: The short distance which the ore has to be handled by hand; it requires less powder, the weight from above breaking a large proportion of the ore; it is considered safer in some localities than the square set or other systems; it affords an excellent opportunity for sampling and thus facilitates the classification of the ore. The greatest advantage, however, is the fact that approximately 95 per cent. of the ore may be extracted. Even better than this is being done in some of the Minnesota iron mines.

The Mesabi Practice

On the Mesabi range, where the caving system is carried on extensively, tracts of 10 to 20 acres are laid out as shown in Fig. 2. Sub-drifts, 15 ft. below the roof, or the caved portion, are run from raises on the haulage drift to the side line of the property, or to the edge of the orebody, as the case may be. This however, is a special case in which the orebody was thin and it did not appear advisable to place the haulage drift any nearer the boundary line. The haulage levels are at intervals of 100 ft. vertically, and while the work of caving 100 ft. is going on, the haulage way 100 ft. below is being completed ready for operation as soon as the ore is caved to the one above. In Fig. 2, the ore is trammed by hand 250 ft., as the longest haul, and dumped into the chute indicated on the sketch. Work is begun either at the outer edge of the ore, or at the property line farthest from the shaft and the orebody is then worked retreating. The section *a*, will be worked out first, then *b* and *c*. As will be noticed, these sections are on alternate drifts, which leave the intervening ore to form a pillar. After the roof has been caved into *a*, *b* and *c*, work then begins on section *d* and is continued to *e*. The scheme is to keep alternate drifts from one to two sections in advance.

Fig. 3 shows section *a* enlarged, and the rotation in which the various blocks of ore are taken out. At this particular mine the set has 7-ft. caps and 14-ft. posts; the sets are spaced 5 ft. apart and 8- to 12-in. round timber is used for this work. The cap extends over the entire top of the post and two sets of posts are used, as indicated by the dots in Fig. 3. It is necessary to use scaffolds when putting up caps and lagging. The blocks of ore, 18 and 19, which are 5x7 ft. are left until the last simply to form a pillar to protect the entrance at blocks 20 and 1. Of course, the lower six feet of block 20 are taken out in the drift and there remains only seven or eight feet of ore above the drift, supported by posts and lagging. This is taken out last.

As blocks 18 and 19 are drawn out, the ore in the upper part of No. 20, also comes down so that the three are really worked out together from the drift entrance. In the case of No. 9, this is worked out by itself and if No. 10 is already against caved ground it can be taken out without timbering; otherwise block 10 will be timbered in the usual way; 35 to 38 ft. of ore are worked out

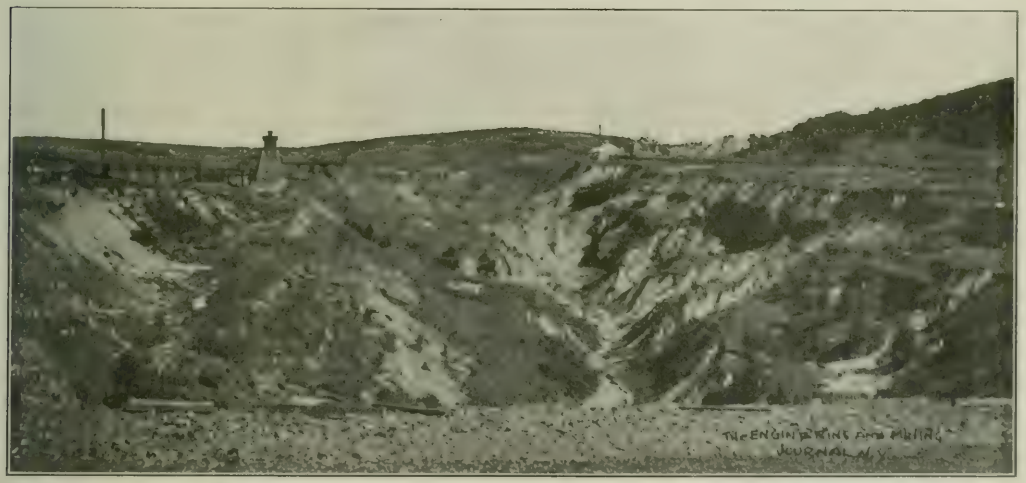

FIG. 1. CAVED SURFACE OVER CHAPIN MINE. ONE-HALF MILE LONG, 800-900 FEET WIDE

on one side of the drift, while only 12 to 15 ft. are taken out on the other. This is to avoid the trouble of laying extra track with curve and switch which would be necessary; 30-lb. rails are used for the track which is laid sufficiently close to the ore to permit loading into the car from any point.

After all the ore is taken out, the floor and the sides that expose ore, are covered with 1-in. boards. This is to prevent the loose dirt of the roof from mixing with the ore when [illegible] to the sub-level below. The track is also taken up and if the roof does not fall by its own weight, about one-half of the center row of posts are shot out. A hole is bored in the post and about [illegible] of powder used. After the roof has become thoroughly broken it is not often necessary to use any powder, as the posts will begin to break by the time work on No. 11 has begun.

Haulage System at Chapin Mine

The haulage level of the Chapin mine on the Menominee range is laid out as shown in Fig. 4, with one drift along the footwall and one along the hanging-wall. These are connected with crosscuts at an angle of 120 deg. The cars used have a capacity of 2½ tons and are operated in trains of 6 to 10 cars. The motor, with the empty cars, leaves the shaft and passes out along the footwall drift. At the junction of this drift and the crosscut, empty cars are left as needed. The cars are run into the crosscuts by hand and loaded at the chute, of which there are usually three in each crosscut.

After the set is loaded, it is pushed out by hand to the hanging-wall drift and then picked up by the motor and taken to the shaft. The grade of the crosscut is 1½ per cent. so that the cars will move without much difficulty. The main advantage in having the cars loaded from chutes in the crosscuts is that there are no live wires to interfere with the workmen. The only live wire is the one along the main haulage drift and the crosscut marked "motor." Another advantage is that the cars can be set off the main track leaving it clear at all times for the motor to distribute empty cars. Furthermore, the loaded cars will have a shorter haul.

At the shaft and back as far as the first crosscut the drift is double tracked. The cars are of the side-dump type and are dumped direct into the loading pocket for the skip. This pocket holds only two cars of ore which is one skip load of 5 tons. No storage bins are used at the shaft.

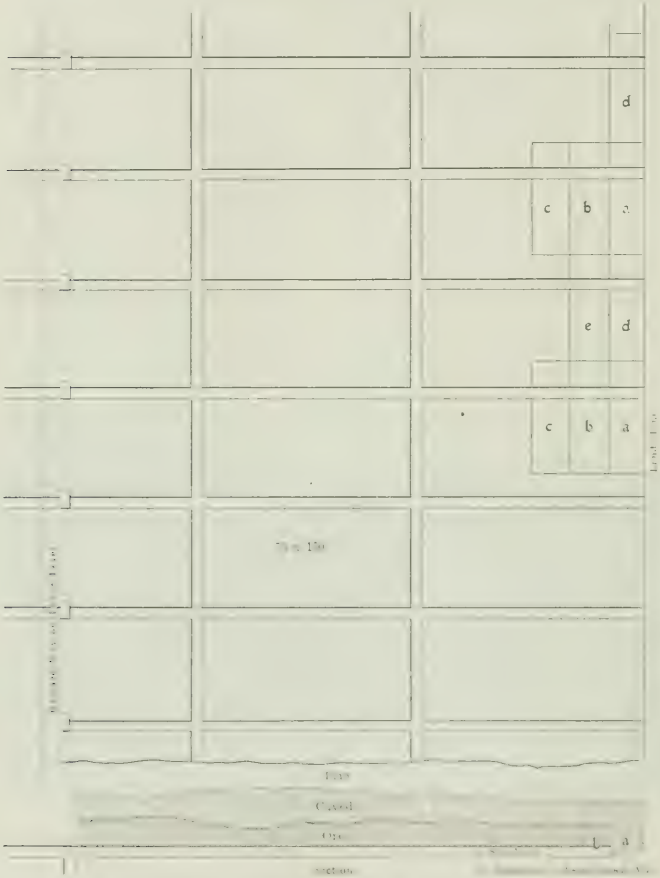

Fig. 4. [illegible]

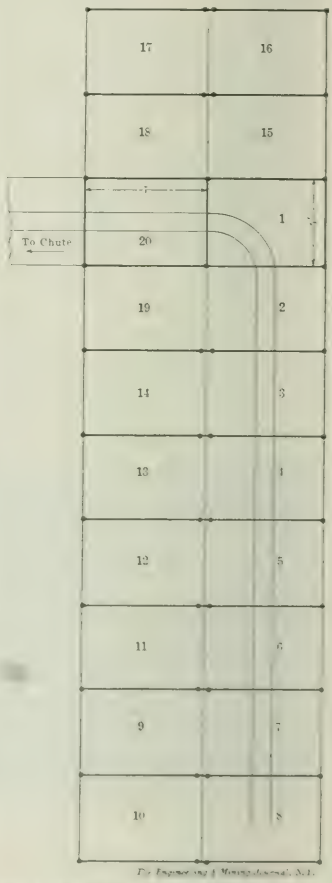

Fig. 5. Method of Working Out Each Slice

All the hoisting is done by two skips run in balance, each of which is loaded from its own pocket, thus giving two pockets in which to dump the ore.

Chutes and Manways

The raises, which are used for chutes, are started from the haulage level, 200 ft. below the working level. The raises are in ore and are inclined 75 to 80 deg. which is approximately the dip of the orebody, Fig. 5. The raises are cribbed from the bottom to the top with compart-

ments for ore, 4x4 ft. and a manway 3x4 ft. The cribbing consists of 6-in. round timber notched at the end and placed close together, as shown in Fig. 6. The oreshoot is lined with 5- or 6-in. poles split in two, and 10 to 12 ft. long.

When a raise has reached a hight of 50 ft. the manway is placed on the opposite side and the chute itself is also offset by its own width. The object in placing the manway on the opposite side is to make a break in the ladderway and at the same time the men will not have to go down more than 50 ft. in order to have a secure place when blasting at the top of the raise. The raise is offset in order to lessen the burden of the ore in the chute. At no time will there be more than 50 ft. of ore even though the raise is 200 ft. high. At the point where the raise is offset, it has a solid ore bottom which supports the burden above.

Timber sets are placed in front of the chute and two bars form a gate to hold the ore in place. This arrangement prevents the ore from falling with two great velocity, lessens the liability of its packing, and protects the lining of the chute. Another advantage is that when mining two or more grades of ore, a gate can be closed above the ore already in the chute and another class of ore run in the chute and at the same time be kept entirely separate and not have to wait until the chute is empty, thus saving time. In case the ore should pack, the manway affords an opportunity to bar it down.

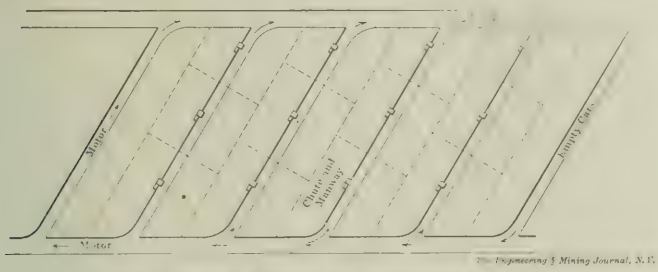

FIG. 4. PLAN OF HAULAGE SYSTEM AT CHAPIN MINE

FIG. 5. SECTION SHOWING RAISES IN OREBODY AT THE CHAPIN MINE

Working Around a Chute

The scheme of working around the chute at the top is shown in Fig. 5. The drifts *a*, are 15 ft. below the caved ground and driven out 25 ft. to meet the work from an adjoining raise. From the end of this drift, crosscuts are run out 20 to 25 ft. until they meet the caved ground in the adjoining workings. A track is put down and the ore handled in ½-ton cars and dumped down the chute. In all cases at the Chapin mine the haulage is short as there are very few of the blocks exceeding 50x50 ft., and practically all the raises are in the center of the section to be worked. This is shown in Fig. 4 by the dotted lines. A second crosscut is then worked retreating, taking out the roof of both the first and second, which are side by side. This leaves a pillar of ore about 30 ft. wide opposite the chute and in the middle of the block. After this is finished, a crosscut is run out from the raise, thus splitting the pillar in two, each one being about 10 ft. wide. These are worked retreating and at the same time the roof is broken out. The ore above (8 ft. thick) is broken by the pressure of the overburden as at *b* in Fig. 5 and is taken out finely crushed. In fact, it is an advantage to have the ore crushed considerably so that it will actually run out from the upper part of the sub-level.

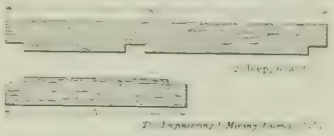

FIG. 6. ROUND TIMBERS USED IN CRIBBING CHUTES

After a number of sub-levels have been worked out in this way it is not necessary to cover the floor and sides with boards as is the case when first beginning to work. The lagging, posts and caps in most cases form a sufficient mat to prevent the waste material from coming in from above. At the Chapin mine this mat is several hundred feet thick, which of course includes a large amount of waste material from the surface. The accompanying half-tone engraving shows the effect of the caving system at the surface of the ground at the Chapin mine.

The superintendent's report on the Alaska Treadwell for the year ended May 15, 1909, shows that in the 240-stamp mill 30.72 per cent. of the quicksilver used was lost.

Sorting Ore by Hand

By Louis D. Huntoon*

The preliminary separation by hand of waste rock and foreign matter from ores or the separation of different mineral in complex ores, before shipment or treatment, is known as hand sorting. The extent to which this is carried at any mine depends upon local conditions and must ultimately be decided by the ledger. When detailed cost and assay sheets are not kept, the great advantages to be derived are too often overlooked, and this comparatively cheap method of eliminating waste rock is neglected.

Hand sorting may be applied underground, on the surface, or in both places. If applied on the surface the first sorting usually takes place on the oversize from the grizzly, and may be followed by sorting the oversize from the coarse trommel. The objections made to sorting underground are poor light and limited space, resulting oftentimes in the discarding of good ore. The advantages to be derived are decreased cost and increased capacity in tramming and hoisting, and the use of the sorted waste rock for filling purposes. Careful hand sorting on the surface requires an ore house containing grizzly, breakers, picking tables or belts and ore bins. The objections made to surface sorting are cost of plant and the apparently high cost per ton of waste rock discarded. The first objection is not as serious as at first appears as all of the machinery, with the exception of the picking-belt, or table, is already installed in the mill. In most cases the second objection is more than compensated for by the advantages derived. The advantages will vary somewhat under different conditions. Freight and treatment charges are decreased per ton of ore mined for properties shipping their ore to smelteries or metallurgical works.

On ores requiring concentration, the milling cost per ton of ore mined is decreased; the capacity of the mill is increased, thereby reducing the original investment necessary; the loss in slimes is less, increasing the recovery; the grade of ore milled is increased, permitting greater care in milling; and foreign matter such as rope, wood and steel which would interfere with crushing and screening operations can be taken out. Iron and steel can be removed advantageously by suspending electromagnets over the chutes receiving the discharges from the first breakers, but ferromagnetic materials such as wood and rope must be taken out by hand.

Conditions Affecting Hand Sorting

The local conditions affecting hand sorting are: (1) Location of the property with reference to the railroad or market; (2) size of ore deposit; (3) treatment required or the products produced for shipment; (4) the character of the ore deposit. Properties situated away from a railroad must of necessity ship a high-grade product to reduce the cost of wagon haul. Properties too small to warrant the erection of a mill must discard by hand an ore which, under favorable conditions, can be concentrated. Properties of sufficient size to warrant the erection of a mill, shipping only concentrates, can well afford, in most cases, to separate the waste and low-grade ore by hand. The concentrates must be of a high grade, resulting in the tailings and waste rock carrying valuable minerals to a greater or less extent.

On large properties preliminary hand dressing is too often neglected, due to the claim made by many engineers that it is cheaper to mill the "run of mine" than to sort the waste rock by hand. The actual cost of the labor per ton sorted, on concentrating ores, may be higher than the cost per ton to mill, but the increased capacity of the plant, the decreased loss in the tailings and the increased recovery will usually not only balance this cost but leave a handsome profit.

The products produced by milling may be either concentrates or bullion. As a rule the production of concentrates from a sulphide ore is less expensive than the production of bullion from a gold-silver ore. Concentrates shipped to a smeltery must be of higher grade than concentrates smelted on the property, and the waste rock sorted will also be of higher grade and a greater percentage discarded. The milling costs being higher for the production of bullion will also permit of low-grade ore being discarded.

The character of the deposit will also assist in determining the extent to which hand dressing should be applied. Homogeneous ores with equal mineral content in the coarse and fines, with no waste rock from the walls, require no preliminary sorting. Such properties are rare indeed, if they exist at all. Ores occurring in veins where more or less wall rock is taken down in mining should be sorted by hand. If rich seams of brittle mineral are intercalated through the ore, it is often advisable to sack the brittle mineral underground to prevent loss of fines by attrition in handling. In such mines, where miners are paid on contract, a small bonus is often paid for the sacked ore, the bonus not being sufficient to warrant the miners cobbing. The balance of the ore according to the surface will contain shipping ore, mill ore and waste; gold concentrates can be profitably hand sorted.

Determination of Size

Only a few years ago complex ores containing various minerals of about the same specific gravity were entirely separated by hand, but with the improvements in milling and separating machinery most of these minerals can now be separated by mechanical means. In most orebodies, whether large or small, the mineral is irregularly distributed, and the products from such orebodies consist of mill ore and low-grade ore or waste rock. The highest value of any piece of waste rock which can be economically discarded by hand will be more than equal to the sum of the cost of milling and loss in the tailings, less the sum of the cost of sorting and value of the waste rock. The cost of hand sorting will depend upon the cost and efficiency of the labor, the size of the ore, the amount of waste picked out, the arrangement of the ore-sorting plant and the ease with which the waste rock is distinguished.

In practice boys or young men under a good superintendent have been found to be more efficient than older men, their keenness to discern waste being much more acute. The common practice of placing old or disabled men on the picking table is to be deprecated, as they are poor at best and tend to disorganize the force. The size of the ore is an important factor on the cost; sized ore can be picked at much less cost than mixed sizes, and at some plants abroad the ore is separated into several sizes before hand sorting takes place. The practice in this country, where hand sorting is applied, is to discard the waste from the grizzly oversize and from the 1- to 1½-in. trommel oversize; sizes below 1½ in. are rarely hand sorted in this country as the expense increases rapidly below this size. Above 1½ in. the size has little effect upon the cost. The percentage of waste picked out will also affect the cost; if the percentage discarded is low and the size comparatively large, one or two men whose duty is to feed the breakers can with little or no extra cost take care of the waste rock at the grizzly. If the percentage is high or the ore requires crushing to about 2 to 3 in. to liberate the waste, the cost of hand sorting per ton milled will increase and an ore-sorting plant will be required. Under these conditions the ore should be delivered to the sorters or pickers by machinery.

Picking Belts Have Greatest Capacity

The methods of delivering the ore to the pickers are: Inclined chutes or grizzlies; stationary, shaking and revolving tables; and belt conveyers of rubber or steel. The stream of ore should be constant, evenly distributed over the surface, and not over two grains deep. When the percentage of waste is small, inclined chutes and grizzlies are in common use in this country. They are simple to install, but require more light than the other types. Stationary tables are used for precious stones, complex ores and ore houses where only the oversize from the grizzly is sorted. Shaking tables are not in common use. Circular or round

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tables are used chiefly in South Africa but not to any extent in this country, the chief objection made to them being that they have a tendency to make the pickers dizzy. The South African reports speak most highly of this type of table.

For large properties, or those discarding a large percentage of waste, belt conveyers are extensively used in this country. They are more extensive to install than the other types but have a greater capacity. The ease with which the waste rock will be recognized will depend upon the difference in color, fracture, structure and mineralization. Waste rock and low-grade ore, which at first sight are hard to distinguish from the milling ore, soon present some physical property to the pickers by which they can be recognized. It is important to have good light and, if possible, the picking should be done in the day time.

Electric Smelting in Sweden

SPECIAL CORRESPONDENCE

Among the papers read at the recent meeting of the Iron and Steel Institute in London was one by E. J. Ljundberg, of Falren, Sweden, who described what was being done by electric smelting in that country. The principal application of electric smelting so far was for making special tool steel. For making steel of ordinary quality the electric method seemed to be too expensive, even where cheap water power was available. At the works at Gysinge, a Kjellin induction furnace uses about 200 kw. of continuous current and the output in 300 days amounts to 1200 tons of ingots, using 50 per cent. pig and 50 per cent. scrap. The product is a carbon steel of high quality. For smelting ore direct a furnace constructed by Gronvell & Lindlad produced in 1903 hours 280 tons of iron containing from 0.95 to 3.09 per cent. of carbon. The quantities used were: Ore, 442 tons; lime, 24 tons; coke, 41 tons; charcoal, 58 tons; electrodes, total, 6.5; electric current (kilowatt hours), 891,623. The pig iron produced per horsepower-year was 2.03 tons.

Mr. Ljundberg considers that the problem of electric smelting is technically solved. As regards its commercial value, he says that it is too early yet to make any definite statement, a position which he thinks all iron and steel makers will understand when they reflect how many years it took to bring the bessemer, the open-hearth and the basic processes to their present state of perfection.

There were employed in Quebec asbestos mines in 1908, 4284 men. The production of the mines was: 900 tons first-class crude worth $261,218; 2771 tons second-class crude worth $438,305; 13,911 tons fiber, $716,811; 47,574 tons paper stock, $1,135,264; 24,011 tons asbestic, $34,660; total value, $2,577,302.

Marine Fiber Deposits of South Australia

By H. L. Jene.*

There exists on certain parts of the South Australian coast, a deposit of fibrous matter known as "Posidonia Australis." Recent investigations have proved the deposits to be of commercial value in the textile industry, and for this reason a brief description of their occurrence, treatment, properties and uses, may be of interest.

Occurrence

The fibrous deposits are in the neighborhood of Spencer's gulf. The plant, however, occurs on the New South Wales coast, and as far east as Tasmania, but

PROSPECTING FIBER DEPOSITS WITH POST AUGER

there appears to be an absence of the fibrous matter in these localities. To accurately determine the thickness of such large deposits, requires a great deal of labor and patience under trying conditions, especially during the winter months. In the neighborhood of Moonta and Tickers in Spencer's gulf, by means of numerous boring and other tests extending nearly two miles out to sea, the workable thickness was found to vary from 7 to 12 ft. The fibrous material has a sand and shell overburden from a few inches to about 2 ft. in thickness. At about 800 yds. from the shore the shells disappear and are replaced by sand. Also from this point going seaward the fiber commences to rapidly improve in quality and quantity. The fiber, which is mixed with more or less sand and sometimes shells, rests on limestone.

Along the shores there is a wide margin between high- and low-tide level, at times over a mile. Between these two points, the sea bottom is destitute of weeds, but on reaching low tide the weeds appear in abundance. Everything points to the fact, that in former times this area, between high- and low-tide level was covered with seaweed, but from continual exposure to the weather the seaweed has rotted away and washed ashore, where it is now in evidence as large heaps in a decomposed condition. An examination shows that the fiber is composed of the finer roots of the seaweeds, these having been preserved to a remarkable degree by the overlying burden of sand and the presence of salt water.

Treatment

The method of working these deposits has not yet been thoroughly investigated, and is still in the experimental stage. From the work so far performed, it resolves itself into a dredging method by means of bucket or suction type. Once raised from the sea bottom the fiber is easily prepared for market. It first undergoes a mechanical washing, which removes the sand and any small shells. The fiber is then squeezed through rollers to remove as much water as possible. It is thoroughly dried, and compressed into bales ready for the market.

Experiments show that one cubic foot of the deposit weighs approximately one hundred pounds, and this after treatment yields between 0.5 and 1.5 per cent. of clean dry fiber. This naturally seems a small quantity, but it must be remembered that the finished product is exceedingly light and bulky, and that the crude fiber after being washed and squeezed between rollers loses on drying about 65 per cent. of its weight. Bulk for bulk, *in situ*, the ratio would be approximately three of fiber and two of sand.

Properties and Uses

The fiber after being cleaned and dried varies from almost white to light brown, and in texture resembles wool. It appears that when washed in sea water and thoroughly dried, it does not absorb moisture to any extent. The fiber is tough, combines with wool, and will take any dyes, either aniline or vegetable most readily. For these reasons it is of great value in the manufacture of cloth, felt, blankets and underclothing.

The fiber is an absolutely pure and sanitary material, and this is one of the greatest advantages over most of the cheaper materials, in place of which it may be employed. There are also many other uses in which the fiber may find application, but nothing can be said definitely, until more research work has been carried out in this direction.

The future prospects of the fiber industry in Australia seem to depend more on whether the material can be raised and prepared for market at a profit, than the demand, and uses to which it can be applied. Already there is great demand for the fiber not only in Australia, but also from Europe and the East.

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Ore Dressing in the United States and Mexico—II

Concentration Begins at 1 1-4-in. Size in Coeur d'Alenes; Not Attempted at Boston Consolidated Until Ore Passes 20-Mesh. Intermediary Practice

BY H. A. GUESS*

Between the extremes of initial-treatment sizes, illustrated by the Cœur d'Alene and Utah porphyry mills, mentioned in the previous article, are the more usual plants where tailings for discard are made at maximum sizes, say, 2, 4, 6, 8 or 10 mm., even though initial treatment with roughing jigs may be made at, say 1½-in. size, with the tailings crushed and re-treated. In the less disturbed areas, geologically, a given district will often have a characteristic ore, which, although varying in minor features in its different occurrences, will still present about the same general type throughout, and although the machines devoted to the recovery of the mineral at the various plants treating such an ore throughout the district may be widely different, still the crushing size at which treatment begins will usually be found to vary only within narrow limits.

For example, in the Coeur d'Alene district previously cited, the mills handling the typical silver-lead ore of the district usually begin the hand picking of clean mineral and waste at about 3 in. maximum size, and begin jigging at about 1¼ in., making tailings for discard at that size.

The mills operating on the disseminated copper ores of Bingham and Ely begin concentration and make tailings at 20 mesh to 2-mm. maximum size. The heavier sulphide copper ores of Butte are given initial treatment by jigging at ⅞-in. to 1¼-in. maximum sizes, and tailings for discard begin to be made at 1½ to 2½ mm. About the same initial jigging and the same maximum tailing sizes obtain, too, in the treatment of the copper ores of northern Sonora and Arizona, excepting in the case of disseminated ores recently opened up in Arizona.

In the Lake Superior copper district, careful hand picking of the metallic copper takes place from mine size down to the entry of the ore at about 3-in. maximum size to the steam stamps, but actual concentration by jigging does not begin until the ore has been crushed to about 4-

STEPTOE MILL PRODUCTS.

District—Ely, Nevada.

Ore—Disseminated chalcopyrite, chalcocite and pyrite in porphyry gangue.

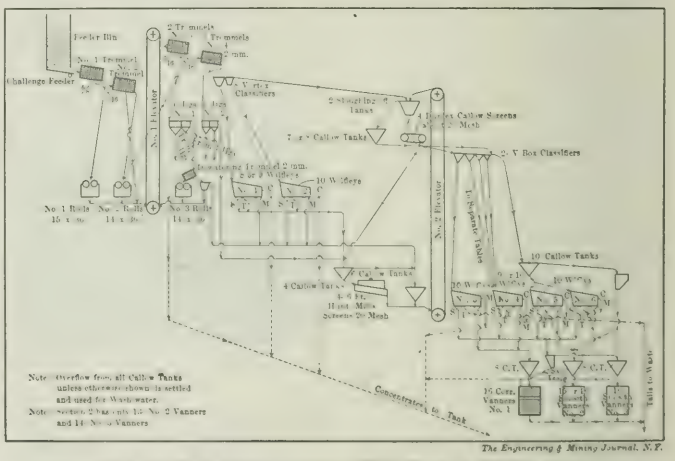
Treatment—As per accompanying flow sheets of Nevada Consolidated and Cumberland-Ely mill sections. Concentration begins at 2-mm. maximum size.

Results—Not as yet ready for publication, but the following assays for their respective products are typical, although not necessarily average.

Product.	Cu Per Cent.
Crude ore mill feed*	2.5
Nevada general tailings	0.8
Cumberland Ely tailings	1.0

General Tailings Screen Tests.	Nevada Consolidated.		Cumberland Ely.	
	Wt. Per Cent.	Cu Per Cent.	Wt. Per Cent.	Cu Per Cent.
On 20 mesh	2.3	1.45	1.5	1.45
On 40 mesh	22.9	0.70	18.7	1.15
On 60 mesh	18.7	0.60	12.6	1.15
On 80 mesh	11.5	0.55	9.6	0.85
On 100 mesh	8.8	0.70	8.9	0.75
On 120 mesh	2.9	0.60	4.2	0.80
On 150 mesh	6.5	0.60	7.8	0.70
On 200 mesh	3.4	0.55	3.9	0.90
Through 200 mesh	22.9	1.10	32.5	1.25
Totals and averages	100.0	0.82	100.0	1.05

*Also contains: Fe, 3.5, S, 3.8; CaO, 0.5; Al_2O_3, 7.0; SiO_2, 50.2 per cent.



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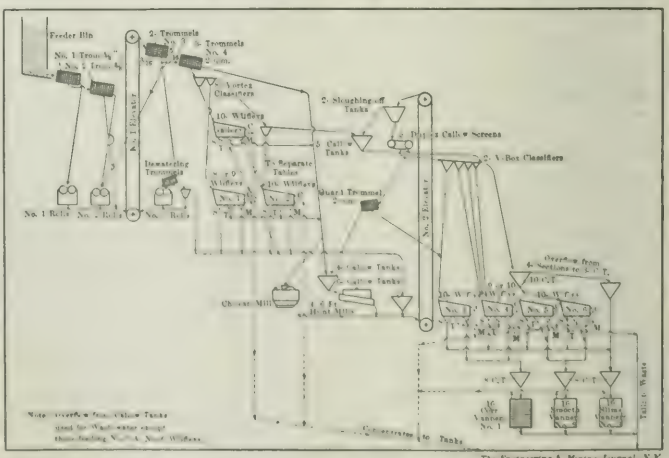
FLOW SHEET OF NEVADA CONSOLIDATED SECTION OF STEPTOE MILL

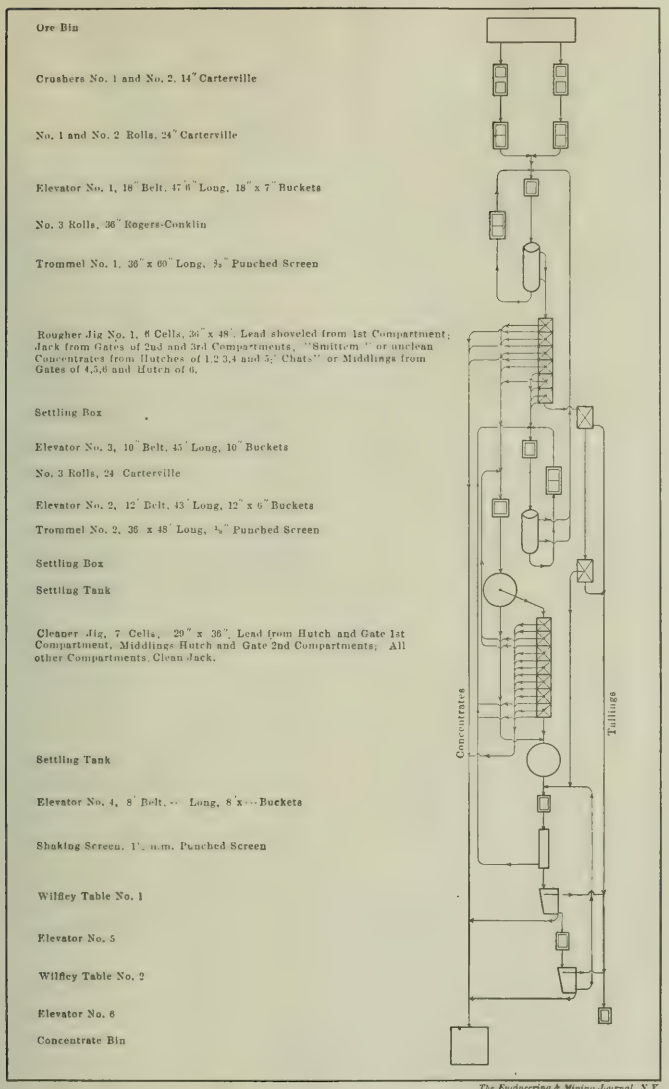


The Engineering & Mining Journal, N.Y.

FLOW SHEET OF CUMBERLAND-ELY SECTION OF STEPTOE MILL

*Manager, Federal Lead Company, Flat River, Mo.

Note—Paper read before the Colorado Scientific Society.



The Engineering & Mining Journal, N.Y.

FLOW SHEET OF GRACE ZINC COMPANY'S MILL

MILL PRODUCTS OF THE GRACE ZINC COMPANY

District—Joplin, Missouri.
Ore—Zinc blende and a little galena in a mixed gangue of flint, limestone, calcite, clay and shale.
Treatment—As per accompanying flow sheet, concentration beginning at ¾-in. maximum size.

Product	Dry Wt. % of Total	Average							
		Zn %	Pb % (Wet)	Fe %	S %	CaO %	MgO %	Al_2O_3 %	SiO_2 %
Crude Ore	100	6 85	0 35	2 8	6 0	18 0	5 5	4 8	33 5
Zinc Concentrates*	7 7	60 3	0 4	1 5	30 5	1 2	0 4	0 5	3 2
Lead Concentrates†	0 35	.	80 0						
Coarse Tailings	...	1 4	0 01						
Slime Tailings		3 6	0 03						

*Zinc recovery, 67.9 per cent. †Lead recovery, 80 per cent.

to 5-mm. maximum size, tailings being made also at these sizes. In the Joplin zinc-lead district jigging begins and tailings are discarded at 6- to 12-mm. maximum sizes. In the southeast Missouri field, the maximum sizes are from 4 to 9 millimeters.

In the more disturbed areas as, for example, the Silverton and Telluride districts of Colorado, great varieties of concentrating ores exist and no particular type can be called characteristic. Even here, however, although considerable diversity of treatment exists with wide differences as to the maximum jigging size, they show similarity in that tailings for discard cannot be profitably made at sizes coarser than about 1½ millimeters.

The same complexity and diversity of mineralization is found in the concentrating ores of the Central Plateau of Mexico, so that these, too, cannot well be classified according to district. Here, as in Colorado, however, the gold and silver are intimately associated with the silicious gangue, and although the mineralization of lead or copper sulphides may be sufficiently coarse to enable concentration to begin at 8- or 10-mm. size, as for example, at Santa Barbara in Chihuahua, yet tailings cannot profitably be discarded coarser than about 1½-mm. size, and in certain of the silicious concentrating ores 30 per cent. or more of the gold and silver, particularly the gold, is not released and recoverable by concentration until the tailings from the coarser concentration are reground to approximately 150 mesh, being in this respect similar to the silica-inclosed metals in certain cyaniding ores.

Crushing and Jigging

With the exception of the Michigan copper district, where steam stamps are used for the crushing of the ore after breakers, the usual concentrating plant begins with jaw or gyratory crushers, followed by rolls crushing either in stages or directly through limiting trommels of the maximum size at which jigging is to be done, the trommel oversize being returned to rolls. Where very coarse jigging sizes are used, however, say 15 mm. or larger, the oversize of the first coarse trommels is sometimes jigged direct, tailings being made, either for discard or for recrushing. Where plunger jigs are used and where concentration begins at 6 mm. size or coarser, the ore is usually divided by trommels into two or more screened sizes for jigging.

The dividing line between jig and table feed is about 1 mm., and as trommels in most mills stop at 2- or 2½-mm. sizes, the usual practice is also to jig the first spigot of the classifiers handling the last trommel undersize. Exceptions to this sizing by trommels previous to jigging are found mainly in two districts—Lake Superior and Joplin. At Lake Superior the discharge from the stamps is at 4- to 5-mm.

max mum size, and is divided by hydraulic classifiers into different jigging sizes, while at Joplin, for the sake of simplicity in equipment and treatment and at the expense of somewhat lessened recovery, the undersize of the limiting coarse trommel is usually jigged direct without previous sizing either by screens or classifiers.

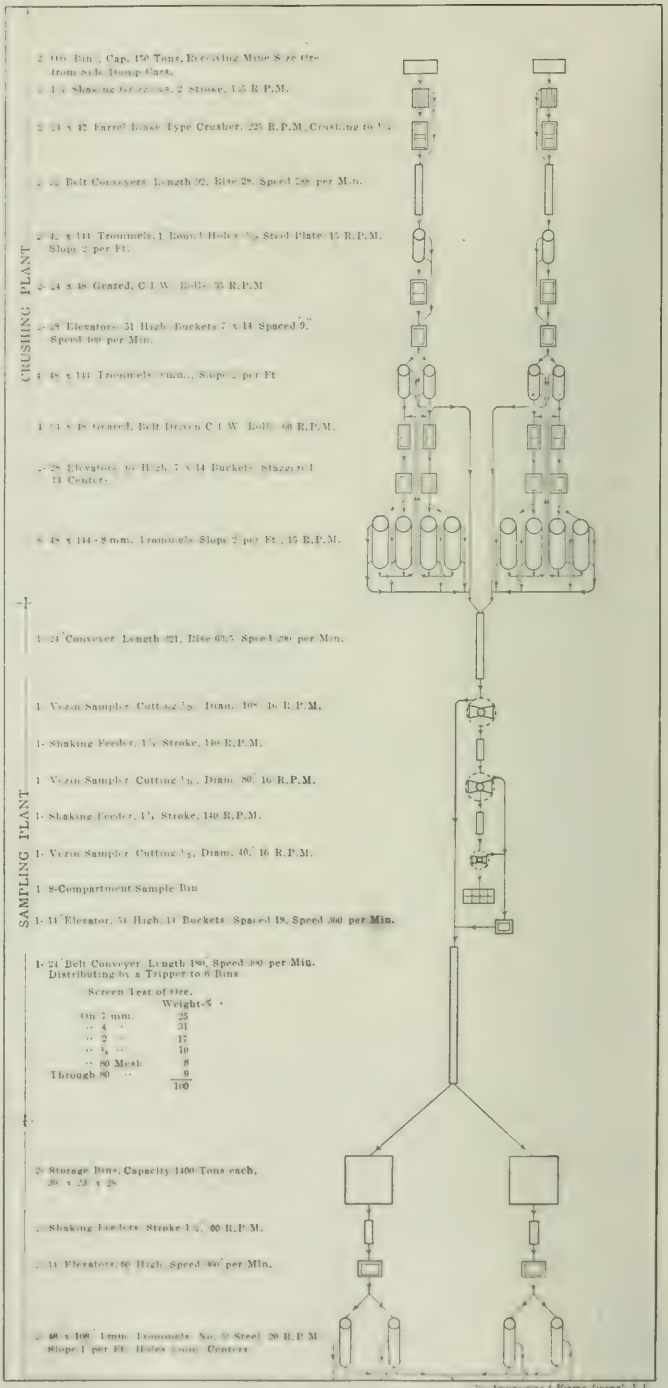
Where only one mineral product is being made, the jigs are of one to four compartments, with clean mineral made on the first compartment for the coarser sizes and the first two compartments for the finer, middlings for regrinding and retreatment being made from the hutches or gates of the other compartment.

Where two mineral products are being made of different specific gravities, as, for example, lead and copper or lead and zinc, three mineral compartments are often used, the first and third for their respective finished products, with the second or middle compartment as a safety hutch, discharging its mixed product for retreatment either over the same or a retreatment jig.

Various styles of plunger jigs are in use throughout the different districts, the more usual being the standard Hartz type. All of these under proper adjustment do good metallurgical work on suitably sized feeds. With mixed feeds of widely differing sizes, however, the recoveries are not so good.

Some years ago a jig operating on a somewhat different principle was introduced from Australia; it is known as the Hancock jig. In this a rotating cam by suitable levers gives a combined vertical and forward movement to a sieve and frame carrying the feed immersed in a tank of water. The jigging effect is given by a positive movement of the sieve carrying the feed, instead of by water pulsation from a plunger, insuring a uniform jigging action irrespective of the width of sieve, thus enabling a jig of this type to be built of large dimensions. In its earlier form this type, although capable of handling large tonnages, did not give as good metallurgical results as well designed Hartz installations. More recently, however, improvements have been made and with a feed of mixed sizes from, say, 9 mm. to 1 mm., where the ore is such that tailings can properly be discarded at the maximum size, it is nowadays possible to make as high a recovery and as clean a recovered product with the Hancock jig as with Hartz jigs operating on the same feed screened or classified into sizes.

For large plants considerable economies in labor, power, water and maintenance, also in installation cost, result in using these large Hancock types, the daily capacity being 350 to 400 tons of initial feed per jig. In the Southeast Missouri lead fields as previously stated, the maximum crushing size for milling is 4 to 9 mm., and tailings are discarded at these maxi-



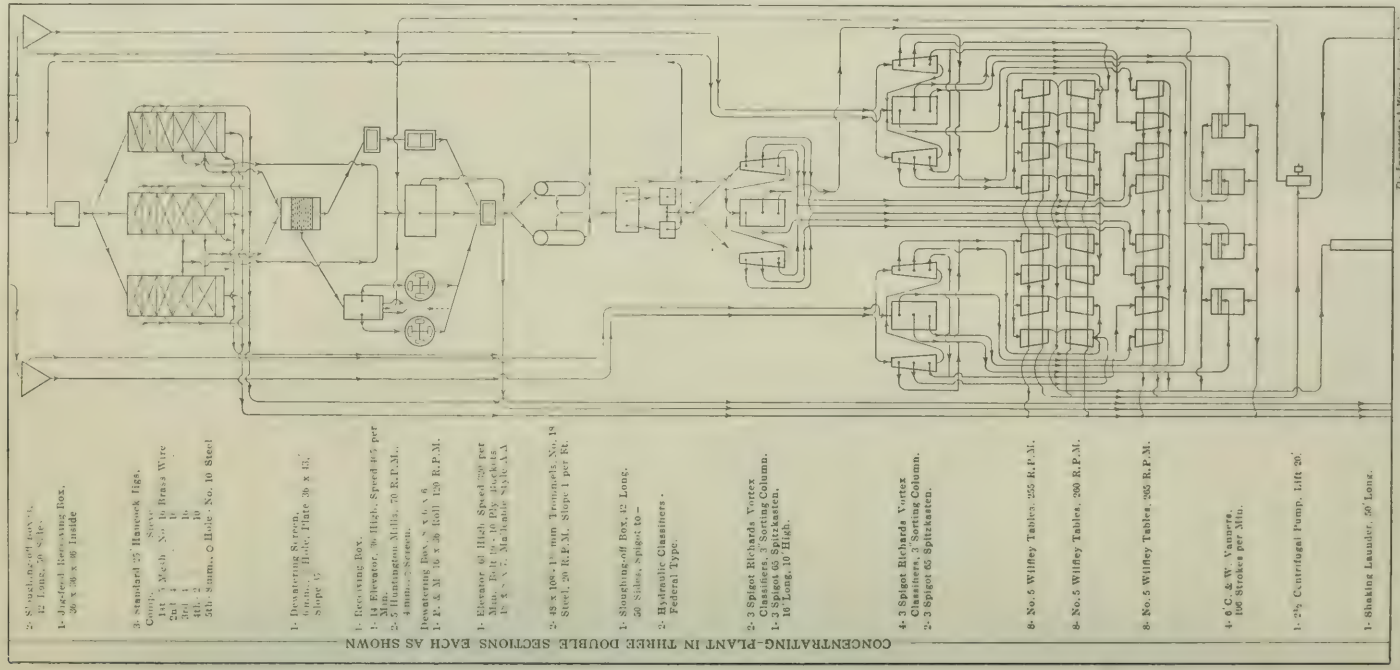
FLOW SHEET OF FEDERAL LEAD COMPANY MILL NO. 3, FLAT RIVER, MO.—Continued

TREATMENT DATA OF MILL NO. 3 OF THE FEDERAL LEAD COMPANY AT FLAT RIVER, MISSOURI

District—Southeast Missouri.
Ore—Galena in dolomitic lime with some shale, chlorite, sand and clay
Treatment—As per accompanying flow sheet, concentration beginning at 9-mm. maximum size.

Product	Dry Wt. % of Total	Average Pb % (Wet)	Fe %	S %	CaO %	MgO %	Al_2O_3 %	SiO_2 %	Percentage Recovery Pb %
Crude Ore	100 00	6 0	4 1	5 2	25 5	14 2	4 8	5 0	
General Mill Concentrates	6 84	73 9	2 8	14 9	2 6	1 9	0 4	0 3	84 2
Canvas Plant Slimes	0.34	37 6							2 1
Totals and Averages for Concentrates	7 18	72 1							86 3
Coarse Tailings	82 00	0 6							
Slime Tailings	10 00	3 0							

Typical Screen Tests	General Mill Concentrates Wt. %	General Mill Concentrates Pb %	Total Tailings Before Separation of Slime for Canvas Treatment Wt. %	Total Tailings Before Separation of Slime for Canvas Treatment Pb %	Hancock Jig Tailings Wt. %	Hancock Jig Tailings Pb %
On 8 mm					3 9	0 95
On 7 mm					10 1	0 70
On 6 mm			18 9	1 00	13 9	0 68
On 4 mm	8 0	80 2	18 1	0 80	31 4	0 85
On 2 mm	10 7	76 5	19 0	0 92	21 2	0 20
On 3 mm	30 5	73 0	22 9	0 58	18 2	0 30
On 80 mesh	26 6	75 2	9 5	0 50	0 6	0 65
On 150 mesh	8 9	68 4	4 8	0 71	0 2	1 20
Through 150 mesh	15 3	67 5	6 8	5 30	0 5	5 80
Totals and Averages	100 0	73 5	100 0	1 09	100 0	0 61



FLOW SHEET, MILL NO. 3, FEDERAL LEAD COMPANY—Continued.

mum sizes. The Hancock jig is well adapted for this duty, and presenting as it does economies over the Hartz system, has become the established jig for the newer mills of the district, installations totaling about 6000 tons daily capacity being now in operation.

Within the last year the Richards pulsator jig in which a water pulsation is given by a rotating cock, has been tried out with some success at several plants, notably at Great Falls, Mont., and may present advantages for certain types of ore.

Regrinding

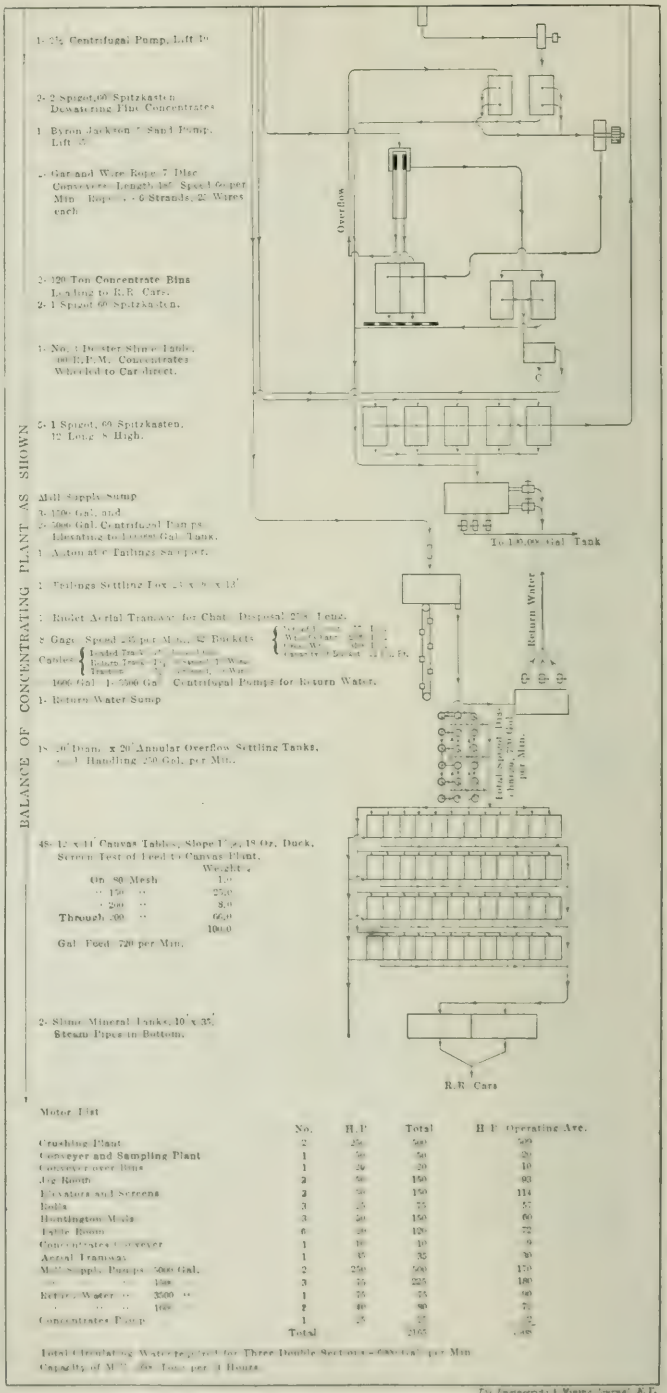
The usual practice is to regrind the richer middlings with rolls and the leaner material with grinding mills of some sort, rolls being also used for the coarser middlings in stage recrushing, irrespective of grade. Rolls are seldom used for finer crushing than 2½ mm. For fine grinding, Huntington mills, Chileans or Bryans are usually used, although other types are found. Stamps have not found favor for regrinding purposes, but for the crushing of lump ore to 20 mesh or finer preparatory to concentration. Stamps of the Nissen individual circular mortar type have given good results on disseminated copper ore at the Boston Consolidated's Garfield plant.

Where the discharges from the regrinding rolls and regrinding mills join, for screening or classification and subsequent treatment over jigs, tables, vanners, etc., the practice frequently is to use screens on the Huntington or other grinding mills, with openings, say, twice the diameter of the size to which it is desired to crush, and depend on the subsequent screening or classification equipment to separate the coarser portion for jigging along with other like material from the rolls.

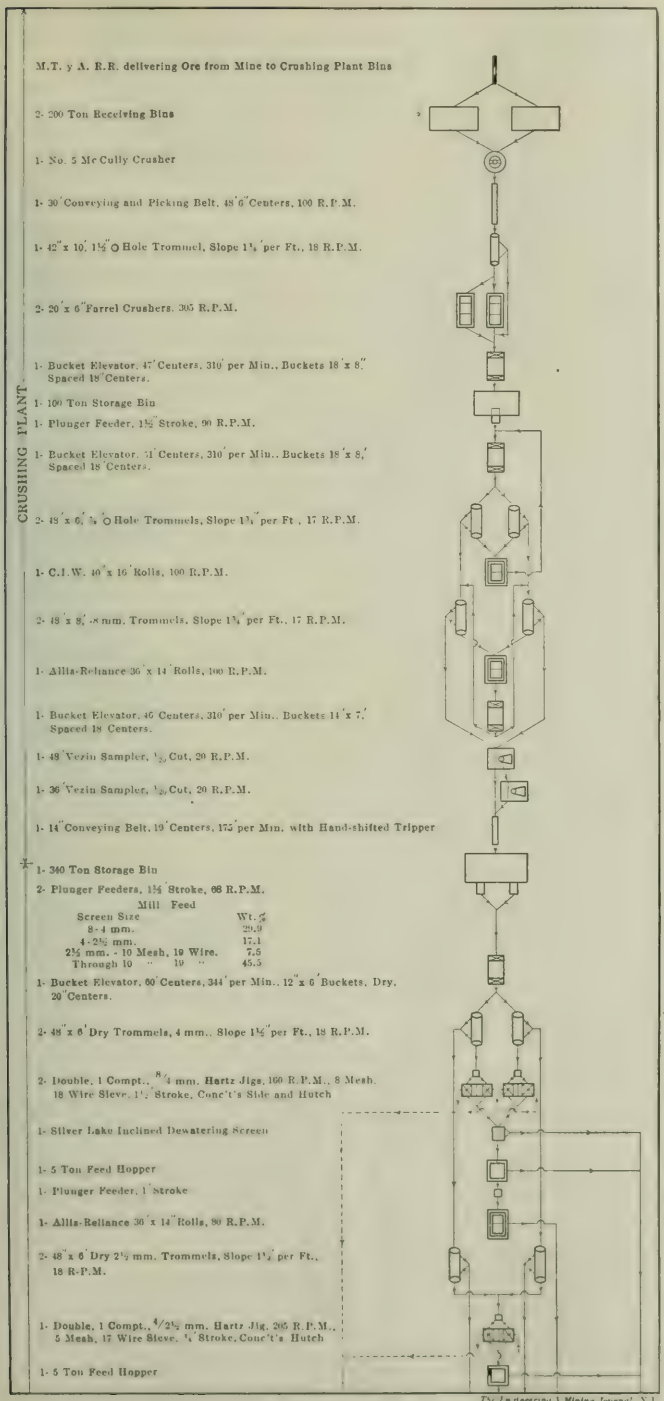
In this way a larger tonnage can be put through the grinding mills at less cost for screens, less sliming of mineral, and with a relatively small percentage of the discharge coarser than the size desired, this coarser material—or whatever of it is of value being caught in the subsequent jigging and returned for regrinding. This gives stage grinding with grinding mills similar to stage crushing with rolls, and under certain circumstances it may be desirable to use as coarse as, say, 6-mm. screens where 2-mm. grinding is desired; perhaps 80 per cent. of the discharge will pass a 2-mm. screen in such case.

Fine Concentration

Material below jigging size—that is finer than, say, 1 mm.—is usually classified into two or more sizes for table feed, and the final classifier overflow thickened and fed to vanners or other slimers. This division of table sizes is sometimes made by traveling belt screens of the Callow type, instead of classifiers; so far, however, this substitute for water classifi-



FLOW SHEET, MILL NO. 3, FEDERAL LEAD COMPANY—Concluded.



FLOW SHEET OF CONCENTRATING MILL OF MINAS TECOLOTES Y ANEXAS—Continued.

cation, although theoretically preferable, has not been widely adopted, perhaps due to the cost of screens, renewals and upkeep.

In the Hancock jig installations of southeast Missouri, where the limestone ores are not very corrosive or abrasive on screens, the practice at the Federal plant, the largest in the district, is to make a definite dividing line between jig and table sizes by trommel screens of No. 20-22 gage, with 1-mm. perforations. The feed to these trommels is of 8-mm. maximum size, as it comes from a dry crushing plant and due to the loose-rolling action, induced by the presence of this coarse material with the fine, the oversize of the 1-mm. trommel, is, by the use of a liberal spray, as free of slime as it would be from a coarser screen of, say, 2½ millimeters.

With silicious ores, though, the life of such thin screens is too short and for these, classifiers although not as desirable in some respects have to be depended upon to make the separation. Of the various classifiers, probably Richards annular is at present the best for coarse material. For finer stuff, table feed material, Richards vortex or pulsator classifiers are largely used, although for these sizes many plants prefer classifiers of their own design.

Of the various reciprocating tables, the Wilfley is the more usual, then the Overstrom, Deister, Card, with numerous other less prominent tables, all of about the same type. In vanners, the tendency of late has been toward those of the suspended type in preference to the older Frue model. One of the more recent and perhaps the nearest competitor of the vanner is the Deister slimer, a short reciprocating table with irregular deck. It requires less attention and repairs than a vanner and under certain conditions might be preferable, even should the percentage recovery average a shade lower.

Overflows of spitzkasten or cones used as thickeners for vanner feed, unless entirely clear, will often be found to yield a profit by passing over canvas tables, either stationary or traveling, and unless retreatment of vanner tailings over a second series of vanners is used, a considerable recovery of mineral will be made by leading vanner tailings also over canvas. Even after second treatment by vanners, a profit can sometimes be made by passing over canvas tables.

A single product may result from water concentrating operations as for example, in the case of straight copper ores or straight lead ores either with or without gold and silver. Where ores containing both lead and copper are concentrated it is usually advantageous to make two products, a high grade lead and a mixed lead and copper, for later separation in smelting.

Ores containing lead and zinc are usu-

ally concentrated into two finished products, except in the presence of iron or copper sulphides. In such case a clean lead product is made, possibly an intermediate product, and a zinc-iron or zinc-iron-copper product; the percentage of zinc and its value under the circumstances determining whether this product is to be shipped to a copper smelter with possibly penalties for zinc, or separated by magnetic, static, or other supplementary treatment into a zinc and an iron or iron-copper product.

Miscellaneous Processes

Under this heading may be included standard processes like chlorination, magnetic separation, etc., which, due to the limited tonnages of ores requiring such treatment, are commercially less important than the more usual processes previously described. Included, also, are newer treatment schemes for specific problems, some of them not as yet thoroughly tried out.

A considerable tonnage of telluride ores is handled in Colorado by chlorination, although cyaniding is competing with it to a considerable extent. Outside of these, chlorination is little used, except for the local treatment here and there of concentrates from amalgamating plants.

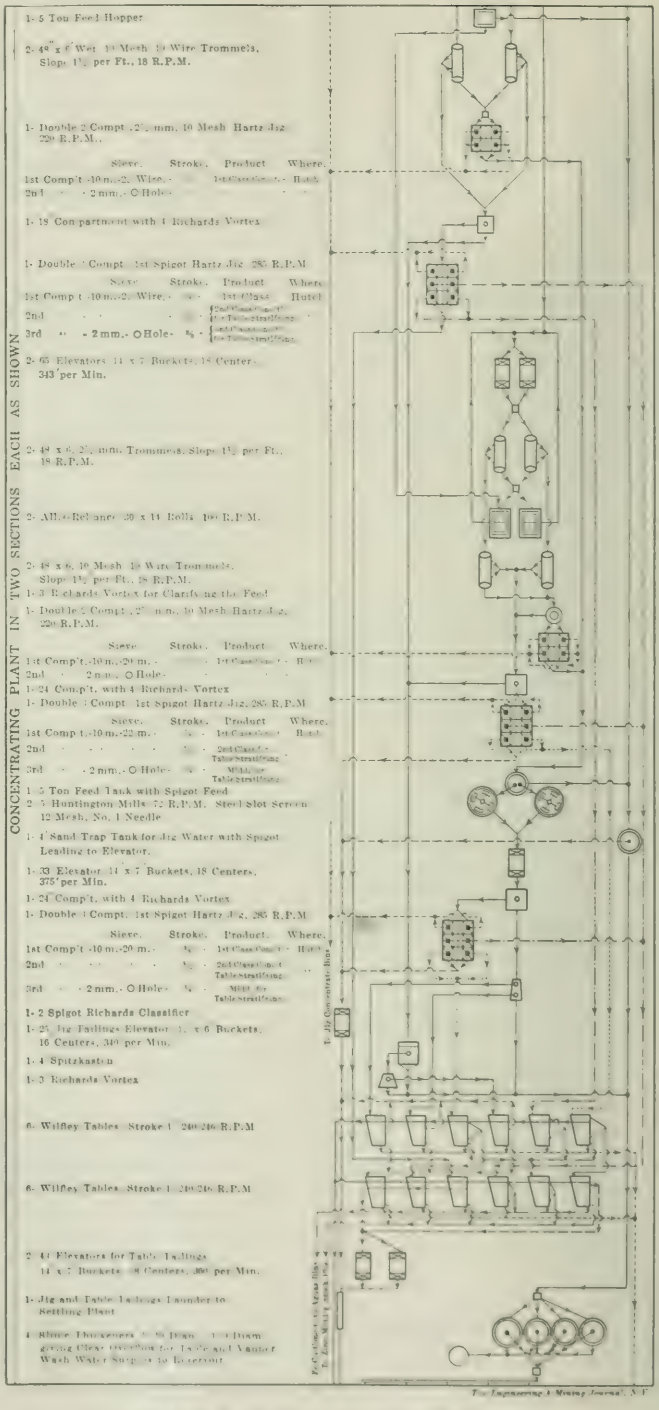
Lixiviation treatment of silver ores by hyposulphite solutions has been in recent years almost entirely displaced by cyaniding.

Leaching of oxidized copper ores by acids or solutions of metallic salts has been used to some extent, for example, at the Arizona Copper Company, Clifton, Ariz., and the Snowstorm in the Cœur d'Alene district, Idaho, but the application of such treatment is rather limited.

Flotation processes of the Broken Hill type, using acid or acid salts solutions have as yet not passed the experimental stage in this country and Mexico. The same may also be said of the Elmore oil and oil vacuum processes.

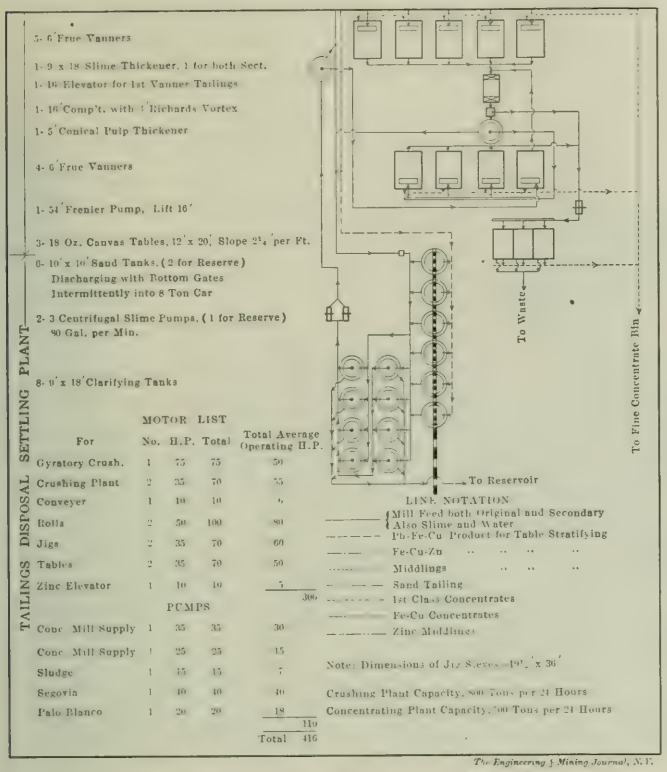
Some interest has been aroused by the flotation of sulphides on water by the use of Macquisten tubes with internal helical grooves at the Adelaide plant in Nevada, and it is possible this process has a field in the separation of sulphides from gangues of heavy specific gravity—say garnet gangues, where water concentration does not make a satisfactory separation.

Magnetic processes, in addition to iron ores, have found extended application in the separation of zinc blende from iron or iron and copper sulphides, either by removing the blende from the raw sulphides or the sulphides after a slight roast from the blende. The Wetherill belt type and rotary, the International rotary, the Ding and the Cleveland-Knowles are at present the more usual machines for these separations.



FLOW SHEET OF TECOLOTE'S VANEXAS MILL—Continued

Static separators of the Blake-Morscher or Sutton Steele & Steele type are sometimes used for similar separations. The Sutton, Steele & Steele dry concentrator does fair work where for any reason it is not possible to use water concentration and where the feed is very closely sized by screening this table yields rather better results in the separation of minerals of close specific gravities—say blende from iron and copper sulphides—than the usual water concentration by tables of the Wilfley type. Close sizing by fine screens, where any considerable tonnage is handled presents, however, many difficulties.



For	MOTOR LIST No.	H.P.	Total	Total Average Operating H.P.
Gyratory Crush.	1	75	75	50
Crushing Plant	2	35	70	55
Conveyer	1	10	10	6
Rolls	2	50	100	80
Jigs	2	35	70	60
Tables	2	35	70	50
Zinc Elevator	1	10	10	5
				306
PUMPS				
Conc. Mill Supply	1	35	35	30
Conc. Mill Supply	1	25	25	15
Sludge	1	15	15	7
Segovia	1	40	40	40
Palo Blanco	1	20	20	18
				110
			Total	416

FLOW SHEET OF TECOLOTES MILL—Concluded.

PRODUCTS AND RECOVERY AT TECOLOTES MILL OF AMERICAN SMELTERS SECURITIES COMPANY

District—Santa Barbara, Chihuahua.
Ore—Gold and silver with galena, chalcopyrite and zinc blende in a siliceous gangue containing considerable fluorite.
Treatment—As per accompanying flow sheet, concentration beginning at 8-mm. maximum size.

Product	Dry Wt. % of Total	Average Au Oz. Per Ton	Ag Oz. Per Ton	Pb % (Wet)	Cu %	Fe %	Zn %	Insol %	CaF_2 %	S %	Percentage Recoveries Au	Ag	Pb	Cu	Zn
Crude Ore	100 0	0 097	5 65	7 2	0 70	7 8	8 6	42 6	13 6	8 2					
1st Class Concentrates	15 2	0 33	22 0	40 6	1 10	10 5	9 0	6 0		16 0	44 9	51 4	74 4	20 7	
2d Class Concentrates	2 1	0 20	11 2	6 5	1 40	21 0	18 8	6 8		25 6	4 3	4 2	2 1	4 2	
Zinc Middlings*	9 2	0 15	7 0	4 0	1 50	14 2	20 0	15 2		19 6	14 2	11 4	5 1	19 7	21 4
											63 4	67 0	81 6	44 6	21 4
Coarse Tailings		0 070	3 0	1 6	0 5	6 1	6 6	54 0		4 6					
Slime Tailings		0 040	3 4	1 8	0 6	7 0	7 5	31 2		6 0					

*A plant is now being built to treat this product by magnetic separation of the slightly roasted material, the gold and silver going largely with the iron and copper in the separation and the fluorite and silica remaining with the zinc for subsequent separation.

Diamond drills are being used with satisfactory results in various parts of the Cobalt district, Ontario, nine drills now being in operation in this district. Outside of Cobalt there are two in South Lorrain, and one has just been taken in to the Miller Lake section. The farthest yet drilled in Cobalt is 760 ft., and the O'Brien mine has proved the continuation of the conglomerate to a depth of 500 ft. The use of the diamond drill has been particularly beneficial to the Cobalt Central in locating the Lower Huronian formation in which that company has found such excellent ore, and was also instrumental in influencing the purchase of the Provincial mine. Other properties that have made use of the diamond drill are the City of Cobalt, Silver Queen, Temiskaming and Hudson Bay, Chambers-Ferland, La Rose, Haileybury Silver in South Lorraine, Beaver and Foster.

The Caucasus Copper Company

The Caucasus Copper Company, which was formed in 1900 to acquire copper and silver-lead mines at Dzansul, South Russia, has spent large sums in the development of its property and in the erection of plants and machinery. At the ninth ordinary meeting of the shareholders recently held in London, the following information was given as to the working of the mines:

The magnetic concentrating machinery has been abandoned and a wet concentrating plant installed to take its place. The capacity of this plant is 250 tons of ore per day, and the results obtained are so satisfactory that an additional unit of 250 tons is to be erected forthwith. The company has also a smelting plant which turned out, during the last financial year, 295 tons of refined copper, which was sold at an average price of £79 13s. 2d. per ton. The present production is at the rate of 113 tons per month. During the year 30,100 tons of ore were mined, and at the present time the output is 250 tons of ore per day. As no statement of revenue and expenditure is given, it is impossible to say what is the cost of producing copper at these mines.

Gold Dredging in the Philippines

The Paracale district in the northern part of Ambos Camarines was regarded by the Spaniards as the most important mining region in the Philippines. The mines have been worked intermittently and the stream beds washed for gold since before the days of the Spanish conquest. The hills, in many places, are honeycombed with ancient workings. Since the American occupation development has been hindered by confusion in regard to titles, arising from uncertainty as to the validity and extent of many of the Spanish concessions. Lately, however, satisfactory arrangements have been made in many cases, and work is progressing, especially in dredging the river beds.

The Paracale district consists of matured eroded hills of metamorphic and igneous rocks containing quartz veins. The large plains of the Paracale and Mabagat rivers as well as smaller valleys afford very promising dredging ground, which is now being thoroughly prospected, chiefly by means of small drills, and shows good returns. The Paracale Dredging Company has had a dredge in operation on the property near the town of Paracale for the last year and a half and such excellent results have been obtained that several other dredges will be in operation in a short time on neighboring properties. The placer ground in the vicinity of Paracale generally consists of about 4 to 6 meters of barren clay mixed with vegetable matter. In places this overlies a few centimeters of coral, and below this is a varying amount of gray clay carrying gold. Beneath this again is an irregular amount of rich sand and quartz pebbles, the latter often showing large amounts of free gold. The gold brought up by the dredge now working is remarkably angular and often shows distinct crystalline structure. The quartz pebbles are often sharp and angular, showing that they have traveled but a very short distance. The bed-rock appears to be a soft rock, decomposed to a clay, which is easily cut by the dredge buckets, making it possible to secure practically all of the rich gravel.

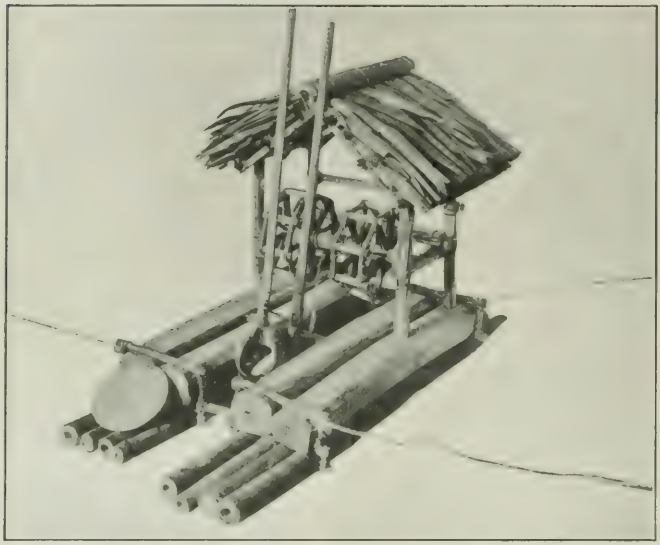
The dredge at present in operation is of the New Zealand type and differs from those generally used in America in that it has no stacking ladder and no quicksilver is used in the riffles. According to the dredge-master's reports, during a period from May 25 to December 31, 1908, 50,244 cu.yd. were handled and 2814 oz. of gold, having a value of $50,654, recovered.

Dredging is made difficult not only by the large amount of barren clay which must be removed but by the unusually large percentage of fine material handled, about 80 per cent. of all the material passing through the screens. The black sand carries gold and is saved for future treatment, as is also part of the gray clay. The oversize material from the revolving screen is sorted by hand and the quartz pebbles saved for future crushing.

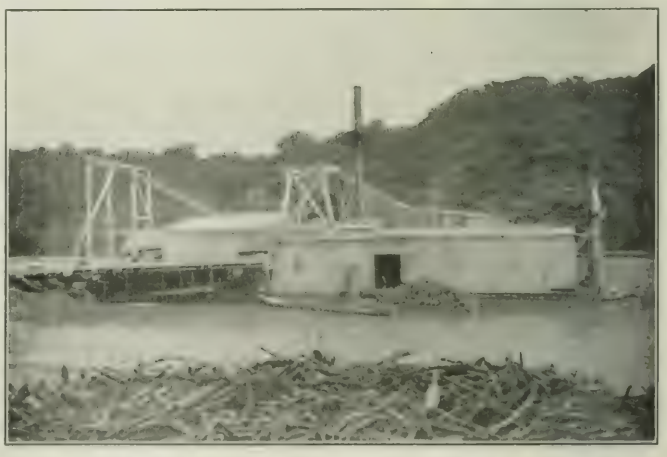
Two more dredges are now (March, 1909) in course of construction. One of these was formerly in operation on the Guinobatan river in Masbate and has been transferred to Paracale, where it is being rebuilt. The other is of the New Zealand type of construction, both screen and stacking ladder being dispensed with, and all material falling directly from the tumbler to the tables. In March, 1909, the pontoon for this dredge was almost completed.

The dredge now in operation has 38 buckets of 137 liters capacity besides three grab hooks. The dredge from Masbate, 45 buckets of 102 liters capacity each, and the third dredge, under construction, 43 buckets of 142 liters capacity.

One of the accompanying engravings shows the dredge above referred to and now in use on the Paracale river. The other forms an interesting appendix to the report, and is a reproduction of a small dredge of Filipino construction, which was used on one of the smaller streams in Ambos Camarines province. It



MODEL OF NATIVE DREDGE, AMBOS CAMARINES, PHILIPPINE ISLANDS



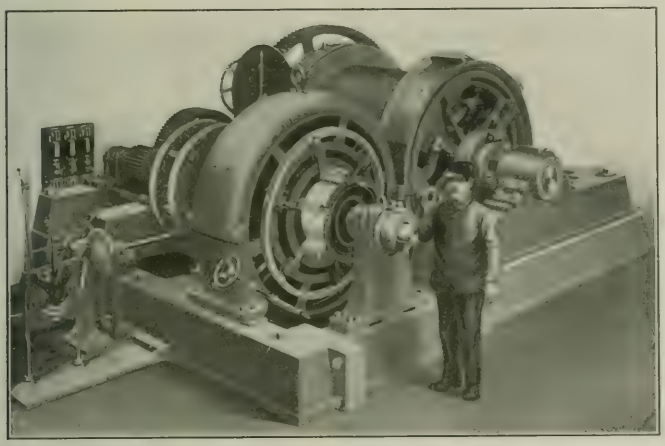
DREDGE ON THE PARACALE RIVER, CAMARINES, PHILIPPINE ISLANDS

* Notes extracted from "Mineral Resources of the Philippines," Bulletin 4, Weston D. Smith, Chief, Division of Geology and Mines, Bureau of Science, Manila.

was worked entirely by hand; its construction, into which bamboo entered largely, is shown by the engraving.

Electric Hoist at Dawson, Penn.

There was recently installed in the mine of the Washington Coal and Coke Company at Dawson, Penn., a 500-h.p. hoist with an electric motor which presents several features of considerable interest. A Connellsville hoist is used to haul 35 mine cars, averaging 3800 lb. each when loaded, up a maximum grade of 8½ per cent., 8000 ft. long, at a speed of 600 ft. per minute. The loaded cars start at the bottom of the slope on a 5 per cent. grade, which gradually increases till the maximum grade of 8½ per cent. is reached near the top. The loaded cars are pulled in on a landing on a grade of about 6 per cent. and on a curve of 150 ft. radius. The empty cars are allowed to run down the slope by gravity controlled by a brake on the hoist drum.



500-HORSEPOWER ELECTRIC HOIST AT DAWSON, PENNSYLVANIA

The hoisting drum is 6 ft. in diameter and 5 ft. wide between flanges. It is fitted with a hand brake on one end and a hand-operated friction clutch on the other end. The drum is of heavy steel construction, with a 12-in. shaft. All the gears on the machine are cast steel with machine-cut teeth, the main spur gear being 10-in. face and the motor gears 13-in. face. The frame is made in sections for convenience in installing in the mine. The drum and large gears and the friction-clutch parts are also made in two pieces for the same purpose.

The hoist is driven through a flexible coupling by a 500 h.p. direct-current non-reversing compound-wound Westinghouse motor. It is controlled by a standard semi-automatic Westinghouse, magnetically controlled, unit-switch controller. These switches are operated from the controller shown in the illustration. The controller carries only small currents, while the main motor current is handled by the magnetically operated switches, thus doing away with arcing difficulties.

This controller has an accelerating relay which prevents the starting switches from closing too rapidly and thereby prevents too large starting currents. Thus the second switch cannot close until the current allowed to flow by the closing of the circuit has fallen to a predetermined value. As soon as this value is reached, the second switch closes, thereby short-circuiting a resistance section and the current rises, but the third switch cannot close until the current has again fallen to the predetermined value. This not only prevents injury to the motor from careless handling during acceleration, but also insures the most rapid starting possible.

The controller also has a safety relay which opens the resistance switches in cases of excessive overload, and thereby protects the motor while running. If this relay operates while the motor is running, the motor does not stop, but is automatically brought to its full speed again. This is a particularly valuable feature in an installation of this kind where the cars may strike some obstruction, as it affords perfect protection to the apparatus. When it is remembered that this hoist is installed 800 ft. below the surface of the ground, the advantages of the electric transmission of power are evident. In no other way could this large amount of power be transmitted as economically nor as easily.

The largest number of unskilled laborers employed in Transvaal mines this year was in March, when the government reports showed 174,270 negroes and 9997 Chinamen to have been at work. In September only 3204 Chinamen were reported, among a total of 161,502 unskilled laborers.

Yukon Operations

SPECIAL CORRESPONDENCE

Supplementing his report of a gold production from Yukon Territory for the last fiscal year, in which there was a production of 217,351 oz. of gold, valued at $3,260,264 (an increase over that of the immediately preceding year of about $440,000), Commissioner Alexander Henderson states there may be expected a further increase in output for the current year. The Yukon Gold Company, working seven dredges and three electrically operated elevators, has had a successful season and added considerably to the quantity of gold recovered. The Northern Light and Power Company, a new enterprise, is installing machinery for the generation of electricity, and will supply low-cost power, and thereby facilitate the extension of mining operations. Prospects for gold-quartz mining are considered good, Hartman & Davidson having lately encountered at the Dome a gold-bearing vein in their tunnel at about 1000 ft. from its portal, while a fair return is being obtained at the Lone Star, Victoria gulch, where a small stamp mill has been erected.

Another Dominion official, recently returned from the Yukon, estimates that the increase in production of gold for 1909 over 1908 will be at least $1,000,000, due largely to dredging rather than results obtained by individual miners. Beside the Yukon Gold Company's dredges, there are others that have done well. During last season Bonanza Basin, Old Discovery, Bear Creek and Stewart River dredges were all at work. On the Guggenheims' 70-mile ditch, from Tombstone mountain, there have been about 600 men employed and the work is so far advanced that the ditch has been used with water running at half capacity. Next season extensive work will be carried out in continuing the system across Bonanza hill.

The North American Transportation and Trading Company is doing much work preparatory to installing gold dredges next season. It is stated that the company will operate along different lines to those followed by the Guggenheims—hydraulicking off the top dirt and leaving the frozen gravel to gradually thaw when exposed to the sun, instead of thawing by steam jet. While this method will take longer, it is thought that it will be cheaper. The company's operations will be on Sixty Mile.

In Wheaton and Conrad camps prospects for quartz mining are considered promising. Ores in these camps carry silver and gold. In the Whitehorse copper camp, mining is at a standstill, attributed to high freight rates over the White Pass & Yukon railway, so that present cost of shipping to a smeltery would be too great for profitable working.

Discovery of coal in considerable quan-

tity, situated within 40 miles of where dredges and hydraulic plants are working, is expected to prove a valuable aid to the material enlargement of hydraulic and other gold-mining operations, not already provided for by existing hydroelectric systems.

Lehigh & Wilkes Barre Coal Company

This company owns, leases and operates collieries in the anthracite region. It is controlled by the Central Railroad Company, of New Jersey, and its coal business is tributary to that road. The report for the year ended June 30, 1909, shows $9,212,500 capital stock, and $23,700,339 bonded debt.

The statement of coal mined and sold is as follows, in long tons:

	1907-8.	1908-9.	Changes.
Coal mined	4,227,573	4,093,655	D. 133,918
Coal bought	1,145,764	844,001	D. 301,763
Total	5,373,337	4,937,656	D. 435,681
Coal sold	5,271,358	4,849,678	D. 421,860
Increase in stock	101,799	87,978	D. 13,821
Per ct., large sizes	.....	65.8	.....
Per ct., steam sizes	.....	34.2	.....

A supplementary statement shows the quantities of coal mined from lands leased and owned, and by the company and its tenants in 1908-9. The figures are as follows:

	By Company	By Tenants.	Total.
From lands owned	3,092,716	980,920	4,073,636
From lands leased	909,475	156,968	1,066,441
From washeries	101,166	214,808	315,274
Total	4,093,655	1,351,696	5,445,351

For each ton of coal mined from lands owned by the company 10c. is debited to depletion of coal-lands fund, and credited to the bond sinking fund.

The income account for the year may be stated in condensed form as follows, averages being calculated on the tons of coal sold:

	Amount.	Per Ton.
Coal sales	$16,091,459	$3.32
Royalties and miscellaneous	508,198	0.11
Coal added to stock	305,162	0.06
Total earnings	$16,906,819	$3.49
Mining and purchase of coal	$8,800,390	$1.82
Transportation and selling	4,051,204	0.84
General expenses, taxes, etc.	676,290	0.14
Total expenses	$13,477,884	$2.79
Net earnings	$3,428,936	$0.70
Depletion, coal lands	$[illegible]	$0.05
Interest and sinking funds	1,186,068	0.25
Total charges	$1,455,511	$0.30
Surplus	$1,973,425	$0.40

Mining charges include $576,758 for colliery repairs, $[illegible] for roadbed, and $[illegible] for coal bought. The coal purchased is charged at $[illegible] per ton, coal added to stock is credited at $[illegible] per ton. Mining expenses were [illegible] per cent. of the total, transportation, [illegible] other expenses 4.6. The total expenses were 79.7 per cent. of gross earnings. The report says:

"On June 1, 1909, the $[illegible] 00 bonds issued under the mortgage of April 27, 1899, which were extended June 1, 1909, for 10 years at 4½ per cent., and the $4,821,000 5 per cent. gold bond of 1910 will mature. The funded debt includes in addition to these bonds only the $2,691,000 due Nov. 1, 1912.

"The office building for use of the mining department at Wilkes-Barre will be ready for occupancy during September next. Property account has been increased $163,801 on account of the same. The sinking of the shafts at Inman colliery No. 21 is progressing rapidly, the Baltimore at the end of June, 1909, being down 930 ft. and the Red Ash 576 ft. in all."

Broken Hill Proprietary Company

For the six months ended May 31, 1909, the balance sheet of the Broken Hill Proprietary Company, Ltd., shows a loss of £59,029, of which £5559 were the company's expenses in the arbitration court and an additional loss of £28,037 is directly attributed to the strike. The reserve fund stands at the same amount as before, £260,000; but of this sum £129,837 is for the present being used in the company's business. Of this amount, £27,600 have been applied to the construction of the spelter plant.

Owing to the suspension of work due to labor difficulties, no production costs of value are reported, work having been suspended for five months out of the six. At the date of the report, the company was employing 1894 men, as against 4427, the number working prior to the strike. The comparatively small number of men employed was mainly due to the mine itself remaining closed, awaiting an improvement in the metal market to justify its being reopened at the wages specified in the award of the arbitration court. The smelting works at Port Pirie is at work, as is also the zinc flotation plant and the sulphuric-acid and sintering works.

In connection with the labor difficulties, it will be remembered that after the customary Christmas shutdown for the cleaning and overhauling of machinery, the men did not return to work, the wage agreement terminating on Dec. 31, 1908. In 1906 the company granted all its employees an increase in wages varying from 10 to 12 per cent. and undertook to pay these increased wages for a fixed period of two years. No agreement was concluded with the men as to the rate of wages to be paid after Jan. 1, 1909, and in accordance with the Australian law, the matter was submitted to the arbitration court. Owing to the fall in the price of lead, the company has since lost money on every ton of ore mined during the latter part of 1908, and proposed a sliding scale, fixing the rate of wages paid in 1906 as a maximum, and assuming that the men continue work pending the settlement of the rate fixed by the court and offering to pay any difference between these wages and the rate fixed by the court.

The decision of the arbitration court was that the wages fixed during 1907-08 period should continue to be paid. An appeal was taken by the company to certain features of the award, and the higher court eliminated the objectionable portion. The company has resumed operation upon this scale, and to the extent indicated by the arbitration court, but of 2600 men formerly employed at Broken Hill, only about 500 were employed at the time of this report at the rate of wages fixed by the court, and the general manager regards it as doubtful if these men are satisfied with the decision which secured them 7½d. per day more, at the expense of throwing a large majority of the men out of work altogether for an indefinite period.

During the six months covered by the report, 39,515 tons of ore were mined and a limited amount of development done. A calyx drill, intended for boring 12-in. holes for tailings passes and ventilation was installed on the 1200 level but only 26 ft. were drilled. The water curtain proved effective, and the fire seems to have lost much of its former activity, and gives no further anxiety. During the cessation of work water was kept constantly dripping on the curtain, and accumulated at the bottom of the mine. At the end of the half year it had risen to within 73 ft. of the 1000-ft. level. All the workings in the mine were kept in excellent condition, and no damage of any kind was done through the cessation of work.

Crown Reserve Report

The financial statement of the Crown Reserve, Cobalt, Ont., for the nine months ending September 30, shows shipments of 22 cars high-grade and 62 cars low-grade ore of a total net value of $1,368,951; operating expenses, $158,532; royalty to Ontario government, $131,613; leaving a net profit of $1,078,806. Out of this were paid dividends amounting to $795,000, leaving a net balance of $282,839, which added to the surplus of Dec. 31, gives a surplus of $629,957. There was spent on new buildings, plant and equipments, $67,464. A report of the development work done during the nine months shows 1224 ft. of drifting, 342 ft. of sinking, 1670 ft. crosscutting and 100 ft. of raising. Winzes on No. 1 and 2 are to be put down to the 300-ft. level, the drifting between these winzes at 200 ft., which is now completed, showing rich ore along its full length. No. 3 winze on No. 17 vein down to the 200 ft. level also shows continuous rich ore, and a drift in 10 ft. at this depth discloses ore 4 in. wide, assaying 1000 oz. On No. 34 vein a drift of 130 ft. at the 100-ft. level discloses continuous ore 2 in. wide of the same grade, and in the main stope on the north side of the Carson vein a drift has been run 100 ft. on a 3 in. vein assaying 1000 oz. to the ton.

Third Annual Report of Nevada Consolidated

Produced Nearly 35,000,000 lb. of Copper, Which Cost Less Than 7 1-2c. per lb.; Ore Averaged 2.34 Per Cent Copper; 6000 Tons Mined per Day

EARNING OVER $3,000,000 PER YEAR

During the fiscal year ended Sept. 30, 1909, the Nevada Consolidated Copper Company produced 34,527,823 lb. of refined copper. The total cost of all the copper produced and marketed by this company during the year was less than 7½ cents per pound.

In regard to the proposed increase of capital stock from 1,600,000 to 2,000,000 shares the president, James Phillips, Jr., says: "The profits during the fiscal year have fully justified your board of directors in declaring an initial quarterly dividend at the rate of 37½ cents per share, involving a disbursement of $750,000, should you see fit to increase the capital stock to 2,000,000 shares, as has been unanimously approved by your Board of Directors. This dividend is payable on Dec. 31, 1909. The early action with regard to the dividend was taken with a view to afford the bondholders the fullest opportunity to convert their bonds into stock and participate in the dividend distribution.

Acquisition of Cumberland-Ely

"At the meeting of the board at which the resolution to increase the capital stock from 1,600,000 shares to 2,000,000 shares was passed, it was also unanimously resolved that the company should acquire its sister corporation, the Cumberland-Ely Copper Company, and a proposition was made to the directors of that company to exchange 3¼ shares of Cumberland-Ely stock for one share of Nevada Consolidated stock.

"Briefly, the advantages which appealed most strongly to the board of directors and larger stockholders were: (1) that the purchase secures to the Nevada Consolidated the absolute individual ownership of the Steptoe smeltery, the worth of which has now been amply proved, and makes it possible to continue treating the full amount of 6000 tons of ore daily instead of 4000 tons; (2) that the control and practical ownership of the Nevada Northern Railway is thereby also secured to your company; and (3) that a perfect unity of administration with a consequent probable reduction in operating expenses is assured. Since the temporary cessation of mining operations on the part of Cumberland-Ely, the general manager of the Nevada Consolidated has not found the slightest difficulty in keeping the entire Steptoe plant, including those units which were used by the Cumberland-Ely, in full operation on Nevada Consolidated ores, and, although the output of ore now treated at the concentrators has attained the great total of 180,000 tons per month, it seems certain that Nevada Consolidated alone could, were it deemed advisable, and were facilities afforded for treating it, produce an output sufficient to supply a plant even larger than the present capacity of the Steptoe smeltery. In plain language, it appeared to the board of directors that Nevada Consolidated had outgrown the arrangement which, in its infancy, it had entered into with Cumberland-Ely to share the smeltery jointly, and sound judgment dictated the formulation of a proposition to the sister company to absorb it upon an equitable basis such as that finally agreed upon."

Auditor's Statement

The report of the general auditor, for the fiscal year ended Sept. 30, is as follows: Net earnings from operations, $1,646,062; dividends received, $432,987; interest, rentals and miscellaneous earnings, $7611; dividends accrued but not received, $150,000; total income, $2,230,661; interest on bonds outstanding, $174,791; net surplus to profit and loss, $2,001,870. In connection with this, it is advised that only during the last three months of that period did the product attain a total in excess of 4,000,000 lb. per month. During the last quarter the production was 14,265,788 lb. While the operations of this quarter were still less than normal, the earnings were on a basis of considerably over $3,000,000 per year.

NEVADA CONSOLIDATED STATEMENT.

Assets.	
Property and development:	
Cost of mine, equipment and developing	$ 4,947,093.98
Investments:	
Par value of stock and bonds of Steptoe Valley S. & M. Co. and Nevada Northern Ry. Co.	5,270,000.00
Trusteed stock:	
Par value of Nevada Cons. stock held in trust to convert outstanding bonds and bonds of Nevada Northern Ry Co.	3,644,500.00
Materials and supplies on hand	100,502.77
Accounts collectible	376,632.93
Metals on hand and in transit	2,449,791.07
Cash	256,101.35
	$17,044,622.10

Liabilities	
Capital stock:	
1,600,000 shares	$ 8,000,000.00
Bonds outstanding:	
Par value of bonds not yet converted	2,784,500.00
Accounts payable	257,784.54
Deferred liability trusteed stock:	
Par value trusteed stock for converting similar amount Nevada Northern bonds that on conversion will belong to Cumberland-Ely Copper Co.	430,000.00
Unpaid treatment on metal	414,449.86
Surplus	
Amount realized from capital stock and securities sold in excess of par value or cost	3,073,178.97
Profit and loss	2,084,108.73
	$17,044,622.10

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In his report, the consulting engineer, Pope Yeatman, gives the following data of technical interest: The Nevada Consolidated mines comprise 63 claims in two groups, the Eureka and Ruth. Prospecting has been done by churn drills in three portions of the property, Copper Flat, Liberty and Ruth. Altogether there have been put down 45 holes aggregating 14,670 ft. It is intended to continue work in the Liberty and Ruth sections and do no further drilling in the eastern section around the Kimberly, Turkoy, Boss of Nevada and August claims.

The ore reserves have been increased in amount by nearly 50 per cent. since Nov. 1, 1908, at which time 20,000,000 tons were reported. This has been raised to about 29,000,000 tons as follows: Copper Flat and Liberty, 21,000,000 tons: Ruth, 8,000,000. The grade of the above ore has been approximately of the average previously developed. Ore on the Eureka group will be mined by steam shovels; on the Ruth, by reason of the greater thickness of overburden, it will have to be mined by the caving system already outlined and prepared for in the old Ruth workings.

Mining

Operations by steam shovels have been actively carried out both on stripping and mining, and this method of excavation has proved most satisfactory both as to cost and ability to handle large tonnages. A large amount of stripping has been done, totaling 1,093,307 cubic yards; an area exceeding 12 acres of overburden has been entirely stripped above the orebody, and in addition a large amount has been removed from at least one terrace out of the present two. The extreme depth of excavation is now 147 ft. below the collar of the Eureka shaft. The average is, of course, much less. This represents a depth into the orebody of about 47 feet.

In addition to the stripping over the orebody, much material was removed from approaches to the pit. The equipment and preliminary work has been such as to furnish ore sufficient for the entire Steptoe plant, 6000 tons per day, during the shut-down of the Cumberland-Ely. There were mined during the year 1,082,000 tons of sulphide ore. For the last two months,

Note—Abstract from the third annual report presented to the stockholders at the annual meeting, Nov. 2, 1909, at Portland, Maine.

when only eight sections of the concentrator were in operation, the monthly tonnage has averaged 169,026 tons. In October an output of over 6000 tons per day was maintained, totaling over 190,000 tons for the month. The Liberty orebody will be stripped and prepared for active mining during the coming season. During stripping, 34,632 tons of oxidized ore have been shipped, and more has been sent to a special dump. This silicious ore furnishes splendid material for converter lining.

All ordinary repairs to locomotives and steam shovels are made on the property. A new distributing reservoir is nearly completed. Connections have been made with the electric transmission lines of the Steptoe plant. A transformer house has been erected at the Star Pointer shaft, and connections made so as to allow for lighting the property and furnishing power for operating hoist and underground haulage systems. An electric hoist has been installed, but the building is not complete. The shaft has been put in shape so that the Ruth mine can be placed in commission, if required, in a short time.

The stripping costs during the year have averaged 43.5c. per cubic yard, including all possible charges such as labor, supplies, repairs, management, taxes and proportion of general expenses. Mining costs have averaged 15.3c. per ton of ore, including all charges. An additional charge of 15c. per ton of ore has been made to cover stripping redemption. This charge is based not only on the cost of removing the overburden directly overlying the ore to be mined, but also such overburden as would have to be removed to allow for the safe working at the bottom of the orebody. In other words, to allow for proper slopes in the ore pit.

Milling and Smelting

The plant of the Steptoe Valley Smelting and Mining Company has been run with great satisfaction during the past year. Many additions have been made and the plant has been increased from three units to treat 4000 tons of ore per day to four units of a capacity of 6000 tons. To allow for this, a fourth unit was added to the concentrator and additions made to two of the first three units. Two new McDougal roasters were added to the 14 originally planned for. The reverberatories have been increased from two to four, and a fourth converter has been added to the three originally authorized.

The capacity of the concentrator has proved to be greater even than originally estimated; the saving obtained has also been greater than promised. The general treatment data for the year are given in the accompanying table. These results are [illegible] being improved.

The power used from the plant is now used again, the [illegible] the [illegible] [illegible] at the time of the last report were finished and two additional ones were added. Little or no trouble was experienced in operation of these furnaces. The reverberatory furnaces have done excellent work. It is found that no fluxes are required other than limestone, which is mined near the plant. The third

GENERAL TREATMENT DATA.

Tons of ore treated, dry	1,065,387
Average copper assay, per cent	2.34
Percentage of extraction, copper	70.73
Ratio of concentration	10.04 to 1
Assay in gold, oz	0.019
Assay in silver, oz	0.072
Percentage of extraction, gold	55.26
Percentage of extraction, silver	56.62
Average gold and silver recovered per ton of ore in cents	23.12
Average copper in concentrates, per cent	16.62

reverberatory, No. 1, was charged Feb. 27, 1909, and the fourth, No. 4, Oct. 1, 1909. Reverberatory No. 5 should be ready some time in November.

The blast furnace is now being completed. Increased flow of water has been obtained from Duck creek by picking up the underground water. The hydroelectric plant was installed near McGill springs, and later this was doubled. The plant serves as a reserve in case of shortage at any time in the main line.

Construction now under way consists of the erection of a new 18,000 cu.ft. blowing engine, and extension of power house for same. This should be completed early in the year. A fifth reverberatory is being built and authorization has been granted for a new converter stand when it may be required. The yield from ore mined and concentrated has been 34,527,823 lb., of which 6,016,602 lb. are still in concentrates not yet treated and in secondaries. The total cost has been 7.14 cents, or including a charge for rental of the Steptoe plant and a credit for miscellaneous earnings, 7.47c. These costs include all possible charges, shipping, refining, marketing, legal. The low costs obtained, the large increase in the ore reserves and the placing in successful operation of the various units of the concentrating, smelting and converting departments of the reduction works reflect much credit upon the staff in Nevada and its work is warmly commended in the annual report of the consulting engineer.

Pocahontas Coal Trade

The Pocahontas Consolidated Collieries Company, Inc., has terminated its agency contract for the sale of coal through Castner, Curran & Bullitt, effective April 1, 1910, and organized its own sales department to deal direct with the coal trade, known as the Pocahontas Fuel Company, with an authorized capital of $1,000,000. The Pocahontas Fuel Company, after April 1, 1910, will have over 3,000,000 tons of Pocahontas coal to market, including all the coal from the mines of the Pocahontas Consolidated Collieries Company, which occupies long leases, assumed the portion of contracts overlapping that date taken under its present sales agreement with Castner, Curran & Bullitt. The Pocahontas Fuel Company has at present a certain tonnage of Pocahontas coal to market, to be included in the tonnage which will be handled by it after April, and will, therefore, in the near future, extend its selling organization, which will be centralized in New York, with branch offices at Boston, Norfolk, Va., Bluefield, Va., Cincinnati, Chicago and possibly other New England and northwestern points, with also a London agent.

The officers of the Pocahontas Fuel Company are: Isaac T. Mann, president; Charles S. Thorne, vice-president; Thomas F. Farrell, general manager.

Foreign Trade in Iron and Steel

Iron and Steel Exports—Exports of iron and steel, including machinery, from the United States for the nine months ended Sept. 30 are valued by the Bureau of Statistics of the Department of Commerce and Labor at $116,480,761 in 1908, and $113,920,860 in 1909; a decrease of $2,559,901, or 2.2 per cent. The leading items of export were, in long tons:

	1908.	1909.	Changes.
Pig iron	30,568	40,667	I. 10,099
Billets, ingots & blooms	86,315	94,594	I. 8,279
Bars	38,252	61,044	I. 22,792
Rails	156,098	189,784	I. 33,686
Sheets and plates	75,722	124,826	I. 49,104
Structural steel	91,448	68,433	D. 23,015
Wire	99,546	109,194	I. 9,648
Nails and spikes	29,361	33,842	I. 4,481
Pipe and fittings	85,962	112,955	I. 26,993

Exports of mining machinery are valued at $2,949,163 in 1908, and $3,392,341 in 1909; an increase of $443,178 this year.

Iron and Steel Imports—Imports of iron and steel and of machinery into the United States, nine months ended Sept. 30, were valued at $14,923,195 in 1908, and $20,878,321 in 1909; increase, $5,955,126, or 39.9 per cent. The leading items of import were, in long tons:

	1908.	1909.	Changes.
Pig iron	65,280	99,823	I. 34,543
Scrap	3,660	14,263	I. 10,603
Ingots, blooms, etc.	7,188	11,853	I. 4,665
Bars	15,034	11,778	D. 3,256
Wire-rods	8,570	8,548	D. 22
Tin plates	49,712	44,388	D. 5,324
Sheets and plates	1,785	2,657	I. 872

Structural steel had a remarkable gain, from 1785 tons in 1908 to 4504 tons this year.

Iron Ore Movement—Imports and exports of iron ore in the United States, nine months ended Sept. 30, long tons:

	1908.	1909.	Changes.
Imports	482,988	1,119,331	I. 636,423
Exports	191,408	390,373	I. 198,965

Of the imports this year 625,052 tons were from Cuba, 312,024 tons from Europe and 144,022 tons from Canada and Newfoundland. Exports were largely to Canada.

Imports of manganese ore for the nine months were 134,430 long tons in 1908, and 169,495 in 1909, increase, 35,065 tons.

The Bank of England and Wall Street*

The recent advance of the Bank of England's official discount rate to 5 per cent. was one of those events which cause a flutter of interest throughout the financial world; and every important market—not least of all our own—at once busies itself in discussing and explaining it. There are several interesting aspects of the matter. In the first place a 5 per cent. English bank rate before the close of October is unusual. Except for 1906, this is the first year in which the rate has gone to that figure at such a date since London's "Boer War panic" of 1899, and 1899 was the first year in which it had been reached in October since the "Baring panic" of 1890. Even this, however, is not the chief consideration. The Bank of England rate has been raised this month in three successive weekly advances from the 2½ per cent. rate which prevailed up to October 7, to the 5 per cent. rate of yesterday. So rapid and violent an advance, though not unparalleled in the bank's recent history, is quite out of the ordinary.

The particular interest which our own market takes in the Bank of England's action as regards money rates arises from the statement, positively made in Lombard Street, that the bank has entered the field expressly to curb the American stock speculation. This is something which needs explanation. The average man, not familiar with the circumstances, would be apt to ask what business it is of the Bank of England whether Wall Street chooses to gamble excitedly in securities or not, and what right a London institution has to force high money rates on its own market, with a view to impeding speculative operations 3000 miles away. The facts are these: Throughout the past five or six months, a stock speculation of extraordinary violence has been raging on the New York and Berlin markets. In New York, at any rate, it has been encouraged and facilitated by capitalists of very great resources. Now, speculation of such a character is necessarily conducted on the basis of enormous borrowings from the money markets. At just what point such demands will begin to interfere with facilities for legitimate trade borrowers is always a matter of uncertainty. As it happened, it was the Imperial German Bank at Berlin which first appeared to take official cognizance of this speculative situation. During the last half of September and the first half of October, that bank raised its official discount rate from 3½ to 5 per cent., and its president plainly intimated at the time the purpose of checking the German stock speculation by making it more costly.

*From the New York *Evening Post*, Oct. 22, 1909.

This effort at Berlin appears to have been reasonably successful. But the German bank's position was in some respects peculiar. Its weekly statements showed plain evidence of an extraordinary strain; at the time it made its second advance in rate, the actual status of the bank was the weakest in many years. Its so-called "emergency note circulation" had reached, in actual fact, the largest total in its history. This was not the situation at the Bank of England. Even its statement of yesterday, submitted when the 5 per cent. rate was fixed, showed the ratio of reserves to liabilities in the London bank to be not far from the usual average at this time of year.

This is where the American speculation bears a part in the discussion. It was at the opening of autumn that the rise in prices on our Stock Exchange reached its pitch of especial violence. Now, ordinarily, speculation halts on the approach of autumn, the reason being that, in this city, capital for the use of Stock Exchange operations is, for the most part, drawn from deposits made in New York by interior banks. This fund invariably grows extremely large in the summer months, for the double reason that it may be counted as part of the reserve against the inland banks' deposit liabilities, and that it earns some 2 per cent. interest in New York. Experience has shown, however, that when the crop-moving season comes and Western banks have abundant use for their funds at home, these New York balances will be heavily drawn upon. The prudent speculator always reckons, therefore, on a period of restraint until the harvest movement is completed. No such restraint was in any sense exhibited this autumn. The speculation, converging as it did on shares of the Steel Corporation, grew in wholly abnormal proportions; prices continued to move up by leaps and bounds. Not only did the stock market as a whole show signs of feverish activity, but the Steel shares, alone, on days when total transactions in all stocks on the Exchange exceeded 1,000,000 shares, made up at times no less than 40 per cent. of that enormous trading.

In accordance with experience, the interior banks began some weeks ago to call home their New York funds; as a consequence of this, and of the rapidly mounting liabilities, surplus reserves of the New York associated banks approached exhaustion. The call-money market, where the Wall Street speculator usually obtains his funds, advanced first to 3 per cent., then to 4½, and eventually to 6. These higher rates had the effect, first, of drawing back to Wall Street large amounts of interior capital, next, of inducing local trust companies to relieve the banks of their unwieldy loans. So great, however, was the demand imposed by the Wall Street operations that even these two expedients failed to meet the situation. It was, then, two weeks ago, that our bankers entered the London money market with exceptionally large demands for funds on the basis of Stock Exchange collateral. In a single week, when the local situation ought to have been expanding New York bank loans, the bank statement at the end of the week, showed $49,000,000 loan reduction—a contraction greater than had ever before been witnessed in this city. It meant unquestionably that an enormous sum of credits had been shifted from New York to London. According to foreign experts, these large American borrowings came on top of an accumulated floating indebtedness by New York to Europe, far exceeding the normal proportions for the season.

This was the phase of the situation, which, according to report, inspired the Bank of England to mark up its discount rate, and thereby raise the general London money rate for restrictive purposes. Wall Street inquires exactly why the bank should feel compelled to meddle in a borrowing operation in which the London lender and the American borrower equally profess themselves to be content. The answer probably will be found in the experience of both markets during 1906 and 1907. In the earlier of those two years, an equally extensive borrowing operation on the London market, to support a Wall Street speculation, had created a huge foreign credit for American account. Things did not go well in the United States. The New York money market fell into disorder, deficits in bank reserves occurred, and the holders of these London credits promptly drew on them in the form of gold, thus draining the London market, and impairing seriously the Bank of England's gold reserve at the most awkward moment of the year. In 1907, a somewhat similar result ensued, emphasized by the panicky nature of the American demands. Unless all indications fail, the action taken this autumn by the Bank of England is designed to prevent by early action a similar experience this season.

To all such reasoning on the question, it is frequently replied, on Wall Street and in certain quarters of financial criticism, that the American speculation has really cut no figure in the Bank of England's action, but that the bank itself is frightened about its power of maintaining a sufficient gold reserve, and is doubtful as to the future situation of the London market. But nothing could very well beg the question more completely. Even granting that such a delicate situation has arisen or is anticipated on the London market, what would be said of a central institution which did not then employ all its power to obstruct a sudden and large demand on home resources by a foreign community whose demands had no better basis than an extravagant Stock Exchange speculation?

The Safeness of Various Types of Safety Lamps

A Comparison of the Construction of Different Lamps; Their Fuel and Method of Operation; Relighters and Locking Devices Discussed

BY J. B. MARSAUT

Since Davy, nearly a century ago, constructed the first safety lamp, almost innumerable inventors have produced lamps bearing their names, but in a majority of instances the alleged improvements have been more apparent than real. At various times commissions have been appointed, and are still maintained by several of the European governments, to pass upon the safeness of safety lamps, one of the earliest being the one headed by LeChatelier, in 1889. After pointing out a few general conditions, I shall outline the progress in the development of those lamps that were approved by Le Chatelier, and then describe a few of those that have appeared since that time and have been tested with satisfactory results.

Principles of the Safety Lamp

It has long been known that the Davy and all other lamps in which the flame is protected by one or even two gauzes, without an outer mantle, are not safe in a current of inflammable atmosphere blowing with a velocity of 2 to 4 m. per sec.; in such a current, combustion of gas will begin inside the lamp, will heat the gauze to redness and will then transmit the combustion outward to the surrounding atmosphere. This knowledge has been gained both by experiment and by the sacrifice of innumerable lives. If, likewise, a lamp of this simple type should become filled with an explosive mixture, the detonation that would ensue inside the lamp would often suffice to blow the flame outward and cause an explosion. This phenomenon is the more likely to occur if the interior volume of the lamp is large in proportion to the area of the surrounding gauze. A relatively large gauze is therefore conducive to safety.

My experiments have pointed to a number of other interesting details. For example, in a lamp having a glass cylinder surmounted by a gauze mantle, an interior explosion is the more violent as the flame of the lamp is the smaller. This is because the amount of inert gas present in the lamp, as a product of wick combustion, is small. Thus a large flame increases the safeness of a lamp of this type, contrary to the common opinion. Fortunately, it is not easy to fill a lighted lamp with a perfectly proportioned explosive mixture of gas and air, but such a contingency is within the realms of possibility.

Working in a testing laboratory with artificial air and gas mixtures, and exploding them at will by an electric spark, the following phenomena are readily observed: (a) In the Clanny, Marsaut and other lamps having a glass cylinder surmounted by a wire gauze, an explosion is the more violent as the point of ignition approaches the bottom of the glass. The hight of the glass should thus be as little as is consistent with satisfactory illumination. (b) With mixtures of illuminating gas and air, transmissions of combustion through even two gauze mantles are common; three concentric gauzes, however, seem to suffice to restrain such transmission. (c) The frequency of transmission of flame through the gauze of a safety lamp of the type described above, is still more apparent if the diameter of the gauze mantle is less than that of the glass cylinder, or if the space within the gauze is obstructed.

Although natural firedamp is much less dangerous than carefully adjusted mixtures of air and illuminating gas, such as are used in a laboratory, the fact remains that the results attained by experiment should be borne in mind while designing safety lamps; that is, the hight of the glass cylinder should be reduced to the lowest limit, the interior should have a cylindrical or very slightly conical shape, and all obstructions to the quiet circulation of currents within the lamp should be avoided.

Among the large number of safety lamps extant in 1889, there were really only a few distinct types, and of these LeChatelier recognized only six, the Davy, Clanny, Mueseler, Marsaut, Fumat and Gray lamps, besides the electric light, which at that time was still in the experimental stage.

Davy and Clanny Lamps

Both of these lamps, in which the wire gauzes are not protected by any kind of exterior mantle, have long since outlived their usefulness, as affording only a slight degree of safety. The inventor of the Clanny lamp, by inserting a glass cylinder at the base of the gauze, increased the illuminating power of the flame, and at the same time, though he was possibly unaware of it, introduced another marked improvement, the downward draft, whereby a gaseous atmosphere would generally extinguish the flame and thus serve as a warning. The gas might, however, continue to burn inside the gauze, when the Clanny would then have all the dangerous features of the Davy lamp. Lamps of these two types have long been interdicted in France and Belgium, though, under the name of Wolf, they are still in almost exclusive use in Germany.

Mueseler

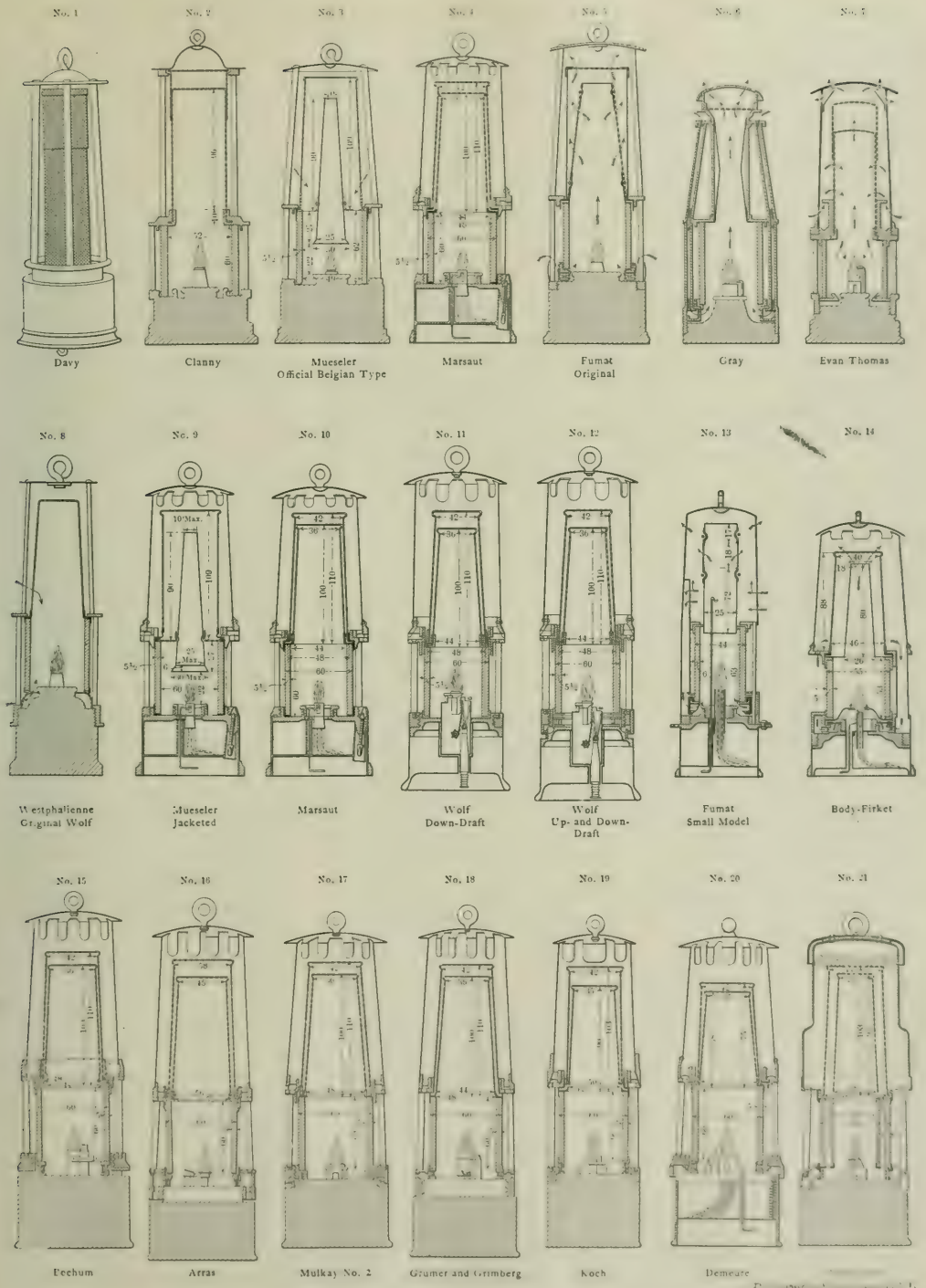
The Mueseler was like the Clanny lamp with the addition of an interior chimney supported by a metallic diaphragm at the level of the top of the glass cylinder. These parts were expected, by reason of their remaining filled with inert gas, to prevent combustion of inflammable gas inside the gauze; accession of firedamp would cause a small explosion in the base of the lamp whereby both the lamp's flame and the burning gas would be extinguished. It was found, however, that a turbulent current of inflammable gas might sometimes upset the natural draft of the lamp, filling the chimney with an explosive mixture which then acted as a fuse to conduct the combustion to and through the gauze. An excess of gas, also, by incomplete combustion within the lamp, might yield an amount of carbon monoxide, capable of transmitting the flame to the exterior.

In an atmosphere of illuminating gas it has been found quite possible for the interior combustion to pass through the diaphragm and even to the outside. In spite of these deficiencies, the use of the Mueseler lamp remained obligatory in Belgium until the tests of Watteyne and Stassart at Frameries in 1905 proved its inferiority. The construction of the Mueseler lamp, especially as to the thoughtfully designed dimensions of the glass cylinder and the method of mounting this in copper rings, is highly to be commended.

Marsaut

The Marsaut lamp borrows the dimensions, the oil reservoir, the thick glass and the method of mounting found in the Mueseler lamp, but instead of the interior chimney and diaphragm has a smaller gauze inside the outer one and a metallic jacket or mantle outside of both. The double mantle permits the rapid escape of the products of an interior combustion of gas, while the jacket protects the lamp from drafts of explosive atmosphere and from breakage. When tested in an atmosphere of illuminating gas and air, three gauzes are found to be necessary to insure the isolation of

NOTE.—Abstracted from the *Bulletin de la Société de l'Industrie Minérale*, March, 1909.



LEADING TYPES OF SAFETY LAMPS

an interior gas combustion, but in the ordinary atmosphere of a gaseous mine two gauzes have been proved, beyond question, to be adequate.

English tests of the Marsaut lamp with two gauzes and a jacket, by maintaining a gaseous current of 20 m. per sec. velocity directed continuously against the lamp, have succeeded in causing a transmission of combustion outwardly, but in these tests the lamp was transformed into a miniature furnace which melted the gauze, a condition which would never be realized in a mine. In these same tests, however, a lamp with three gauzes proved entirely safe. The Belgian commissioners in their report, in which they condemn the use of the Mueseler lamp in distinctly gaseous mines, make the following statement as to the Marsaut: The Marsaut lamp with vegetable oil withstood all tests, both with and without dust, both new and old lamps being tested; the Marsaut lamp with benzene, although it became heated, withstood all tests for the passage of combustion through the gauze.

Fumat and Gray Lamps

The Fumat lamp was designed to obviate the possibility of explosions within the lamp, by causing an inflammable gas to burn as rapidly as it enters. This was accomplished by reducing the diameter of the glass cylinder. A solid metal cylinder covered by a gauze cap was put outside the usual wire gauze. Upward draft was provided in order to improve the illuminating power. This lamp did not prove satisfactory, and was superseded in 1903 by a smaller model, in which the current of air is introduced into the lamp through a small metallic duct leading from near the top of the lamp down to the vicinity of the flame. This accomplished about the same result as the Gray lamp, but without interfering so much with the illuminating power, since the large tubes through which the air is conducted into the Gray lamp cast rather large shadows. Neither of these two lamps has come into general use.

The Wolf Lamp

The Wolf is the most common of the lamps that have come into use since the time of LeChatelier's investigations. It has acquired its present form by gradual improvements. The first step was to substitute benzene for heavy oil in the ordinary Westphalian lamp. This came into quick favor in Germany, but the backwardness of French miners to accept benzene for the illuminant compelled other improvements. The Wolf lamp first took on two gauzes, then a metal jacket, becoming, though not appreciated by Wolf, the same thing as the Marsaut lamp. A further change was introduced by causing the air to enter both from above and below the glass.

As with all lamps drawing their air from below, an inflammable gas will burn inside the Wolf lamp, heating the oil reservoir sometimes to the danger point, and frequently cracking the glass. The illuminating power of the Wolf lamp is certainly better than that of some other lamps, but it is well known that the security of a safety lamp is inversely proportional to its candle power. It seems to me that the points of the Wolf lamp to which credit is chiefly due are the use of benzine instead of heavy oil and the admirable relighting and locking appliances which were designed to go with the lamp.

Body-Firket

Among the lamps approved by the Frameries investigators is the Body-Firket. This resembles the Fumat in respect to the admission of air while its interior arrangement is like that of the Gray lamp. It has the Upton and Roberts shield for protecting the glass from the flame of an internal combustion of gas, which is a very valuable adjunct to any lamp deriving its air from below. The lamp has only one gauze and one jacket, while the interior cylinder affords all the disadvantages referred to above in discussing the Mueseler lamp. Its illuminating power is also deficient.

Recent Lamps

As a result of the long investigation at Frameries, the following lamps were permitted in Belgian mines under regulation as to their shape and size: Mueseler (jacketed); Marsaut; Wolf (with either up or down draft); Fumat (heavy oil only); Body-Firket (heavy oil only). The Frameries commission put no restraint on the invention of new lamps, and as a result at least seven new lamps have been authorized since 1904. They are the Bochum, Arras, Mulkay No. 2, Grümer & Grimberg, Koch, Demeure, and the Wolf No. 3. An examination of the first six of these lamps shows them to be only slightly modified types of the Wolf pattern, differing among themselves only in the method of baffling the entrance of air. Some of them have less illuminating power than the Wolf lamp, and it is hard to see any reason for their existence. The Wolf No. 3 lamp, invented by H. Joris, is smaller and lighter than many others. It has a double glass cylinder, being to this extent more complicated than its prototype. Double glasses have been tried before, but without affording any marked advantage.

Benzene vs. Heavy Oils

Benzene has now for a long time been permitted in German mines as an illuminant, and its use is coming more and more into favor in France and Belgium. It has the advantage of yielding a brighter light, but many engineers are still uneasy as to its safety. The defects of benzene for this purpose are more or less grave. Lamps burning benzene get hot quicker than those burning oil, especially in a gaseous atmosphere, and the glass cylinders break more frequently. To obviate these difficulties, the lamps have to be made more bulky and heavier, while at the same time the thickness of the glass has to be diminished, so that if one should take hold of a hot lamp by mistake, and drop it, there would be danger of breaking the glass and causing an explosion.

In certain kinds of work in which a lamp is subjected to a good deal of jolting, a benzene lamp goes out more frequently than an oil lamp, and the handling of benzene requires greater caution than that of oil. It is possible to get better illumination out of an oil lamp by enlarging the gauze mantle and making the lamp bigger, but this has corresponding drawbacks. The argument that lamps of high illuminating power decrease the danger of falls from the roof, by enabling the workmen to discover sooner the symptoms of caving ground, seems to me to be not well demonstrated, which opinion is shared by the eminent engineer Harzé, the Belgian director general of mines.

Air Draft and Relighting

From the preceding descriptions it will have been noticed that, in some lamps the air is admitted from above the flame, in others from below, and in others from both directions. Each method has its own effect on the illuminating power of the lamp, but they are not all equally safe. The object of the downward draft is to keep the lamp filled more or less with a volume of inert gas, to the exclusion of any possible explosive mixture; only in exceptional circumstances can a perfectly explosive mixture make its way into such a lamp. With an upward or a mixed draft, on the other hand, the lamp, sometimes highly heated in a gaseous atmosphere, acts as a chimney in drawing inflammable gas upward into the chamber; if the light should go out, the gaseous mixture would still circulate, expelling the inert products, and might end in the accumulation of a perfectly explosive mixture within the lamp.

If, now, a relighter should be put into operation an internal explosion would ensue which would probably be conducted to the exterior. The rules of France and Belgium forbid the relighting of a lamp that has been extinguished by a fall, a blow or any accident that might cause a rent in the gauze; German regulations prohibit the relighting of a lamp at any place in which an accumulation of gas is suspected, but if a lamp is provided with a relighter, such rules as these are of little effect. In my opinion it would be wise to forbid the use of a relighter in any lamp not having downward draft alone. A downward draft lamp is thought to be somewhat less easy to relight than one with an upward draft, but German experience does not support this idea.

Locking of Lamps

The locking device is not an essential feature of the safety lamp, but it assists greatly in assuring the safety for which the lamps have been designed. Many inventors have attacked the problem, and it may now be considered as satisfactorily solved. We have a choice of several different but equally effective methods, some of which are very ingenious, as Cuvelier's hydraulic lock, the magnetic lock originated by Villiers and improved by Wolf, and the lead-rivet lock.

Personally I prefer a lock consisting of a large lead rivet which shall be easily felt and visible to the naked eye. A group of miners supplied with lamps having this kind of a lock, if barricaded behind a fall of roof, could make their joint supply of oil last a great while.

The Coal Deposits of Peru

By Z. Camilo B. Borlkjof*

One of the abundant natural products of Peru, although not exploited, is coal which is found in different forms, scattered throughout the country. There are 15 principal coal-bearing zones, and from them there could be extracted 1,000,000,000 tons of commercial coal. In some regions the buildings of railroads is necessary for the quick and economical realization of the coal resources, but this is ordinarily not difficult for the topographic conditions are not unfavorable and the low wages permit of cheap construction. On account of the great latent possibilities of the coal-mining industry of Peru and the bearing its development will have on the exploitation of the metalliferous mineral resources of the country it is important to call detailed attention to these Peruvian coalfields.

In the department of Túmbes there are coal deposits of 450 square miles in area. These are found along the Pacific coast, exposed at water line and in other directions from Túmbes outcropping in the hills and ravines. To the north of Túmbes the beds are only 6 to 8 meters beneath the surface. Coal is found at Zorritos as well as at other points in this department.

In the department of Piura in the region of Tambo Grande, and the valley of Chira, and of the Quirós and Marcará rivers, near Morropón, and to the right of Piura valley and about 55 km. from Tambo Grande there are also coal beds. The distance from Tambo Grande, the center of the coalfields, by horse trail to Sullana, is 30 km., and from there to Paita on the coast there is a railroad about 75 km. in length.

The department of Lambayeque has coal in a zone between the districts of Farrenafe and Motupe. An English syndicate and a Peruvian company are negotiating for these deposits for, respectively, £32,000 and £30,000. Recently new denouncements have been made beyond the area owned by the English intersets. The distance of this field from the port of Eten is 124 km., of which distance there is now a railroad from Eten to Farrenafe, 44 kilometers.

In La Libertad department, province of Pacasmayo, is a coal deposit found at the coast and extending, exposed at intervals, to the large deposits of Cupisnique and Trinidad. The bed at Cupisnique is 0.6 m. thick of clean coal, with from 54.5 to 73.75 per cent. of fixed carbon. An analysis of a sample gave: Moisture and volatile matter, 17.5; fixed carbon, 76.6; ash, 6 per cent. The beds at other places are 1.8 m. thick and as high as 72.7 per cent. fixed carbon. The distance of the district from the port of Malabrigo is 40 km., now a wagon road, but a railroad is planned. In Santiago de Chuco province the coal formations form a basin of 24 sq.km., with beds from 3 to 5 m. thick. In places the beds are from 5 to 8 m. and up to 12 m. thick, and the coal carries an unusually high per cent. of fixed carbon. This district is distant from the port of Salaverry via Motil, 129 km., and via Salpo, 149 km., where there is also coal. There is coal in the province of San Pedro, 125 km. south of Pacasamayo, and in the province of Otuzco at numerous places coal is found in beds up to 6 m. thick, averaging in fixed carbon between 60 and 70 per cent. and as high as 92 per cent. Near Huaiday is a very high quality coal, 1.5 m. thick, with a lower bed of 2.3 m. The estimated tonnage of this field is upward of 15,000,000 tons. This is tributary to the port of Malabrigo. In Huamachuco province coal is found in several places, and anthracite is reported at Comunbamba. Coal is also found in the provinces of Pataz and Trujillo.

The department of Ancash is an important coal region in the provnice of Cajatambo. Deposits at Oyen are more than 8 m. thick. These deposits are 200 km. from the port of Huacho. In Huari province are extensive coal deposits, and in the province of Pallasca, near Panca. At San Antonio is exposed not less than 4,000,000 tons of commercial coal.

In Cajamarca department, in the north of Peru, coal is found in the province of Contumazá, Cajabamba, Cajamarca, Celendin, Hualgayoc and Chota. Much of it is reported to run less than 50 per cent. carbon. Anthracite is noted in Cajabamba in a bed of 0.75 m. thick and carrying 84 to 87 per cent. carbon; also in Celendin. In Chota is a deposit of anthracite occurring in four beds from 4 to 20 m. thick, estimated to contain 700,000,000 tons. This district is 245 km. from the Pacific.

Coal also exists in the departments of Amazonas, San Martin, Loreto and Huanuco on the eastern Andean slope in the northern part of the country. Most of the deposits are in the Andean region, but in San Martin coal is found at Moyobamba, 120 km. from the port of Yurimaguas on a tributary of the Amazon.

In the important commercial and industrial department of Lima much coal is found. At Checras in the province of Chamcay, there is coal of good quality. Other fields in the province at Parquin and Quiruragra have beds 4 and 1.5 m. thick. The estimated tonnage here is 720,000,000. The coal is of fair commercial grade. This is one of the largest and most important coal deposits in Peru. It lies in the Andes not far from the famous mining camp of Cerro de Pasco. Coal is found in several other provinces of Lima.

The department of Junin east of Lima and on the other slope of the Andes has 1200 sq.km. of coalfields with coal from 50 to 60 per cent. carbon. The estimated tonnage is 600,000,000. This coalfield is about 50 km. distant from the Huancayo. Coal is found also in the provinces of Yauli Cerro de Pasco. The latter is 372 km. from Callao, the port for Lima, the capital.

A coal is found in the departments of Huancavilica and Ica, south of Lima, particularly in the former. Coal is reported near the coast in Ica at Lagunillas. In the department of Apurimac and Cuzco on the eastern slope much coal is found. The Cuzco coalfields is 125 km. from Cuzco, which is by railroad 682 km. from the Pacific port of Mollendo.

Coal is found in the department of Puno, north of Lake Titicaca, and 523 km. by railroad from Mollendo. Deposits in the Pacific province of Moquegua have been exploited. At Ichuna is an extensive and thick coal deposit. In the southern department of Tacna, coal is found at the coast at Morro de Sama.

*Engineer, Lima, Peru.

The Batan Island Coal Mines in the Philippines

In 1906 and the early part of 1907 rather vigorous exploration work was being carried on in no less than five coalfields. At the present time this activity has become confined to one island, Batan, off the east coast of Albay, Luzon. We find here the coal mine of the United States army on the west end and on the east the Batan Coal Company's property. The former is producing 80 tons per day, the latter 50 tons.

There is a marked difference in the coals of the two fields, the coal of the Army mine on the west end being somewhat better, but more difficult to mine, while on the east end it is just the reverse. Development work has corroborated the prediction made in 1905 that considerable faulting would be found on the west end of the island. This may seriously embar-

Note: Abstract from "Mineral Resources of the Philippine Islands;" by Warren D. Smith, chief of Division of Geology and Mining, Bureau of Science, Manila.

rass the operations there. At any rate, it will call for the most experienced engineering and managing ability.

An important feature in the growth of coal mining in the Islands is the coaling of the Army transport "Dix" for her trip to Seattle. During the past year the inter-island transport "Wright" has been using this coal with good results, but the "Dix" by taking on 2500 tons in April marked the first use of Philippine coal on a trans-Pacific steamer.

The East Batan Coal Company's mine is the first one since the American occupation to furnish coal to the general market and the first successful coal property in the whole history of these Islands. This mine was visited in March, 1909, by H. G. Ferguson, geologist of this bureau, to whom Mr. Daniels, the superintendent, kindly furnished information.

The mine is situated in the eastern part of Batan island which is just 19 km. east of the port of Legaspi in the southern part of Luzon. It is within a few hundred meters of the *barrio* of Batan and approximately 210 m. from the sea. The outside plant in March, 1909, consisted of one 30-h.p. Sedgwood double-drum hoisting engine and boiler. The cars are hoisted from the tunnel and run down by gravity on a small track to the sea, where the coal is loaded into lighters, in which it is conveyed out to deep water beyond the reef to the ship's side. A new wharf, 91 m. long with 7 m. of water at low tide alongside, is nearly completed. A stock-pile will be placed about 300 m. from the wharf end and about 600 m. from the tunnel. Two small steam locomotives are used now.

Coming to the underground work, the coal seam varies from 1.67 to 1.75 m., with 7 to 12 cm. clay parting 55 cm. from the roof, and dips 13 deg. to the north. The roof is a hard, sandy clay and stands remarkably well with only a slight tendency to slab off in the first half meter.

There are two adits and three air shafts. The system adopted is the room-and-pillar, with the rooms running up the dip 4.5 m. wide and 60 to 120 m. long, with 15 m. pillars. The coal is sometimes worked 15m. beyond the timbering. The west gallery is 213, and the main tunnel 198 m. long. Wire haulage is used in the main tunnel, but cars are pushed by hand in the rooms. Rails are soon to be laid right up to the working face.

The coal is easily broken from the face by working up the dip. Coal cutting machines are not required. The coal breaks cleanly from the clay and possesses a good clean. All mining is done underground. Timbering pickers were originally solely used but the natives have been trained and have been found entirely satisfactory. They can use from 5 to 7 tons per day. Timber for posts and mining for timbering and advancing main tunnel. The [illegible] is as follows:

[illegible] 2.00, Filipino pickers, 1.20; Filipino helpers, 1.00 surface laborers, 0.80. The Filipino peso is worth 50c. United States currency. There was some difficulty with the labor at first, but now there is none. The Filipino laborers are all Bicols from the surrounding country, and have proved steady workers.

A good feature in the working of the mine is the absence of dust. Narra has been found to be the most satisfactory timber available.

Preliminary work was begun in October, 1906, in this mine. The first shipment of coal was 77 tons in the bunkers of the "San Juan". The production up to date amounts to 15,000 tons approximately. At present only one shift is working, giving a daily output of 45 tons.

In this district only the uppermost seam is being worked. From the general relations which obtain over Southern Luzon and the Visayas, I feel safe in predicting the discovery of at least two more and perhaps considerably thicker seams below this one. I feel confident that the entire eastern end of this island is underlain by workable, merchantable coal.

To show the steaming value of this coal reports were secured from the engineers of two coastguard cutters, the "Busuanga" and the "Negros," showing two months results with Australian and Batan coal, as follows:

	Australian.	Batan.
Miles steamed.....	5,662	5,442
Tons coal consumed.....	229	348
Cost of coal consumed (pesos)	3,744	2,088
Cost per 1000 miles steamed (pesos).....	660	380

Compared with Australian coal, Batan coal burns freer, requires light and frequent firing, and but little attention. It gives hardly any soot in tubes and connections and little clinker. It disintegrates very rapidly after being spread on fires and quite a percentage is lost if used on coarse grates. It is seen that about 50 per cent. more of the Batan coal is required for a given run, but the cost is just a trifle more than half that of the Australian, so that when bunker space is available a saving can be made by using Batan coal.

On Cebú island the mine of the Insular Coal Company was in operation during a part of the past year. At present, however, the mine is closed down, though the company is hoping to reopen it in the near future.

Utilizing Slack Coal in the Manufacture of Briquets

At the Bankhead collieries near Banff, Canada, on the main line of the Canadian Pacific railway in British Columbia, 30 per cent. of the total output of the mine is slack coal of such fineness that it is too small to be sold for steam or fuel purposes. In preventing the waste of such a large percentage of the daily output, the management of the Bankhead mine has installed and is operating a plant for making briquets. The slack coal as it originally comes from the mine is crushed and passed through a 12-mesh screen; this procedure is necessary in order to make a hard briquet.

From the crusher the dust is conveyed to a series of six mixers. In the first three of these the dust is thoroughly dried over furnace flues and raised to a temperature of 300 deg. By means of an atomizer, pitch is introduced at the lower end of mixer No. 3, and the particles of coal become coated with the pitch. In mixers Nos. 4 and 5 a more thorough mixture is effected, and mixer No. 6 is used for cooling off and adding a small quantity of hot water. The proportion of pitch required is about 14 per cent. The material is conveyed from the No. 6 mixer to the press, which latter is a pair of rollers with indentations on their faces corresponding to the size of briquet to be made, which in this case is small, square and knobsided, weighing 2 ounces.

The output of the machine is 12 tons an hour. Leaving the machine, the briquets are conveyed to a series of traveling tables, moving at a slow rate of speed, on which they are thoroughly dried. After passing through the circuit, the briquets are discharged by a self-acting arrangement on to a belt conveyer, by which they are taken to the bin ready for loading into trucks. The total cost of manufacturing these briquets, including interest, depreciation, etc., but excluding the price of the coal dust, is said to be $1.56 per ton.

The pressure of the atmosphere is equal to that of a column of water, approximately 34 ft. in hight, and this hight is the maximum lift theoretically possible with an ordinary suction pump. According to the *Engineering Digest*, October, 1909, an ingenious French machinist has found that by running a small tube (about ⅜-inch.) from the free air down in the well and curving its lower end upward so as to project into the pump suction pipe, it is possible, by working the pump rapidly, to lift water as high as 65 ft. The principle is that employed in the air-lift pump. The column rising in the suction pipe is an emulsion of air and water, whose density is less than that of water, the air being drawn in by the partial vacuum produced by the pump plunger and mixing with the water. To operate successfully, it is necessary that the velocity of the pump plunger shall be greater than the velocity of ascension of the air bubbles in the suction pipe.

The best water softening plants for power plant installation, according to the [illegible] Oct. 1909, cost from $4 to $5 per horsepower for plants less than 1000 h.p., 1000 to 2000 h.p. cost from $4 to $3 per horsepower, 2000 to 5000 h.p. cash $3 to $2 per horsepower.

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The Sore on the Mining Industry

Schemes to entrap the unwary are not confined to mining, but for certain obvious reasons it is mines, real or fictitious, that lend themselves most attractively to this sort of thing, and because of the evil practices, mines, mining and mining stocks are in popular disrepute. Yet the mining industry is one of the great basic industries. It is one of the largest employers of labor; it furnishes the major part of the freight that the railways carry; and in the creation of wealth it is preeminent. The swindling schemes that are attached to mining by noxious parasites are a sore upon a great and noble industry.

This mine swindling is an evil that far surpasses the pool and policy evils which public sentiment and the strong arm of the law have nearly eradicated. It is a worse evil because it afflicts a class of people who are not vicious or idle, but are honest and hard-working, a class of people that is the backbone of the nation. It is an evil that sucks away the savings of very poor people.

The machinations of the gang that we exposed last week were merely an example of what has been, and is, going on. It was a particularly flagrant case. There are others of varying degrees. The Curb market festers with schemes to inveigle the public. It is time to call a halt to this business.

It would be utopian to attempt to devise plans absolutely to protect the public from its own folly. But we can at least eliminate the leading-on of the ignorant and unwary. The newspaper that prints alluring advertisements which are obviously for such a purpose aids and abets the evil and does so knowingly. If the newspapers exclude this kind of advertising a great step will have been taken. We opine that a portion of the daily press of New York has learned a lesson and will hereafter be more careful.

There should, moreover, be a stop to the "market letters" of irresponsible brokerage houses, advising the purchase of stocks, that are scattered broadcast. In recommending the purchase of stocks there is a great responsibility which the conscientious hesitate to shoulder. If any brokerage houses may properly do this it is only those of high standing which have carefully investigated what they offer and present sound engineering reports to support their advice.

There must be a reform of the Curb market whereof the chaotic condition has permitted scandal after scandal to arise. The swindler with a wildcat to sell must not be allowed to find a footing in the market. So long as the New York Stock Exchange stands in the way of a curb organization it devolves upon that Exchange to find a way to correct this phase of the evil.

The whole stock-jobbing business is bad enough, Heaven knows. It would be chimerical to hope ever to eliminate all its evils. Stocks, trading in them and a place for that purpose are necessities of commercial civilization. It is inevitable that they be attended by some malpractices or that a gambling public create unreasonable valuations that every now and then crumble away. The stock exchanges and the curb markets are full of mining stocks that are enormously overvalued and of many of these the "interests" are seeking to make a "distribution," i.e., pass them among the public. But at least they are not doing so by deceptive advertising, and imploring the public to come and buy, and to some extent the public has its eyes open. With respect to these companies the American public will gradually learn the true basis of mine valuation, as the British public has learned it, and market quotations will adjust themselves accordingly.

But this is quite a different matter from the peddling of wildcats to poor sempstresses or the palming off of raw "prospects" upon hard-working mechanics with the aid of the curb market, the press, "newsletters," and the rest of the machinery. This is the canker upon the mining industry that we intend to lead the way in cutting out and we shall have the help of one many thousand readers who are the brains and spirit of the industry which the parasites corrupt.

The Tariff on Zinc Ore

The correspondence that we print on another page is finely illustrative of the bureaucratic mind. The easy manner in which the Treasury Department assumes in its letter of Oct. 7 that section 24 of the Payne law refers only to the smelters that are bonded for the smelting of lead, although that section opens with the pro-

vision for smelting in bond of "ores and crude metals," seems moreover to manifest a certain spirit of levity in the administration of that department.

In its letter of Oct. 13 the Treasury Department reiterates this ruling and makes an additional ruling, namely that the bond given for the smelting of the ores can be cancelled only upon the exportation of 90 per cent. of the metal as shown by assay to be in the imported ore, and while no credit can be given for the lead which is lost in the smelting of the ore, if any is recovered it may be applied to make up the 90 per cent. of metal exported. Here the department contradicts itself in the same sentence. Having said that the bond can be cancelled only by exportation of 90 per cent. of the assayed metals it calmly proceeds to say that 90 per cent. of the zinc only has to be exported and that any lead recovered may be counted as zinc. According to this turbid thought, if a smelter should import an ore assaying 30 per cent. zinc and 20 per cent. lead, paying duties of $5 on the zinc and $6 on the lead and should recover 240 lb. of lead he might cancel the bond by exporting 240 lb. of lead plus 300 lb. of zinc.

Of course, there is no authority for anything of that sort either in the Payne law or any unrepealed portion of the Dingley law or any possible combination of both. In these arbitrary rulings of the Treasury Department we seem to be having legislation by the executive branch of the Government.

We do not think that the contingencies that may arise in the zinc-smelting industry can be dismissed so lightly as the Treasury Department seems to think. Ore of somewhat the character that we have suggested above has been in the past imported into the United States where it has been treated for a product of both lead and zinc. In some foreign countries the production of lead is a highly important part of the zinc-smelting industry. The lead production of Belgium, amounting to 25,000 to 30,000 metric tons per annum is derived chiefly from the zinc smelters' residues. It is not beyond the limit of imagination that American zinc smelters may some day devote a good deal of attention to the production of lead. Indeed, during the last two or three years about 1,000 tons of lead per annum has been thus produced in this country and this has come from some few smelters.

Of course it is the courts and not the Treasury Department that will eventually determine how the Payne law is to be administered in the cases of dispute. The courts are apt to stick to the letter of the law, and not go far into the unraveling of the intentions of the Solons responsible for it. It might be exceptionally difficult to determine the real intentions of such a pork-parceling congress as the last one.

One of the objectionable features of Treasury rulings in such matters is the injustice that remains uncorrected after the courts have decided in favor of the plaintiff. The unfortunate importer is obliged to bring suit and pending the decision thereof, the Government continues to collect the duty according to its own idea. The plaintiff is not only put to a large expense in carrying on the suit, but also suffers loss of interest on money held by the Government that may be rightly his. There are such delays that he is usually willing to sell his claim for a percentage. It is shameful that a great nation should treat any of its citizens in this way. This is a matter wherein there ought distinctly to be a more equitable method of procedure.

The Nevada Consolidated Report

We have previously criticized, rather severely, the Nevada Consolidated Copper Company for its failure to be more explicit and frank in its reports to its stockholders. Our criticisms have, perhaps, been the more pointed inasmuch as we have indicated that this company had no reason to be otherwise than perfectly frank. It is, therefore, with pleasure that we are able to say that the annual report recently issued, covering the fiscal year ending Sept. 30, 1909, conveys about all the information that the most exacting stockholder needs to know. He is informed as to the amount of ore reserves, the tonnage of ore mined and milled, the average assay of the same, the percentage of metal production, and the cost of production. These are the essential elements in determining the value of a mining property. We wish that the profit and loss account and the statement of assets and liabilities had been given with somewhat more detail. We should like, moreover, to have more details bearing upon the cost of production, but we have been given much, and it is perhaps ungracious to look a gift horse in the mouth.

As to the cost of production, it is stated that the yield from ore mined and concentrated was 34,527,823 lb., of which 6,016,002 lb. were still in concentrates not yet treated and in secondaries. The cost of production was 7.14c. per lb., or including a charge for smelting and a credit for miscellaneous earnings (which we may take as profit from the railway) the cost was 7.47c. per lb. We should like to have data to form our own opinion as to whether these figures represent the real cost, or take advantage of some deferred charges that must be reckoned with later on, but such data the company fails to give. However, when Pope Yeatman, consulting engineer for the company, as to whom we have the highest respect, states that "these costs include all possible charges—shipping, refining, marketing, legal, etc.," our disposition is to accept them on their face. It is to be noted that the figures reported were realized from a year in which the company was only getting going. On the other hand they represent the work of a new outfit which has not yet had to be replaced in any material way. During the first six months the tonnage milled was only 35,000 to 71,000 tons per month. It was not until April, 1909, that the monthly tonnage began to exceed 80,000. The data submitted furnish ample evidence in support of the deductions, published in the JOURNAL of Sept. 4, 1909, that the recent cost of production by the Nevada Consolidated has been as low as 6.8c. per pound.

The Tribune

In some remarks last week, in connection with B. H. Scheftels & Co., we stated that the *Tribune* had printed advertising matter of that corporation in a way that might be regarded by the unwary as reading matter. We have been informed by the *Tribune* that this matter was accepted as an advertisement and run innocently in the absence of superior authority of the paper, and that upon discovery of the occurrence the continuance of this advertising matter was promptly declined. The *Tribune* took this action of its own initiative, before our exposure. It was with deep feeling of regret that we accused the *Tribune*, which has had a long and glorious history as an honorable newspaper, and we now have pleasure in presenting the facts respecting it to our readers.

Views, Suggestions and Experiences of Readers

Comments on Questions Arising in Technical Practice and Debatable Points Suggested by Articles in the Journal

CORRESPONDENCE AND DISCUSSION

The Tariff on Zinc Ore

The editorial remarks in the JOURNAL of Oct. 30 illuminated a confused and irritating subject. In further elucidation of the position of the Treasury Department the following communications may well be printed:

Washington, Sept. 9, 1909.

The Surveyor of Customs,
Kansas City, Mo.

Sir:

The Department is in receipt of your letter of the 30th ultimo, in which you report that certain bonded zinc smelters wish to withdraw their products for exportation.

In reply, I have to advise you that there is no provision in the tariff act of Aug. 5, 1909, for the remission of duty upon zinc withdrawn for exportation from a bonded smelter, as section 24 of this act provides only for the exportation of lead from bonded smelters.

Section 29 of the tariff act of July 24, 1897, provides for the smelting and refining of crude metals in bonded smelting and refining establishments, and for the cancelation of the bonds for the payment of the duties upon the exportation of 90 per cent. of the metals smelted or refined.

In the opinion of the Department there is nothing inconsistent in the provisions of the two cast insofar as they relate to metals other than lead, and it will, therefore, treat section 29 of the act of July 24, 1897, as remaining in force to this extent, and permit zinc to be withdrawn for exportation as provided therein; that is, upon the exportation of 90 per cent. of the spelter produced from the zinc ores, the bond for the payment of the duties will be canceled.

Respectfully,
J. B. REYNOLDS,
Acting Secretary.

Washington, Sept. 10, 1909.

The Surveyor of Customs,
Kansas City, Mo.

Sir:

Referring to Department's letter of the 9th instant, advising you that section 29 of the tariff act of July 24, 1897, insofar as it covers the smelting and refining of ores containing zinc in bond, remains operative, I have to call your attention to the last paragraph of said letter, and to advise you that the bond given for exportation of the refined zinc should be canceled only upon the exportation of 90 per cent. of the zinc as shown by the assay to be in the imported ore, and so charged against the bond.

Respectfully,
J. B. REYNOLDS,
Acting Secretary.

Washington, Sept. 23, 1909.

. . . . Zinc Company,
New York, N. Y.

Gentlemen:

I have to acknowledge the receipt of your letters of the 16th and 20th instant, further in regard to the exportation of spelter, with a remission of the duties upon the imported ore, and I herewith inclose for your information a copy of a letter dated the 10th idem addressed to the surveyor of customs at Kansas City, Mo., instructing him that the bond given for the exportation of the refined zinc should be canceled only upon the exportation of 90 per cent. of the zinc as shown by the assay to be in the imported ore, and so charged against the bond.

In regard to your statement that you are informed that the Government cannot collect two duties on one article, I have to advise you that no duty is collected upon the ore imported into this country, but on the metals contained therein, and paragraph 181 provides that duty shall be assessed upon the lead contained in lead-bearing ores of all kinds, and paragraph 193 provides for the assessment of duty upon the zinc contents of zinc-bearing ores of all kinds. In view of these specific provisions the collector must assess duty upon the zinc and lead contained in the ores under consideration, and this, notwithstanding, as stated by you, the lead is lost in the smelting.

Respectfully,
J. B. REYNOLDS,
Acting Secretary.

Washington, Oct. 7, 1909.

. . . . Zinc Company,
New York, N. Y.

Gentlemen:

The Department is in receipt of your letter of the 30th ultimo, in which you express the opinion that upon the smelting of zinc ores in bond, the bond given for the payment of the duties may be canceled upon the exportation of the actual amount of lead recovered in the smelting of the ores.

In reply, I have to advise you that section 24 of the tariff act of Aug. 5, 1909, which provides for the bonding of smelters and the cancelation of the bonds for the payment of duties upon imported ores, upon the exportation of the lead produced from the said ores, refers to smelters which are bonded for the smelting of lead for exportation and not to smelters which are bonded for the smelting of other ores in which there may be small quantities of lead.

In view of the foregoing, the Department is of the opinion that the bond given by you for the smelting of zinc ores can only be canceled upon the exportation of 90 per cent. of the metals as shown by the assay to be in imported ores.

Respectfully,
C. D. HILLES,
Acting Secretary.

Washington, Oct. 13, 1909.

. . . . Zinc Company,
New York, N. Y.

Gentlemen:

I have to acknowledge the receipt of your letter of the 8th instant, further in regard to the exportation of ores smelted in bond, in which you express the opinion that under the law only such amount of the lead as is actually recovered must be exported to cancel the bond.

While section 24 of the present tariff act provides for the cancelation of the bond upon the exportation of the actual amount of lead produced from the smelting of the ore, and thus in effect makes an allowance for wastage in the smelting thereof, the Department is of the opinion, as stated in its letter of the 7th instant, that this section has no application to ores which are primarily smelted for the metal contents other than lead and in which the lead is a mere incident.

Paragraphs 181 and 193 of the tariff act provide the rates of duty to be assessed upon the lead and zinc in lead- and zinc-bearing ores, respectively, while section 24 provides for the remission of the duty upon the lead if it is smelted in bond and exported.

From the records on file in this office it appears that zinc ores contain from a trace to 10 per cent. of lead, and if your view was accepted, and the bond given for the payment of the duties on the zinc and lead in the zinc ores canceled upon the exportation of the actual amount of lead recovered, it would result in admitting the zinc free of duty.

In view of the foregoing, the Department must adhere to the position taken in its letter of the 7th instant, *supra*, that the bond given for the smelting of the ores can only be canceled upon the exportation

of 90 per cent. of the metal as shown by the assay to be in the imported ore, and while no credit can be given for the lead which is lost in the smelting of the ores, if any is recovered it may be applied to make up the 90 per cent. of metal exported.

Respectfully,
CHARLES D. NORTON,
Acting Secretary.

The Treasury Department is now treating the zinc-smelting-in-bond matter under the above rulings.

SMELTER.

New York, Nov. 1, 1909.

The Moving Picture Mine

Apropos of the advertisement of Pathé Freres (the makers of moving-picture films) appearing in some of the foreign journals, whereby it is proposed that wide-awake mine managers should have films made for use at directors' meetings showing new machinery in motion, interesting engineering problems, etc., a look ahead opens up a vista of possibilities hitherto undreamed of. The wily promoter already shows infinite versatility in the employment of means for making an untried prospect appear a storehouse of fabulous wealth, and the innocent (?) assay certificate is relied upon to convert a stray specimen into a workable deposit whose dimensions are limited chiefly by the boundaries of the property in question.

And yet, times change and men and methods change with them. Only a few years ago the very word "flying-machine" stamped its user as a suspicious character, a dreamer and a fit subject for the madhouse. Likewise, in a short time how crude will seem the most polished present-day methods of mine flotation. How simple and beautiful will it all become!

At an event like the recent opening of the Walker Lake Indian reservation, in Nevada, the film might be made to cover a series of chapters headed thus: Waiting for the Signal; The Start; The Discovery (here the frenzied prospector is seen digging out nuggets and rich quartz by the hatful); Staking the Claim; The Battle for Possession; Victory!!!; etc., etc. A film like this, a vacant store or a church (church preferred) in a series of towns of the corn-fed belt, a well designed "line of patter" (I believe that is the correct term), and, presto! the deed is done.

Or the scene might be laid at a mine in a later stage of its life. Breaking the Ore; Loading the Pack Train; At the Mill; The Clean-up; Squeezing the Amalgam; The Retort; Weighing the Gold. Or if the imagination is inadequate, a Jules Verne or an H. G. Wells might do wonders in this subject, else we must be content to wait and watch for the day when the promoter and the moving picture man lock arms and work together "for the good of the cause."

KISMET.

New York, Nov. 10, 1909.

Notes on Copper Smelting in the West

In the JOURNAL of Oct. 9, 1909, in the article, "Notes on Copper Smelting in the West," reference is made to simultaneous rabbling and poling in copper-refining furnaces. It seems to be inferred by Professor Peters that this is a novelty at the Washoe works, which is far from being a fact. Simultaneous rabbling and poling has been carried on at the Quincy Smelting Works since its erection; and one of the foremen, Richard Howells, a man well along in years, did it in Wales when a boy, and his father and grandfather did it before him.

It may be added that we rabble and pole simultaneously only when the highest purity of the product is not desired, as when making anodes. For most of our product we rabble first and pole afterward.

ALEXANDER LAIST.

Hancock, Mich., Nov. 6, 1909.

The Potash Salts Question at Washington

SPECIAL CORRESPONDENCE

The potash-salts question has now assumed sufficient importance as a probable international issue to receive the attention of the tariff experts of the Government. Within the past few days, considerable study has been given to the matter in connection with reports from Berlin that there was some evidence of an intention to "relieve the conditions" in the industry through governmental interference. The type of governmental interference spoken of is the imposition of an export tax, or a production tax, or the adoption of other measures designed to break up the conditions under which consumers in this country succeed in getting their supplies at a lower price than formerly. It is considered that the subject falls properly within the province of the Government because of the section of the new tariff law relating to discriminations on the part of foreign countries. That an export tax, or a tax of any other kind intended to operate against the interests of consumers here, would be in violation of the intent of Congress with respect to the minimum rates of the present tariff, would be an undue discrimination in the meaning of the law, and would preclude the possibility of continuing our minimum rates in effect with regard to German importations is the expressed opinion of the tariff experts who have considered the matter. The subject has been brought to the attention of the tariff board which is compiling all possible information on existing and possible discriminations by foreign countries and will, it is understood, be discussed with Secretary Knox in connection with the other questions now open between this country and Germany.

Mexican Institute of Mining and Metallurgy

SPECIAL CORRESPONDENCE

The Instituto Mexicano de Minas y Metalurgia, of Mexico, promises to be much respected in the Republic, and is in a most flourishing condition. Its membership is gradually increasing, now approaching closely to 200 members. This membership will place the institute on a good financial basis, and permit it to build up a technical library, publish its bulletin of transactions every other month, and enter upon broader fields of activity.

The Minister of Hacienda has promised the institute his support and has welcomed the organization, not only in words, but by placing at its disposal documents and data on different investigations made by its members. There is every probability that the institute and the Mexican Chamber of Mines will work in harmony for the general welfare of the miner, and the president of the institute has already been made an honorary member, *ex officio*, of the chamber.

Regular meetings and discussions are held by the members the last Thursday of each month in the rooms of the organization in Mexico City. The first excursion of the institute will be held on Nov. 28 and 29, when a trip is to be made to Pachuca, to visit the larger mines and the new cyanide plants now being completed; while one evening will be given to the presentation and discussion of papers related to the activities in this, Mexico's greatest silver camp.

Ely Central

The Ely Central stock closed Saturday, Nov. 6, at $4.25 a share. On Monday it dropped to $1.50 a share, closing at $1 15/16 to $2, about 60,000 shares being traded in. On Tuesday the stock dropped to $1 and closed at about that figure with small demand. About 20,000 shares were traded in. On Wednesday the close was $1 ⅛.

According to a recent Reuter despatch, the government engineers have confirmed the news of the sensational discovery of naphtha in the Kuban Cossack territory of the Black Sea. The property where the spout has appeared belongs to the Baku Black Sea Company, and is situated 70 km. from the Black Sea coast. Its natural outlet for export is Touapse, the terminus of the projected Armavir-Touapse railway. Pipe lines will shortly be constructed.

Camp Bird, Limited

SPECIAL CORRESPONDENCE

At the general meeting of the shareholders of Camp Bird, Limited, held Oct. 27, 1909, an official announcement was made that a policy of investing in other mines outside the Camp Bird district had been adopted by the directors. It was urged that the company had built up a strong, technical organization and had a large reserve fund at its command, and that it was to the interest of the shareholders to make use of these favorable factors in order to extend their operations so as not to be dependent on a single mine.

It was explained that the adoption of this policy did not mean that the end of the Camp Bird mine was in sight. On the contrary, the prospects of this mine continuing its successful career for some time to come were favorable. Exploration work on an extensive scale is now being conducted with the object of attacking other veins in the ground owned by the company, and if the results of this work disclose payable ores, and competent engineers speak hopefully of the prospect, the future of this mine will be assured for an indefinite period.

On the Camp Bird vein itself the development work continues to be of a satisfactory character, fresh orebodies not previously considered being opened from time to time. But in spite of these favorable features, the directors consider that any opportunity of purchasing other mines on advantageous terms ought to be taken advantage of. Acting on this policy the directors for some time past have been looking round for a suitable property and are now able to announce that they have secured an option on the well known Santa Gertrudis mine, near Pachuca, Mexico. This mine is recommended to the company by John Hays Hammond, the company's consulting engineer, and has been examined by W. J. Cox, manager of the Camp Bird, and by R. J. Frecheville, mining engineer and a director of the company.

It was not possible to give at the meeting the terms upon which the property was to be bought, as the final details of the scheme have not yet been concluded, but it was announced that the transaction, if completed, would be a favorable one for the shareholders. Another meeting will of course be called to approve the purchase when the terms are finally arranged. The company has over a quarter of a million sterling of accumulated profits which some shareholders might prefer to divide up. But it is more likely that the majority of the shareholders will support the directors' recommendations and agree to some of their Camp Bird profits being invested in this new undertaking which has been subjected, from all accounts, to the most searching examination by men of the highest professional standing, and of wide experience of Mexican mines.

ETHICS OF SANTA GERTRUDIS PURCHASE

On the question whether it is right or wrong for directors to invest the profits of a mine in a new undertaking, there is much to said for and against. It is a practice that is open to abuse. It offers, for instance, the temptation to create fresh business for the sake of professional fees and salaries. On the other hand, it must be recognized that the directors of an important mine have frequently exceptional opportunities of acquiring fresh business on favorable terms, and that their experience should reduce immensely the chance of failure. On the whole, I believe the practice is one to be condemned, and especially so when the new investment proposed is in a country remote from the original mine and where the conditions are entirely different. Instances of this nature have been frequent of late, and one reads of Australian mines taking up properties in West Africa, Nicaragua and Cornwall, and of Witwatersrand banket companies acquiring quartz mines in Rhodesia.

But while this kind of outside investment is open to adverse criticism, it is different where the acquisition of new property is in the same country as the original mine, and still more so when the new property is an extension, or is in the nature of an extension. No one can well object to this class of investment, and when the new property is of the same character as that already operated, the objection is only of lightly less weight.

The proposal of the Camp Bird directors to acquire a mine in Mexico has, as stated above, much to recommend it. The new mine is certainly in a different country, but as regards mining methods there is no great difference between Mexico and Colorado. Many of the mines in the former country are already managed and financed by Americans or Englishmen, and the conditions there are familiar to several, if not all, of the directors, and certainly to all the engineers of the Camp Bird company. In view of these circumstances I consider that as a question of ethics the Camp Bird's expedition into Mexico is fully justified.

THE YEAR AT THE CAMP BIRD

At the meeting it was stated that the gross revenue from the mine during the fiscal year was £466,000, nearly 60 per cent. of the capitalization; £320,000 was carried forward to profit and loss after deducting all mining and milling expenses. Net profits after deducting a payment of £81,000 on the property were 30 per cent. of the issue capital, or £240,000. After paying all taxes and other costs and a dividend of 20 per cent., the balance carried forward is £100,000, an increase of £38,800 in the reserve over that of a year ago. The profit in the ore reserves is estimated at £472,000, £288,000 having been blocked out by work done during the past year. By March 1, 1910, it is expected to make the final payment on the property, thus discharging in full the obligations of the company.

Following the recommendation of Spurr & Co., deep-level work has been abandoned as Mr. Spurr believed the lower limit of pay ore to have been reached. The grade of ore treated has improved; during five months ended Sept. 30, 31,900 tons were treated, yielding a profit of £225,000.

During the past seven years the Camp Bird has produced a gross revenue of £2,600,000 and a net revenue of £1,800,000. The actual dividends have exceeded the issued capital (£820,000) by 35 per cent., and a reserve of 25 per cent. is established. In other words, in seven years the Camp Bird has paid back the entire capital plus 60 per cent. profit in addition to having rebuilt the mill.

A fund of £1000 was voted to be sent to Mr. Cox for distribution among the members of the staff at the mine.

Imports and Exports of Metals

Exports and imports of metals in the United States, nine months ended Sept. 30, are reported as follows, in the measures usual in the trade:

Metals:	Exports.	Imports.	Excess.
Copper, long tons	241,237	100,031	Exp. 141,206
Copper, 1908....	236,988	62,892	Exp. 174,096
Tin, long tons....	329	32,717	Imp. 32,388
Tin, 1908.....	183	26,478	Imp. 26,295
Lead, short tons.	70,273	82,728	Imp. 12,455
Lead, 1908.....	54,659	81,270	Imp. 26,611
Spelter, sh. tons	2,279	7,437	Imp. 5,158
Spelter, 1908....	2,378	823	Exp. 1,455
Nickel, lb.	8,500,328	14,477,581	Imp. 5,977,253
Nickel, 1908....	8,026,950	13,390,285	Imp. 5,363,335
Antimony, lb.	6,648	6,272,943	Imp. 6,266,295
Antimony, 1908.	.....	5,786,121	Imp. 5,786,121
Platinum, oz.....	.....	83,177	Imp. 83,177
Platinum, 1908.	.....	24,978	Imp. 24,978
Quicksilver, lb	460,896	.....	Exp. 460,896
Quicksilver, '08	185,089	.....	Exp. 185,089
Aluminum, value	$373,821	.....	Exp. $373,821
Aluminum, 1908	285,711	.....	Exp. 285,711
Ores, etc.:			
Zinc oxide, lb.	21,303,659	.....	Exp. 21,303,659
Zinc oxide, '08	18,341,917	.....	Exp. 18,341,917
Zinc dross, lb.	12,658,074	.....	Exp. 12,658,074
Zinc dross, '08	13,555,081	.....	Exp. 13,555,081
Zinc ores, lg. tons	9,092	83,420	Imp. 74,328
Zinc ores, 1908.	21,056	37,157	Imp. 16,101
Antim'y ores, lb.	504	3,386,768	Imp. 3,386,264
Ant. ores, 1908.	.....	1,731,709	Imp. 1,731,709
Chrome ore, tons	.....	29,182	Imp. 29,182
Chrome ore, '08	.....	.....	.....

Estimated zinc contents of ore imported in August and September of this year were 3,048,024 lb. Copper, lead and nickel include the metal contents of ores, matte, bullion, etc. The exports given include reëxports of foreign material. Chrome ore was not reported separately last year.

The death rate from accidents, at the Alaska Treadwell, for the year ended May 31 was 2.45 per thousand.

Details of Practical Mining

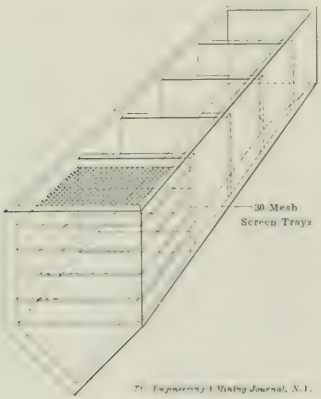
Notes of Interest to Prospectors and Operators of Small as Well as Large Mines. Things That Have to Be Done in Everyday Mining

REPORTS FROM EXPERIENCE

Readers of the JOURNAL are invited to contribute to this department. Articles should be brief, thoroughly practical, and preferably illustrated by drawings or sketches. Our draftsmen will prepare properly any kind of a pencil sketch that is intelligible. Something that is an old story in one district may be quite unknown in another. Articles accepted and published are suitabl paid for.

Screen Trays for Zinc Boxes

More than half the expense of the ordinary cyanide plant clean-up can be avoided by using screen trays, the scheme first adopted on a large scale at Dos Estrellas, Mexico. Gold and silver, when precipitated on zinc, are ordinarily in a state of minute subdivision, except where



SCREEN TRAY

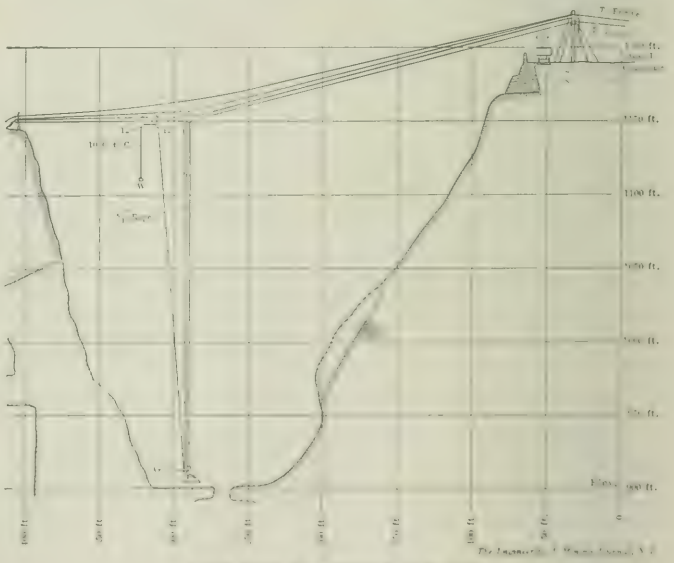
copper is deposited with them. If then, the precipitate and short zinc accumulated in a clean-up be scrubbed and rubbed vigorously over a 60 mesh screen in the clean-up tank, the precipitated metal will pass the screen and the short zinc will remain on it. The gold and silver which pass the screen can be melted directly without further acid or other treatment, beyond drying and fluxing.

[illegible] more of the compartments [illegible] be provided with [illegible] screen trays, as per sketch, the [illegible] [illegible] to consist of the boxes [illegible] trays. It will remain necessary to [illegible] and [illegible] precipitate gold and silver. [illegible] additional performance to [illegible] through these trays, thus securing full value from the zinc, reclaiming all the gold and silver which adheres to the short zinc and avoiding entirely the sulphuric-acid treatment.

The Solution of a Cableway Hoist Problem

At Mine 21, Mineville, N. Y., the greater part of the ore in the open pit was hoisted and carried to the gondola cars on the surface by means of a Lidgerwood traveling suspension cableway. The towers on opposite sides of the pit were 400 ft. apart, the greatest hoisting depth 300 ft. vertically, and the carriage was usually carried out about 200 ft. where the bucket was dumped by hand.

Some time after installation and as hoisting depth increased the scoop on be-



CABLE HOIST AT MINEVILLE, NEW YORK

ing raised began to rotate in mid air, twisting the fall block cables and throwing out most of the ore. The problem was to know to guide the scoop in its upward journey, suspended from little attention. Many schemes were suggested and many were tried. A hoisting rope [illegible] [illegible] [illegible] This was [illegible] but did not help matters in the least.

The master mechanic finally devised the following scheme. An 18-in. arm was attached to the fall block frame and from this a 5/16-in. wire rope was run over two 12-in. sheaves (spaced 10 ft. apart center to center and hung by a frame to the traveling cable) and then to an overhanging light counterweight. The rope and counterweight proved to be a satisfactory guide. In fact the rope alone was sufficient to steady the scoop during the ascent, the only part the counterweight played was to keep the small rope taut so it would travel well over the auxiliary sheaves. The arrangement is shown in the accompanying sketch.

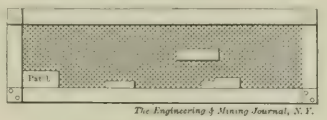
A Transfer Track

Two 25-ton electric cranes are operated on tracks which are parallel, with a distance of about 100 ft. between centers. The cranes have a span of 75 ft. One crane operates in a building, the other outside. It is necessary to transport heavy pieces of machinery from one crane to the other. A heavy car is operated on a general track at right angles to the crane tracks. This car is moved by the crane. When one crane places a piece of machinery on the car, a cable connected with the other crane passes through a pulley at

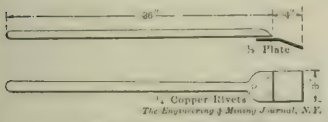
the end of the track and is attached to the car. As the crane travels along, the car is pulled from the first crane to the yard covered by the second crane. The cable is detached and the crane travels back to the car and picks up the load and disposes of it. The cable is hooked to the other end of the car and drawn back by the first crane. An arrangement of this kind could be used occasionally around smelting and converting plants where heavy machinery has to be moved out of the field of the crane.

Scraping and Patching Battery Screens

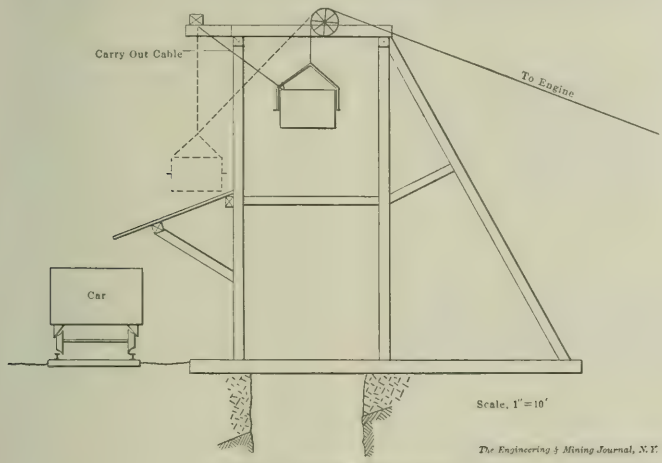
The usual screen scraper, shown in the sketch, must be applied vigorously when wood chips are sent to the mill in the ore, or when daily capacity per stamp is expected to reach five tons through 40-mesh. This scraping keeps the screen open, but also it shortens the life of the screen by occasionally punching holes in it. Holes made this way are advantageously patched, particularly in punched screens, by tacking a block of wood, faced with a bit of blanket, to the frame and against the screen. Where the hole is too far from the frame, the screen is removed and another substituted, when the patch can be attached by nailing through the screen into the block from the back of the screen. As many as 20 patches are sometimes seen on a screen. Even a hole that is made when a wedge is forced through a screen by a stamp, can be patched—with loss of screen area, to be sure, but not enough to interfere with the crushing and discharging capacity, if the unblocked screen surface is kept clear with the scraper and wire brush. The latter is made with flat wire bristles which fit the slots of the screen, and is used with the screen lying reversed on a table. In this way the necessary pressure can be applied and a screen, the upper part of which has become completely blinded with rust and sand, can be brushed clear in a few minutes.



A PATCHED BATTERY SCREEN



BATTERY SCREEN SCRAPER



SCHEME FOR SWINGING BUCKET

Device to Carry Bucket away from Shaft Mouth

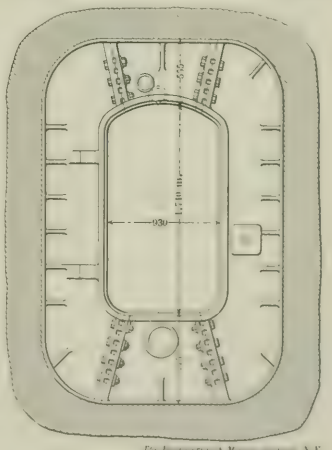
A method commonly used in the Mineville, N. Y., district for dumping a bucket away from the shaft collar is here illustrated. The bucket is hoisted by windlass or engine to a point above the collar where a short cable, hung from the headframe 5 or 6 ft. from side of shaft, is attached by hook to the bail of the bucket. The bucket is then lowered by releasing the band brake on the motor and is carried out by the short rope to a safe distance from the shaft where it is dumped. Carrying to one side and dumping on a chute which discharges well away from the shaft allows the men in the shaft to work in safety between hoists. This method is particularly adapted to shaft sinking, and is found more convenient than the other method of dropping a trap door on which runs a tram car to receive the dump directly from the bucket.

Gravity Haulage

At one of the Cleveland Cliffs properties, Ishpeming, Mich., 3-ton end-dump cars are used. The track from one shaft to the crusher plant has a grade of 5 ft. in 300; from the other shaft it is 8 ft. in 500. The cars run out by gravity, unwinding a small tail rope as they go, and dump automatically at the crusher. At each shaft is a small engine controlled by the station tender. With this the empty cars are brought back. Thirty cars per hour can be handled on the 300-ft. haul. Skips are not used in either shaft.

Cast-Iron Mine Bulkhead

The following notes on the construction of a mine bulkhead appear in *Annales des Mines de Belgique*, Vol. XIV, No. 2. The Bernissart collieries, while driving an entry into new territory on the 380-m. level, encountered a water-bearing zone which emptied 18 cu.m. of water per hour into the entry. During the sinking of a nearby shaft a water-bearing horizon, presumably the same one, had also been penetrated; this caused the management to expect difficulty in extending the entry. It was decided, therefore, to postpone the drifting until a water-tight bulkhead could be placed in the entry, not far from the shaft, in order to avoid flooding the latter, should a heavier flow be liberated.



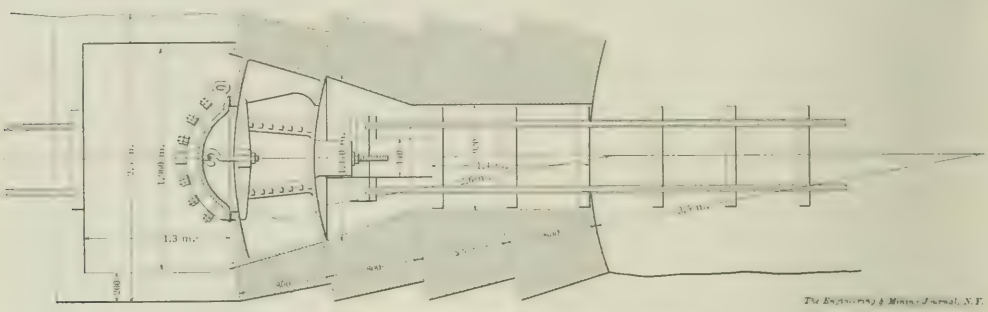
ELEVATION, PULKHEAD FRAME

A stratum of solid rock, 60 m. from the shaft, was selected, and for a horizontal distance of 3.2 m. the walls, roof and floor were cut into four notches, each

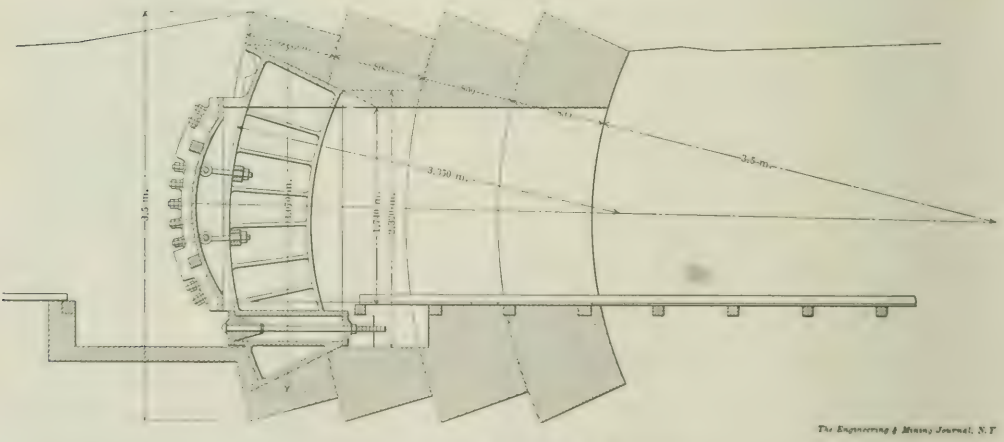
of which had the form of a truncated cone, as shown in an accompanying figure. A masonry abutment was then erected of brick set in cement mortar, to support the cast-iron bulkhead.

This consisted of an outer rim in four segments, held together by bolts passing through flanges. The castings were strongly reinforced by webs. After the rim had been put in position, cement grouting was poured around it. The actual door, also of cast iron, was hung from the frame by two hinges, and was held firmly in a closed position by two hook bolts engaging a pair of eyes on the door. A pipe at the bottom of the frame allowed the escape of water during the erection, and another at the top liberated the air when the final closure was made. The bulkhead was designed to support a pressure of 735 lb. per square inch.

The actual door was 1.74 m. high and 0.94 m. wide; it weighed 8410 kg. Its cost, including the masonry, was 5435 francs, to which should be added the cost of preparing the site and building the masonry, which amounted to 2500 francs.



PLAN AND HORIZONTAL SECTION OF MINE BULKHEAD



LONGITUDINAL VERTICAL SECTION OF MINE BULKHEAD

Diamond Drilling under Difficulties

By Guy C. Stoltz*

A diamond drill hole put down about 500 ft. in a shattered gneiss formation in the Mineville, N. Y., district, presented an interesting problem to the contractor. The hole at an angle of 45 deg. was drilled with a 1.42-in. bit. At a depth of 150 ft. the drill encountered a disintegrated and seamy zone, jointed and fractured. Very little headway could be made with the carbon bit for the material caving around the bit would cut the steel so quickly that there was great danger of losing the carbons. A chopping or X bit was put on the rods and some little advance was made.

Casing the hole was not practicable, for not more than 2 ft. advance could be made before the hole would cave and necessitate constant reaming out and the driving of short lengths of casing. The water so necessary to wash away the borings from the carbon bit flowed away in the fractured zone.

In order to block the cavities and put an end to the caving most schemes common to drillmen were tried and the usual remedies of forcing in manure, oats and different grades of wood pulp were not effective. Finally hot cement grouting was tried and was forced into the hole under pressure, allowed to set and then reamed out. This was found to form a satisfactory casing and by drilling 3 ft. at a time and applying the cement the hole was driven through the shattered formation. Some idea as to the difficulty in drilling will be realized from the records, which show for a period of 20 days an average advance of 2 ft. per day exclusive of the time taken in cementing and reaming.

*Mining engineer, Mineville, N. Y.

Laboratory walls may be more artistic when plastered, but acid fumes soon disintegrate the plaster and it drops into quantitative determinations, spoiling the accuracy of the work. White glazed bricks are better, but expensive.

Personal

Mining and metallurgical engineers are invited to keep THE ENGINEERING AND MINING JOURNAL informed of their movements and appointments.

Morton Webber is examining a group of mining claims in Sinaloa, Mexico.

Corey C. Brayton, of San Francisco, is making an examination in South Dakota.

Robert Musgrave, manager of El Tigre mine, Mexico, recently visited Victoria, B. C.

Newman Erb has been elected a director and vice-president of the New Dominion Copper Company.

Edward L. Dufourcq has returned to New York from a professional trip in Colorado, Utah and Sonora.

J. S. Coupal is manager of the Providencia Mining Company at Parral, Mexico, succeeding W. Irving Moore, resigned.

Arthur K. Adams, mineral inspector in the General Land Office, has been transferred from Santa Fé, N. M., to Phoenix, Arizona.

Albert G. Jenkins, of New York, is examining the mines of the Amador Gold Mining Company on the Mother Lode in California.

Benjamin Hammond, of New York, president of the Big Master Mining Company, visited the mine in the Manitou Lake area, Ont., recently.

M. K. Rodgers, of Seattle, Wash., is at the Nickel Plate mine, near Hedley, Similkameen, B. C., in connection with extension of development work there.

A. N. C. Treadgold, of Dawson, Yukon Territory, one of the principal gold-mining operators in the Klondike district, has gone to San Francisco for the winter.

E. R. Faribault, of the Canadian Geological Survey staff, has been appointed superintendent of mines for Quebec Province, in place of J. Obalski, recently resigned.

A. B. W. Hodges, manager of the Granby Consolidated mines in British Columbia, has been appointed also manager of the Shattuck Arizona Mining Company.

J. M. Bates and T. H. Mackie, who had spent the fieldwork season at the work of delimiting the boundary line between Canada and Alaska, were in British Columbia lately on their way back to Ottawa.

R. G. McConnell, of the Geological Survey of Canada, has returned East after his season's work on Texada island and at other parts of the Coast district of British Columbia.

J. G. Bart, formerly with the Ellsworth Colliery Company, has been appointed assistant to the general superintendent of the Berwind-White Coal Mining Company, with office at Windber, Pennsylvania.

Dr. N. H. Darton and H. M. Wolflin, of the United States Geological Survey, after visiting Rosslyn, Wash., proceeded to Vancouver island, B. C., where they obtained particulars of a recent coal-mine explosion.

Dwight E. Woodbridge arrived in New York this week on his way to Duluth, Minn. During his stay abroad he visited the Sydvaranger, Kirunavaara, Malmberget, Gellivaara, Grangesborg and other mines in Sweden and Norway.

Prof. C. K. Leith, of the University of Wisconsin, who, it was feared, had been lost in the course of his explorations on the shores of Hudson bay, has arrived at Haileybury, Ont., and will shortly visit Toronto on his return journey.

R. H. Channing, formerly manager of the Utah Consolidated, and for three years past general manager of the Cerro de Pasco mines in Peru, has been chosen president of the Cerro de Pasco Mining Company, with office in New York.

W. H. Trewartha-James, general manager of the Tyee Copper Company, of Ladysmith, B. C., arrived in New York Nov. 6, on his way to London to confer with the directors. His address in New York will be care A. B. Cordner, 60 Wall street.

J. T. Hill, after 30 year's continuous service in the management of coal-mining and coking plants in the States of Tennessee, Alabama, Georgia, and Kentucky, has resigned his position as manager of the Alpine Coal Company, at Alpine, Ky., and retired from active mine management. He contemplates devoting his time in the future to examining and reporting on Southern coal properties, for which purpose he will open an office in Chattanooga, Tenn., about the first of the coming year.

Dr. Edward Dyer Peters, of Harvard University, spent the summer months in Montana and Utah at the various copper smelters, collecting material for an entirely new edition of his "Modern Copper Smelting." The book is to be entirely rewritten, but is expected to follow the general lines of the earlier treatise. It will be devoted especially to plants and equipment, in distinction from his recent "Principles of Copper Smelting." Dr. Peters secured a large amount of other valuable and hitherto unpublished material.

Obituary

Webb H. Parkinson, a well known mining man of Goldfield, Nev., was shot and instantly killed at that place, Oct. 20, by his wife.

William Douglas Mason, for many years prominent in the anthracite coal trade, died in Philadelphia, Oct. 23, aged 53 years. He was for a long time connected with A. S. Van Wickle & Co., formerly large independent operators.

Thomas Stanley Nedham died at Perth Amboy, N. J., Nov. 3, aged 57 years. He was educated as a civil engineer, and for a number of years was engaged in construction work in the South. For 10 years past he had been engineer of the New Jersey Portland Cement Company, and was an authority on cement manufacture and construction. He was a brother of Henry B. Nedham, who is president of the cement company and secretary of the Maryland Coal Company.

Pierce N. Welch, New Haven, Conn., for many years identified with the metal industry, died suddenly in Berlin, Germany, Oct. 26, aged 68 years. At the time of his death he was president of the Bristol Brass Company and vice-president of the Bristol Manufacturing Company, Bristol, Conn., and a director of the New Haven Clock Company. In 1870 he became president of the New Haven Rolling Mill Company and held the office for 20 years. He was a native of Plainville, Conn., passed his boyhood in New Haven, and graduated from Yale University in 1862. After a short experience in business in New York, he engaged in the brass and copper manufacture in Connecticut, in which he continued all the rest of his life.

A. P. Swineford died at Juneau, Alaska, Oct. 19, aged 75 years. He was born at Ashland, O., and in 1852 was admitted to the bar at Oshkosh, Wis. He removed to Negaunee, Mich., in 1868, and for a number of years was identified with newspapers in that and other cities of Michigan. In 1874 he wrote and published the earliest work attempting a comprehensive treatment of mining in the Lake Superior region. In 1885 he was made the first governor of Alaska by President Cleveland, and at the conclusion of his term he returned to Michigan where he again became interested in newspaper work. The later years of his life, however, were spent in Alaska where he greatly aided in the task of educating the country to a realization of the great future in store for the territory.

Societies and Technical Schools

Wilkes-Barre Mining Institute—At the regular meeting in Wilkes-Barre, Penn., Oct. 29, a lecture on "Outside vs. Inside Operations" was delivered by Charles Enzian, division engineer of the Lehigh Valley Coal Company.

Scranton Mining Institute—At the regular meeting in Scranton, Penn., Oct. 20, there were several papers and discussions on first aid to the injured in accidents. The following officers were elected: President, S. C. Jones; vice-presidents, Benjamin Melton, Joseph Palmer; secretary, Thomas Thomas; treasurer, Charles Kurtzholtz.

Special Correspondence from Mining Centers

News of the Industry Reported by Special Representatives at Butte, Denver, Salt Lake City, Goldfield, Cobalt and Toronto

REVIEWS OF IMPORTANT EVENTS

San Francisco

Nov. 3—The Anti-Débris association of Sacramento, the persistent enemy of hydraulic mining in California, is putting on more watchmen—or "spies" as the miners call them—for the winter months, to stop any hydraulic mining that they can. The association professes to have learned that many of the old mining companies which have been inactive for years and closed by injunction, are getting ready to resume operations when they get a chance this winter during the water season. Close watch is to be kept on all such companies so as to report if the law is violated. Activity is expected as soon as the rains, now due, come. The attorneys for the association have also prepared a complaint, shortly to be filed, for the purpose of enjoining a certain dredging company from continuing operations, on the ground that these operations are injurious to the river interests.

In the Gray addition and De Lancie tracts within the city limits of Oroville, an electric scraper is leveling down the piles of rock gravel, cobbles, etc., placed there by the dredges. The cobbles are being turned into crushed rock for road and concrete making as fast as steam shovels and rock crushers can dispose of them. The leveled places are being graded and re-covered with soil and sold off for building lots so that houses will replace the piles of dredge tailings. This leveling process is also filling spots now full of stagnant water, so that the sanitary condition of Oroville and surroundings is being improved. On the soil being placed on the site of the old rock piles, trees and shrubs grow readily. The appearance of the locality is rapidly improving, thus removing one of the main objections to dredge mining, viz., that it destroys the lands where it is carried on and leaves an unsightly tract behind it. All this may be remedied if proper steps are taken, as in this instance.

Attention is again being turned to the mines of Mariposa county mainly through the recent phenomenal find in the Mexican mine of the Trujillo Mining Company, where a vein carrying very high-grade ore is being worked. The mill is running steadily on ore running over $150 per ton. The mine is on a spur of the so-called East belt of the Mother Lode. In the same county, at Coulterville, a number of mines are being successfully worked. Nearly all the old mines at Hornitos are again in operation as well as those at Quartzburg. The Cream Lead mines at Coulterville, closed for many years, are in operation once more and turning out quite satisfactorily. Numbers of miners and prospectors are going into the county by the Yosemite Valley railroad, leaving it at Snelling and Pleasant Valley and going over the old stage road to Hazel Green and Grizzly creek, the sections attracting the most attention.

The representatives of the Mammoth Copper Company at Kennett and the Shasta County Farmers' Protective Association have had a harmonious meeting on the subject of smelter fumes. The company had explained the plans and operation of the bag-house under construction and the results which would probably be obtained. It is now probable that the copper-mining companies will be given more time to make the desired arrangements to prevent damages from smeltery smoke and fumes, it having been shown to the farmers that such steps are being taken.

Denver

Nov. 5—In the Cripple Creek district, the heading of the deep drainage or Roosevelt tunnel is now said to be entering Beacon hill, where the intersection of pay veins may soon be looked for. The total distance driven is 11,400 ft., and the remaining distance to the point where it is expected to tap the main water course of the Cripple Creek basin is about 3250 ft. The output of the Trilby company for October is given at 750 tons, with a gross value of about $15,000. This is being treated at the company's mill. A reduction of 50c. per ton on ore worth $10 per ton has been made by the United States Reduction and Refining Company, the new rate, including freight and treatment, being $4 per ton. The output for October of the Cripple Creek mines is given at 63,260 tons, of a gross value of $1,201,630, the average value in gold being $20.30 per ton. The dividends paid during the past month by four corporations alone was $154,000, and, of course, this does not by any means represent the profits made, as many of the companies are owned by individual and close corporations, and others worked by lessees who do not publish the result of their operations. Lessees on the Maloney shaft of the Empire State, of the Isabella company, have discovered a new ore shoot at 350 ft. deep, and have begun shipping. At Stratton's Independence the third chilean mill is being erected, which will bring the capacity of the mill up to 800 tons per month. The buildings are completed, but the usual delay is being experienced in the arrival of machinery. An automatic power shovel of 60 tons per hour capacity was placed in position in the deep cut in the dump this week, and will be in operation in a few days. The mine continues to make a fairly steady production under lessees and company operation, the output being about 2000 tons per month, worth $50,000. The production of the Mary McKinney main shaft in October was 800 tons of ore, yielding from $25 to $30 in gold per ton. The October production of the Vindicator company was about 2800 tons, of a gross value of $84,000 in gold. The leases on the El Paso for October produced about 2000 tons of an average value estimated at $25 per ton. The October production of the Granite company was approximately 2000 tons of a gross bullion value of $56,000. The October production of the Cresson mine was 3500 tons, of an average value of one ounce of gold per ton.

The Horrigan shaft on the Highland Mary, of Leadville, is said to be still keeping up its reputation for rich gold ore, and it is stated that there are in the ore-house 350 sacks of ore which will run from 18 to 30 oz. gold per ton, and what is somewhat unusual, there is from 30 to 60 per cent. bismuth; and it is also said that several carloads of second grade have been shipped.

Butte

Nov. 4—The need for a branch line connecting the Radersburg mining district with the Northern Pacific has been felt for some time, and the present indications are that the work of constructing such a branch will be begun within a few months. It is thought that a corporation will be formed by those interested in the mines of the Radersburg district, which will construct the road. The route of the proposed road has not been determined. At present the ore from the mines in the district is being hauled by teams to the nearest railway point, 14 miles from Radersburg.

The hearing on the order made by Federal Judge Whitson citing the creditors of the Idaho Smelting and Refining Company to show cause why the bankruptcy proceedings against that corporation should not be dismissed, was held Nov. 2, and there being no resistance, the bankruptcy proceedings were ordered dismissed. The fact that the creditors did not resist the dismissal is taken as an indication that the debts have been paid off, and that the smeltery at Sandpoint, Ida., will resume operations at an early date.

James W. Neill, consulting engineer for the Boston & Corbin Mining Company, has recently made an examination of the company's property at Corbin. The management states that on the 700-ft. level a vein has been cut which shows 6 ft. of copper-silver ore. The management plans to have the shaft sunk to 1000 ft. by July 1, 1910.

Since the East Butte company acquired control of the Pittsmont properties in Butte, numerous improvements have been made. A new hoist has been installed, and also a new blast furnace, capable of treating 250 tons of ore daily. Other furnaces may readily be installed should the supply of custom ores warrant. A new machine shop is being constrcted through which will run an electric car line for the hauling of tools and machinery to and from the mine, concentrator and smeltery. At the East Butte proper, operations are confined to the 600-ft. level from which regular shipments are being made to Pittsmont. When the vein on the 900-ft. level was cut a considerable flow of water was encountered, necessitating a temporary suspension of operations at that point, but a new electric pump is now being installed on that level, and as soon as this is done, the exploration of the vein will be continued.

R. M. Atwater, of Duluth, the newly appointed general superintendent of the Butte & Superior Copper Company, has recently arrived in Butte, and will select the site of the new zinc mill and concentrator which is to be constructed by the American Metal Company. D. F. Haley, lately connected with the North American Lead Company, will have charge of the designing of the mill. The management states that the heavy mill machinery has already been ordered and that the mill will probably be in operation by May 1, 1910, with a capacity of 500 tons daily.

Salt Lake City

Nov. 3—After 10 years of litigation the suit against the Mammoth Mining company by the Grand Central Mining Company has been decided in favor of the plaintiff and the first payment of $30,000 has been paid to the Grand Central. The original judgment against the Mammoth was $152,000, but accrued interest has brought the present judgment up to $176,385. The total amount is to be paid in full within sixty days. The case has been dragged through all the State courts and has twice been before the United States Supreme Court. In every trial the Grand Central has been victorious. The Mammoth is accredited with sufficient money on call to satisfy the judgment and the Grand Central is reported to be about to declare dividends as the result of this enrichment. Both mines are in Tintic district.

The Yampa smeltery has made a contract with the American Smelting and Refining plant at Garfield for the matte of the former and the Yampa converters have been shut down. Whether the perennial need of matte forced the Garfield smeltery to bid high enough to induce the closing of the Yampa converting plant or whether some inherent difficulty at the plant caused this move cannot be stated. The American Smelting company made strenuous efforts seven years ago to make a similar contract for the Bingham Consolidated matte but without success. At the Tintic smeltery, recently closed, a sintering furnace invented by G. G. Vivian is at work on the flue dust of which there is enough to keep the furnace busy for a month.

The Woodman property, comprising 13 patented claims, in the Deep Creek district in the western part of the State, has ben purchased for $280,000, of which $10,000 has been paid. The purchasers are supposed to be the Guggenheim interests. A spur from the main line of the Western Pacific has been promised as soon as the main line is in operation.

Cobalt

Nov. 6—After the new directors of the La Rose had examined the properties in this district, they issued a statement regarding their future policy, and the conditions of the various mines. That portion of the report which is of greatest interest lies in the admission that the work done on the main Lawson vein, known as the Silver Sidewalk, at a depth of 88 ft., has been disappointing. The vein continues strong to that depth, but so far as has been ascertained it contains little silver. There have been, however, a total of 12 veins discovered up to date on this property, and it would not be fair to condemn it on the small amount of work that has been done. This work has been greatly retarded on account of the lack of power. Work has been started on three of the veins, but has not as yet advanced far enough to give much idea as to their prospective value. One of the first actions of the new board of directors was to cut the present dividend rate from 16 to 8 per cent. per annum, which came as a great surprise to most people. The directors were well pleased with the development of the properties, but did not consider that enough money had been spent in developing their other holdings, or that the ore and cash reserves were sufficiently large. The directors, therefore, decided to cut the dividend rate in order to spend more money in developing their different properties so as to put them as soon as possible in a position to ship ore. They also decided to increase the cash and ore reserves. Up to date this year the La Rose has shipped over 11,000,000 lb. of ore, and this has practically all come from the main La Rose mine, and even although the ore reserves of that property were very large, they cannot stand this rate of shipment, and the other properties are not yet in a position to ship any great quantity of ore, nor will be for some time until their development work has been more advanced.

The Larder Lake district has been commanding considerable attention lately and several hundred prospectors have already made their way into that section, and it is expected that during this winter there will be a considerable rush there. It is understood that the Gold King property, which adjoins the Harris Maxwell, has been sold. The Fournenie Mining Company has announced the intention to develop the water power at Raven Falls to supply Larder camp. Considerable development work has been accomplished on the Doctor Reddick and Victoria Creek, and some very good results have been obtained. The 300-ft. tunnel is being driven to cut the vein of the Berkshire Mining Company on their Southern Star claim. The new goldfields at Porcupine lake are attracting a great number of prospectors, and some of the samples that have come down from the district show spectacular free gold. The veins are all in quartz. The Bannerman vein, which is from 4 to 6 ft. wide, has been traced for over a mile, and in many places shows free gold on the surface. As the majority of the smaller lakes in this section are now frozen over, it is a very difficult matter to get into the country.

The New York attorneys acting for D. M. Steindler and J. A. Jacobs have served a writ on the American Smelting and Refining Company, which prevents it paying about $7000, the proceeds on the sale of a shipment of ore by the Peterson Lake Company. This money has been attached in connection with a suit brought against the Peterson Lake Company by Jacobs and Steindler to recover $28,000 which they claim is due for money advanced.

Toronto

Nov. 5—Count Alfred von Hammerstein, who has spent the summer in northern Alberta, directing the drilling of oil wells in the Fort McMurray district, is in Winnipeg on his way to Europe. He states that the interests he represents have so far expended $100,000 in the work. During the last two years 14 wells have been sunk under his supervision, eight of which had a depth of 1400 ft., and were producing oil of a medium quality to the extent of about 40 bbl. each per day. They are scattered over an area of about 40 miles, and it is proposed to extend operations considerably. Count von Hammerstein is now making arrangements to send a number of derricks through to the Peace River country in the spring. If oil is struck in sufficient quantities in this region it is the intention of von Hammerstein and his associates to construct a pipe line southwest from these borings and also to pipe the oil from the wells at McMurray.

effecting a junction some 250 miles north of Edmonton and continuing in a trunk line to that city. The oil wells in the Fort McMurray district have been inspected by Frank B. Smith, mineral-lands inspector for the province of Alberta.

The provincial Department of Mines has received an official report from James Bartlett, who was commissioned to investigate the reported gold discoveries in Whitney and Tisdale townships. Among the claims reported on is that of Robert Bruce, Lot 1, Concession 5, of Tisdale, where the find consists of a series of parallel veins of milky quartz varying in width from 1 to 18 in., which had been stripped 25 ft. On the contact of one vein in the rock, gold is visible in grains and in leaf form. The largest body of quartz seen in the district occurs on the property of F. C. Remington, north half of Lot 4, concession 1, of Tisdale. It is associated with a decomposed green schist. Little work had been done on it, but it could be traced for six chains in a southwesterly direction and at one point appeared to be two chains in width. Gold could be seen at five or six different spots near the northern end of this outcrop. At one of these showings enough gold not in the leaf form, but rather resembling nuggets, was scattered through the quartz in a space of about 1½ in. square, to cover a 25-cent piece. The quartz in this vein, as in the other claims, was of the milky variety and practically free from sulphides. No sinking has been done on any of the properties and very little trenching, so that any estimate of ore in sight are unwarranted.

Officials of the Ontario Department of Mines who have visited the new oil-fields of north Ontario lying south of the line of the Grand Trunk Pacific Railway, where a rush of prospectors is in progress are satisfied that some of the discoveries promise good returns. The principal center at which staking is being done embraces large areas of Tisdale and Whitney townships around Porcupine lake. Other sections which are favorably regarded are Cody and Macklem townships a short distance east of the Porcupine Lake area, and a region including portions of Beaty, Munro, Hislop and Guibord townships lying to the east of the McDougall's Falls, a station on the Temiskaming & Northern Ontario Railway. The discoveries are all of gold quartz, which in the Porcupine lake area is found in dike formation. This at one point has been traced by outcroppings for several hundred feet with a width of 60 ft. There is a fine showing of free gold and assays from [illegible] have run as high as $200 to the ton. Owing to the lateness of the season [illegible] cannot be done before next year to ascertain the depth of the deposits, which [illegible] at the discovery deposit. At Frederick House lake, to the north of the Porcupine Lake field, discoveries of nickel have been made, to which some significance is attached.

Mexico

Nov. 3—The leave of absence granted to General Bernardo Reyes, governor of the state of Nueva Leon, and his acceptance of the appointment to study military tactics and customs abroad will no doubt afford a conclusive adjustment of the political situation here. The methods employed by some of the "Reyista" party to further the interests of their popular candidate for vice-president are accredited with the recent unsettled business conditions in Mexico. General Reyes leaves within a week for Europe and will not return until after the elections in 1910, which leaves the situation entirely in the hands of the "Reeleccionistas." General Mier, sub-secretary of the war and navy department, has been appointed as acting governor during the absence of General Reyes.

A. Goerz & Co., of London, who have been developing the La Fe y Anexas property at Guadalupe, Zacatecas, under option from the Pimentel interests of Mexico City, since April of 1909, have purchased 2500 shares out of the original 3000 comprising the Mexican company, giving control of 4000 m. on the east extension of the Veta Madre vein of Zacatecas. This property borders La Cantera mine, which is one of the famous "antiguas" of the district. Recent exploration work on the 54-m. level has opened up extensive bodies of high-grade milling ore. A 1200-gal. Cameron station pump is to be installed on this level to handle the water from the vein, and sinking and further development will be continued as rapidly as possible. These same London interests have formed a holding company called the Zacatecas Syndicate, Ltd., of 20 Bishopsgate, London, issuing 3000 shares at a par value of £1 each to take over, from Capilla Brothers and other Mexico City interests, the properties known as San Agustin, Perdernalillo, El Creston and Maria Victoria on the extension of the same vein which give them an additional 4000 m. Exploration work on these properties will be started at once.

Goerz & Co., who are represented in Mexico by Karl F. Hoffman, are heavily interested in South Africa, owning the May Consolidated, Princess Estate, Van Dyke and other large properties on the Rand. The fact that they are acquiring properties in Mexico at this time is another proof of the popularity of Mexican mining investments abroad. It also indicates a revival of this old district that has been one of the largest producers of silver in Mexico in the past. The high cost of power has been the main cause of the inactivity of Zacatecas in recent years, but as like difficulties have been overcome in both Guanajuato and Pachuca by hydro-electric power being brought in from a considerable distance, it is predicted that Zacatecas will not long be handicapped on this account.

The Mexican company having a large power concession at Guadalajara, and the Guanajuato Electric and Power Company are both planning to carry their lines to Zacatecas. The Guanajuato company, which are now constructing a line from their new plant at Noriega, on the Angula river to Aguascalientes, expect to have power in Aguascalientes by August, 1910, and it is quite probable that they will continue the line through to Zacatecas.

The Southern Pacific Railway announces the opening of 61.6 km. with daily train service between Orendain, the junction with the National on its Ameca branch, and Magdalena in Jalisco. Now that the rains are over, the construction work is being pushed through to Tepic, and according to the reports of the engineers and contractors, the line should be completed to Tepic by July, 1910. A temporary bridge will carry the extension across the Santiago river, to be replaced later by a steel and masonry structure.

The Mexican Mines Prospects Development Company has made a separation of its holdings into two groups, one of which has gone to the French stockholders who hereafter cease to have any interest in the main company and the other remains with the Mexican group and will form the basis for a re-organization. One large group of properties in Oaxaca, together with adjacent properties belonging to Maurice Clark, has been taken on option by the house of John Taylor & Sons, of London. These well known South African operators have determined to enter Mexico again, and on a large scale.

A correspondent from Sinaloa writes: "Mining in this state, also in the part of Durango adjacent to Sinaloa, is at present in an almost dead condition. When the metal prices started to drop mine after mine closed down, especially in Topia. The ores are rather low in silver and when lead was selling for $6 in the United States, these ores were profitable as the lead was shipped in bond and the results were satisfactory. There is nothing going on at present, though there are several new properties preparing to start soon."

London

Oct. 27—In reference to the published correspondence about the Brazilian Gold-en Hill, Ltd., the company has submitted the following revised data: "The capital is £150,000, of which £63,493 represents the vendor interest. The issue was 40,000 shares, and this subscription, after paying all promotion expenses, and purchasing plant to the amount of £3500, will leave a clear £40,000 of working capital, with 6000 shares in reserve also for working capital."

Mining News from All Parts of the World

New Enterprises, Installations of New Machinery, Development of Mines and Transfers of Property Reported by Special Correspondents

THE CURRENT HISTORY OF MINING

Alaska

Candle—The great drawback to this district for this season has been the lack of water. In some favored localities operations have progressed well, but the results were secured at a disadvantage.

Fairbanks—The Moonshine group is being operated by Craig & Lee with fair results.

Nome—The latest estimate on the season's gold output for the Solomon river district is $4,120,000. This is the largest ever secured from dredging operations on the river.

Seward—The Alaska Northern Railway Company, recently incorporated, proposes to build a 38-mile branch from Mile Post 146 to Matanooska coalfields. Another branch 300 miles long will run through the Kuskokuim country from Suitna to Iditarod. Eagle river, a tributary to Knik arm, is the scene of a new rich strike.

Arizona

Cochise County

Leadville—The company has extended the option to the Calumet & Arizona company. Two mines are under bond for $200,000, the Maid of Sunshine and the King Solomon.

Copper Queen—The October output was 9,282,000 lb. of copper.

Princeton—This mine in the Huachuca mountains is in negotiation with a Chicago company represented by R. C. Brophy and W. J. Roach.

Courtland—A gold strike is reported on Sugar Loaf mill, two miles from this camp.

Denn-Arizona—Black sulphide ore has been found in the west drift on the 1250-ft. level. The water is increasing but is easily handled.

Wolverine & Arizona—This mine is shipping 15 cars of ore monthly.

Graham County

Keating Group—This property has been sold to a Michigan company for $90,000.

Morenci-Mesabi—The company has commenced development on the Lakenan property, Gold gulch, near Morenci. H. Lakenan is in charge.

Detroit Copper Mining Company—The output for October was 2,100,00 lb. of copper.

Arizona Copper Company—The copper output for October was 2,802,000 lb. as compared with 2,472,000 lb. in September.

Copper Creek Mining Company—The company has four groups of claims in the Bunker Hill district, Pinal and Graham counties. More than 9000 ft. of development work has been done. A power plant and extensive equipment has been installed and a mill with an initial capacity of 100 tons daily is being erected. Frank J. Sibley, Los Angeles, Cal., is in charge. The company furnishes power to the Minnesota-Arizona company and for a property controlled by the Calumet & Arizona company in the same district.

Gila County

Warrior—Hoval A. Smith is shipping from this mine at Globe about 70 tons of ore daily to El Paso. Development is being done on the 300-ft. level. The Warrior Development company is being formed to acquire this group.

Pinto—An important copper strike was accidentally made by the Cactus company in making the Pinto shaft below 500 ft. for ventilation. The property is jointly owned by the Cactus and Pinto companies.

Tonto River Copper Company—The company is sending freight from Globe preparatory to starting on the property north of Globe in Tonto box cañon.

Old Dominion—The October production was 2,660,000 lb. of copper as compared with 3,686,000 lb. for this month in 1908. The Bigelow suit, decided in favor of the company, will be appealed according to a representative of the Bigelow interests.

Mohave County

Tom Reed Extension—A Colorado Springs company has been organized to develop claims adjoining the Tom Reed. John Wellington Finch, of Denver, made the examination.

Golconda—This mine in the Cerbat range is producing zinc ore. A mill is being installed and arrangements for power drills made to increase the operations. John Boyle is manager.

Pima County

Helvetia—During the year ended Aug. 31,1909, 296 cars of ore were shipped from which 999,847 lb. of copper was obtained and sold for $93,842 net. Work is concentrated at the Copper World and Leader mines. At the former 11,775 ft. of work has been done and the shaft is down 480 ft. Shipments are now being made.

Pinal County

Ray Consolidated—According to D. C. Jackling, this company will have the largest hoisting plant in the world with a capacity of 400 tons an hour

Ray Central—The installation of machinery is enabling the development to proceed faster. The company will shortly commence development on the Calumet claims which are independent of the claims now being proved up.

Yavapai County

United Verde—W. A. Clark has won in the New York courts in the suit brought by George A. Treadwell, a minority stockholder, alleging mismanagement.

Yuma County

Liberty Group—This property near the Clara Consolidated at Swansea has been sold to a Los Angeles company.

California

Amador County

Argonaut—The 40-stamp mill at Jackson is being kept busy during sinking.

Hunt's Gulch—In a new location between the Doyle and Champion mines, Matt Thomas has struck a 4-ft. gold lode.

Calaveras County

Newman—This mine at San Andreas, owned by B. Levaggi, is being opened up by a new company.

Boote Mining Company—This company is working the Nuner gravel claim at Mokelumne Hill on Stockton ridge.

Reiner—Bedrock has been reached at 315 ft. The blue gravel is 27 ft. thick.

Del Norte County

Oro del Norte—This company Theodore R. Heintz, manager, will erect on the beach near Crescent City a plant to work the beach sands for gold and platinum.

El Dorado County

French Creek—At this mine, Brandon station, F. F. Alexander, superintendent, a 10-stamp mill is being installed. Gasolene engines will be used.

Wagner—At this mine, near Kelsey, development work is being done and machinery will be installed.

Fresno County

Delilah—Machinery is being hauled to Sampson flat. W. A. MacDonald is manager.

Humboldt County

Clover Flat and Dugan—W. E. Olmstead of Eureka, has purchased these properties and their water rights at China flat.

Mariposa County

Clearinghouse—Egenhoff brothers are opening this mine on the Merced river below El Portal

Crown Lead—This company near Name-

less dam is building an aërial tramway 1½ miles long and the 20-stamp mill will be started.

Mabel and Ethel—L. D. Stockton is opening, for E. S. O'Brien, of Merced, this mine on Bear creek four miles from the Hite. A new vein has been found.

Mt. Gaines—At this property a full force is at work and the orebody is yielding better.

Grub Stake and Scorpion—These mines at Bagby, owned by J. H. Blakenship, have been sold to Hunt Brothers, of Bear Valley.

MONO COUNTY

Masonic District—At this camp the Pittsburg-Liberty continues to yield well. The owners of the True Friend will erect a mill. A new strike has been made in the mines of the Monalda company.

Parrott—J. H. McCormick and associates have bought this mine at Lundy and extensive development will be done.

NAPA COUNTY

Bella Union—This quicksilver mine west of Oakville, after having been closed for 30 years, has been started.

NEVADA COUNTY

Delhi—Superintendent H. Eddie announces that the plant recently destroyed by fire will be rebuilt.

Kenosha—Very good ore is coming out of the north end of the 400 level in this Grass Valley mine.

SIERRA COUNTY

Standard—Rock carrying free gold and exceptionally rich sulphurets is being taken from this mine in Sailor ravine by Frye & Winrod.

California—It is expected that James McDonald, of Bodie, will start up this drift mine at Howland flat.

Quinn—At this mine near Poker flat, James M. Conlan has struck good gravel in an upraise.

Sierra Poorman—Work is being done on this claim ten miles east of Downieville, formerly the Big Boulder mine.

Colorado

BOULDER COUNTY

Amalgam—A Massachusetts company has purchased this property near Sugar Loaf, and the output will be treated at the new cyanide mill of the United States Gold Corporation.

CLEAR CREEK AND GILPIN COUNTIES

King Bee—High-grade gold and silver ore has been found in the lateral workings from the Newhouse tunnel, at a vertical depth of 1400 ft., and a good body of milling and smelting ore on the Iron Duke vein, Russell district. A. H. Heller, Central City, manager.

Aurora—A heavier plant of machinery has been installed and sinking commenced. P. R. Alsdorf, Central City, is superintendent.

Frontenac Mines Syndicate—Increased shipments are being made from the mines, and additional machinery for regrinding as well as more Card tables are to be installed in the mill, increasing capacity from 75 to 100 tons per day. H. P. Lowe, Central City, is manager.

Commodore—A good body of silver ore has been opened in property near Georgetown and increased shipments will follow. R. B. Morton, Idaho Springs, is manager.

Belmont—A new company is to be formed to operate this property on Saxon mountain by W. L. Mallernee, of Georgetown, and machinery will be installed.

Georgetown Tunnel—The capital of this company at Georgetown has been increased from one to five million dollars, and the company proposes to drive the tunnel 4000 ft. further and will install heavy machinery.

Continental—A compressor plant is to be installed at the Seemann tunnel, Fall River. H. I. Seemann, Denver, is manager.

Milton—Blackhawk men have opened up exceptionally high-grade silver-lead ore in the property below Blackhawk.

C. & H. Group—This property in the Empire district is leased and bonded to Lendecke & Shields, of Georgetown.

Eagle—For a consideration of $16,000, the mill has been sold to the Great Bonanza company, and will treat company and custom ores.

GARFIELD COUNTY

A new camp called Goldstone is attracting attention. It is in Elk Creek cañon north of New Castle. Exploration work is being done.

LAKE COUNTY—LEADVILLE

Highland Mary—Sinking continues with the shaft down 110 ft., and in ore, dipping south. The shaft will be sunk another 50 ft. The development shows the vein to be 9 ft. wide, and the oreshoot parallels with the Breece fault. Some of the first-class ore runs up to 30 oz. gold, and high in bismuth. This is being sacked. The second-class ore is shipped in bulk and in addition to the gold and silver carries copper. The finding of the oreshoot in this property has started work on the Chemung, Grand Prize, Curran Alice and Eliza.

Progressive—Several weeks ago work was resumed on this property on North Fryer hill, at the 350-ft. level, and a drift driven south 50 ft where the ore was opened. The vein is 8 ft. wide and runs high in silver and lead.

Valley—Shipments of 50 tons daily are being sent to the local smeltery. Development work is being carried on into Prospect mountain to the Silver Spoon claim.

Resurrection No. 2—The Yak tunnel has reached this property and drill holes have tapped the water.

Moyers—These properties on Iron hill, belonging to the Iron Silver Mining Company, have put on a night shift, increasing the daily output of zinc sulphides.

Doris—After being closed down for several months this property in Iowa gulch has resumed work. In the upper levels there is a large body of iron, but an effort will be made to catch the body of sulphide that trends through the claim.

International—The company is constructing a 150-ton mill in the Robinson camp for zinc ore; the higher grade ore is being shipped to the local smeltery.

SAGUACHE COUNTY

Sangre de Cristo Range—An important gold strike is reported on Gibson mountain, eight miles north of Crestone. John Macdonald, of Denver, is interested.

TELLER COUNTY—CRIPPLE CREEK

Maggie—Carl Johnson will sink the shaft on Raven hill from 200 ft. to 300 ft.

Rose Nichol—This mine on Battle mountain has resumed shipments. It has been recently released for 18 months to the Reed Investment Company of Colorado Springs.

Idaho

SHOSHONE COUNTY

Enaville Smeltery—The new smeltery at Enaville will be blown in this month. The present capacity is 30 tons per day, and the ore treated will come principally from the Murray district. The process used at the plant is an invention of Maurice Blanchard.

Sampson—A strike has been made on the property near Murray about 375 ft. from the portal and shipping will be begun as soon as the Eagle Creek branch of the Idaho Northern railway is completed.

Slime Plant—A $40,000 plant for the treatment of slimes from the South Fork of the Cœur d'Alene river will be erected between Wallace and Mullan. These slimes carry high lead content from the Morning mills. Work on the plant will be begun immediately.

WASHINGTON COUNTY

Iron Mountain Group—The Lewisohn Brothers, of New York, are negotiating for the property 25 miles from Weiser.

Indiana

A deal has been closed by which Eastern capital takes over the coal rights on 1200 acres of land in Hadden township near Carlisle. It is announced that steps to drill for coal and sink shafts will be taken at once. The deal will require an expenditure of $45,000. Options on more than 1000 acres within four miles of the

court house in Sullivan have been taken also, and further coal-mine developments in that vicinity are anticipated. Two mines have been opened in that territory within the last year.

Epworth Coal Company—This company, with offices in Boonville, has been dissolved. It is understood the company's property will be taken over by another company. Frank Stauser was president.

Kansas

The Galena camp will have 11 new mills before the close of the present winter. There is the greatest activity in mill building since the boom of 1899. New leases let on low royalties and the purchase of fees by large companies have started this activity.

Catholic—Six feet of sheet lead and silicate has been struck at a very shallow depth, south of Lincolnville, Kan., by O. C. Sullivan.

Okmulgee—This mine at Miami is the latest in that camp to make one of the old-time strikes and is now turning out a ton of concentrates an hour. This mine is on the land of the Baxter Royalty Company, and is north of the Golden Hen and west of the Emma Gordon.

Michigan

Copper

The October copper output was 19,632,394 lb. of copper, a decrease from September of 485,523 lb. The detailed production and percentages are as follows: Calumet, 6,670,899 lb., 1.625 per cent.; Wolverine, 823,200, 1.32; Superior, 211,351, 1.25; Champion, 1,855,000, 1.189; Baltic, 1,675,800, 1.15; Tamarack, 1,013,035, 1; Allouez, 314,230, 0.875; Osceola, 2,247,700, 0.865; Trimountain, 491,000, 0.787; Isle Royale, 604,773, 0.775; Quincy, 1,925,000, 0.771; Michigan, 195,000, 0.75; Mohawk, 947,800, 0.7; Centennial, 199,096, 0.65; Mass, 169,000, 0.65; Victoria, 162,250, 0.65; Franklin, 127,200, 0.6115.

Mohawk—Sinking has been resumed at No. 6 shaft below a depth of 130 ft., where it was temporarily suspended while a concrete collar was being put in. This shaft is going down on the footwall side of the Kearsarge lode about 60 ft. behind the formation. The levels will be established by means of crosscuts, the first of which will be established at a depth of about 200 ft. Drifts south from No. 5 shaft have been extended beyond the line of this shaft and show the best grade of rock so far opened. Sinking and drifting is going forward in the five producing shafts; Nos. 1 and 2 are down to the 18th level, 3 and 4 below the 13th level and No. 5 down to the 8th. All shafts have been connected by drifts down to the 7th level. Rock shipments aggregating about 2700 tons are being made daily to the stamp mill.

Calumet & Hecla—A connection from the 75th level of No. 4 shaft to the Tamarack has been made. This has been done for ventilating purposes and will also afford another exit from the lower levels.

Michigan—The last rock shipment to the mill has been made from this mine, and all operations other than a small force carrying on exploratory work have been suspended. A plat is being cut in the shaft on the Bec tract and drifting on the formation will be started.

Iron

M. A. Hanna & Co.—This company is developing the Hollister mine at Crystal Falls and two other properties in the locality.

Volunteer Ore Company—The drilling in the Cascade district on the Alger lands has decided the company to sink a shaft near Palmer lake. T. F. Cole is interested in the explorations.

United States Steel—The corporation will drill extensively west of Iron mountain on the Menominee range.

Minnesota

Vermilion Iron Development Company—The company will sink a shaft on Pine island, near Tower. James Cardle is president.

Northern Minnesota Iron Company—The company has been formed to operate west of Buhl on the Mesabi range. P. R. Vail is the incorporator.

Crosby Exploration Company—The company has taken option on the Ole P. Erickson land in section 6, near Deerwood, and will drill.

Missouri

Joplin Zinc-Lead District

Excelsior—This company has started the Gouverneur mill on the Creler & Young tract at Four Corners. The ground is being opened from two shafts. The same company has completed the purchase of the Leonard lands consisting of 1100 acres in Jasper county and has opened up the Lehigh tract to leasers in 10-acre lots. D. V. Sholl, manager.

Carbondale—This mine in the North Webb City district is installing skips.

Little Princess—This mine at Webb City is preparing to take up a 15-ft. stope which will give them a large amount of cheap ore. This company has not yet sold its lead accumulated during the low prices.

Montana

The monthly report of the United States assay office at Helena shows gold receipts from Montana for October $173,763, an increase of $14,000 over last year.

Butte District

Butte & Superior—The shaft is 1030 ft deep. The station is being cut at the 1000-ft. level.

Coalition—The total output, excluding that which is hoisted through the Pennsylvania shaft of the Boston & Montana, averages 2000 tons daily.

Kaw—John Burkin, formerly general manager, has been succeeded by W. D. Blackmeyer. Mr. Blackmeyer states operations will be resumed shortly.

East Butte—The October output is reported at 635,365 lb. of copper.

Granite County

Bimetallic—The engine in the mill is now running after a shutdown of four years.

Madison County

Rochester—The company has been incorporated by C. J. Kelly, J. C. Adams and I. A. Heilbonner, of Butte, to operate claims in the Rochester district.

Nellie Bly—J. A. McKee, W. S. Jennings, and D. W. McInture have secured a bond on the claim from C. E. Danours. The mine is a low-grade gold deposit at Butcher gulch.

Nevada

Esmeralda County—Goldfield

Frances-Mohawk—The United States Circuit Court of the district of Nevada has appointed an ancillary receiver of this company, the outcome of a suit brought by Timothy Nester, of Chicago. The assets in Nevada consist of patented mining claims, machinery, and $100,000 in the John S. Cook & Co. bank, Goldfield.

Goldfield Consolidated—The oreshoot upon the 730-ft. level of the Clermont shaft has been opened up for 250 ft. along its strike, and upon the 860-ft. level it has been followed for 260 ft. The breasts of both drifts are ore.

Coming Nation—Stockholders of this defunct company are to be given a chance to realize something upon their investment by joining with the Goldfield Consolidated East Extension Mines Company, J. F. Clark, president.

Florence-Goldfield—The daily tonnage now being produced from the property is about 160 tons, the ore averaging about $30 per ton. This is a little higher grade than produced in the past.

Esmeralda County—Rawhide

Kerns No. 1—This lease has milling ore blocked out between the 100- and 200-ft. levels.

Kerns No. 2—San Francisco parties are operating this lease on a large royalty. Much milling ore is developed.

Mint—Work is being pushed to the 1000-ft. level, and the shaft retimbered; the Coalition company is working through this shaft, now 440 ft. deep.

Humboldt County

Seven Troughs District—Most of the properties have started again paying the Goldfield wage scale after several weeks' shutdown on account of labor negotiations.

Nye County

Bullfrog Syndicate—Work has been re-

sumed at Rhyolite under the management of E. S. Giles.

Pioneer Leasing and Mining—This property at Pioneer is getting in position to maintain a steady production from the ore recently discovered upon the 210-ft. level.

Sunrise-Pioneer—This company, operating the K. K. lease at Pioneer is driving a crosscut into the hill to cut the vein discovered on the surface.

Anglo-Pioneer—A crosscut is being run at the 165-ft. level to cut the vein encountered upon the 65-ft. level.

Pioneer Conservative—This company, operating a lease upon the Conservative ground, at Pioneer, has resumed sinking in the main shaft.

NYE COUNTY—TONOPAH

The camp's production for the week ended Oct. 30, was 6274 tons, having an estimated value of $156,850.

Tonopah—Good milling ore has been encountered in the west drift from the north crosscut of the Red Plume shaft. The vein has a width of 4 ft. The mill report shows 3475 tons of ore treated during the week. The average value of the ore was $18 per ton, and extraction 88 per cent.

Jim Butler—A. M. Gillespie, leasing upon this property, has installed a 20-h.p. gasolene engine, and expects to maintain a regular production in the future.

Tonopah-Belmont—Six feet of milling ore has recently been uncovered upon the 1100-ft. level of this property. The advisability of moving the company's mill from Millers to Tonopah is being considered by the board.

WHITE PINE COUNTY

Ely Calumet—The company will develop by a tunnel. A. D. Meyers is in charge.

Cumberland-Ely—The directors at a recent meeting recommended to the stockholders the acceptance of the proposition for consolidation with the Nevada Consolidated company, but the matter of exchange of stock will be left to the individual stockholders, of which there are about 4500. In the exchange of 3¼ shares of the former company for one share of Nevada Consolidated, no fractional shares will be issued, but in lieu of same cash settlement will be made on the basis of $24 per share of Nevada Consolidated. The Veteran mine remains closed, but an output of 197,330 lb. of copper is reported for the quarter ended Sept. 30.

New Jersey

Pahaquarry Copper Company—H. D. Deshler, of Bangor, Penn., writes to correct the statement that he had sold a controlling interest in this company to persons in Allentown, Penn. The statement probably arose from the fact that he recently sold his controlling interest in the Eagle Metallic Company in Adams county, Penn. The controlling interest in the Pahaquarry mine is still held by H. D. Deshler, O. R. Deshler and associates. The office of the Pahaquarry Copper Company is at Bangor, Penn.; the offices are O. R. Deshler, president; H. D. Deshler, secretary; Elias H. Utt, treasurer.

Oregon

JACKSON COUNTY

E. K. Hum, of Los Angeles will erect a floating dredge to be operated by electricity on Foot's creek. Estimated cost $157,000.

BAKER COUNTY

At the Amazon mine, Greenhorn district, a strike was recently made. The ore was encountered in the tunnel to open the vein at 300 ft. J. W. Marshall and G. R. Wiegand who are operating the Banzette mine will soon begin their first mill run. The E. E. mines at Bourne, owned by Jonathan Bourne and the Ladds, of Portland, will soon be reopened. The Porcupine mine, owned by the North American Gold Mining company, has let a contract for the continuation of the crosscut tunnel, now in 700 ft. with about 600 ft. yet to drive before reaching the objective.

Pennsylvania

BITUMINOUS COAL

Surveys are being made of a large tract of coal land near Hastings, north of Cambria. The work is being done for the Berwind-White Coal Company, and it is reported that the company will open one or two mines on the tract.

ANTHRACITE COAL

Clear Spring—Work will soon be resumed at this colliery, which has been closed since a serious squeeze in the workings during the spring filled the lower veins with water. The three upper veins of the mine will be operated on a large scale. The work has been diligently pressed to reduce the water that has been pouring into the working and it is now fully under control. The Red Ash vein will not be mined for the present, as it is still filled with water. Resumption of work will give employment to upward of 300 men.

Lake Fidler—A fire broke out last week in this colliery, near Shamokin. It is believed that it was started by a miner's lamp coming in contact with dry timbers. The fire soon assumed serious proportions and the colliery has been closed until it can be brought under control.

South Dakota

BLACK HILLS DISTRICT

Ellipse—Diamond drilling has been discontinued until spring. Three holes have been put down, two of them over 1000 ft., to the quartzite supposed to be the same as the North Homestake at the other side of the fault.

Golden West—This company has concluded its drill prospecting, and in the spring will start a shaft. The property is in the Rochfort district.

Tennessee

Tennessee Copper—The October production of blister copper will total above 2,000,000 lb.; of this about 400,000 lb. is from outside ores, mostly from El Cobre, Cuba, shipped via Pensacola, Fla. The second 400-ton unit of the acid plant is in construction. The Burra Burra, Polk County and London mines are producing regularly. Sinking has progressed to 350 ft. at the Macpherson and a new shaft has just been started at the Eureka. Diamond drilling is being carried on at the Culchee and Bond mines. The crusher plant and bins at the quartz quarry at Austral were recently destroyed by fire but will be rebuilt at once.

Texas

GRAYSON COUNTY

J. W. Pollard, of Sherman, is developing lead deposits on the McFarland land near Wood lake.

Utah

BEAVER COUNTY

Frisco Consolidated—A body of silver-lead ore 30 in. thick has been struck in the Kruse shaft at 135 ft. This shaft is 4000 ft. northeast of the main workings.

Lead Gold and Copper—Galena ore has been encountered in the winze sunk from the tunnel level on the first vein. Drifts have run both ways on the tunnel level. J. T. Breckon is manager.

Indian Queen—The tunnel being driven to cut the lime-quartzite contact at the base of the quartzite mountain is now in 3750 ft., which gives a vertical depth of 1750 ft. A large, highly mineralized fissure has just been encountered. The tunnel will be driven 1000 ft. further before reaching the big contact. David Evans is manager.

Majestic—The new compressor and electric power plant at the Harrington-Hickory mine has been put in commission and the deep development of the mine will now be pushed. The shaft will be put down to the 600-ft. level. The water in the shaft remains stationary at the 500 level on which level work is to be continued in developing the known orebodies.

JUAB COUNTY

Grand Central—The ore zone on the 2100 level is improving and shows such similarity to the Centennial Eureka orebody that the management has decided to sink the shaft another 100 ft. to the 2200 ft. level.

Centennial Eureka—Seven men and two Burleigh drills have advanced the tunnel, which is being driven from the 550 ft. level to the County road, 250 ft. from the

north end, and as soon as the station is completed in the shaft an equal force will start from the south end.

Boston-Tintic—This old-time producer of West Tintic, closed down for a long period, has been doing development for a year and has now reëntered the shipping list.

Tintic Standard—The new shaft has reached 600 ft. The bottom is still in much-fissured ground, highly mineralized. Sinking will be continued to 700 feet.

Opohongo—This property, which is being operated through the 300-ft. level of the Black Jack mine, has opened a good body of copper ore of sufficient extent so that one carload has been shipped and the management expects to make a carload shipment every third day. William Hatfield is manager.

SALT LAKE COUNTY

Butler Liberal—At this mine of the North Utah mining company the shaft is down 95 ft., to get under the orebody being mined in the tunnel level. A crosscut will be started at the 100-ft. station. The mill is treating 100 tons of ore per day, and is turning out 15 tons of high-grade concentrates. The mill will very soon be increased to 300 tons. W. D. Bohm is manager.

SUMMIT COUNTY

Scott Hill—The Copper Apex property of this company, in the Park City district, will be developed by a tunnel which will attain a depth 200 ft. greater than the old workings.

Daly-Judge—A drift is being run to connect the drain tunnel with a back crosscut which will give easier access to the richest portion of the mine. It will also drain these workings to the tunnel level and afford better ventilation. George W. Lambourne is manager.

New York—The shaft is now down 835 ft. Underlying a body of black lime 10 ft. of iron-bearing material has been encountered which, while it is not ore, encourages the management to expect ore shortly. The shaft will be continued to 1000 ft. M. J. McGill is manager.

TOOELE COUNTY

Silver Island Coalition—This company in the new Silver Island district has 50 tons of ore sacked that will average $120 per ton. This is from a new strike. David Morrison is superintendent.

West Dip—This mine has been sampled for the Dern interests of Salt Lake. The total average of the mine is said to exceed that of the Sunshine, which the same interests have recently rejuvenated. The sliming process will also be applied here.

Daisy Combination—The Daisy and South Daisy mines, West Dip section, Mercur district, have been taken into a close corporation headed by E. S. Leaver, who was formerly manager of the Nevada-Goldfield Reduction Works. The plant used on the Sacramento tailings dump has been purchased and will be remodeled for the Daisy. The ore is a carbonate with associated talc, which has been the cause of the trouble in the former treatment. The modern slimes process will be used and it is expected to solve the difficulties.

Washington

FERRY COUNTY

The Summit Gold and Copper company will sink 50 ft. on the Railroad group. The Oversight mine has installed a hoisting plant and will resume. The Factor company is developing on First Thought hill.

OKANOGAN COUNTY

The Ruby company is installing machinery at the Ruby. The German-American company has commenced development. The Golden Chariot Company has the shaft down 234 ft. and is shipping.

STEVENS COUNTY

Windfall Mining Company—Work on the tunnel will be resumed.

Lehigh Valley Cement Company—A contract has been let for a 10,000-h.p. power plant.

SPOKANE COUNTY

Deer Park Mining Company—A concentrator has been installed and shipments will be made soon.

Wisconsin

ZINC-LEAD DISTRICT

Kohinoor-Blende—A discovery of heavy sheet jack at the 125-ft. level has been made; the pitch carries a sheet 10 to 30 in. thick. Contract for a 75-ton mill has been let to the Galena Iron Works.

Vinegar Hill—The company has begun milling at the Ellesworth mine, two miles north of Rewey.

Chicago Zinc Company—This company, prospecting on the Miller land west of the Board of Trade, has drilled through 24 ft. of jack ground.

Robert-Kickapoo—The mine at Linden has been purchased by C. R. and Dr. J. B. Hinkle, Indianapolis. A 50-ton mill will be erected.

Canada

BRITISH COLUMBIA

Granby Consolidated—The capacity of the smeltery at Grand Forks having been increased to 4000 tons per diem, the output of the mines is now proportionately larger.

Quesnel Hydraulic—A contract has been let to C. L. Morris for the construction of a ditch and flume between Swift river and Quesnel Forks, a distance of about 20 miles. The grade is easy along the greater part of the route, the chief exception being where a siphon nearly a mile in length is required. Included in the work is a dam at the intake, where the water is diverted from Swift river. The company has a large area of gold-bearing gravel in the vicinity of Quesnel Forks. Howard L. DuBois is manager.

Crow's Nest Pass Coal Company—Production at the Coal creek colliery is being increased, development work of six months having made a considerable quantity of coal accessible. J. D. Hurd is retiring as manager.

Corbin Coal and Coke Company—A large coal deposit is being opened at this company's mine in southeastern Kootenay. E. J. Roberts, Spokane, Wash., is managing director.

New Dominion—This company will pay 75 per cent. of the amount of wages owing the miners by the Old Dominion Copper Company, so the local miners' union will withdraw its opposition to a resumption of work pending payment of arrears of wages. The first mine to be operated, now that matters have been satisfactorily arranged, is the Rawhide, at Phœnix.

ONTARIO-COBALT

Ore Shipments—Shipments of ore from Cobalt camp for the week ended Oct. 30, were as follows: Cobalt Central, 46,131; Crown Reserve, 122,200; Foster, 187,800; La Rose, 278,085; McKinley-Darragh; 96,000; O'Brien, 127,358; Trethewey, 64,625; total, 1,171,120 pounds.

Trethewey—An English company has taken a contract for the balance of the treasury stock, 54,459 shares at $1.50 a share.

Silver Leaf—Two veins have been discovered in this property, now worked by the Crown Reserve.

White Reserve—This property, in the Maple Mountain district, which has been closed down for two months, commenced operations Nov. 1.

Silver Cliff—The management has decided to install a cyanide plant in connection with the new mill.

McKinnon Mines—This company's capital, $1,000,000, owning 160 acres 5½ miles northwest of Cobalt is about to begin active development. A plant has been ordered and a shaft will be put down 300 ft. Alexander McKinnon, president, is in charge and Dr. Milton L. Hersey is consulting engineer.

ONTARIO

North Ontario Reduction & Refining Company—The building erected by this company at Sturgeon Falls, but never occupied were destroyed by fire Nov. 1. Incendiarism is suspected.

Alpha Mining Company—The Ontario government has completed the payment of $130,000 to this company in accordance with the terms of the settlement by which the O'Brien company was secured in its title to the O'Brien mine. The Alpha company contested the claim and after some litigation the case was settled by confirming the title of the O'Brien company subject to a 25 per cent. royalty

cost of which the government was to pay the Alpha company $130,000. So far, the government has realized $327,000 out of the royalties in addition to the sum paid the Alpha.

NOVA SCOTIA

Dominion Coal Company—The output of this company for October amounted to 205,215 tons of coal, being a substantial gain over September. The production in October, 1908, was 262,000 tons. The company has signed a new agreement with the Provincial Workmen's Association, extending the present agreement, which expires Dec. 31, for two years longer.

Nova Scotia Steel and Coal Company—The output for October was: Steel, 7148 tons; pig iron, 5640 tons; coal, 77,130 tons. The company has struck a 30-ft. seam of solid ore on its Wabana, Newfoundland, property after tunneling for two years. The tunnel to the new seam extends 1½ miles under the sea through the Dominion Iron and Steel Company's areas.

YUKON TERRITORY

Donahue gulch, five miles below Thistle, is the scene of a discovery, and a number of claims have been staked.

Enormous areas of hydraulic and placer ground have lately been acquired by A. N. C. Treadgold, who is representing large interests. His purchases represent 25 miles of Upper Dominion creek, and three miles of Quartz creek. It is proposed to operate these holdings by means of dredges and electric lifts.

Dawson—About 20 men will work this winter on Sixty Pup. Last winter pay yielding as high as $1 or $2 a pan was found, and greater success is looked for. Extensive work is being planned on the Scroggie creek for the winter. Several tons of supplies are at the mouth of the creek and these will be freighted to the several claims with the first snow.

Yukon Gold—The company in July had 1060 men on the pay roll, and will retain 900 of these for the winter.

Lone Star Quartz—To work the quartz properties at the head of Victoria gulch, the company will next year bore a 200-ft. tunnel, and will install a 15-stamp mill to crush the ore. The company made a good showing this year.

Mexico

CHIHUAHUA

Rio Plata—The September net returns of shipments were $15,221. The crushing was 1610 tons of dry ore containing 91,387 oz. silver. The net value of silver recovered was $24,195 and operating expenses $12,633.

Cusi—The company is making a small production of concentrates. Preparatory to increased operations a wagon road is being built from San Antonio on the Chihuahua & Pacific. M. F. Crosette is manager.

La Oro—This is a new camp 40 miles north of Chihuahua and 25 miles east of Terrazas where several gold prospects are under development. The Allemana Mining Company is opening the Fortuna property and Juan Maria Salazar is exploiting the Media Fortuna and San Miguel alongside. The quartz ore assays from 1 to 2 oz. gold and from 10 to 40 oz. silver. The Allemana company, D. M. Evans, Chihuahua, manager, will purchase hoisting machinery.

New Year—This company is sending lead-silver ore from the Mojina mine 30 miles west of Gallega on the National line.

La Verde—This old property at Candemania is being operated by James Murray. High-grade lead-silver ores are mined.

Hinds Consolidated—This company, operating in the Santa Barbara camp, has resumed operations after an extended shut-down. The new manager, succeeding Otto E. Slinack, is Fred Matthews.

Propagadora—This company has been organized to exploit properties in the district of Sierra de Nombre de Dios. Luis R. Creel, Chihuahua, is president and Jose M. Salas manager.

Rio Tinto—This company at Terrazas will immediately double its smelting plant and add converters. This is a Corrigan-McKinney concern. R. B. Hutchinson, manager.

San Amada—These mines at Ocampo have been acquired by Qualey & Co. The same company may also take over the Santa Teresa mine.

Santiago—The company is to resume large scale operations in the Santa Barbara camp.

HIDALGO

Real del Monte y Pachuca—The company has been hampered owing to lack of power due to scarcity of water in the canal from which the power is generated for the camp. The report that the company has made denouncements in the El Chico camp is denied.

JALISCO

Centralia Mining Company—This company has purchased from N. C. Feitz, properties in the Hostotipaquillo district, on the San Felipe vein. S. O. Morris is manager.

Carrizo Copper Company—The company has finished paying for the mines and small concentrating plant of the Ayutla Mining Company. The concentrating plant is to be increased to 100 tons daily, and as soon as it is ready the 30 ton custom smeltery of the Carrizo company at Ayutla will be blown in.

Providencia—Ore from this copper silver property at Ayutla is being shipped to Aguascalientes smeltery. Edward Fitzpatrick is the owner.

OAXACA

Guebeshe—The mill near Ocotlan is handling a mill product formerly treated unsatisfactorily. The equipment includes two five-compartment jigs, five Cooley tables, two Johnson vanners, and a magnetic separator, besides the crushing, sizing and roasting machines. The capacity is 60 tons per day.

American Consolidated—This company, owning several Taviche properties held by the old Teresa company, recently sent a representative to Oaxaca to dispose of the properties to local interests. Two engineers are now in the field making an investigation of the Taviche and Peras properties of the company.

San Juan—On Oct. 15 the option on this property in Taviche expired. Denny Brothers made an examination which it is believed gave the favorable results but complications arose. The owners have received overtures regarding an independent option.

SONORA

Sierra de Cobre—Work on this recently acquired property has been begun by the Cananea Consolidated company.

Washington—This mine in the Arizpe district has been acquired by parties allied to the Cole-Ryan interests. Dr. L. D. Ricketts made examination of property.

Greene Cananea—The October output was 1765 tons of blister copper containing 72,575 oz. silver and 460 oz. gold.

Orizaba—High silica ore suitable for converter lining is being opened up at this property at Nacozari, owned by W. G. Melcher.

Pilares Esquina—Development on this Nacozari property, owned by Morton Lindley, of San Francisco, is being pushed vigorously. Mineralized breccia similar to that in the adjoining Pilares mine has been found. C. F. Nourse is in charge.

Los Dividendos—The property adjoining La Caridad, 10 miles east of Nacozari, has been transferred to T. W. Carter, of Silver City, New Mexico, who also has an option on the Copper Plate group between the Pilares and La Caridad.

Africa

RHODESIA

The production of metals other than gold in Rhodesia for the nine months ended Sept. 30 included 108,380 oz. silver, 67 tons copper, 735 tons lead and 12 tons tungsten ore. The production of minerals included 288 tons asbestos and 22,764 tons chrome ore. Coal output, all from the Wankie mines, was 123,998 tons.

The number of negro laborers employed at the mines in August was 30,309. The number of deaths was 143, being at the rate of 47.26 per 1000 per year.

Germany

SAXONY

Zinnstockwerk Geyersberg—This company has completed its Franz shaft at Geyer, in the Saxon Erzgebirge. The indications at the bottom of the shaft are encouraging for the discovery of other orebodies.

Metal, Mineral, Coal and Stock Markets

Current Prices, Market Conditions and Commercial Statistics of the Metals, Minerals and Mining Stocks

QUOTATIONS FROM IMPORTANT CENTERS

Coal Trade Review

New York, Nov. 10—The coal trade in the West continues to show a steady gain. Local conditions are somewhat disturbed by the rush of coal to the Lake ports, but business is good almost everywhere.

In the East the bituminous coal trade is also improving and at the present time is better than it has been for nearly two years. There is a general demand for steam coal which is putting up prices slowly.

The anthracite trade is without special incident, except the usual improvement consequent upon the approach of colder weather.

Both in the East and in the West car shortage is beginning to be felt, and there are complaints of difficulty in securing cars enough to accommodate the needed shipments.

Coke Wages—An increase in wages of miners and coke workers is to be made by the H. C. Frick Coke Company, and the independent companies will probably follow. The advance will vary from 10 to 15 per cent., and will put wages back to the standard prevailing two years ago.

Coal Traffic Notes

Coal and coke tonnages originating on Pennsylvania railroad lines east of Pittsburg and Erie, year from Jan. 1 to Oct. 30, short tons:

	1908.	1909.	Changes.
Anthracite	4,285,312	4,084,096	D. 201,216
Bituminous	27,854,121	30,495,124	I. 2,641,003
Coke	5,791,558	9,251,391	I. 3,459,833
Total	37,930,991	43,830,611	I. 5,899,620

The total increase this year to date was 15.6 per cent.

Shipments of Broad Top coal over the Huntingdon & Broad Top railroad, 10 months ending Oct. 30, were 802,233 tons in 1908, and 677,929 in 1909; decrease, 124,304 tons.

Coal passing through the locks on the Monongahela river, 10 months ended Oct. 31, was 2,794,200 short tons in 1908, and 2,984,560 in 1909; increase, 190,360 tons.

Coal tonnages originating on the Southern Railway, eight months ended Aug. 31: Tennessee district, 840,418; Alabama district, 1,525,589; total, 2,366,304 short tons, an increase of 670,081 tons over last year.

Coal tonnage passing through Sault Ste. Marie canals, season to Nov. 1, short tons:

	1908.	1909.	Changes.
Anthracite	1,024,029	1,107,097	I. 83,068
Bituminous	7,210,583	7,211,743	I. 1,160
Total	8,234,612	8,318,840	I. 84,228

There was a small increase this year, chiefly in anthracite.

Anthracite shipments in October were 5,579,759 long tons, being 1,163,629 tons more than in September, but 379,738 less than in October, 1908. For the 10 months ended Oct. 31 shipments were, in long tons:

	1908.	1909.	Changes.
Reading	10,089,009	9,556,542	D. 532,467
Lehigh Valley	9,007,476	8,234,413	D. 773,063
N. J. Central	6,945,430	6,447,448	D. 497,982
Lackawanna	8,245,273	7,753,873	D. 491,400
Del. & Hudson	5,283,699	4,980,449	D. 303,250
Pennsylvania	4,941,169	4,770,738	D. 170,431
Erie	6,152,997	6,177,290	I. 24,293
N. Y., Ont. & West.	2,332,582	2,245,894	D. 86,638
Total	52,997,585	50,166,647	D. 2,830,938

Total decrease 5.3 per cent. The Erie showed a small gain, but all the other companies report decreases.

New York

Anthracite

Nov. 10—Cold weather is in sight again, and the anthracite trade is doing fairly well, the putting in of stocks being on the increase. The work at several collieries has been delayed by scarcity of water resulting from the dry season.

Schedule prices for large sizes are unchanged at $4.75 for lump and $5 for egg, stove and chestnut, all f.o.b. New York harbor. For steam sizes quotations are: Pea, $3.10@3.25; buckwheat, $2.25@2.50; No. 2 buckwheat or rice, $1.75@2; barley, $1.35@1.50; all f.o.b. New York harbor.

Bituminous

The soft-coal market is improving all around. Eastern territory is taking more coal, and in New York harbor there is a good deal of buying. This improvement seems to extend to all the consuming territory along the coast, while all-rail trade is also as much better as transportation conditions will permit.

The car question is a serious one. There is shortage on nearly all the roads and on the Baltimore & Ohio conditions are very bad, the supply of cars being far below the needs of shippers. Transportation is slow also, owing to a short supply of locomotives, which has resulted in much delay of coal shipments.

Prices are higher, about 10c. more being asked for fair grades of steam coal, New York harbor, with an improvement also in the higher grades. Gas coal is in demand and is selling at prices which realize 90c. for ¾-in., 80c. for run-of-mine, and 70c. for slack at the mines.

In the Coastwise trade vessels are in better demand and rates have at last advanced. From New York harbor the quotation is 60c. per ton for small vessels to points around ape Cod. Philadelphia quotes 75@80c. for large vessels to Boston, Salem and Portland.

Birmingham

Nov. 8—Coal operations in Alabama are fast assuming the conditions that prevailed three years ago. There is a scarcity of labor, in fact the shortage of labor is holding back the output. Imported labor is filling the want slowly. There is a demand for every ton of coal that can be mined. The railroads are doing their best to keep the product moving, but there are not any too many cars in this section. The need for coke is steady and heavy and every coke oven in condition is being fired up. The independent coal companies are beginning to produce coke where there are ovens, too, because of the sharp demand.

An advance in wages about the coal mines will be given the first of the year.

Chicago

Nov. 8—Increasing demand, coupled with difficulty in moving consignments promptly because of lack of cars, has advanced prices generally in the coal market. Western coals, the main source of supply for steam purposes, are firm. Eastern coals, also, have shared in the advance and practically no kind of coal is weak or selling at low prices even occasionally because of too great consignments. The situation is common to both city and country trade, with domestic coals strong and yet inclined to quiet sales because of mild weather throughout Chicago territory.

Illinois and Indiana lump and egg now bring $2@3; run-of-mine sells for $1.75@1.85 and screenings—heretofore weak but now in fair demand because of shortage of shipments bring $1.15. Hardly any forced sales are being made.

Hocking continues strong, and holds up stiffly to the list price of $3.15. Smokeless is a good deal stronger than for many months and brings $3.00@3.80 for lump, with run-of-mine $3.05@3.15. Youghiogheny ¾-in. gas sells for $3.15 and Pittsburg No. 8 for $2.55 in the same size, both being quiet, minor eastern coals are unchanged. Anthracite is moving fairly, with nut in strong demand but good supply.

Cleveland

Nov. 9—All is rush and push in the Lake trade, in the effort to get all the coal possible loaded before navigation closes.

Local trade is good for both steam and domestic coals, orders being heavy.

Prices are a little firmer. No. 8 district is $2.15@2.25 for 1¼-in.; $1.95 for ¾-in.; $1.85 for run-of-mine; $1.50 for slack. Middle district, $1.90@2 for 1¼-in.; $1.80@1.85 for ¾-in.; $1.70@1.75 for run-of-mine; $1.25 for slack. Pittsburg brings $2.25@2.35 for 1¼-in.; $2@2.05 for run-of-mine; $1.40@1.50 for slack. Massillon domestic is $2.05 for lump.

Indianapolis

Nov. 7—The prospect for fall and winter coal production from Indiana mines is exceptionally good. A greater number of men are now employed than at any previous period. The wage scale and working conditions are satisfactory and there is considerable rejoicing over the outlook for steady work. A large acreage of coal land has been secured by syndicates and already arrangements have been completed to sink new shafts and develop new territory.

Pittsburg

Nov. 9—The coal market has quieted down somewhat but is still strong, and prices are fairly well maintained at $1.25@1.30 for mine-run at mine, Pittsburg district, with slack at 75c. The car shortage, of course, continues on account of the rush on Lake shipments.

Connellsville Coke—The coke market has been quiet as to contracts for next year, in both furnace and foundry coke. The furnaces are distinctly standing off, and are hardly even sounding the market as they seem to have become imbued with the idea that waiting will pay. There is probably close to 200,000 tons of furnace coke a month uncovered for the first half of the year and it is somewhat surprising, in view of the activity in the latter part of September and the fore part of October, that so little business is coming up. The operators continue firm in their views, which are clearly fixed at $2.00 for standard furnace coke for first half or all of next year. It seems evident now, however, that their price ideas are based more upon the fact that this figure has actually been obtained in several cases than it is upon a careful summing up of the prospects of supply and demand. Prompt furnace coke is in fair demand, sales having been made in the week at $2.85 and also at $2.00, and it is possible to get coke for delivery to the end of the year at $2.85. Foundry coke continues dull, and is quotable at $3@3.25 prompt, $3.25@3.50 for contracts for next year.

The *Courier* reports the production in the Connellsville and Lower Connellsville regions in the week ending Oct. 30 at 450,768 tons, a gain of 8000 tons over the previous week. Shipments at 5081 cars to Pittsburg, 848 cars to points west of Pittsburg and 856 cars to points east of Connellsville, a total of 14,121 cars.

St. Louis

Nov. 8—November is even warmer than October. This has slowed up the domestic trade to a very large extent. The rail yards which cater to the wagon trade claim that business is now absolutely at a standstill. Of course this condition has reacted on the wholesale market locally and the demand is very poor. This has caused an easing up all around and prices on the lower-grade coals have been shaded during the last week in order to keep coal moving. The only mines that are affected by the slump are those directly tributary to St. Louis.

Carterville and southern Illinois coal is higher than ever in spite of local conditions. This is due entirely to the strong demand from the Northwest. The car shortage was felt more keenly this week in southern Illinois than at any other time this year. For two days practically the entire Carterville district on the Illinois Central has been idle and it is reported that only 100 empties moved south to the mines in the last 24 hours when 1000 would not have supplied the mines. The Iron Mountain road seems to be giving the best service of any road in the district now. The railroads complain that the car shortage is partly due to the fact that the mines all have so much fine coal unmoved on track which ties up, in the aggregate, a large amount of equipment. The market on the smaller sizes is so bad that they are almost impossible to move at any price.

Standard 6-in. lump is quoted freely at $1.10 at mines, or $1.62 St. Louis; 2-in. lump is only bringing 95c., or $1.47 St. Louis. Steam nut coal is bringing 30@50c. at mines, or 72@92c. St. Louis. Screenings are being given away for the freight.

Staunton, Mt. Olive and Springfield district coals are quoted at $1.50 mine, or $1.92 St. Louis for 6-in. lump; $1.25 mine, or $1.77 St. Louis for 2-in. lump. Nut coal is bringing 85c. mine, or $1.37 St. Louis. Carterville 6-in. lump or egg is being held firm at $1.75 at mine, or $2.42 St. Louis.

Franklin county 6-in. lump is strong at $2 per ton mines, or $2.67 St. Louis. Nut is $1.50 at mines, or $2.17 St. Louis. There is very little of these coals moving into St. Louis at present, as the demand seems to be from the Northwest.

Foreign Coal Trade

United States Coal Exports—Exports of coal and coke from the United States, with coal furnished to steamships in foreign trade, nine months ended Sept. 30, long tons:

	1908.	1909.	Changes.
Anthracite	2,054,906	2,104,526	I. 49,620
Bituminous	6,574,777	7,094,754	I. 519,977
Total exports	8,629,683	9,199,280	I. 569,597
Steamer coal	4,501,509	4,583,475	I. 81,966
Total coal	13,131,192	13,782,755	I. 651,563
Coke	450,125	667,451	I. 217,326

Canada took this year 7,188,862 tons of coal, or 78.1 per cent. of the total exports. The coke went chiefly to Mexico and Canada.

United States Coal Imports—Imports of coal and coke into the United States, nine months ended Sept. 30, long tons:

	1908.	1909.	Changes.
Anthracite	15,023	3,145	D. 11,878
Bituminous	1,143,065	862,914	D. 280,151
Total coal	1,158,088	866,059	D. 292,029
Coke	87,647	131,269	I. 43,622

Canada furnished this year 720,031 tons of coal and nearly all the coke; Australia, 123,911 tons coal; Japan, 9274 tons coal. Imports are chiefly on the Pacific Coast and in the northwestern border States.

Welsh Coal Market—Messrs. Hull, Blyth & Co., London and Cardiff, Wales, report prices of coal as follows on Oct. 30: Best Welsh steam, $4.14; seconds, $3.90; thirds, $3.72; dry coals, $4.02; best Monmouthshire, $3.48; seconds, $3.36; best small steam, $2.16; seconds, $1.68. All prices are per long ton, f.o.b. shipping port, for cash in 30 days, less 2½ per cent. discount.

Iron Trade Review

New York, Nov. 10—The iron and steel trades have been comparatively quiet during the past week. Business continues on a very large scale, but the contracts recently placed are entirely sufficient to carry most buyers over the end of the year and it is quite possible that there will be a comparative lull during the coming month.

In pig iron there have been fewer transactions, but prices remain firm, and most furnaces are well sold up not only for the current year but for the first quarter of 1910. The principal demand just now is for basic pig.

In finished material the same conditions prevail for the most part. A revival of the demand for structural steel, however, is reported and there are several large contracts pending. The structural people rather look for a rush of orders for spring work.

Thee is some talk about prices of Lake Superior ores for next season, and the general feeling is that there will be an advance all round, probably 50c. per ton. No action, however, will be taken by the sellers of ore before December.

Pig Iron Production—The reports of the blast furnaces on Nov. 1, as collected by the *Iron Age*, show on that date 309 coke and anthracite furnaces in blast, having a total weekly capacity of 593,600 tons. This is an increase of 28,000 tons over the report for Oct. 1, and of 231,000 tons over Jan. 1. Making allowance for the charcoal furnaces, the estimated production of pig iron in the United States in October was 2,027,500 tons; for the 10 months ended Oct. 31 it was 20,458,500 tons.

Baltimore

Nov. 9—Exports for the week included 1514 tons steel rails to Australia; 4308 tons rails and 334 tons rail fastenings to Brazil; 1500 tons steel rails and 133 tons rail fastenings to Mexico; 117,470 lb. tin scrap to Rotterdam. Imports included 25 tons silicospiegel and 633 tons ferromanganese from Great Britain; 11,900 tons iron ore from Cuba.

Birmingham

Nov. 8—The Southern pig-iron market continues firm and while there are not many sales being booked right now the conditions are most favorable. Sales are mostly for delivery during the first half of 1910. The production is at high-water mark just now. The Tennessee company during October produced 73,158 tons of pig iron against 69,350 tons in October, 1899, the best previous record. This company mined 145,641 tons of red ore last month against 143,208 tons in September, 1909, the best previous record. The coke production went to 116,559 tons against 113,477 tons in May 1907, the best previous record. The blowing in of a furnace at Sheffield will add to the output. There is some delay reported in deliveries of iron on old orders, but this is not general.

Chicago

Nov. 8—Sales of pig iron continue quiet but well distributed and of a good sized aggregate tonnage. There is no disposition of melters to hold off or to seek a falling market; they are, indeed, inclined to press for contracts running into the last half of 1910, with the inclination of furnace agents the other way. Some contracts, however, are being made for deliveries in the third quarter, with prices about the same as for the last two or three weeks—$15 Birmingham, or $19.35 Chicago, for Southern, and $19 for Northern as standard prices on No. 2. Above and below these prices is a range of 50c., according to the desirability of the contract. Sales of Northern iron are of good volume, but irregular, so that the range of prices is somewhat greater than on Southern, but with practically the whole output of local furnaces well engaged for the next six months. Weakness on small lots for quick delivery has practically disappeared, although occasionally an odd lot is picked up for last-quarter delivery at a bargain price. The tendency is toward increasing contracts steadily for 1910 delivery into the third and fourth quarter. Melters are assured of heavy requirements from their customers.

Cleveland

Nov. 9—There is much talk about ore prices for next season, and many inquiries, but nothing definite will be done before December. An advance of at least 50c. per ton all round is generally expected.

Pig Iron—The market is rather quiet, but firm. The principal inquiry is for basic just now. Quotations are for bessemer, $19.50@19.75; basic, $17.75@18; No. 2 foundry, $18.25@18.50; gray forge $17.25@17.75; all Cleveland delivery.

Finished Material—New business is rather quiet, but deliveries are being urged. Bars are in demand and 1.75c. is quoted by mills; 1.90c. by jobbers.

Philadelphia

Nov. 10—Inquiry continues for pig iron for next year and also for early delivery, but there is not much to be had for December. Most of the call is for foundry, but some Virginia basic has been sold, and some forge iron. No. 2X foundry can be quoted $19@19.50; No. 2 plain, $18.50@19; basic, $19; gray forge, $17.75 @18. Southern iron is not being offered.

Steel Billets—Demand is active, buyers being anxious to cover for first quarter. Sales have been made at $30@31, seaboard delivery, with $2 more for forging billets.

Bars—A good business is being done, especially in refined iron, which brings 1.65@1.70c. for early delivery.

Sheets—Business is heavy and premiums have been offered for early deliveries.

Plates—Demand is heavy, and the mills are taking large orders for first quarter.

Structural Material—One or two large building contracts are noted and a number of bridge orders. Early deliveries are not to be had.

Scrap—The market is temporarily easier, but dealers are not worrying, believing they will get good prices for all they have to sell. Some foreign steel melting scrap is coming in.

Pittsburg

Nov. 9—Record-breaking outputs continue in iron and steel. The market has been quiet as to new transactions, but specifications on old contracts for finished steel continue heavy. A large tonnage of contracts expires Dec. 31, and although some of the contracts seemed to represent very optimistic views on the part of buyers at the time they were made, it appears that all the tonnage will be specified, as prices have been advancing steadily and represent good profits.

Pig Iron—The market has been quiet, but prices are firm. Anna furnace, at Struthers, O., blew in Nov. 2, leaving only two merchant furnaces out of blast in the Mahoning valley. Brier Hill and one of the Andrews & Hitchcock stacks. These will go in early in the new year, after complete rebuilding. In the Shenango valley only one merchant furnace is out, Stewart, which is being relined and will come in late this month. The market is quotable at Valley furnace, according to delivery, as follows: Bessemer, $19@19.25; basic, $17.25@17.50; No. 2 foundry, $17.25@17.75; malleable, $17.50@18; gray forge, $16.50@16.75, freight to Pittsburg being 90c. per ton.

Steel—There is scarcely any steel to be had for this year, prices being nominally: Bessemer and open-hearth billets, $27; sheet-bars, $28@29; rods, $32, all f.o.b. mill, Pittsburg district. No definite market has been established for next year as producers do not care to sell, but the trend seems to be in the direction of an advance of about $2 a ton.

Ferromanganese—The Carnegie Steel Company has purchased some ferromanganese and is expected to take more. It had bought practically no ferromanganese for several years, depending on its own production, which cannot well be increased on account for the pressure for pig iron. The ferromanganese market is trending distinctly upward, sales of prompt being made at $44, Baltimore, while next year's deliveries are generally quoted at $45, the freight to Pittsburg being $1.95 per ton.

Sheets—The market is stiff, all mills being conservative about booking additional business, and some mills have advanced asking prices, particularly on galvanized sheets. The regular market is 2.30c. on black sheets; 3.35c. on galvanized; $1.60 on painted corrugated roofing, and $2.85 on galvanized corrugated roofing.

St. Louis

Nov. 8—The pig-iron market is strong and firm this week, though it has settled down to a quieter tone than has prevailed for the last month. Last month was noted by excited buying from all quarters by these desiring to cover up shorts. Very little business has been closed this week, owing to the fact that furnaces have sold up a large percentage of their output for the first half and are holding off as better prices are anticipated. Prices on iron remain unchanged at $15@15.25 per ton Birmingham, or $18.75@19.25 St. Louis.

Metal Markets

New York, Nov. 10—The metal markets have shown more activity, especially in copper. Business is generally improving.

Gold, Silver and Platinum

UNITED STATES GOLD AND SILVER MOVEMENT

Metal.	Exports.	Imports.	Excess.
Gold			
Sept. 1909	$ 7,346,442	$ 2,450,958	Exp. $ 5,135,484
" 1908	3,971,391	4,563,051	Imp. 592,660
Year 1909	97,252,834	41,105,193	Exp. 56,167,641
" 1908	68,835,380	38,425,974	" 30,509,407
Silver			
Sept. 1909	4,485,592	3,361,497	Exp. 1,124,135
" 1908	4,198,866	3,370,971	" 827,695
Year 1909	41,289,116	31,240,530	" 10,048,586
" 1908	38,781,380	30,792,704	" 7,988,676

Exports from the port of New York week ended Nov. 6: Gold, $10,125; silver, $440,600, chiefly to London. Imports: Gold, $124,319; silver, $129,421, from Mexico, Central and South America.

Gold—The price of gold on the open market in London was 77s. 9¼d. per oz. for bars and 76s. 4¼d. per oz. for American coin. Most of the supplies arriving were taken by the Bank of England. In New York $2,000,000 was taken this week for export to South America.

Platinum—Demand continues good and advices from Russia indicate decreased supplies of the metal. Prices have been again advanced, and dealers are now asking $29.50 per oz. for refined platinum and $33.25 for hard metal.

Silver—The market advanced to 23⅜d. on China buying, but closes quiet in London at 23 5/16d., on cessation of buying orders from Chinese account.

The average price of silver in New York for October was given last week at 50.013c., through a typographical error. The correct figure is 50.923 cents.

SILVER AND STERLING EXCHANGE

Nov.	4	5	6	8	9	10
New York....	50⅝	50⅝	50⅝	50¾	50¾	50⅝
London...	23⅞	23 7/16	23⅞	23⅜	23⅜	23⅛
Sterling Ex..	4.8720	4.8710	4.8715	4.8725	4.8750	4.8730

New York quotations, cents per ounce troy, fine silver; London, pence per ounce sterling silver, 0.925 fine.

Exports of silver from London to the East, Jan. 1 to Oct. 28, as reported by Messrs. Pixley & Abell:

	1908.	1909.	Changes.
India.....	£ 8,171,813	£5,205,300	D. £2,966,513
China.....	516,400	1,555,200	I. 1,038,800
Straits.....	164,885	82,800	D. 82,085
Total.....	£ 8,853,098	£6,843,300	D. £2,009,798

Indian exchange in London, 16.04d. per rupee.

Copper, Tin, Lead and Zinc

Nov.	Copper. Lake, Cts. per lb.	Copper. Electrolytic, Cts. per lb.	Copper. London, £ per ton.	Tin. Cts. per lb.	Lead. New York, Cts. per lb.	Lead. St. Louis, Cts. per lb.	Zinc. St. Louis, Cts. per lb.
4	12⅞ @13⅛	12¾ @12⅞	57⅝	30⅛	4.35 @4.37½	4.22½ @4.27½	6.22½ @6.25
5	13 @13⅛	12¾ @13	57⅝	30⅛	4.35 @4.37½	4.22½ @4.27½	6.20 @6.25
6	13 @13⅛	12¾ @13	....	30⅛	4.35 @4.37½	4.22½ @4.27½	6.20 @6.25
8	13 @13⅛	12⅞ @13	58⅛	30⅛	4.35 @4.37½	4.22½ @4.27½	6.20 @6.25
9	13 @13⅛	12⅞ @13	58⅞	30 @30⅛	4.35 @4.37½	4.22½ @4.27½	6.20 @6.25
10	13 @13⅛	12⅞ @13	58½	30½	4.35 @4.37½	4.22½ @4.27½	6.20 @6.25

London quotations are per long ton (2240 lb.) standard copper. The New York quotations for electrolytic copper are for cakes, ingots and wirebars, and represent the bulk of the transactions made with consumers, outside New York cash. The prices of casting copper and of electrolytic cathodes are generally 0.125c. below that of electrolytic. The quotations for lead represent wholesale transactions in the open market. The quotations on spelter are for ordinary Western brands; special brands command a premium.

Imports and exports of metals will be found on page 180.

Copper—The speculative movement which started last week gained greatly in volume during the week of Nov. 4 to 10, and under the leadership of the London standard market buying continued at a very large rate both on the part of consumers and speculators. The demand was freely met by producers, who, however, have but slightly raised their prices. Some large transactions have been made at 13@13⅛c., delivered, 30 days, or a little less than 12⅞@13c., cash, New York, and plenty of copper seems to be still available at that price. Lake has sold as high as 13¼c. for some of the special brands, while good ordinary brands have sold at 13⅛c. or a little less. At the close, the market is steady at 13@13¼c. for Lake copper, and 12⅞@13c. for electrolytic copper in cakes, wirebars and ingots. Casting copper is quoted nominally at 12¾@12⅞ cents.

Copper sheets are 17@18c., base for large lots. Full extras are charged, and higher prices for small quantities. Copper wire is 14½c. base, carload lots at mill. Business is improving.

The standard market reached its highest point on Tuesday, Nov. 9, with spot at £58 17s. 6d. and three months at £60 2s. 6d. It is not surprising that after this rapid rise there should be a realizing movement, bringing about a reaction at the close to £58 10s. for spot, and £59 15s. for three months.

Refined and manufactured sorts we quote: English tough, £62 10s.; best selected, £61 10s@£62 10s; strong sheets, £73 10s.@£74 10s. per ton.

Exports of copper for the week from New York and Philadelphia were 3818 long tons. Our special correspondent gives the exports from Baltimore at 2368 tons of copper.

Copper Producers' Association—The latest report gives the following figures for October, in pounds:

	October.
Stocks, Oct. 1.....	151,472,772
U. S. production.....	124,657,709
Total supplies.....	**276,130,481**
Deliveries, domestic.....	66,359,617
Deliveries, export.....	56,261,238
Total deliveries.....	122,620,855
Stocks, Nov. 1.....	153,509,626
Inc or dec in stock.....	I. 2,036,854

Production includes all copper refined in the United States, whether from domestic or foreign material.

Tin—The London market throughout the week has been firm. This market was no doubt somewhat influenced by the advance in copper, and it is therefore natural that it should continue to act in sympathy with the copper market. The close is easier at £138 10s. for spot, and £140 12s. 6d. for three months.

Notwithstanding the firmer London market, consumers in this market did not show any interest and held off with purchases. Consumption continues at a very satisfactory rate, and no doubt sooner or later supplies will have to be replenished against orders which were taken to be executed during the next few months. The market closes at about 30½ cents.

Lead—The market has been quiet and steady at 4.22½@4.27½c. St. Louis, and 4.35@4.37½c. New York. The nominal quotation of the American Smelting and Refining Company for desilverized continues to be 4.40c. New York.

The London market is barely steady, and the close is cabled at £12 18s. 9d. for Spanish, and £13 1s. 3d. for English lead.

Spelter—The market is quiet and but little business has been done since Nov. 4. Consumers are holding off, and offerings are on a more liberal scale due to a weakening in the ore market all along the line. Prices are easier at 6.20@6.25c. St. Louis, and 6.35@6.40c. New York.

Quotations for spelter in New York, Nov. 4, were 6.37½@6.40c.; Nov. 5 to 10 inclusive, 6.35@6.40 cents.

The London market is steady at £23 5s. for good ordinaries, and £23 10s. for specials.

Our Pittsburg correspondent writes: The large advance in spelter to 6.25., East St. Louis, bears heavily on the manufacturers of galvanized sheets. It is figured, on the average prices prevailing in the last four years, that a spread of $1 per 100 lb. between black and galvanized sheets, 28 gage, corresponds to spelter at 5c., East St. Louis, and that for every ¾c. advance in spelter above 5c. the spread between black and galvanized sheets should increase 5c. per 100 lb., so that the present spread of $1.05 would correspond to 5⅜c. on spelter; while the current market of 6.25c. should call for a spread of between $1.15 and $1.20, or an advance of $2 to $3 a ton in galvanized sheets over the present market.

Other Metals

Antimony—Business has been rather dull, and prices are unchanged. Cookson's is quoted at 8⅛@8½c. per lb.; Hallett's, 8¼@8⅜c.; U. S., 7⅞@8c; outside brands, 7⅝@7¾c. per pound.

Aluminum—The price of aluminum continues unchanged at 20@23c. per lb. for ingots.

The Aluminum Company of America has filed notice at Harrisburg of a proposed increase from $3,800,000 to $20,000,000 in its capital stock.

Quicksilver—The market is very strong and continues to advance. In New York the quotation is now $52.50 per flask of 75 lb., large lots for spot delivery. For small lots 72@75c per lb. is asked by jobbers. For future deliveries $51@52 may be quoted. The London price has been again advanced, and is now £9 5s. per flask, with £9 6s 3d asked by jobbers.

Magnesium—The price of pure metal is $1.50 per lb. for 100-lb. lots f.o.b. New York.

Nickel—Large lots, contract business, 40@45c. per lb. Retail spot, from 50c. for 2000-lb. lots, up to 55c. for 500-lb. lots. The price for electrolytic is 5c. higher.

Cadmium—Current quotations are 65@70c. per lb. in 100-lb. lots at Cleveland, Ohio. In Germany 450@475 marks per 100 kg., at factory in Silesia.

Zinc and Lead Ore Markets

Platteville, Wis., Nov. 6—The highest price paid this week for zinc ore was $52 per ton; the base price, 60 per cent. zinc, was $51 per ton. The top price paid for lead ore was $59.50 per ton; the base price, 80 per cent. lead, was $56@58 per ton.

SHIPMENTS, WEEK ENDED NOV. 6.

Camps.	Zinc ore, lb.	Lead ore, lb.	Sulphur ore, lb.
Benton	650,050	65,360	185,900
Platteville	367,900	.....	332,500
Cuba City	316,020	133,230	173,275
Highland	300,600	.....	.....
Rewey	274,900	.....	.....
Galena	264,000	.....	.....
Hazel Green	252,200	.....	.....
Linden	242,160	.....	117,930
Days Siding	240,000	.....	.....
Shullsburg	210,000	.....	.....
Livingston	140,000	.....	.....
Montfort	123,000	.....	.....
Mineral Point	120,000	.....	.....
Harker	70,800	.....	.....
Buena Vista	50,000	.....	.....
Total	3,630,630	198,590	809,605
Year to Nov. 6	119,357,765	7,964,775	12,888,515

There was also shipped to the American Zinc Ore Separating Company, 147,880 lb. and to the Joplin Separator Works, 138,700 lb. zinc ore.

Joplin, Mo., Nov. 6—The highest price paid was $55 per ton, the base price ranging from $50 to $52.50 per ton of 60 per cent. zinc for zinc sulphide ores. Zinc silicate ore sold on a base of $27@29 per ton of 40 per cent. zinc, the highest being $32 per ton. The average price, all grades, was $48.30. Lead sold as high as $50 per ton, on a base offering of $54.50 per ton of 80 per cent. metal content. The average price, all grades, was lowered by increased sales of lead-carbonate ore, being $55.54 per ton.

The shipment was 6325 tons, and though a material decrease from the previous week, was 650 tons above the average weekly shipment of the 10 months of this year. The higher price level is stimulating the output of ore. Without an influx of new laborers into the district operators will very shortly be confronted with a labor problem that will increase the cost of production and lower the output of ore.

SHIPMENTS, WEEK ENDED NOV. 6.

	Zinc, lb.	Lead, lb.	Value.
Webb City-Carterville	4,269,800	658,770	$125,190
Joplin	2,742,660	253,810	76,715
Galena	729,080	74,590	20,277
Granby	689,340	4,600	13,885
Duenweg	453,600	100,710	13,638
Aurora	704,360	.....	13,574
Oronogo	514,220	.....	13,064
Prosperity	388,100	50,700	11,129
Badger	409,260	18,470	10,526
Spurgeon	330,810	81,720	8,536
Alba-Neck	334,110	.....	8,353
Zincite	214,870	8,940	5,720
Quapaw	212,690	.....	5,094
Jackson	147,350	.....	3,636
Saginaw	147,960	.....	3,025
Carthage	120,390	.....	3,020
Carl Junction	106,080	.....	2,918
Sarcoxie	134,830	.....	2,225
Totals	12,651,810	1,252,220	$340,425
45 weeks	511,946,190	76,554,300	$12,344,465

Zinc value, the week, $305,642; 45 weeks, $10,253,936
Lead value, the week, 34,783; 45 weeks, 2,090,529

MONTHLY AVERAGE PRICES.

Month.	Zinc Ore. Base Price. 1908.	Zinc Ore. Base Price. 1909.	Zinc Ore. All Ores. 1908.	Zinc Ore. All Ores. 1909.	Lead Ore. All Ores. 1908.	Lead Ore. All Ores. 1909.
January	$37.60	$41.25	$35.56	$38.46	$46.88	$52.17
February	36.63	36.94	34.92	34.37	49.72	50.50
March	36.19	37.40	34.19	34.71	49.90	50.82
April	35.40	38.63	34.08	37.01	52.47	55.63
May	34.19	40.06	33.39	37.42	56.05	56.59
June	33.06	44.15	32.07	40.35	50.48	57.52
July	34.55	43.06	31.67	41.11	59.90	53.74
August	36.53	48.25	33.42	44.54	60.34	57.60
September	37.63	47.70	34.44	44.87	54.59	56.11
October	35.95	49.50	33.28	45.75	52.63	55.02
November	39.13	.....	35.02	.....	54.53	.....
December	42.75	.....	39.63	.....	49.68	.....
Year	$36.63	.....	$34.31	.....	$53.93	.....

NOTE—Under zinc ore the first two columns give base prices for 60 per cent. zinc ore; the second two the average for all ores sold. Lead ore prices are the average for all ores sold.

Chemicals

New York, Nov. 10—Contract deliveries continue on a fair scale and spot business shows an improvement in several lines.

Copper Sulphate—The market is steady on a fair business. Prices are unchanged at $3.95 per 100 lb., for carload lots and $4.25 per 100 lb. for smaller shipments.

Arsenic—Trade is improving slightly, but is still rather quiet. Prices are unchanged, white arsenic bringing 2.70@2.75c. per lb. for spot, and 2.87½c. per lb. for futures.

Nitrate of Soda—Messrs. Mortimer & Wisner, New York, report the position of nitrate in the United States, Nov. 1, as below, in long tons:

	1908.	1909.	Changes.
Stocks, Jan. 1	5,900	9,140	I. 3,240
Imports 10 months	242,950	282,350	I. 39,400
Total supplies	248,850	291,490	I. 42,640
Deliveries 10 months	235,850	275,440	I. 39,590
Stocks, Nov. 1	13,000	16,050	I. 3,050
Afloat for U. S.	60,000	80,000	I. 20,000

Quantities afloat include all cargoes due to arrive at United States ports by Feb. 15 next.

Current quotations are unchanged at 2 10c. per lb. for both spot and futures. These are for the ordinary 95 per cent. grade; for 96 per cent., 5c. per 100 lb. more is asked.

Imports and Exports—Imports and exports of chemicals and raw materials in the United States, nine months ended Sept. 30:

	Imports.	Exports.	Excess.
Copper sulph. lb.	2,183,559	.....	I. 2,183,559
Bleach, lb.	64,330,838	13,964	I. 64,316,874
Potash salts, lb.	273,060,927	1,878,974	I. 271,211,953
Soda salts, lb.	11,898,711	510,810	I. 11,387,901
Acetate lime, lb.	.....	53,777,557	E. 53,777,557
Nit. of soda, tons	282,901	6,460	I. 276,441
Phosphates, tons	16,877	843,206	E. 826,329
Sulphur, tons	26,912	26,094	E. 5,182
Pyrites, tons	511,750	.....	I. 511,750
Magnesite, lb.	40,107,385	323,675	I. 39,783,710

Estimating sulphur contents of pyrites, total imports of sulphur this year were 225,612 tons. Exports include reëxports of foreign material. Magnesite figures are for three months only, July to September, inclusive.

Mining Stocks

New York, Nov. 10—On the general stock markets the course of prices has again been rather irregular on a large volume of trading. The market is still mainly in progressional hands. Some recessions last week were followed by a recovery yesterday, but upon the whole speculation is being rather discouraged by higher rates for money. Steel Corporation issues have been quieter but Amalgamated Copper was a strong feature.

There were some sales of Homestake of South Dakota during the week at $88 @ 86.25 per share.

The Curb market was active during the week, but rather irregular in quotations. A strong upward movement in copper stocks has been the feature of the past few days. The Cobalt stocks were rather in demand, but prices varied slightly on most issues.

Boston, Nov. 9—Copper shares had quite a smart rise last week on the reports that a combination of some sort was pending among certain well known copper-producing interests. Amalgamated has been the leader and after a long sustained advance it touched $89.75. Activity at first was in the socalled Cole-Ryan, Guggenheim stocks, but later shifted to the Lake Superior issues. A reaction set in today which wiped out a part of the gains, but public sentiment is optimistic regarding mining shares and the belief is becoming more general that before the Winter is through a good sized boiling market for coppers will be witnessed.

Prominent among the advances were Butte Coalition, which rose $2.75 to $30.75, with subsequent setback to $29.62½. Greene-Cananea rose to $12.37½ and Nevada Consolidated rose $2.50 to $27.75. Giroux rose to $10.37½ and Miami to $17.50; rights for the latter company's convertible bond issue were quoted at 50c. today. Superior Copper was the leader in the Lake Superior group and easily mounted to $60, against a close at $38.25 a week back; it reacted to $62.75 today on profit taking. Lake Copper had a $2.87½ advance to $30.37½ on knowledge that a shipment of ore had been made to the Franklin mill for a test.

North Butte acts very peculiarly and seems to be under pressure when any strength is shown. It stiffened $2.25 to $61.25 during the week but lost most of it.

Curb trading has been animated, particularly in the Ely stocks. Ely Central furnished the sensation of the week by its drop from above $1 to $1, due to the exposé in the JOURNAL of last week.

STATISTICS OF COPPER

Month.	United States Product'n.	Deliveries, Domestic.	Deliveries for Export.
I	112,135,200	51,862,624	38,499,797
II	103,700,817	43,578,118	30,968,496
III	117,058,661	48,871,964	59,191,043
IV	113,574,292	47,546,010	65,110,111
V	118,356,146	61,163,325	70,542,753
VI	116,567,493	60,591,116	70,966,457
VII	118,277,603	75,520,083	75,018,974
VIII	120,597,234	59,614,207	48,382,704
IX	118,023,139	52,105,955	50,077,777
X	124,957,709	66,359,617	56,261,238
XI	....	....	....
XII	....	....	....

VISIBLE STOCKS.

	United States.	Europe.	Total.
I	122,357,266	124,716,480	247,073,746
II	144,130,045	118,574,400	262,704,445
III	173,284,248	117,140,800	290,425,048
IV	182,279,902	115,024,000	297,303,902
V	183,198,073	114,050,320	297,248,393
VI	169,848,141	127,352,960	297,201,101
VII	154,858,061	150,928,960	305,787,021
VIII	122,596,607	171,492,160	294,088,767
IX	135,196,930	197,993,600	333,190,530
X	151,472,772	210,224,000	361,696,772
XI	153,509,626	222,566,400	376,076,026
XII	....	....	....

Figures are in pounds of fine copper. U. S. production includes all copper refined in this country, both from domestic and imported material. Visible stocks are those reported on the last day of each month, as brought over from the preceding month.

Monthly Average Prices of Metals

SILVER

Month.	New York. 1908.	New York. 1909.	London. 1908.	London. 1909.
January	55.678	51.750	25.738	23.834
February	[illegible]	51.472	[illegible]	23.706
March	[illegible]	[illegible]	[illegible]	23.227
April	[illegible]	[illegible]	[illegible]	23.708
May	[illegible]	[illegible]	[illegible]	[illegible]
June	[illegible]	[illegible]	24.570	24.10[illegible]
July	[illegible]	[illegible]	24.514	23.519
August	[illegible]	[illegible]	[illegible]	[illegible]
September	[illegible]	[illegible]	[illegible]	23.743
October	[illegible]	[illegible]	[illegible]	23.502
November	49.647	......	[illegible]	......
December	48.766	......	[illegible]	
Total	52.864	......	24.402	......

New York, cents per fine ounce; London, pence per standard ounce.

COPPER

	NEW YORK Electrolytic 1908	NEW YORK Electrolytic 1909	NEW YORK Lake 1908	NEW YORK Lake 1909	LONDON 1908	LONDON 1909
January	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]
February	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]
March	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]
April	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]
May	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]
June	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]
July	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]
August	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]
September	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]
October	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]
November	[illegible]	......	[illegible]	......	[illegible]	....
December	14.1[illegible]	...	14.411	...	[illegible]	...
Year	13.208	...	[illegible]		[illegible]	

New York, cents per pound. Electrolytic is for cakes, ingots or wirebars. London, pounds sterling, per long ton of standard copper.

TIN AT NEW YORK

Month.	1908.	1909.	Month.	1908.	1909.
January	[illegible]	[illegible]	July	29.207	[illegible]
February	[illegible]	[illegible]	August	29.942	[illegible]
March	[illegible]	[illegible]	September	[illegible]	[illegible]
April	[illegible]	[illegible]	October	29.444	30.475
May	[illegible]	[illegible]	November	[illegible]	....
June	28.024	[illegible]	December	[illegible]	....
			Av. year	29.465	....

Prices are in cents per pound.

LEAD

Month	New York. 1909.	New York. 1909.	St. Louis 1909.	London. 1908.	London. 1909.
January	[illegible]	4.175	4.025	14.469	13.113
February	[illegible]	4.018	3.868	14.250	13.313
March	[illegible]	3.986	3.835	13.975	13.438
April	3.993	4.168	4.051	13.469	13.297
May	[illegible]	4.287	4.214	12.938	13.225
June	4.466	4.350	4.291	12.600	13.031
July	4.744	4.321	4.188	13.000	12.563
August	4.580	4.363	4.227	13.375	12.475
September	4.515	4.342	4.215	13.125	12.781
October	[illegible]	4.341	4.215	13.375	13.175
November	4.330	......	......	13.538	...
December	4.213	......	......	13.166	..
Year	4.200	......	......	13.439	..

New York and St. Louis, cents per pound. London, pounds sterling per long ton.

SPELTER

Month.	New York. 1908.	New York. 1909.	St. Louis. 1908.	St. Louis. 1909.	London. 1908.	London. 1909.
January	4.518	5.141	4.363	4.991	20.563	21.225
February	4.788	4.880	4.638	4.739	20.875	21.563
March	4.665	4.757	4.527	4.607	21.075	21.438
April	4.645	4.965	4.495	4.815	21.344	21.531
May	4.608	5.124	4.458	4.974	19.906	21.975
June	4.543	5.402	4.393	5.252	19.000	22.000
July	4.485	5.402	4.338	5.252	19.031	21.969
August	4.702	5.729	4.556	5.579	19.450	22.125
September	4.769	5.796	4.619	5.646	19.563	22.906
October	4.801	6.199	4.651	6.043	19.750	23.200
November	5.059	......	4.909	......	20.875	...
December	5.137	......	4.987	......	20.625	...
Year	4.726	......	4.578	.....	20.163	....

New York and St. Louis, cents per pound. London, pounds sterling per long ton.

STOCK QUOTATIONS

NEW YORK Nov. 10

Name of Comp.	Clg.
Alaska Mine	‡.11
Amalgamated	87
Anaconda	48[illegible]
Balaklala	‡2[illegible]
British Col. Cop.	7[illegible]
Buffalo Mines	3[illegible]
Butte Coalition	2[illegible]
Colonial Silver	[illegible]
Cum. Ely Mining	8[illegible]
Davis Daly	6
Dominion Cop.	7
Douglas Copper	1
El Rayo	2½
Florence	2[illegible]
Foster Cobalt	‡.32
Furnace Creek	‡.05
Giroux	10
Gold Hill	[illegible]
Goldfield Con.	7[illegible]
Granby	‡95
Greene Gold	1[illegible]
Greene G. & S.	‡[illegible]
Guanajuato	2
Guggen. Exp.	222
Hanapah	‡15
Kerr Lake	8[illegible]
McKinley Dar.	‡.8[illegible]
Miami Copper	17[illegible]
[illegible]	[illegible]
[illegible]	[illegible]
[illegible]	16[illegible]
[illegible]	1
Nev. Utah M. & S.	[illegible]
Newhouse M. & S.	[illegible]
Nipissing Mines	1[illegible]
[illegible]	[illegible]
[illegible]	[illegible]
Stewart	[illegible]
Tennessee Copper	[illegible]
Tri-Bullion	1
[illegible]	[illegible]
Utah Apex	[illegible]
Utah Copper	[illegible]
Yukon Gold	5[illegible]

‡Last quotation.

BOSTON Nov. 10

Name of Comp.	Clg.
Adventure	4
Allouez	59[illegible]
Am. Zinc	37[illegible]
Arcadian	4
Arizona Com.	45
Atlantic	11
Boston Con.	14[illegible]
Calumet & Ariz.	101½
Calumet & Hecla	665
Centennial	39[illegible]
Copper Range	80[illegible]
Daly West	7[illegible]
East Butte	11[illegible]
Franklin	17
Greene Can.	11[illegible]
Hancock	11½
Isle Royal	2[illegible]
Keweenaw	2[illegible]
La Salle	1[illegible]
Mass	[illegible]
Michigan	6[illegible]
Mohawk	60
Nevada	27[illegible]
North Butte	[illegible]
[illegible]	[illegible]
Old Colony	‡50
Old Dominion	5[illegible]
Osceola	1[illegible]
Parrot	28[illegible]
Quincy	8[illegible]
Rhode Island	[illegible]
Shannon	1[illegible]
Superior	62[illegible]
Superior & Bost.	1[illegible]
Superior & Pitts.	16[illegible]
Tamarack	66
Trinity	11
U. S. Smg. & Ref.	54
U. S. Sm. & Re. pd.	52
Utah Con.	44[illegible]
Victoria	[illegible]
Winona	7
Wolverine	150
Wyandotte	2[illegible]

‡Last quotation.

N. Y. INDUSTRIAL

Am. Agri. Chem.	48¾
Am. Smelt. & Ref.	97[illegible]
Am. Sm. & Ref., pf.	112
Colo. Fuel & Iron.	48¼
Federal M. & S., pf.	‡80
National Lead	88
National Lead, pf.	‡110
Pittsburg Coal	27[illegible]
Republic I. & S.	47
Republic I. & S., pf.	106
Sloss-Sheffield	‡92
Standard Oil	‡685
U. S. Steel	89[illegible]
U. S. Steel, pf.	126½
Va. Car. Chem.	49

BOSTON CURB	Low.
Ahmeek	210
Chemung	‡16½
Chino	8¾
Gila	7¼
Indiana	6¼
Mason Valley	1⅞
Ray Central	2⅜
Ray Con.	‡19
San Antonio	‡8⅛
Yuma	‡1½

Furnished by Hornblower & Weeks, N. Y.

ST. LOUIS Nov. 6

N. of Com.	High.	Low.
Adams	.40	.30
Am. Nettie	.10	.07
Center Cr'k	1.80	1.60
Cent. C. & C.	86.50	85.00
C. C. & C. pf	85.00	84.00
Cent. Oil	110.00	100.00
Columbia	9.00	7.00
Con. Coal	18.00	16.00
Doe Run	115.00	105.00
Gra. Bimet.	.30	.25
St. Joe	12.50	11.00

LONDON Nov. 10

Name of Com.	Clg.
Dolores	£1 10s 0d
Stratton's Ind.	0 3 3
Camp Bird	1 9 3
Esperanza	2 19 6
Tomboy	1 9 0
El Oro	1 6 0
Oroville	0 11 3

Cabled through Wm. P. Bonbright & Co., N. Y.

NEVADA STOCKS. Nov. 10.
Furnished by Weir Bros. & Co., New York.

Name of Comp.	Bid.
COMSTOCK STOCKS	
Belcher	1.05
Best & Belcher	.55
Caledonia	.35
Chollar	.20
Comstock	‡.33
Con. Cal. & Va.	.88
Crown Point	.98
Exchequer	‡.43
Gould & Curry	.28
Hale & Norcross	.32
Mexican	1.20
Ophir	1.32
Overman	.44
Potosi	‡.40
Savage	.41
Sierra Nevada	.42
Union	.56
Utah	.09
Yellow Jacket	.98
TONOPAH STOCKS	
Belmont	.65
Extension	.47
Golden Anchor	...
Jim Butler	.11
MacNamara	.23
Midway	.13
Montana	.70
North Star	.02
Tonop'h Mine of N.	6.50
West End Con.	21
GOLDF'D STOCKS	
Adams	.01
Atlanta	.10
Blue Bell	.02
Booth	.09
C.O.D. Con.	.06
Columbia Mt.	.06
Comb. Frac.	.50
Cracker Jack	.01
Dia'dfield B. B. C.	.01
Florence	2.50
Goldfield Belmont	.04
Goldfield Daisy	.06
Great Bend	.03
Jumbo Extension	.12
Kendall	.02
Lone Star	.02
May Queen	.04
Oro	.03
Red Hill	.03
Sandstorm	.05

Name of Comp.	Bid.
Silver Pick	.09
St. Ives	.05
Triangle	.01
BULLFROG STOCKS	
Gibraltar	.02
Homestake King.	‡.01
Mont. Shoshone C.	1.00
Tramp Cons.	.04
MISCELLANEOUS	
Cumberland Ely.	8.37½
Giroux	9.87½
Greenwa'r Copper	.08
Nevada Con.	27.50
Nevada Hills	.70
Navada Smelting.	.75
Nevada Wonder	.50
Nevada-Utah	1.12
Penn-Wyoming	.
Pittsburgh S. Pk.	.69
Ray Central	2.25
Ray Con.	18.75
Round Mt. Sphinx	.05

COLO. SPRINGS Nov. 5

Name of Comp.	Clg.
Acacia	.07
C. C. Con.	‡.03
Doctor	.08
Elkton	.72
El Paso	.59
Findlay	.09¼
Gold Dollar	‡.14
Gold Sovereign	‡.04
Isabella	.18
Jack Pot	‡.08½
Jennie Sample	.07¾
Jerry Johnson	.06[illegible]
Lexington	‡.01¾
Mary McKinney	.46½
Old Gold	‡.04
Pharmacist	.03[illegible]
Portland	.82[illegible]
U. G. M.	.08
Vindicator	.72½
Work	‡.06

Assessments

Company	Delinq.	Sale.	Amt.
Alpha, Nev.	Nov. 11	Dec. 7	$0.05
Belcher, Nev.	Nov. 9	Nov. 30	0.10
Challenge, Nev.	Nov. 8	Dec. 1	0.10
Copper Chief, Utah	Oct. 30	Nov. 22	0.001
Crown Point, Nev.	Nov. 30	Dec. 20	0.10
[illegible], Utah	Sept. 15	Nov. 15	0.0025
Gould & Curry, Nev.	Oct. 28	Nov. 17	0.10
Hypotheek, Ida.	Sept. 30	Dec. 1	0.005
[illegible], Ida.	Oct. 23	Nov. 15	0.01
[illegible], Ida.	Oct. 30	Nov. 30	0.002
[illegible] Copper, Ida.	Oct. 4	Dec. 6	0.01
Overman, Nev.	Nov. 9	Nov. 30	0.10
Potosi, Nev.	Nov. 12	Dec. 6	0.10
San Antonio Copper, Mex.	Dec. 1		1.00
Savage, Nev.	Nov. 10	Dec. 1	0.10
[illegible] M. & M., Ida.	Nov. 20	Dec. 20	0.002
[illegible], Utah	Oct. 7	Nov. 15	0.025
[illegible] M. & M., Ida.	Nov. 20	Dec. 14	0.002
[illegible], Ida.	Sept. 21	Nov. 20	0.001
Utah, Nev.	Oct. 26	Nov. 16	0.05
Yellow Jacket, Nev.	Nov. 18	Dec. 22	0.10

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Mining Coal in Southern Colorado

The Carbon Coal and Coke Company Is Operating a Model Plant at Cokedale. Advanced Systems of Sprinkling and Short Firing in Use

BY KENNETH S. GUITERMAN*

The coking-coal producing measures of Colorado are located principally in the Spanish-Peaks quadrangle. This quadrangle occupies the territory bounded by the meridians 104 deg. 30 min. and 105 deg., and by the parallels 37 deg. and 37 deg. 30 min., and with the exception of 28 square miles in Huerfano county, lies in Las Animas county. Of the 950 square miles comprising this quadrangle, 495 square miles contain coal measures of industrial importance. The seams which are worked by the Carbon Coal & Coke Company are situated in Reilly cañon. This cañon is about seven miles southwest of Trinidad.

Geology

The main facts in the following geological description have been taken from the "Geological Folio of the Spanish-Peaks Quadrangle." The coal bearing measures of this quadrangle of economic importance lie between the Trinidad sandstone and the Laramie series of the upper Cretaceous period. The Trinidad formation consists of a basal zone of thin-bedded, fine-grained sandstone separated by thinner partings of shale varying from 3 in. in thickness to 4 or 5 ft. at the base. This lower zone has a thickness of from 70 to 75 ft. in the vicinity of Trinidad, but shows about 90 ft. at the northern boundary.

The upper zone consists of 80 ft. of massive, light gray sandstone, capped by a few feet of brown sandstone. The Laramie series lie above this for a variable thickness. Along the southwest border of the quadrangle nearest the Baton mountains, it is 2000 ft. thick. This thickness, however, is much less in the northern portion, becoming about 1500 ft. at the boundary.

The coal from which the present output is derived in the Spanish-Peaks quadrangle lies within 150 ft. of the base of the Laramie. The seams throughout this series number no fewer than 30, but most of them are only 3 to 12 in. thick and lack continuity. These are, therefore, of little economic value. One of the accompanying figures shows a representative drill-hole section of the formation on the Carbon Coal and Coke Company's property in their present workings. The seams lie with very little dip, the maximum being along the outcrop, where it varies from 3 to 7 degrees.

Owing to the volcanic nature of the country, considerable natural coke is found, this being noticeable along the sides of Reilly cañon where a large portion of the outcrop is natural coke. This crop coal and natural coke is, however, much weathered and dirty and of no value.

The coal in the south of the quadrangle is highly coking in contradistinction to that in the northern portion, which is only semi-coking. Like other coals in this vicinity, however, it contains two or three streaks of bone and needs washing prior to treatment in the coke ovens. It is noted for the perfection of its faces and the ease with which it breaks in large rectangular blocks.

The average composition of the coal on the Carbon Coal and Coke Company's property as mined is as follows: Fixed carbon, 47; volatile matter, 27.5; moisture, 1.5; ash, 23.

FIG. 1. COKE OVENS AND SURFACE PLANT OF THE CARBON COAL AND COKE COMPANY IN COLORADO

The coke made from the washed material from this coal carries 18.5 per cent. ash, and has the high specific gravity of 1.10 to 1.15.

The plant of the Carbon Coal and Coke Company is admirably situated for the rapid and economic mining of the coal and the production of coke. The mine itself is far above water level, which renders extensive pumping machinery and hoisting apparatus unnecessary.

Mining

The method of mining that is practised here is what is known as the double entry, room and pillar system, with robbing on

retreat. Double entries are driven from the crop to facilitate ventilation and haulage. The main entries run north and south and are face entries, owing to the fact that they are driven across the faces of the coal. As far as possible no rooms are opened from these entries as but rooms offer greater difficulty to the rapid and economical removal of the coal than face rooms. In driving the entries, crosscuts are turned every 100 ft., in order to provide ample ventilation for the men. These crosscuts are gobbed up as the entry work proceeds further and new ones are driven. By so doing, a current of air is always passing up one entry and down another. From the north and south entries, the east and west entries are driven, and from these latter rooms are turned off at 45-ft. centers. The room necks are 10 ft. wide and the rooms 20 ft. Crosscuts are driven between adjoining rooms as the work proceeds for the purpose of ventilation.

High Recovery of Coal

While the rooms are being opened from one east and west entry, others are opened from an adjacent entry, so that the two sets of rooms meet in the center. When this has been accomplished, the work of retreating is commenced and the pillars are robbed, letting the roof cave in as the work progresses. The result of this national system is that over 90 per cent. of the coal is recovered in mining.

As the coal is mined it is hauled by mules in pit cars to what is known as the "main parting." There the cars are left until at least 30 have accumulated. The cars are then attached to the main rope of the main hoist and the entire trip is brought to the shaft bottom. The empties, which in the meantime have accumulated here, are then attached to the fall rope and hauled back to the "main parting." Mule teams distribute them from here to the various rooms. For this work there are 13 drivers employed, each of whom handles from 6 to 12 cars, depending upon the length of the pull. Each trip to and from the rooms consists of three cars which are distributed one car at a time to each room. By this system one driver will handle the coal mined by about 18 to 20 men, and will average about 100 tons per day.

The ventilation of the mine is accomplished by a double-inlet, reversible Clifford-Capell fan 15x7 ft. direct connected to an Erie engine 19x18 in., placed at the end of the first north entry just west of the boiler house. This fan has a rated capacity of 225,000 cu.ft. per min. against ¾ in. water-gage pressure at 175 r.p.m.; this system provides a splendid circulation of air throughout the entire mine.

Special Inspectors are Employed

The workings are remarkably free from gas as well as dust, but nevertheless the greatest precautions are taken to prevent accidents. By 6 o'clock every morning, before any miners are permitted to enter the mine, the fire boss has made a thorough inspection with a safety lamp and then reports to the mine foreman concerning the conditions that he found on making his tour. Should any gassy places be found no miners are allowed to work there until the gas has been thoroughly removed. A particular pattern covering the safety of the coal miners at this property is the employment of two inspectors, whose sole duty it is to cover the mine continually during working hours and inspect working conditions in rooms and entries and pass on the state of the roof and walls. No miners are allowed to work in dangerous places nor are they permitted to do anything which is reasonably endanger the safety of others.

In the near future an electric shot-firing system and also a sprinkling system will be installed. A plan of the former proposed systems is shown on the accompanying drawing. At present all shots are fired by hand. For this purpose there are employed four shot-firers and four helpers. These men enter the mine about 6 o'clock p.m. after the miners have left, and start loading the drill holes which have been bored by the miners during the day. The powder, etc., used is charged to the miners who have drilled the holes. On leaving the rooms, where they have been working, the miners mark up on a board their respective check numbers as well as the number of holes they desire to be loaded. The shot-firers alone handle the powder and at all times are the judges as to whether the holes shall be charged or not and how they shall be loaded. When all the holes in one room have been charged, the firers go on to the next room, at the same time lighting the fuses. They are thus able to judge as to whether all the shots have been fired and of the effects of the shots. In this way, all shots are tried. These often number as many as 175 in a night. During the firing no other men are allowed in the mine.

As there is not much water in the mine an extensive pumping plant is required. There is, however, one main pump having a capacity of 80 to 90 gal. per min. which draws water from one large collecting sump. This pump is electrically driven and will be used in conjunction with another for the sprinkling system to be installed later on.

The Method of Checking

The method of checking in the men is a most thorough and comprehensive one. All men enter and leave the mine through the check house. As each man is employed, he has issued to him a special

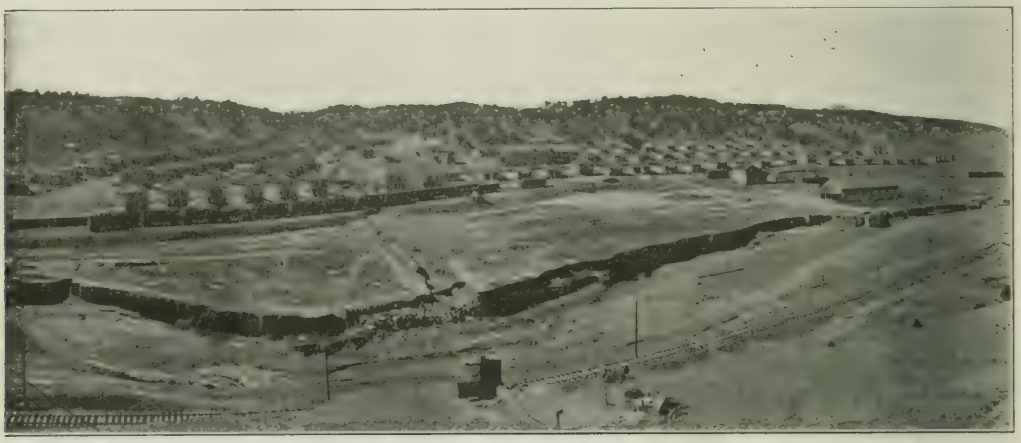


FIG. 2. SHOWING TOWN OF COKEDALE, COMPANY STORE AND OFFICE BUILDING. THIS VIEW IS A CONTINUATION OF THE PHOTOGRAPH SHOWN IN FIG. 1

check number. This is done from the main office. He is then given a brass check with his number and he is supposed to keep this with him at all times while in the mine. At the check house there is kept a description of the man. When the miner is out of the mine his brass check is kept hanging over this identification card. When the man reports for work in the morning he passes through the check house and is given a brass check, which he must return to the check-house keeper on leaving the mine. He then goes to another check board at the mine mouth and takes from it ten iron checks having his number stamped on them. Each of these iron checks he places in a car of coal as he loads it. When this coal is weighed at the tipple the weighmaster secures the check from the car and at once marks up the net weight of the coal under the man's check number on the weigh sheet. In the evening the weighmaster returns to the checkmaster all the iron checks together with a carbon copy of the weigh sheet. This sheet is posted on a board outside of the check house for the men's inspection and the checks are returned to the check board. The number of checks for each number should correspond to the number of cars of coal mined by the man having that number. This gives a check on the weighmaster's report.

A careful record is kept of all supplies, timber, etc., taken into the mine and a charge is made against each man taking them in. The failure of any miner to properly timber a dangerous place pointed out by an inspector or the foreman means dismissal or suspension for a time.

An emergency room is located in the mine and is well equipped for accidents. This room is connected with other parts of the plant by telephone.

As the coal lies very nearly horizontal throughout the mine, there are few steep pitches. Nevertheless the greatest care is used to obtain the most suitable grades for hauling, the maximum being 1.20 per cent. at any portion of the main haulage ways.

The giant powder, caps, etc., are stored in two magazines located on the hillside. The main magazine is used only for a storehouse. From this the supply for the smaller magazine is obtained. In the latter the powder is thawed in cold weather by an electric heater and it is from this magazine that it is taken into the mine. Both large and small magazines are built entirely of stone, cement and iron, rendering them absolutely fireproof.

The labor distribution of the mine is shown by an accompanying diagram. There are constantly employed one track-layer and helper, one timberman and helper and two to three gangs of laborers under local foremen. The mining and entry work are carried on under contract system, that is, by fixed payment for coal tonnage and yardage.

Coal Washing Plant

The coal-washing plant is one of the simplest and best of its kind in the West and gives most satisfactory results. The accompanying drawing gives an idea of its construction.

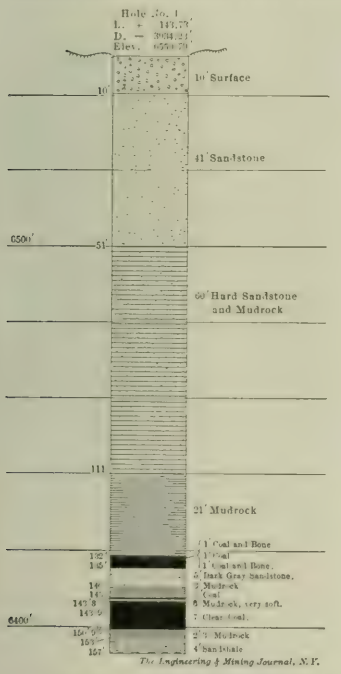


FIG. 3. SECTION THROUGH COAL MEASURES

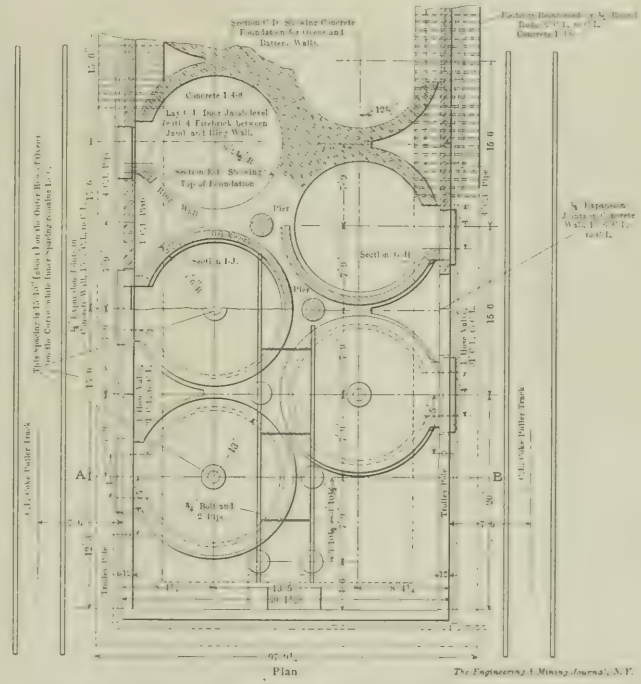


FIG. 4. PLAN SHOWING ARRANGEMENT AND CONSTRUCTION OF COKE OVENS

From the slope mouth the loaded cars are hauled by means of a chain-haul to the tipple. Here the car is automatically released from the chain-haul and rolls down a slight incline toward the dumping device. While on this incline the car first

DIAGRAM SHOWING LABOR DISTRIBUTION

MINE FOREMAN

Two Inspectors	Fire Boss	Pit Boss	Driver Boss
		Track Layers Timbermen and Laborers	Station Tenders Rope Rider Drivers

passes through a braking device so that the velocity of the car is reduced sufficiently to allow of its being automatically weighed. The scale is of the Fairbanks self registering dial type and is placed immediately after the braking device. The cars have a net weight of 2000 lb. and the scale is previously counterbalanced for this weight. As each car passes over the platform the dial registers the net weight of the coal. This weight is recorded by the weighmaster as has been already mentioned.

The car then runs on to a crossover dump and is stopped before reaching the end by a boy with a sprag. The coal is then dumped and the iron check removed from the car. This check is tossed to the weighmaster for registration. After the car has been dumped, it rests until the next car runs into it and pushes it along.

The empty car then runs down an incline and is automatically switched to another incline running in the opposite direction. This can be clearly seen in plate No. [illegible]. At the lower end of this incline is a gripping device which holds the car until it is caught by the chain haul by which it is taken again to the slope mouth.

At the dump is stationed an inspector or trade-boss who informs the weighmaster if the car is in bad order. The dumper controls the chain-haul and is notified by the ringing of an electric bell should it be [illegible] for any [illegible] to stop the haul.

From the car the coal drops into a bin having a capacity of 50 tons. This bin has a gate and star feed at the bottom which feeds into a Jeffrey crusher. This reduces the size to about 2½ in. in diameter. Falling from this crusher the coal drops to the boot of a continuous bucket elevator. This carries the coal to the top of the building where it is first discharged to a scraper conveyer and then by means of hand gates drops into storage bins. These bins have a capacity of about 1200 tons. From these bins the coal is now fed to a Robbins belt conveyer through hand gates. This conveyer delivers the coal to a cutter operated by hand and by means of which a sample is cut out. A portion of the entire coal stream is cut out here every 10 min. for the sample. During periods of intermission the coal drops through a chute to a grizzly. All the coal of ¾ in. size or under drops through this grizzly, while the oversize drops through a chute to a pair of rolls set at 1 in. aperture. After passing through these rolls the coal unites with that which passes through the grizzly in a bin directly underneath. The sample is quartered down at the end of the day's run to about 50 lb. and is then taken to the laboratory for analysis.

From the crushed coal bin the coal passes through three gates and star feeds into three modified Pittsburg jigs. These jigs operate on a 1 in. stroke, and at a speed of 24 per minute. The jigs separate the coal into two products: (1) headings, (2) tailings.

The headings from the jigs Nos. 1 and 2 pass to a screw conveyer which delivers the washed slack to the boot of a bucket conveyer. The buckets of this elevator have perforations to allow as much water as possible to drain out. This is elevator No. 1. The headings from jig No. 3 pass at once to the boot of a similar elevator, No. 2.

Both of these elevators deliver the washed slack to a scraper conveyer. This conveyer distributes the coal with the aid of hand gates into the five compartments of the washed slack bin.

The tailings from these jigs pass through a slate gate and to another screw conveyer which delivers them to a bin behind jig No. 4, which is known as the primary rewash jig. The quantity of tailings passing through the slate gate is so regulated by hand as to maintain a bed of 8-in. thickness. To aid the jig tender in accomplishing this, the jigs are provided with indicators of local design and with gates of special construction.

Returning again to the tailings deposited in the bin behind jig No. 4. These tailings pass through a gate and feed this jig. The jig has 24 six-inch strokes per minute. This jig likewise separates the coal into two products, heads and tailings.

The headings wash over and to a plate and by means of a short scraper elevator are delivered to jig No. 5. The tailings, which are rock, pass out through a hopper and into the boot of the refuse

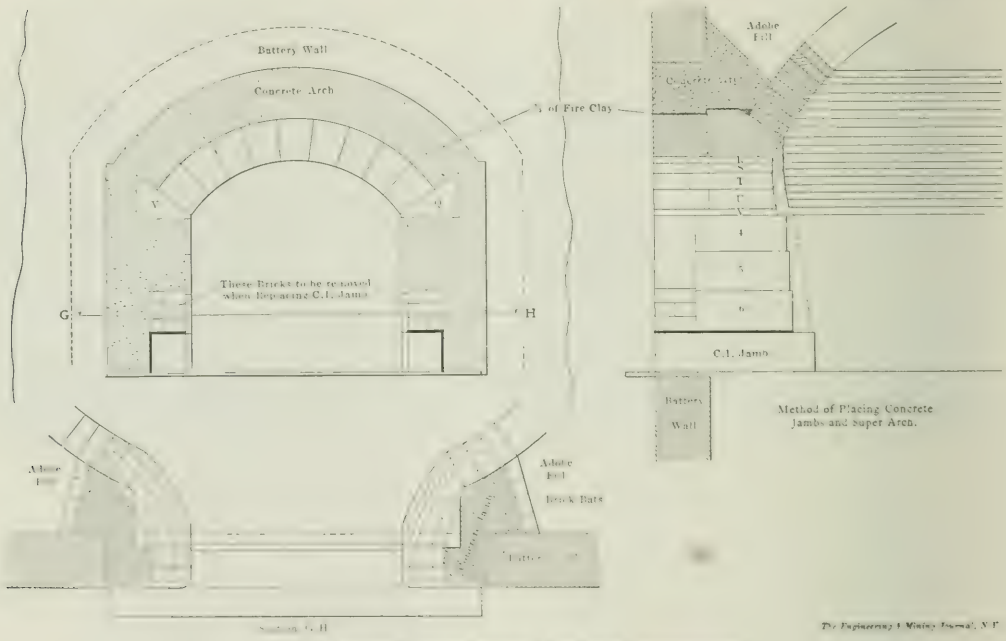


FIG. 5. SECTIONAL VIEWS SHOWING COKE OVEN CONSTRUCTION

elevator. This elevator likewise has perforations for the purpose of draining off as much water as possible. It delivers the rock to the refuse bin of 50 tons capacity.

Jig. No. 5, having twenty 6-in. strokes per minute, divides the coal again into two portions known respectively as heads and tailings. The headings pass into the boot of a bucket elevator and unite with the washed slack from elevators Nos. 1 and 2 on the scraper conveyer above. The middlings fall into the boot of the middlings elevator and are delivered to a grizzly overhead. All coal over ¾ in. passes over this grizzly and into a 25-ton quential further reduction of moisture content.

The refuse bin has a capacity of 50 tons, and is emptied by two hand gates, one for the rock and one for the middlings. The refuse is drawn alternately from each of these gates into buckets holding 800 lb. Two men are employed for this purpose, each using one gate. Each man keeps a careful tally of the buckets filled. The buckets are also counted twice by automatic counters before leaving the loading platform. In this manner an exact record is kept of the total number of buckets removed, and the quantity of each material is computed therefrom. These buckets tons. The other larries weigh about 12,950 lb. and can carry about 13 tons.

The washed slack is drawn in such a manner as to allow it 20 hours to drain. This is accomplished by drawing from only one section of the bin at a time.

The larries pass over a Fairbanks scale before reaching the ovens and the total weight is recorded by the larryman. After dumping, the larry again passes over the scale on its return, and the tare weight is recorded. After this is once done the tare is checked up again every five or six loads by the foreman. While dumping, the larryman takes a scoop sample of the slack amounting to about 1½ quarts. This sam-

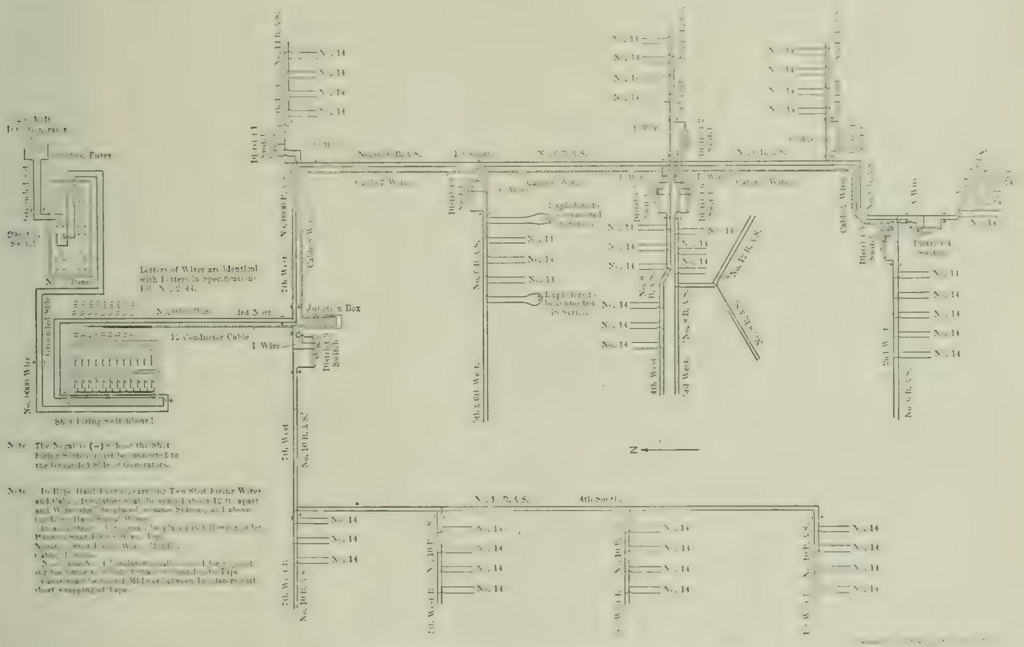


FIG. 6. SHOWING SHOT-FIRING SYSTEM AT THE COKEDALE PLANT

bin from which it is drawn for boiler use.

The undersize passes through the grizzly and into the refuse bin before mentioned. It is separated by a partition from the rock bin. A scoop sample is taken from each elevator every 20 min., and at the end of a day's run all like samples are united and quartered to a convenient size and taken to the laboratory. One reserve is always kept from each quartering in case of accident.

The washed slack bin has a capacity of 1200 tons and is for the purpose of storage and drainage. The moisture is reduced here from 18 to 20 per cent. to 9 to 10 per cent. There is at present an additional bin in the process of construction, which, when completed, will allow the slack a still longer time to drain, with conse- are taken by an aërial tram to the refuse pile at some distance away, where they are automatically dumped.

Coke Ovens

The washed slack is drawn from the bin into electric larries by means of hand gates, 22 in number. These gates differ from others heretofore mentioned in having hollow frames. In winter, steam passes through these and prevents the gates from freezing.

One of the larries, known as the "head larry," has a partition which divides the load in half. This makes it possible for the whole or only half of the load to be dumped at a time as conditions require. The head larry has an average weight of about 12,500 lb., and has a capacity of 11 ple is thrown in a sample bin and then removed from time to time to the laboratory for analysis when the charging is done.

There are two batteries of ovens in all; one consisting of 190 ovens, and the other of 100 ovens. Of these only 200 are in operation at present.

The construction of these ovens shows a radical departure from the usual style, but this has proved extremely satisfactory in every way. All are beehive ovens having a floor diameter of 13 ft. The battery walls, instead of being built of stone, are of reinforced concrete. These walls have not only great stability, but have the advantage over stone in not allowing air leakage. The novel construction of the door arches is also worthy of note. Heretofore it has been the custom to construct

both the main and superarch of the oven doors of fireclay tile leaving small expansion spaces between the two arches and between the upper arch and the battery wall proper. This has the great disadvantage that neither arch has enough weight upon it to hold the arch firmly in place. When expansion takes place after the ovens are fired, the result is that these arches soon bulge and if not repaired soon, fall out. A remedy for this trouble has been found by making the superarch of concrete and allowing no expansion spaces whatever, as they have been found to be unnecessary. Since this construction has been adopted none of the arches has given any trouble whatsoever. The concrete battery walls yield slightly to the expansion force, but spring back into place when the oven is put out of commission.

Another feature of interest is the use of a cast-iron jamb at the bottom of the door. These jambs were formerly made 8 in. high, but it was found that the upper portion was soon ruined by the intense heat. This led to the making of jambs only 5 in. high, which have given entire satisfaction. The accompanying illustrations show the construction of the ovens in greater detail. All outside repairs are made without shutting down the ovens at all.

Up to the present time repairs to a floor necessitated the oven being out of commission for a considerable time in order to allow it to cool so that the men could work inside. There has just been invented, however, by one of the employees, a small floor-laying machine by which floors can be laid while the oven is still hot. This machine has proved very satisfactory and is not only a labor-saving, but a time-saving device.

Each oven is charged with 13,500 lb. of slack for 48-hour coke, and with 16,000 lb. for 72-hour coke.

There are four Covington coke-drawing machines in use at the plant. Coke is drawn from alternate sides of the battery at the same time, such as the upper left and lower right. This is done in order that the temperature may not fall too far before the ovens are recharged. Coke drawing starts at about 10 p.m., so that the largest part of the work can be done while it is cool. Each of these machines pulls 48 ovens during a shift, it taking from 12 to 15 min per oven. Scrapers follow the machines and thoroughly clean the ovens.

As soon as the drawing is over the ovens are charged again, and as soon as the charge is leveled off, the door is bricked up, and in about 1½ hours after charging the coal has started again. The watering of the coke is started about 9:30 p.m., and takes an average of about 25 min. for each oven.

The coke yield is extraordinarily high for bee-hive oven practice, being on the average a trifle over 72 per cent. This yield is figured on ingoing larry weights of slack to the ovens with attendant moisture determinations and receiving smelter weights on coke shipped. This very high yield can be attributed:

(1) To the excellent construction of the ovens which prevents air admission except through the ports for airing.

(2) To close control of airing by which wastage is prevented.

(3) To the employment of coke-drawing machinery by which the coke charge is drawn quickly and the oven recharged without loss of time and with consequential saving of heat.

(4) To the ability to use much heavier charges to the oven than would be the case in ovens of like size using manual labor for coke drawing, since by the use of coke-drawing machinery the coal has from 4 to 5 hours more time for coking in each 48 hours. As the wastage through burning is a function of surface area, the loss through the burning of fixed carbon lessens with increasing tonnage of charge.

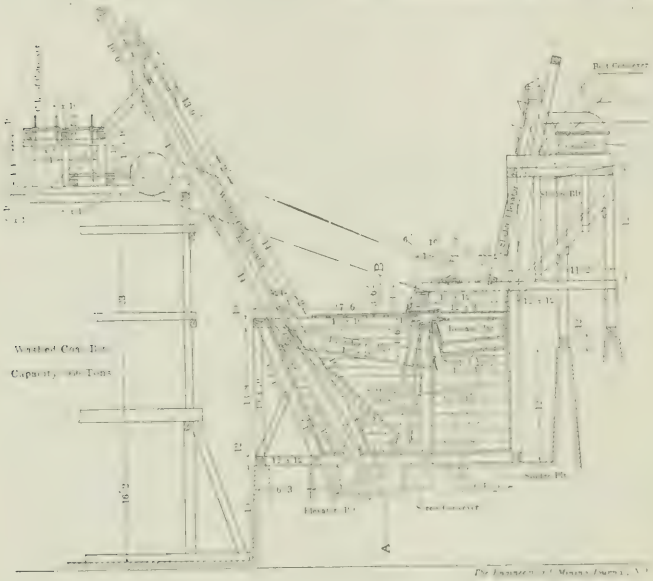


FIG. 7. SECTION THROUGH WASHERY SHOWING ARRANGEMENT OF MACHINERY

Power Plant

The power house and boiler plant are in one building north of the washery. This building is absolutely fireproof, being made solely of steel and concrete. The boilers and engines occupy different rooms, being separated from each other by a brick partition. The equipment in the boiler room consists of the following:

Five Heine water-tube boilers of respectively 97, 106, 97, 97 and 89 h.p. under 100-lb. pressure. Besides these there are two O'Brien boilers of 80 h.p. under 100-lb. pressure. These boilers supply the necessary steam for all engines and local pumping apparatus. This does not include the pumps located at the upper and lower pumping stations.

In the engine room are the following machines: One Ball-Wood engine of cylinder dimensions 12x12 in. connected by belting to an alternating-current generator and its separate exciter; two Hamilton-Corliss engines. These have cylinder dimensions 28x48 in. and are belted to a 250-kw. direct-current generator.

The mine fan is direct connected to an Erie Engine Works slide-valve engine. This engine has cylinder dimensions 19x18 inches.

The rope haul in the mine is served by a Leyner double-drum mine hoist.

The crusher and elevator for the crushed coal are operated by an Atlas Engine Works engine having cylinder dimensions 12x18 in. A double engine of similar design, 13x18 in., supplies power for the remainder of the washery.

All the generators are placed in the engine room. The alternating current generator, driven by the Ball Wood engine, is a Bullock, 3-phase, 2300-volt generator, having a capacity of 74 kw. The accompanying exciter is an Allis-Chalmers direct-current 120-volt generator. This alternating-current circuit supplies current for all lighting purposes as well as for the motors driving the main water service pumps.

The General Electric Company generators, driven by the Corliss engines, each have a capacity of 150 kw. at 275 volts. This current is used for all power purposes in the plant other than those already mentioned. In the laboratory is a Westinghouse 10-h.p. motor which drives the rolls, grinders, etc. The chain haul,

of Heyl & Patterson design, has a capacity of 200 tons per hour and is operated by a Westinghouse motor of 75 h. p. This motor is in the tipple building.

The main pump, at the Townsite or upper pumping station, is gear driven by a Wagner alternating-current 10-h.p. motor. At the lower or River pumping plant, the main pumps are gear driven by two alternating-current Westinghouse 20-h.p. motors.

Pumping Plant

For the boiler feeds there are two Worthington, simple, direct-acting, duplex-piston pumps. The feed-water heater is supplied by another pump of the same type. A large fire pump of the above make, having a capacity of 700 gal. per min., is also in the power house. This pump is used only in case of emergency, as the name implies.

At the Townsite station, the main pump is an electrically-driven Rumsey & Co., single-acting, triplex, plunger pump, having a capacity of 93 gal. per min. As a relay, there is here a Davidson double-acting, steam-driven pump. These pumps deliver water direct into the service mains, all the sulplus going to reservoir No. 2 on the hill nearby. This reservoir has a capacity of 160,000 gallons.

At the main pumping plant there are two Rumsey electrically-driven triplex-plunger pumps, having a capacity of 130 gal. per min. each. These are relayed by a Worthington direct-acting, duplex-piston pump, steam driven. These pumps deliver water to the mains serving coke ovens, washery and boilers, all the surplus going to reservoir No. 1. This reservoir has a capacity of 2,800,000 gallons. The two electric pumps used here are so arranged as to make it possible for one or both to be used as occasion demands. The mains receiving this water are identical with those receiving water from the Townsite pumping plant but are separated from the latter by a gate valve. In case of accident to either pumping station this gate valve can be opened and the mains still be supplied with water.

Civic Features

At the present time there are 1286 men, women and children in the camp. Of this number 500 men are registered permanently on the pay roll. These men are employed at the mine, washery, coke ovens, etc. There are 120 houses provided for their use, ranging from three to eight rooms, the majority being from four to eight rooms. These houses represent an interesting departure from the ordinary construction. The walls are made of large, hollow, blocks of coke braize. These blocks are not only very light but have great tensile and compressive strength. The rest of the construction of the houses is in keeping with this, being solid and substantial throughout. The rent charged for these houses is nominal. Water is furnished free and electric light at a minimum rate. The houses are attractive in appearance and furnish most comfortable quarters for the employees.

For medical service a charge of $1 per month is made to each man. This entitles not only himself but likewise his family to all medical treatment and hospital care, in case of sickness or injury.

A large hall comprising the entire second story of the school house is used for all amusements. The floor is of hardwood and is kept polished for dancing. Besides this, there are stage, dressing and check rooms. The use of this hall is given free to employees.

The company has provided a large building for the purpose of a club house. This building, like the other buildings in the camp, is constructed of coke braize. It has ample furnishings in the way of billiard tables, card rooms, etc., besides a finely equipped bar. The sale of intoxicating liquors is closely regulated by company rules, and no form of gambling is permitted.

Bath House

For the convenience of the men the company has established a splendid bath-house. It is fitted with 12 showers and several enameled bath tubs. There are now 125 wire lockers for the care of clothing, etc. An additional wing is in the process of construction at present, which will still further increase the locker facilities. There is also a barber shop with a barber in constant attendance. The privileges of this bath-house are granted to all men joining the bath-house club, for which a small fee is charged. Certain afternoons are reserved for the women.

Sunday school and church services are held once a week in the schoolhouse. These services are conducted by the different Protestant churches of Trinidad. No discrimination, however, is shown toward any denomination. The Roman Catholic church has at present material on the ground for the construction of a church.

A large, exceptionally fine, schoolhouse is in the camp. It is thoroughly equipped with large class-rooms on the ground floor. During the term the children are in charge of three teachers. These teachers give courses similar to those given in the grammar schools of Trinidad. A certificate from this school allows any student to enter the high schools of Trinidad without further examination. A kindergarten will soon be added. During the term there are from 125 to 150 children in constant attendance. This is entirely free.

Store privileges are leased to the Gottlieb Mercantile Company. This store handles not only general merchandise but has also a splendid meat market and refrigerating plant in conjunction. The aim is to sell all goods to the employees on the same scale of prices as those obtaining in Trinidad at first-class establishments. The employees, however, are in no wise obligated to trade here. A post office with money-order department is also established in the store.

Conclusion

The enterprise of the Carbon Coal and Coke Company was inaugurated and carried out under the direction of Franklin Guiterman, president, assisted by the following able staff: F. D. Baker, chief engineer, F. P. Bayles, superintendent, and E. A. Sutton, assistant. The plant is noted for its cleanliness and its systematic operation. The yield of coke not only surpasses that of any other plant in the West but is of the highest quality physically and is splendidly adapted to the metallurgical purposes of the American Smelting and Refining Company to which it is furnished.

In concluding I wish to express my appreciation of the great kindness and courtesy accorded me by Mr. Bayles and his assistants during my visit to the camp.

Fuel Tests with Illinois Coal

"Fuel Tests with Illinois Coal," issued as circular No. 3 of the engineering experiment station of the University of Illinois, presents the results of an elaborate series of tests conducted at the fuel-testing plant of the United States Geological Survey. The circular is compiled by L. P. Breckenridge and Paul Diserens. It deals only with coals taken from mines within the State of Illinois. The investigations described include steaming tests under boilers, gas-producer tests, washing tests, coking tests, briquetting tests and tests to determine composition and heating value.

From the results stated it appears (1) that the average calorific value of Illinois coal (ash and moisture free) is 14,319 B.t.u.; (2) that its evaporative efficiency is but slightly affected by the moisture it contains; (3) that its evaporative efficiency decreases as the ash and sulphur content increases, and that when burned in a hand-fired furnace its evaporative efficiency decreases as the amount of fine coal contained in it increases; (4) the performance of Illinois coal in a gas producer compares favorably with that of any other bituminous coal tested at the laboratory of the United States Geological Survey; (5) one-fourth of all the samples tested may be used for the manufacture of coke; (6) briquetting improves the evaporative efficiency of Illinois coals only when the raw coal is in the form of slack or screenings.

Metal ties are to be preferred to wooden ones, especially for movable tracks. A simple tie is made by cutting channel iron into appropriate lengths and bolting the rail to the flat side of these by clips and bolts. Ties are usually placed 2 ft. apart; in portable tracks, 3 feet.

Ventilation System at the Comstock Mines

Mines Are the Hottest in the World; Water Temperature 160 Deg. F.; Ward Shaft Association Working at 2500 Ft.; the System Is Simple

BY GEORGE J. YOUNG*

Dr. John A. Church, in his treatise[1] on the Comstock lode, gave a full and clear account of the conditions of the mines during the period of greatest activity. The difficulties in the way of deep mining at that time were excessive water and high temperature. The drainage of the mines taxed the financial resources of the mining companies, and the high temperatures restricted the capacity of the miners for underground labor. In spite of these difficulties exploratory work was continued until the financial burden of removing the water became too great. The companies then restricted the work to the upper levels. The years 1883 to 1886 marked the period of cessation of deep mining.

For 12 years thereafter mining was confined to the levels above the Sutro tunnel; and, while the question of drainage was more or less agitated, nothing of importance was done until the formation of the Comstock Pumping Association in 1898. Since that time successive levels have been drained until, at present, on the north-end mines, a depth of 700 ft. below the Sutro tunnel level has been reached. Mining is now carried on in the Ophir mine from the 1700 to the 2200-ft. levels, and a winze is being sunk to make connection with the 2300-ft. level (the 2450 ft. of the C. & C. shaft).

In 1903 the Ward Shaft Association was formed to undertake the draining of the Central and Gold Hill group of mines, and at the present time a depth of 2500 ft. has been reached in the Ward shaft. The situation at the Ward looks promising, and the 3000-ft. level may be reached in the near future. It is proposed to establish a large pumping-station on this level, and then begin the opening of known orebodies and the prospecting for new ones.

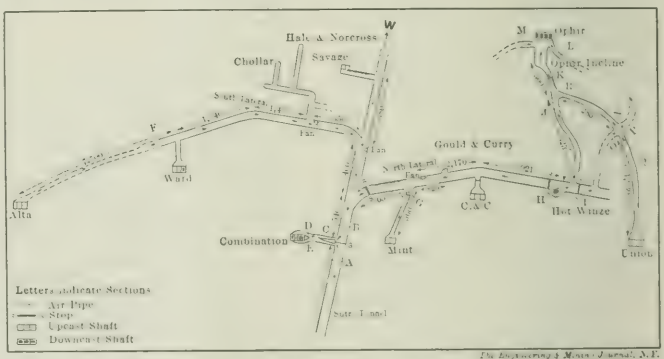
The main factors which have contributed to the successful solution of the drainage problem are the Sutro tunnel, the use of the hydraulic elevator as a sinking pump, the concentration of pumping units and cheap electrical power.

The question of high temperature and its restricted staff remains as a minor but important problem. The temperatures on [illegible] are as great as those in the earlier periods. The

[illegible]

*Consulting engineer and metallurgist, Los Angeles, Cal.

Comstock was considered the hottest group of mines in the world, and I am not aware of similar conditions in any other mining district. A water temperature as high as 160 deg. F. has been reported from the Ward shaft, and temperatures below the Sutro tunnel are very high in many instances. The control of excessive underground temperatures is effected by proper ventilation, or by the provision and distribution of air-currents of sufficient volume. Upon the Comstock of late years considerable attention has been paid to ventilation, and underground conditions have been much improved.



The Engineering and Mining Journal, N.Y.

FIG. 1. PLAN OF SUTRO TUNNEL LEVEL, SHOWING DISTRIBUTION OF AIR

Ventilating System in General.

A ventilating current on the Comstock must provide pure air for the miners and a sufficient volume to temper the heat of the underground workings; also remove the steam and the gaseous products of blasting. A ventilating current of sufficient volume to cool the workings enough to be noticeable would meet all the other requirements. The general and considerable elevation of temperature along the lode makes it possible to secure air currents of some volume and velocity by natural ventilation alone. With the exception of the Ward shaft, all of the ventilation is effected by upcast shafts, supplemented by small fans for local distribution of the air in drifts, raises, stopes and winzes. Three shafts, the Ophir, the Combination, and the Belcher, are used as upcasts; six shafts, the Union, the C. & C., the Mint, the old Yellow Jacket, the Occidental, and the Alta, are used as downcasts. The Ward shaft is divided by a brattice, and one compartment (the pump) is used as an upcast, the other two compartments, in which the hoisting is done, serving as a downcast. A fan is attached to the upcast compartment and exhausts the air.

Ophir Upcast.—This shaft takes the air from the workings of the Ophir mine, the downcast air coming principally from the C. & C. shaft. The upcast air is taken from a winze in the north lateral and by a crosscut to the Ophir incline, and thence to the foot of the Ophir shaft. At the foot of the Ophir shaft a south drift takes air from old stopes and workings of the Ophir mine, and an east crosscut connects with the Union shaft and takes air from that shaft.

Combination Upcast—This shaft draws air from the Sutro tunnel, both east and west of the Combination partition, which is so placed as to split the connection from the Combination shaft to the Sutro tunnel. The downcast air comes from the Union, Mint, and Alta shafts. The air from the Union crosses the current from the Ophir through a 20-in. galvanized-iron pipe, two wooden partitions keeping the currents from mixing. The air from the Mint shaft is taken through three lines of 15-in. air pipe, assisted by fans, to the Gould and Curry, the Savage, the Chollar, and the Hale Norcross workings. It is then returned through the north and south laterals to the Sutro tunnel, and thence to the Combination shaft. The air from the Alta passes through a long connection and into the south lateral near the connection to the Ward shaft. The air east of the

Combination partition comes from the Sutro tunnel portal.

Belcher Upcast—This shaft ventilates the Yellow Jacket, the Overman, and the Caledonia mines, and draws air for this purpose down the old Yellow Jacket and the Overman shaft.

The total amount of upcast air from the three shafts and the Ward measures 235,835 cu.ft. per min., and the amount of downcast air measures 216,687 cu.ft. per min. The discrepancy between the two amounts is due to the difficulty of making accurate measurement of rise in temperature, leakage, variation in the velocity of the air current at different times, and the accession of water vapor and gases from the mine workings. Fig. 2 shows the relation of the underground workings, the principal upcast and down cast shafts.

Ventilating System in Detail

Union Shaft—The downcast air is taken to the 2000-ft. level, and thence by means of a 15-in. air pipe to a fan 600 ft. distant in the east crosscut. It is then forced to the face of the northwest crosscut, and also to the face of the south drift, distances respectively 500 and 1000 ft. The discharges are respectively 1042 and 796 cu.ft. per min. The combined discharge is 1838 cu.ft. per min. With an inflow at the Union shaft of 4287 cu. ft. per min., the delivery is 42.9 per cent. of inflow. The air returns through the east crosscut to the shaft and then passes up through the pump compartment, which is bratticed off, to the Sutro tunnel level, and then through a long connection to the south lateral and also to the connection leading to the Ophir shaft. The north lateral takes 4086 cu.ft. per min., and the remainder, 9728 cu.ft. per min., finds its way into the Ophir upcast. The average temperature on the 2000-ft. level is 98.3 deg. F. and on the Sutro tunnel level it is 76.3 deg. This is due to the fact that a comparatively large proportion of the downcast air leaks past the air-pipe on the 2000-ft. level and goes up the pump compartment, cooling the air coming from the Union workings. The portion of air passing to the Combination shaft traverses 12,061 ft. from surface to surface; the portion passing up the Ophir moves 7680. Fig. 1 shows in plan the distribution of the air on the Sutro tunnel level.

The Ophir Mine—The downcast air in the C. & C. shaft splits into four parts—one split on the 2150-ft. level, an air current of 7024 cu.ft. per min.; one on the 2250-ft. level, an air current of 14,521; one on the 2350-ft. level of 11,667, and one on the 2350-ft. level, which was not measured.

On the 2150-ft. level the air is taken through the drift to a point 860 ft. from the shaft, then picked up by a fan and forced to the Ophir winze and down through that connection to the stopes upon the 2200-ft. level of the Ophir. The fan takes 5389 cu.ft. per min., and the difference, 1635 cu. ft., leaks past a canvas curtain and joins the upcast air.

On the 2250-ft. level part of the air is taken by a fan at the station and forced down to the 2350-ft. level to ventilate the east drift; the remainder, amounting to 14,521 cu.ft. per min., passes into the drift until it reaches a stope, where two fans pick it up, one forcing the air past the stope into the Consolidated Virginia workings, the other forcing the remaining air down through the Ophir winze to the 2200-ft. level of the Ophir mine. The Consolidated Virginia fan takes 3323 cu. ft. per min., while the Ophir fan takes 11,566 cu.ft. per min. Beyond the stope another fan takes air from the Ophir winze station and forces it on the stopes north of the Ophir winze. This air rises up through the stopes and eventually joins the air in the "hot winze" of the north lateral. The fan takes 3791 cu.ft per minute.

The air on the 2350-ft. level passes through the main drift, while the air from the fan on the 2250-ft. level passes into a crosscut and a drift east of the main drift, returns and joins the air passing through the main drift toward the Ophir winze. The high temperatures, noted previously, were taken in this drift before the connection was made. The average temperature before connection was 125.4 deg., and some months after the temperature measured 100.4 deg. The lowering in temperature was due to the increased volume of air and to the boarding-up (snow shedding) of the sides and top if the drift, which very effectually shut off hot water, steam, and much of the heat radiated from the rock surfaces.

The 2450-ft. level is ventilated by a No. 8 cast-iron American blower. The air is taken through an inlet pipe extending toward the south compartment of the shaft and forced to the working face in the east crosscut, returning through the crosscut. The fan was not in operation at the time of my visit. On account of the danger of flooding this level the fan was driven by a compressed-air engine.

The total quantity of air in the three main splits amounts to 33,212 cu.ft. per min., and this compares closely to the 32,700 cu.ft. measured on the same day on the Sutro tunnel level.

Gould & Curry Mine—At the Sutro tunnel a west crosscut has been started, which is ventilated by an air pipe and fan taking air from the Mint shaft. The inflowing air at the shaft measured 1122 cu.ft. per min. (1159 cu.ft., November 15). A 15-in. air pipe takes this air to the fan, and from the fan a 11-in. pipe connects with the crosscut, distant 189 ft. The air discharged measured 989 cu.ft., or 88.1 per cent. of the inflow. The fan was not in use.

Savage Mine—An east crosscut is being run in the Savage mine from a raise 75 ft. above the Sutro tunnel, which also receives air from the Mint shaft. A 15-in. air pipe takes 2404 cu.ft. per min. to a fan 1110 ft. distant in the Sutro tunnel, and the fan discharges through a 15-in. pipe to the top of the raise and then by a 11-in. pipe to the working-face, 180 ft. distant from the top of the raise. The discharge measures 894 cu.ft. per min., or 37.1 per cent. of the inflow. The section of 11-in. pipe caused the most leakage. The fan was in operation at the time.

Hale & Norcross Mine—The Hale & Norcross receives air from the Mint shaft. A 15-in. air pipe leads to the Hale & Norcross connection in the south lateral, 1460 ft., and from this point a fan takes the air and forces to the Hale & Norcross and Chollar crosscuts, distant 325 ft. 11 in.; branch pipes take the air to the working faces, 100 ft. to the Hale & Norcross and 122 ft. to the Chollar. The Hale & Norcross discharge measures 941 and the Chollar 934 cu.ft. per min. The combined discharge measures 1875 and the inflow at the Mint 3761 cu. ft. per min. The discharge is 49.8 per cent. of inflow.

Sutro Tunnel—The Sutro tunnel is an upcast airway and is the largest airway on the Comstock. The air enters at the portal and passes to the Combination partition, a distance of 18,700 ft., then through the connection to the Combination shaft, a distance of 400 ft., and then to the surface, a distance of 1600 ft. vertically. The total distance is 20,700 ft.

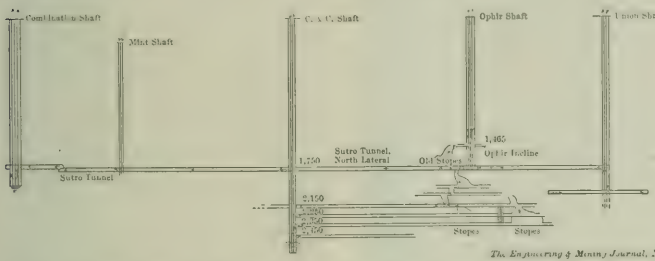


FIG. 2. LONGITUDINAL SECTION OF THE NORTH END MINES, COMSTOCK DISTRICT

This Combination shaft also serves to draw air from the workings west of the Combination partition. The average quantity of air from the east is 27,339 cu.ft. per min. (average of four observations at different times); from the west it is 29,961 cu.ft. per min. (average of four observations at different times); and the total average passing to the Combination from both directions measures 57,300 cu. ft per minute.

Yellow Jacket Mine.—Three levels of this mine are open and operated from the old Yellow Jacket shaft. On the first level, the 900 ft., the air entering measures 3075 cu.ft. per min. The air passes through a drift and thence down a winze to the 1000-ft. level. The temperature and relative humidity of this air current, at a point 500 ft. from the shaft, measured 66.2 deg. F. and 55.6 per cent. respectively. The second, or 1000-ft. level, receives 3030 cu.ft. per min. from the shaft. Part of this air is taken by an air pipe and conducted a distance of 350 ft. to a raise on the footwall of the vein, returns, joins the remainder, and then passes down through old stopes to the 1100-ft. level.

The third, or 1100-ft. level, is closed by a door in the drift, so as to force the air down the incline, which heads at this level, into an old station which is being reopened. The air escapes up through old stopes to the 1100-ft. level. All the air passing down the Yellow Jacket shaft is brought together in the south drift, passes through a crosscut to the old Belcher incline, and thence to the surface through the Belcher shaft. The amount of air passing through the drift measures 10,695 cu.ft. per min. The 900-ft. level of the Overman and Caledonia, corresponding to the 1100-ft. of the Yellow Jacket, delivers 5981 cu.ft. per min. to the Belcher shaft. The total quantity of air measured on this level is 16,646 cu.ft. per min., while the average passing up the Belcher is 31,706, leaving unaccounted for 15,060 cu.ft. per min. This comes from the lower levels of the Overman and Caledonia, but no measurement was possible at the time. The Yellow Jacket air at the foot of the Belcher incline gave a temperature of 79.7° deg. and a relative humidity of 68 per cent.; the air coming from the Overman a temperature of 82.4 deg. and a relative humidity of 62.3 per cent.

Ophir and Belcher Upcasts.—The measurements of both these shafts shows an average of 22,222 cu.ft. per minute.

Combination Shaft.—The measurements of the Combination shaft average a total of 51,582 cu.ft. per min., with an average velocity of 450 ft. per min. This has a temperature at the shaft collar of from 80.6 to 89 deg. Fahrenheit.

General Conclusion

Since the cooling of the upcast air directly affects the efficiency of the upcast shaft, the factors contributing to this are of some importance. I reached the following conclusions:

(1) The greater the difference between the temperature of the upcast air and the rock temperature, the greater the cooling effect of the shaft.

(2) The higher the temperature of the air entering the bottom of the upcast, the greater the cooling effect of the shaft.

(3) The lower the velocity, and consequently the smaller the volume of air in the upcast shaft, with given area and rubbing surface, the greater the cooling effect of the shaft.

(4) The greater the proportion of rubbing surface to shaft area, the greater the cooling effect.

(5) Where incast and upcast air are conducted through the same shaft, the cooling effect of the incast upon the upcast air is very marked.

Regarding the effect of humidity upon the cooling effect of the shaft, no definite conclusion was reached.

Supplementary Ventilation

At the Ward shaft a No. 200 American, three-quarter housing, vertical-discharge, suction fan, driven by a 50-h.p. induction motor, is used to ventilate the workings of the shaft; and, as sinking is the only work, with the exception of the pump stations, practically the full capacity of the fan is used for this work. The incast air passes down the two hoisting compartments, and is deflected in part by a canvas curtain at the 2475-ft. station (pump station). The curtain is one-half the width of the compartment, and is suspended by its upper edge from a wall-plate on a level with the roof of the station. The lower edge hangs loose over the guard bar in front of the compartment. This gives a curved surface and deflects enough air to ventilate the station, while allowing the cage, in passing down, to sweep it out of the way. The greater part of the air passes down to the sump and then rises through the pump compartment, which is bratticed off from the hoisting compartments.

Control of Humidity and Heat

Control of humidity and heat is a matter of considerable importance as affecting the efficiency of the miners. High temperatures and saturated air are conducive to low labor efficiency, while, on the other hand, high temperature with low humidity does not lower efficiency to an unreasonable extent. The examples in the previous section show that if water can be kept away from the air a moderate humidity is possible, but this cannot always be done. Careful boxing of drains and boarding-off hot water is beneficial; the carrying of large quantities of drainage water in closed conduits, such as the stave pipe, is very effective, but, on the whole, the mine drift or tunnel cannot be considered an ideal air-way under high temperature conditions. However carefully the drainage water may be carried, the emanation of water vapor from the walls and surfaces of the timbers still remains as an important humidifying agent. The construction of moisture-tight walls for the drifts is out of the question, and the use of excessive volumes of air impracticable. The carrying of air through sheet-metal conduits of moderate cross section is the only practicable way of delivering air currents of low humidity to working places where a high temperature prevails, and this method is in general use upon the Comstock. The small sections of the air pipe as compared with the drift requires the use of power-driven fans to force a sufficient quantity of air. The working face of a dead end, such as a drift, is perhaps the most difficult to maintain in proper condition, and as a consequence a number of measurements were in the ends of drifts ventilated by pipes.

Cost and Operating Expense

It is almost impossible to obtain detailed figures on the cost of the ventilating system, but fairly accurate estimates may be made. The accompanying estimate was made by taking the cost of motors and fans and adding 20 per cent. for cost of installation. The 15-in. air-pipe in place was estimated as $0.77 per ft. and 11- and 20-in. proportionally:

Cost of supplementary ventilating plant—Motors, $6,000; fans, $6,000; air-pipe, $10,000; total, $22,000. This does not include the cost of the fan and pipe in the Overman and Caledonia mines, nor the cost of electrical conduits.

Depreciation, maintenance, and operating expense—Depreciation and maintenance assumed as 10 per cent. of plant cost, or $2200 per annum, or per month, $183.

Operating cost—Power: 165 h.p., at $5 per h.p. month, $825; electrician, at $4 per day, $120; incidentals, $50; total expense per month, $1,178. Shift bosses and miners take immediate charge of fans and motors, and no extra men are employed except the electrician.

The expense of maintaining the upcast shafts may be properly charged against the cost of ventilation, and this is a large item, but at present no figures are available. During the past year shaft crews of from four to six men have been employed on single shafts in all three upcast shafts for periods of from 2 to 6 months. On an average this work has to be done every other year. On the foregoing estimate of expenses per month, the cost of each 10,000 cu.ft. of air passing through the mines is $0.00116, not including the cost of repair of upcast shafts.

The exportation of antimony ore from Bolivia in 1908 was 734 metric tons against 2279 tons in 1907.

A New Gas Producer for Low Grade Fuel *

By Alfred Gradenwitz

In spite of the enormous strides made by the makers of steam engines and steam boilers, suction-gas plants and liquid-fuel combustion motors are rapidly gaining ground because of the extraordinary saving in fuel insured by their use. The Deutz gas-motor factory, Cologne, has taken a further step in advance toward reducing the cost of fuel by designing an improved gas producer for low-grade fuel which appears to combine simplicity and safety of operation with durability and reliability. This producer takes the very cheapest classes of fuel such as anthracite dust, anthracite rubbish, coke rubbish, smoke-chamber coal dust, etc., for which no satisfactory use was previously available. Though the first cost of such a plant is slightly higher than that of a plant for gasifying the usual kinds of fuel, the advantage is very great because of the extraordinary difference in the cost of the fuel.

The coal-dust generator consists of a rectangular pit with a step grate and a circular fuel reservoir having an "overflow" edge on which the hight of the active fuel bed depends; in the lower part is a water sump. Both above and below the grate are slag doors; only the lower ones have to be kept open during operation. The fuel bed is kept at a constant hight by discharging the slag and ashes through the sump as they accumulate in the lower part of the step grate.

The mixture of steam and air admitted below the step grate can be accurately controlled as to its composition by a regulating cock, the steam being generated in an exhaust-heat boiler by means of the exhaust gases from the engine. This process avoids the drawback inherent in the vaporizers fitted into the generator, of withdrawing heat from the gas-generating process. It is likewise superior to steam generation from the heat of the incandescent zone of the generator, as this in the case of fuels containing large percentages of ash (as in the present case) is quite inadequate, and involves some risk of excessive heating and scorification of the grate.

Fig. 3 illustrates the arrangement for providing uniform distribution of the supplied air to the whole of the grate area. Experience has shown that in this type of generator an excessive amount of air may pass along the wall, so that the ozygen is not utilized sufficiently, while the formation of slag on the wall is assisted. In order to do away with this drawback, the overflow edge of the fuel reservoir, on which depends the hight of the fuel bed on the grate, has been so designed as to bank the fuel higher on the walls, thus offering a greater resistance to the passage of air along the latter than in the center of the grate. This arrangement has in practice given excellent results.

In connection with tests recently made by Engineer Hildebrand at the suggestion of Professor Josse of the Charlottenburg Technical High School, there was used anthracite dust of from 3 to 8 millimeters and a heat value of 7,300 calories (about 13,000 B.t.u. per pound), costing 8 marks per 1000 kilograms (about $2 per ton). After issuing from the producer, the gases pass through a dust separator, a scrubber and a purifier of the type generally used in connection with Deutz suction-gas producers. These tests extended over three days, and only small quantities of slag discharged occasionally during operation, without any reduction in the output of the engine.

The weight of the ashes taken from the generator was about 10 per cent. of the fuel supplied. The consumption of anthracite dust was found to be 445 to 446 grams per horsepower-hour (about 1 pound per English horsepower-hour), the amounts of material withdrawn during the discharging of slag being deducted. The cost of fuel thus worked out at 0.35 pfennig per horsepower-hour (about 0.09 cent per English horsepower-hour).

In the case of coke dust, the cost was found to be even lower; a consumption of from 750 to 800 grams was obtained with coke dust of 5700 calories from the

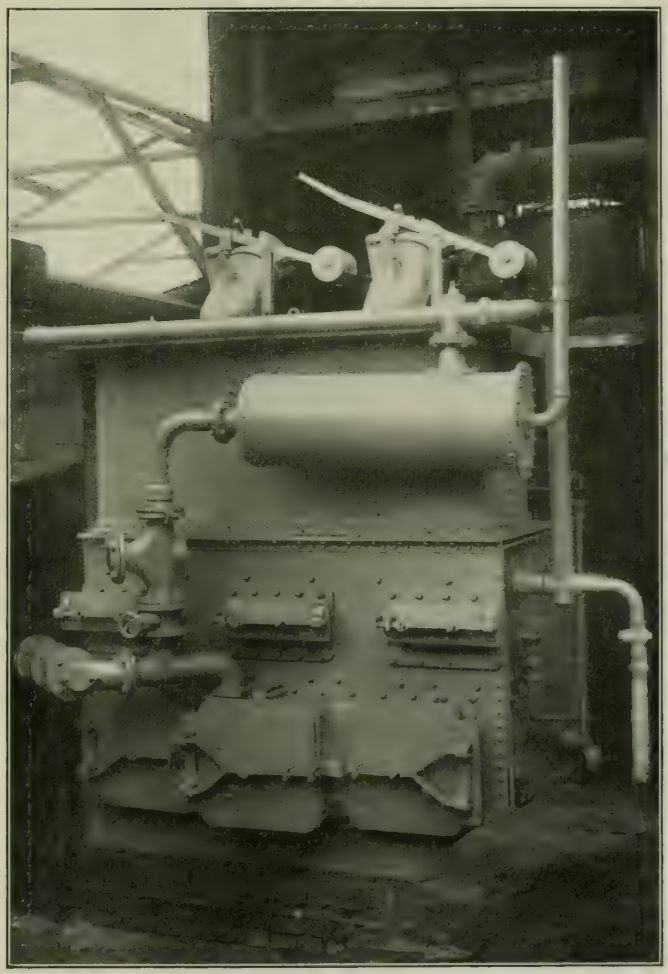


FIG. 1. DEUTZ GAS PRODUCER FOR LOW-GRADE FUEL

*Reprinted from Power, Oct. 19, 1909.

Stuttgart municipal gas works, the material withdrawn from the sump being left unutilized.

Especially remarkable results were obtained in connection with smoke-chamber coal dust taken from the smoke chambers of locomotives. This material, as used in connection with one gas producer of the above type in operation at Swinemünd, forms a reddish-brown sandy powder, containing 55.6 per cent. of solid carbon and having a heat value of 4500 calories. Of this was consumed about 0.75 to 1 kilogram per horsepower-hour, and in tests made on delivered work a consumption of 1.28 kilograms was registered for each kilowatt-hour, corresponding to a consumption of about 0.77 kilograms per brake horsepower hour.

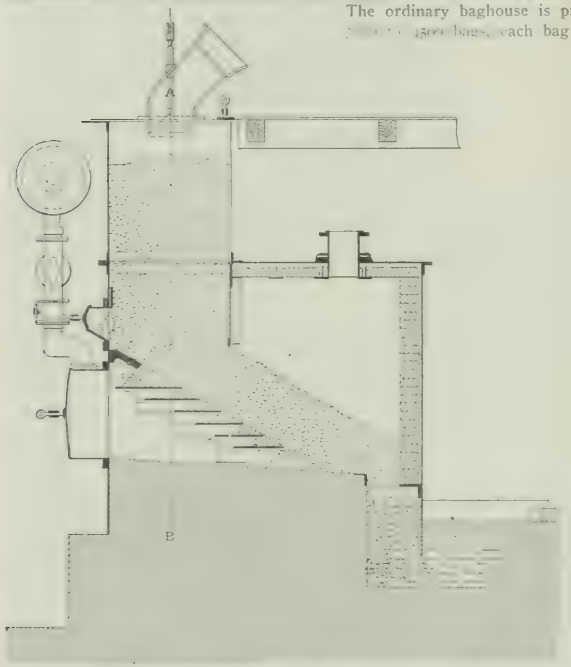


FIG. 2 LONGITUDINAL SECTION OF DEUTZ GAS PRODUCER

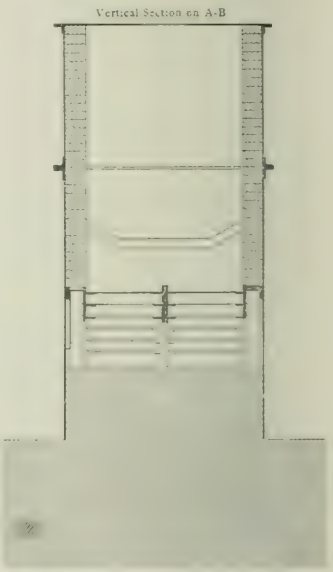


FIG. 3 CROSS SECTION SHOWING GRATES

Sept. 23 was the thirtieth anniversary of the first make of basic converter steel in Germany. The Hörde Works and the Rheinische Stahlwerke, according to Stahl und Eisen, jointly acquired the rights to use the Thomas-Gilchrist process in Germany early in 1879, and both works started on a trial furnace on the same day, as it happened, though without previous arrangement. The process proved to be actually adopted in the Hörde plant, plans for a large steel plant from German iron and steel makers were general and Emil von Ende beginning to press and to [illegible] the well of [illegible] Germans in the trade [illegible] Thomas-Gilchrist process [illegible]

The Baghouse and Its Recent Applications

By W. C. Ebaugh*

For lead and zinc furnaces the baghouse has long been recognized as a most efficient means for removing solids from smoke. Fans capable of moving 150,000 to 250,000 cu.ft. of gas per minute force the flue gases, laden with dust and fume, through a number of large pipes or flues into the smoke cellar and through the bags, and the solids are removed so perfectly that the escaping gases are invisible. The ordinary baghouse is provided with [illegible] to 4500 bags, each bag being about 18 in. in diameter and 30 to 33 ft. long. Whereas the earlier baghouses had 750 to 1100 sq.ft. of filtering surface per ton of charge, modern practice finds 300 to 500 sq.ft. per ton of charge, [illegible] for filtration a ratio of 150 to 200 sq.ft. of filtering surface per square foot of hearth is customary.)

As a filtering medium cotton cloth having 40 to 50 threads to the inch and weighing 0.3 to 0.5 oz. per sq.ft. was largely used. The objection to this material was that when used at a temperature approximating 200 deg. F. it became brittle and tender, and if used at temperatures over 200 deg. F. it was destroyed by the acid substances in the filtered solids. It was [illegible] to use bags made of woolen material, like flannel, not only withstood the action of the corrosive agents better than did cotton, but that the woolen fabric retained its elasticity even when used at temperatures of 250 to 270 deg. F. Perhaps this is due to the relatively nonvolatile oil contained in the wool, or to the nature of the nitrogenous fiber itself. Modern practice, therefore, is to use the expensive woolen bags rather than the cheaper ones made of cotton. To obtain the benefits of wool, but at a less cost, Iles[1] proposed that a fabric be used in which the warp should be wool and the weft cotton, or *vice versa*, and Sheedy[2] suggested that the lower section of a bag should be made of flannel (wool) and the upper portion of muslin (cotton). The most recent experience has shown that vegetable fibers should not be used at all. Even linen thread for stitching is unsatisfactory.

Dampers to Keep Temperature Constant

When woolen bags are used a wide range of temperature is permissible. Perhaps 150 to 175 deg. F. is safest, but a minimum of 70 deg. F. and a maximum of 270 deg. F. have been used. The best practice is to adjust dampers at the furnaces and in the flues so as to maintain the temperature as near 100 deg. F. as possible. Under these conditions the material collected in the bag will be dry and [illegible] can go on readily. Lead blast-furnace gases are usually so cool that

*[illegible]

[1] U. S. Pat. No. 185,797 (1897).
[2] U. S. Pat. No. 480,824 (1892).

their treatment in a baghouse can take place directly, but the gases from copper furnaces and most roasters ordinarily require cooling. This is effected either by a suitable flue system, which must be as elastic as possible, or by the admission of cold air into the flues with the gases.

Until the investigations of Rhodes and Sprague (1907-1908) had shown the possibilities of filtering neutralized gases, the baghouse was looked upon as not suited for copper-furnace and roaster gases. These experimenters, impressed with the fact that the baghouses at zinc works were sometimes managed in what seemed to them, as lead and copper smeltermen, a very reckless fashion, yet with little apparent ill effects, conducted an extensive series of investigations with a miniature baghouse. A variable-speed motor drove a fan that drew gases from a flue and then forced them through a 4-in. pipe into a cylindrical dust chamber 2x5 ft. Upon this cylinder were placed two nipples over which bags were tied. Necessary thermometers, manometers and other instruments were provided, and a house of corrugated iron inclosed the whole apparatus.

This experimental baghouse was set up at various parts of the flue system of a lead and copper smeltery, and the effects of the flue gases with their accompanying solids were determined. During this series of tests neutralizing copper blast-furnace and lead-roaster gases by means of zinc oxide were tried, and the results were so satisfactory that now the lead plant is operated under conditions suggested by them for filtering all the smoke from the blast furnaces, hand roasters working on matte, and converter or pot roasters charged with ore. Stacks, which under ordinary conditions emit large volumes of dense smoke, send only colorless gases and no solids into the atmosphere when the bag-filtration plant is used. An observer would judge from the appearance of the stacks that the smeltery was not running.

Under this system of operation, zinc-roasting furnaces for the treatment of zinkiferous middlings have been erected, and the flue from these furnaces leads directly into the main roaster flue. The middlings, mixed with fuel, are roasted on a grate and the liberated sulphur dioxide and zinc oxide pass into the roaster flue, where the latter oxide neutralizes the corrosive sulphur trioxide that comes from the roasters. Provision is made at the baghouse fan for adding ordinary zinc oxide constantly, if need be, by an automatic feeding device.

It would not be economical to use this method, under ordinary conditions, with roasters of the hand or McDougal types, because of the large quantities of sulphur trioxide produced by them; but the treatment of the gases coming from pot or converter roasters presents no difficulties. In these the amount of sulphur trioxide is relatively much less than in the hand- or McDougal-roaster gases, and zinc oxide neutralization is commercially possible. Were this small amount of sulphur trioxide not neutralized, however, the filtering bags would soon be destroyed.[3] Gases from copper blast furnaces, reverberatories and converters are amenable to treatment under the conditions herein given.

Bags Suspended from Levers

An item of importance in baghouse operation is the means adopted for shaking the bags. Originally the method used was to shut off the gas from a set of bags, open the doors in the bag room, and after the noxious gases had escaped shake the bags by hand. This was at best a disagreeable—even dangerous—task and consumed much time. At East Helena a device was provided whereby an attendant could move a lever on the outside of the bag house and have a set of beaters strike against the rows of bags within. The scheme was abandoned, both because the shaking was ineffectual and the wear and tear on bags was great. Rourke[4] attached ropes or wires to rings placed around the centers of bags so that a whole row could be shaken by jerking the end of the rope extending outside the building. The most satisfactory device is one designed by Benedict[5] in which the bags are suspended from short levers attached to a central shaft. The outer end of this shaft projects beyond the wall and is provided with a larger lever, so that when this lever is moved to and fro the tops of the bags are given a similar motion, and a wavy motion is imparted to the bags as a whole.

The baghouse product, collected in the dust chambers or smoke cellar, usually has a black or dark gray color, is quite light (density less than water) and can be handled with difficulty when in its original state. Therefore it is burned. Some oily waste is lighted and thrown upon it, the doors to the dust chambers are opened, and a fan draws the fumes through a flue situated at the back of the chamber and discharges them into the main flue leading to the baghouse. Here the fume evolved during the burning is caught in a part of the house that is operating as usual.

The material on the floor of the dust chamber burns slowly like punk, gradually sinters to a product resembling soft lava, and loses some of its arsenic and sulphur. The burning continues a number of days, and then the sintered product goes to an arsenic refinery. The white arsenic is volatilized and used as such, and the residual cinder is charged again into the lead blast furnace. Thus the arsenic, lead, copper and precious metals are recovered.

[3] Hand roasters present a double difficulty. Not only is the production of sulphur trioxide large, but the products from coal firing seem to make the bags and their contents liable to spontaneous combustion, a combustion that is not accompanied by flame but is more like that which one observes in the burning of punk.

[4] U. S. Pat. No. 530,553 (1894).

[5] Patent pending.

Workmen's Health Must be Watched

The labor question has been a serious one in baghouse management, and the expenditure of thought and care upon the welfare of the men is imperative. It will not do to put any kind of a laborer in charge of a baghouse. The foreman should be at least as able as the charge-floor foreman or the head furnaceman, and his helpers should be capable of understanding orders and executing them implicitly. A wash room divided into three parts should be provided. The laborer enters the "clean room," disrobes and places his clothing in sanitary lockers, passes through the "wash room" into the third room and there dresses in heavy underwear, socks, overalls, jumper, cap, gloves and shoes provided by the company. His shift completed he leaves his working clothes where he got them originally, bathes thoroughly from head to foot, using plenty of soap and hot water, and then passes from the wash room to the locker room he entered at first, and there clothes himself.

Constant watchfulness on the part of the management is necessary to make sure that the washing is done regularly and thoroughly. Careful attention must be given to the health of the men, and at the first appearance of arsenical or lead poisoning proper antidotes should be administered and the men ought then to be transferred to some other kind of work until recovery is complete. When regulated as here indicated, the same crew of men can work at a baghouse for months at a stretch without discomfort or danger.[6]

The objections to the use of a bag house are: (1) Cost of installation; (2) cost of maintenance; (3) artificial draft must be substituted for natural draft; (4) danger to operatives; and (5) the arsenic saved as a by-product is sometimes disposed of with difficulty. To offset these disadvantages we must consider: (1) The greater recovery of metals; (2) regularity in draft and ventilation; (3) greater safety and less discomfort to the inhabitants of the region surrounding the smelter, and consequently less expense for lawsuits.

Consul Robert S. S. Bergh, of Belgrade, announces in a recent report the discovery of antimony-containing terrain, in the center of Servia, a few miles from the railroad town of Yagodina. The ore is in quartz and contains over 60 per cent. antimony. The expert's opinion is that, notwithstanding the present low price of antimony and its fluctuating value, the exploitation ought to pay. The total Servian export of antimony during 1908 amounted to $20,250, of which the United States purchased about one tenth.

[6] Some idea as to the dangerous nature of the bag house dust may be gained from the fact that it contains from 10 to 30 per cent. arsenic and from 15 to 30 per cent. lead.

[7] A bag house of 1000 bags will cost approximately $150,000.

Condition of the Quicksilver Industry in Texas

Depth of Workable Ore Estimated at 1600 ft.; Attention Turning toward Bituminous Ores. Coal for Producer Gas Near Mines

BY WILLIAM B. PHILLIPS*

In the Terlingua quicksilver district there are now seven furnaces equipped and ready for regular business, the Scott furnace being used.

FURNACES IN THE TERLINGUA DISTRICT.

Name	Number of furnaces	Daily capacity in tons.
Marfa and Mariposa Mining Company	2	20
Terlingua Mining Company	1	50
Colquitt Tigner Quicksilver Mining Company	1	10
Chisos Mining Company	1	20
Big Bend Cinnabar Mining Company	1	50
Texas-Almaden Mining Company	1	20
Total	7	170

Of these seven furnaces, only two are now in operation, viz., one 10-ton furnace of the Marfa and Mariposa Mining Company, and the 20-ton furnace of The Chisos Mining Company. Of the 5 idle furnaces, 4 have not been in operation for several years (Terlingua Mining Company, Colquitt-Tigner, Big Bend and Texas-Almaden), so that the discontinuance of work at these plants can not be ascribed to any very recent causes.

It is not the purpose of this article to discuss the reasons that may have led the owners to close down. It would require an intimate acquaintance with the physical and financial condition of each company to enable one to speak of this matter at length. The fact that only two furnaces out of seven are in operation and that these two have a combined daily capacity of 30 tons out of 170 tons total capacity for the district need cause no apprehension that the supply of ore is being exhausted or that the cream of the ore has already been taken. The two large furnaces, each of a daily capacity of 50 tons of ore, were built at a time when the local conditions were not clearly understood. As these conditions were more and more closely studied, especially those that dealt with an adequate supply of efficient labor and a regular supply of fuel, it became apparent that the large furnaces were much in advance of the times.

On this account I am inclined to exclude them from this discussion and to consider that I have to deal only with the smaller furnaces that are out of commission. If this be done, there are two 10-ton furnaces and one 20-ton that should be running. These three have a combined daily capacity of 40 tons. In other words, out of a total daily capacity of 70 tons the furnaces now in operation are treating 40 tons, or about 43 per cent. of the smelting capacity of the district. Remembering that the district is 100 miles from the railroad and that wagon freight is 50c. per 100 lb., this is by no means a bad showing.

Furthermore, during the last year there has been erected a new Scott furnace of 20 tons capacity, well designed and well built, by a company that has shown no disposition to take any undue risks. In the face of the idle furnaces, and after a long experience with D-retorts and a leased furnace, this company has built a furnace on its own property, has carried the main shaft down to the 500-ft. level, a second shaft to the 300-ft. level, a third shaft to the 125-ft. level, and is now preparing to sink a larger shaft to the 1000-ft. level. This does not look as though the district were dead or that people who know it are afraid to spend money here. Another company, long in the district and owning an excellent 20-ton Scott furnace, has put down a number of diamond-drill holes with satisfactory results and is about to resume active operations.

Greatest Production from the Limestone

The total production of quicksilver in Texas from 1897 to the close of the present year will approximate 40,000 flasks containing 75 lb. each and of a total value of about $1,800,000. By far the greater amount of this yield has been obtained from the rich deposits of cinnabar, terlinguaite (a yellow oxychloride of quicksilver) and native quicksilver which were found in and around California hill, in the Edwards limestone of the Lower Cretaceous. Many of these deposits were extremely rich and lay near the surface, so that expensive mining operations were not required. The furnaces that were running on this ore and that were well looked after gave results that were highly satisfactory to their owners.

It was not unusual for some of these pockets in the limestone to yield $10,000, $15,000 and $20,000 worth of quicksilver, and at one famous locality, near California hill, the waste dump did not comprise 10 per cent. of the material removed, more than 90 per cent. being sent to the furnace. This place was characterized by the presence of large masses of terlinguaite, mixed with native quicksilver, and within a short distance of it a cavity in the limestone yielded 150 lb. of native quicksilver which was dipped up with a cup and bottled on the spot.

The Edwards limestone in the Terlingua district is characterized by many veins of calcite, aragonite and gypsum which traverse it in all directions. While the general course is northeast-southwest, the ore-bearing veins ramify in all possible directions and exhibit no recognized regularity. They are not continuous but are to be regarded as pockets or chambers of calcite connected by stringers (*hilito, pegason*) of the same substance. These chambers are frequently lined with beautiful crystals of calcite and aragonite together with many curious forms of gypsum, the long, slender, curved semi-crystallized variety predominating. A deeply colored, amorphous hematite is often present and has caused some grievous mistakes, being taken for cinnabar by some of the earlier prospectors.

Some of the handsomest specimens of cinnabar exhibit an outer shell of deeply colored hematite, the cavity inside being lined with calcite, gypsum and cinnabar. The new quicksilver compounds, terlinguaite, eglestonite and montroydite, were found in the Edwards limestone in close association with native quicksilver. As these are oxychlorides one may refer their origin to the action of saline waters on cinnabar. I have in my possession a piece of shale showing cinnabar surrounded by terlinguaite, the contrast between the deep yellow of the terlinguaite and the rich crimson of the cinnabar being especially attractive. I was fortunate enough to discover a new locality for terlinguaite recently, finding it in the Eagle Ford shales six miles east of the original locality at California hill. Until this new discovery it was not known that terlinguaite occurred in the Eagle Ford shales, all of the former occurrences being in the Edwards limestone.

Two Classes of Ore

As has been shown already in the columns of the Journal the Brewster county quicksilver area falls naturally into two great divisions, separated by what is known as Vogel's Draw (Long Draw). On the west side of this broad arroyo, with its steep western wall of Edwards limestone, is the limestone of the Lower Cretaceous with here and there a small inclusion of the Eagle Ford shales, both yellow and bluish-black. On the eastern side is the shale of the Upper Cretaceous with an occasional small inclusion of limestone and the tenacious clays of the coal measures. This shale is highly bituminous and in the old D-retorts that

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were formerly used it yielded quicksilver, lubricating oil and illuminating gas. It was a common sight to witness quicksilver and lubricating oil coming at the same time from the condensing pipe while the gas could be lighted.

With the exception of a few thousand flasks, probably not more than 5000, the quicksilver has been yielded by the Edwards limestone rather than by the bituminous shales. The product of the Marfa and Mariposa company, the Terlingua Mining company, the Lone Star Mining company (now out of business), and the Colquitt-Tigner Company (in part) was obtained from the deposits in the limestone, while The Chisos Mining Company, the Big Bend and the Texas-Almaden treated the ore from the shales, the Big Bend and the Texas-Almaden also treating ore that was carried by the rhyolite of Study butte and Maverick mountain. The longest continued and most successful operations have been confined to the limestone where the rich pockets gave opportunity for easy and inexpensive mining, yet comparatively deep shafts have been sunk in this limestone, the deepest being nearly 600 ft.

The thickness of the limestone is about 1600 ft. and within this depth it is thought that profitable operations may be conducted. With the present equipment of the furnaces within the limestone area it is probable that ore carrying as low as 0.75 per cent. of metal can be treated profitably, this being considerably below the average of the material sent to the furnace. It is possible that the limestone ore can be treated at a less cost than the bituminous ore and that a lower tenor of metal can be used as a basis of estimates. But this difference might disappear if, in the construction of the furnaces designed for treating the bituminous ore, the space between the tiles was reduced to 4 in. in order that the fines could work down more regularly and uniformly. The fines from limestone ore do not seem to hang on the tiles as persistently as those from the bituminous ore and daily capacity is increased, with a corresponding decrease in the cost accounts.

The Scott is an excellent furnace, but it seems to me that closer attention should be given to the radical difference between the limestone ore and the bituminous ore, especially when one considers that in the latter there may be considerable amounts of pyrite in addition to the bituminous matter. It is possible that some of the bituminous ore yields a coke-like substance that adheres to the tiles and prevents the regular sliding down of the ore, especially the fines, but there are no positive data on this point.

Exploiting Bituminous Area.

Inasmuch as the tendency in the district is decidedly toward the bituminous-shale area between Vogel's draw and Rough run, the treatment of such ore should receive greater attention. This is the area within which the more extensive operations will be conducted in the future, and this without any disparagement of the limestone area. It can not be said that the ore deposits within the limestone area have been exhausted. On the contrary it is my deliberate opinion, based on an intimate acquaintance with the entire field, that this area can furnish as good and as much ore as has been removed from it. That the greater interest is now being shown in the eastern part of the field can not be taken to indicate, in the slightest degree, the passing of such properties as the Marfa and Mariposa, the Terlingua and the Colquitt-Tigner from the realm of profitable production.

Causes entirely apart from the available ore supply have directed attention to the shale area. Among these may be mentioned the decreased mining costs, somewhat cheaper fuel, a better water supply and a much better and shorter road to the railroad. The last item cuts no figure in transportation costs, for the Mexican freighters charge just as much for hauling from Marathon, 90 miles, as from Alpine, 100 miles, or from Marfa by way of Alpine, 130 miles. It is 50c. per 100 lb. and they do not regard distance at all. Whether they are five days on the road or ten does not disturb their serenity or enter into their calculations.

Another reason for the renewed interest in the bituminous shale area is the possibility of the construction of the Kansas City, Mexico & Orient Railway from San Angelo to Presidio del Norte by way of Marathon instead of Alpine. If this route is selected the shale area would be within a day's ride by rail over a fairly good road. There has been much discussion of the relative value of the several routes proposed for this road and I have no opinion to offer at this time. All that I desire to say is that if the Marathon route is chosen there would be a saving in distance of between 35 and 40 miles, an avoidance of the heavy grades at Paisano Pass and a diminution of the distance from the quicksilver and the coalfields in the southern part of Brewster county of 40 miles. The quicksilver region has already been proved, with a credit, to the end of this year, of 40,000 flasks. The coal area remains to be proved, but it is thought that the beds in the lower part of the county and immediately adjacent to the quicksilver area are well worth attention, especially those at Rattlesnake mountain.

Coal for Producer-gas at Hand

There is not a large available supply of wood for fuel and the time will come when the fuel question will press with some insistence upon the furnace operators. Already one of them is considering the hauling in of oil in tank wagons. This I do not think is advisable, but it is advisable to consider the making of producer-gas from local coal and using it as fuel in the furnaces. It is quite idle to say that only wood can be used in quicksilver furnaces. In the first place it is not true, for coal is used for furnaces that work just as economically as the wood-fired furnaces. In the second place, if it has been true in certain localities, it would be a serious charge against metallurgical engineers to say that no other fuel can be used. It is freely granted that, as some furnaces are designed and built, wood is the only fuel that can be used, but to say that because this is true it is likewise true that no quicksilver furnace can be successfully operated with producer-gas as fuel is to belittle the entire science of metallurgy.

The coal that is within an hour's horseback ride from the center of the quicksilver area in Brewster county would make a good quality of producer-gas and solve for many years to come the question of fuel supply for the furnaces and for the hoisting, pumping and crushing. No one claims for this coal that it is a high-grade bituminous coal or that the area underlain by it is extensive. But there is enough for all local purposes and the quality is good enough for the making of producer-gas.

In this part of Texas we have to deal with a region that lacks but little of being a desert. The rainfall is scanty, certainly not more than 8 or 10 in. per year, and this falling within two to three months. When it does fall it runs off with distressing rapidity or is absorbed by a soil that is always extremely thirsty. Within the limestone area there are many excellent sites for impounding dams and one of the companies has a number of such dams, the largest one holding a million gallons, an ample supply of good drinking water for a considerable camp.

Two of the companies, the Big Bend and the Texas-Almaden, have used steam power for hoisting, pumping and crushing, obtaining the water from Terlingua creek through a pipe line $1\frac{1}{4}$ miles in length. The other companies use gasolene engines. Terlingua creek traverses the heart of the shale area, and, while it is not a continuously running stream, yet there are stretches, pools, etc., that never go dry and afford plenty of water for boiler and domestic purposes. For boiler purposes this water has to be treated with a boiler compound and it then acquires fair steaming qualities. It is now proposed by one of the companies to pipe an excellent water from the Christmas mountains, a distance of 7 to 8 miles, the difference in elevation being about 800 ft. The supply of water to be secured in this way would be enough for boiler and

camp purposes, but would not run a Pelton wheel for power.

In the limestone area there is very little mine water to handle and at least one of the mines in the shale area has no water at 500 ft. But other mines in the shale district have had a good deal of water at depths less than 200 ft., especially those near Terlingua creek and between this creek and Maverick mountain. This may be due to the fracturing of the shales near the contact with the rhyolite of Study butte and Maverick mountain. The mine water here has so far resisted all attempts at beneficiation and is allowed to go to waste, or to the irrigation of nearby lands. An enterprising Mexican built ditches and flumes for conveying the water to his farm and used to complain, when the pumps were not running, that the mines were ruining his business. It is easy enough to construe a privilege into a right and the Mexican, on his little labor, thought he had a real grievance when the water failed to reach his beans, chile verde and watermelons.

The thickness of the bituminous shales carrying the cinnabar has been estimated at 1200 to 1500 ft. and it is likely that workable deposits will be found to this depth. In the absence of deep bore-hole records we have to depend upon general geological conditions for estimating the thickness of these shales.

Low-grade Ore Can Be Treated

What is the quicksilver content of the ores mined and treated in the Terlingua district? To this question there can be no direct answer returned for the reason that there are no published records of the amount of ore treated. The total production can be obtained but not the output of ore. Failing other information on this point I can but give my own experience in the district. During 1905 and 1906, I mined and treated, from the bituminous shales, more than 3000 tons of ore which averaged a trifle over 2 per cent. quicksilver. A much higher yield than this could have been secured but it was thought best to grade the ore to this standard and keep the furnace running on material of about the same grade. From this particular property there should be no special difficulty in sending 20 tons a day of this grade of ore to the furnace for a long time. I know that much better ore than this has been sent to the furnaces operating in the limestone area, and also ore in no means as good. The same observation holds true with respect to the ore from the bituminous shales elsewhere than at the locality under notice.

The income of the district depends not so much on what has been done as on what can and will be done, on the quality of the ore that can be sent to the furnaces regularly. With properties comparatively undeveloped, and having not a great deal of assured ore blocked out, the question of ore value is always difficult. The opinion has already been expressed that some of the furnaces can work profitably on ore carrying 0.75 per cent. quicksilver and I am inclined to take this as the lowest content that can now be successfully handled. The ore now being treated is certainly much better than this, perhaps twice as good, on the average. With 1.50-per cent. ore and an extraction of 95 per cent., a flask of quicksilver would represent 5282 lb. of ore or 2.64 tons. With Mexican labor it is not likely that the mining cost is below $6 per ton, or $15.84 per flask. A 10-ton furnace running on such ore will consume about a cord of wood per day at $7 per cord. The 10 tons represent 3.79 flasks and the fuel cost is, therefore, $1.85 per flask. The mining cost and the fuel cost will thus be $17.69 per flask. If one allows $7.31 per flask for all other expenses, the total cost per flask is $25, leaving from $15 to $17 per flask net profit. The distribution of the costs may not be as indicated but the final result will be about as given for the district on an estimated yield of 75 lb. of metal from each 2.64 tons of ore sent to the furnace.

Good Maps of the District

There are excellent maps of the quicksilver district, prepared by the U. S. Geol. Surv., in co-operation with the University of Texas Mineral Survey. This latter survey was discontinued in 1905, but the recently established Bureau of Economic Geology is designed to take its place as far as possible. The ownership of the lands within the known area is of three kinds; private, railroad and public-school fund. Information with respect to the railroad lands can be obtained from the Southern Pacific Railway, Houston, Texas; and from the commissioner of the general land office, Austin, with respect to the public lands. Requests for copies of the State mining law governing the acquisition of claims, etc., should be addressed to the latter official. The largest body of private lands there is now held by the Games Land Company, Austin, about 56,000 acres in the heart of the bituminous shale area with known deposits on it. Requests for information concerning these lands should be addressed to this company. The Watkins Land Mortgage Company, Lawrence, Kansas, also owns a large holding of contiguous land and on a portion of it cinnabar has been found.

According to *Glückauf des Mines*, the sales of Spanish iron ore to American blast furnaces since [illegible] reached [illegible] tons, or [illegible] more than in 1909. The purchasers are chiefly furnaces in eastern Pennsylvania. Prices will be 7½c per unit, f.o.b., customs duties included, for 55 per cent. ore, which is [illegible] more than the latest sales, as [illegible] the new duty.

Conditions on the Rand

Special Correspondence

The report of Consolidated Mines Selection Company, Ltd., for the fiscal year ended June 30, 1909, contains some interesting statistics recording the progress that has been made by the mines on the Rand during the year under review. The average working costs decreased 10.78 per cent., the average recovery decreased 8.3 per cent. and the average profit decreased 7.56 pence per ton or 4.67 per cent.

The reduction in recovery and working profit are offset by the longer life of the mines resulting from the working of lower-grade ore and by the gain in gross profits due to the enlarged scale of working. Dividends have increased 17 per cent. over the previous year. As regards the work done on the developing mines, figures are given showing a substantial increase of footage. With regard to the ores disclosed in the developing mines, the report, which may be taken to express the view of W. L. Honnold, the consulting engineer to the company, says that although different properties vary much as they do in the producing class, the situation on the whole continues reassuring. Particular attention is drawn to the favorable developments in the City Deep of the Central Rand and in the Brakpan mines in the far eastern section.

Regarding the future of the Rand the report says that this depends partly on the outlook for the deeper areas and partly on conditions affecting working costs. With regard to the former it may be said in a broad sense that payable conditions will continue to the limit of workable depths. One of the strongest arguments in favor of this view is the evidence of the Brakpan mines, where satisfactory conditions are being disclosed at a distance of 3½ miles from the outcrop as compared with 1½ miles—the deepest point reached—on the central Rand.

The tendency in the long run will be toward lower standards of working costs, lower, probably, in view of the longer period of sustained activity which may be reckoned on than one would now venture to suggest. Such improvements will chiefly be obtained by cheaper power and cheaper railway rates. The opinions expressed in this report have been quoted rather fully as they are the opinions of a prominent engineer, and on that account of special value. It has become too much the position for financiers in addressing their shareholders to usurp the functions of the engineer, and instead of dealing with the financial side of the business alone, to make forecasts of future production and profits and generally to deal with technical subjects which for proper treatment should be left to a responsible trained engineer or geologist.

Wooden Jig Grates in the Joplin District

By Otto Ruhl and Frank Sansom*

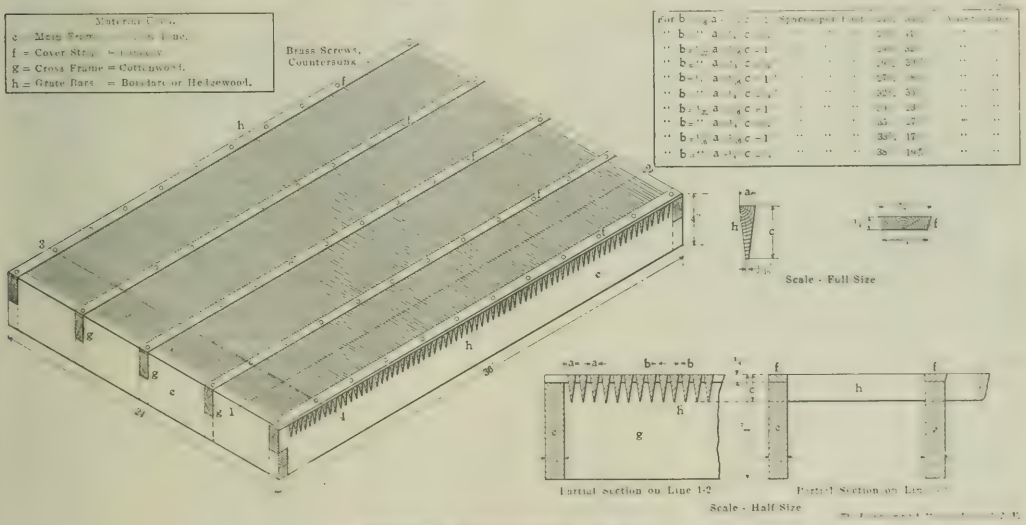
A jig grate made entirely of wood is receiving favor in the Joplin mining district. While this type has been in use for three or four years, in a crude form, it has only recently been perfected in construction and efficiency, so as to give promise of supplanting other jig-screen materials. It was originally designed and introduced for use in bad water, i.e., water strongly impregnated with sulphuric acid. In some mines the corrosive action is so strong that cast-iron jig grates are rendered unfit for use in two weeks' time.

Experimental Work

A great deal of experimenting was performed to determine what woods were best adapted to the requirements of the grate, and the most suitable form and method of construction. Yellow pine and cottonwood were found to be satisfactory for the main framework, as these were already in common use as frames and rests for other forms of grates and screens. But a much harder wood was required for the grate bars, and after trying all available hard wood, *bois d'arc*, common hedgewood or osage orange was found to wear longest, and to have the least expansion in water. Swelling of these bars would tend to close the spaces, and hence would be a serious objection. This wood is also particularly available since wire fences are supplanting the old hedge fences.

Construction of Grate

Referring to the accompanying drawing the construction will be easily understood. The main framework *c* and *g* is simple in design and is made of pine or cottonwood. The grate bars *h* are V-shaped in cross-section, and fit snugly into notches sawed into the longitudinal timbers of the frame. To hold these bars firmly in place, the hickory cover strips *f*, slightly tapered in cross-section, being ⅞ in at the top, ¾ in. at the bottom and ¼ in. thick, are sunk into the upper surface of the grate bars, directly over the longitudinal timbers of the frame and fastened securely by means of brass screws countersunk. It will be noticed in referring to the table of variable dimensions, that for each given width of opening *b*, there are two dimensions *a* and *c*, the larger being used for rougher or large-size grates, say 36x48 in., while the smaller are used on the cleaning jig or smaller sizes. The jig grate is the invention of M. S. Robinson, of Galena, Kansas.



ROBINSON'S PATENT WOODEN JIG GRATE

The grate bars are machine sawed to exact measurements, and the V shaped notches in the frame are also spaced and sawed mechanically, insuring uniform width of opening. The improved grates are very compact and strong. They are easily put into place, being made to fit exactly the cell spaces of the various jigs used in this district.

Advantages of Wooden Grates

In addition to being acid proof, these grates are said to have so many additional advantages that they are rapidly being introduced where the acid water has no especial effect on iron materials. Many points of superiority are claimed for the wooden grate. They wear longer than iron grates, wire cloth or perforated metal, not being attacked by rust and not requiring such frequent cleaning. There is not the difficulty from rusting which makes the particles cling to the iron and stop up the spaces. The iron grates, also due to the rough edges of the casting and rusting, rapidly clog, and at least twice a day must be "spudded," i.e., cleaned while in operation by means of a chisel-shaped iron bar. The wooden grates may go a week or a month without cleaning, which, however, can be done when necessary while in operation, by means of a steel knife inserted in the clots to remove clogging particles.

Capacity Increased

The slotted openings allow "flakey" particles to pass through easily. It is also claimed that the vibrating, springy action of the wooden grate bars, due to the pulsating action of the upward moving water, tends to keep the spaces free. The V-shaped bars offer the minimum resistance to the ascending water; and also the minimum opening of the water space being at the upper surface of the bars, all particles that enter the space will easily pass on through.

Cost of Grates

The wooden grates sell for $20 each, or per cell of jig, regardless of size, making the cost for a 5 cell rougher jig complete, $100. The cast iron grates are sold by sections, 6 in. wide of any standard length. The price then of a complete 36x48 in. cell would be $8; for one 24x36 in., $6. However, in the Goodrich mine at Prosperity the cast iron grates have to be renewed every two weeks or 26 times a year. At this rate a 36x48 cast iron rougher grate

*Joplin, Mo.

would cost $208 per year, or the wooden grate, which is guaranteed for 8 to 12 months, and frequently lasts a couple of years, would be much more economical.

Comparison with wire cloth or perforated metal would not mean much for this district, for the square and round holes clog so badly that the iron grates are generally used. It would seem, however, that with the larger-size openings, say 3/16 or 3/32 in., where the water space is about equal to wire cloth and perforated metal, that if the wood grates last a year or over, and do require very little cleaning, they might be very economically used as the former types have to be cleaned every day and the cleaning is quite difficult. Wooden grates are now in use in nearly every camp in the Joplin district, over 16 of the principal mills having used them for periods up to three years

How to Recognize Pitchblende

By Herman Fleck*

Pitchblende occurs in fissure veins, in igneous rocks like granite. It is valued for its uranium and radium contents. It is not found in sedimentary rocks, although alteration products of it may be found therein. Such alteration products are colored yellow or greenish, and when in sufficient concentration and quantity, are valuable for their uranium contents. The radium value in these is small, as a rule.

Pitchblende is found in vein matter in stringers varying from knifeblade thickness to several inches. It is "bunchy." The associated minerals in addition to vein matter are sulphides such as zinc blende, galena, and iron pyrite. The latter usually predominates. It is detected by the following properties:

Color—Pitch black, velvety black, brownish sometimes with a grayish or greenish cast. The streak on rough porcelain, i.e., the edge of a broken plate, is brownish black, olive green, or grayish.

Luster—Dull, metallic, greasy, pitchlike.

Fracture—Conchoidal, that is, with smooth curved surfaces to uneven. Brittle

Hardness—Less than quartz. It is not scratched by a knife blade unless weathered.

Specific Gravity—Heavier than iron or steel, also heavier than galena.

The following common minerals are likely to be mistaken for pitchblende by prospectors: Obsidian or volcanic glass, which differs from pitchblende in its light red, glassy luster, and light streak. Magnetite, which differs from pitchblende in that it is attracted by the magnet. Hematite, which differs from pitchblende mainly in possessing a red streak.

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Conditions and Costs at the Braden Copper Mines, Chile

By William Braden*

This paper is presented in the hope that it will be instructive in view of the future large expansion of the mining industry in the west-coast countries of South America. There is a more or less general impression that the Spanish-American workman is inferior to the American, but after some years of experience and observation I doubt the correctness of this view. Taking into consideration all the elements which make for efficiency of labor, it has been found, particularly in Chile, that under proper organization native labor yields as much, man for man, and more, dollar for dollar, than in the western United States.

If a manager is willing to accept unreservedly the *costumbres del pais*, without combating intelligently and patiently the ones tending to inefficiency, he should expect no better results than he deserves. He must conscientiously insist that a "square deal" be given and exacted; that liquor be excluded from camp as far as possible; that comfortable quarters and other uplifting elements of life be provided; and that the *costumbres del pais* shall not be over-ridden roughshod. He should also insist upon the gradual and reasonable adjustment of these conditions to the exigencies of the work; and (by no means the least difficult of his tasks) he should select the most competent men to patiently direct and teach the natives in the several departments, and by their own example encourage self-respect and decency.

While the Braden mine is by no means as yet operated on a large scale, according to modern rating, it will nevertheless be interesting to note what has actually been accomplished there. An illustrative description of the mines and mill of the Braden Copper Company has already been published.[1] However, in order to lend value to the figures given, the general conditions will be explained.

No Timbering Done

The copper deposit is a zone of mineralized, fractured and brecciated diorite, 150 ft. wide, lying under a hanging-wall of brecciated tuff, which has an approximate dip of 65 deg. The mine is dry and little or no drainage of any kind is necessary. The system of mining may be described as overhand mining on broken ore, in a series of transverse stopes, 10 m. wide, with intervening pillars 7 m. wide, which will be ultimately extracted by the caving system. The ore is moderately hard and the roof of stopes, 10 m. wide by 50 m. long, stands perfectly well without timbering. The only timbering in the mine is for the framing of the ore gates for extracting ore from the stopes.

The air drills, used to the fullest extent, are handled carefully and intelligently by the Chilean miners and the results have been so favorable that eventually hand drilling will be almost entirely supplanted. Rack-a-rock is the principal explosive used; but dynamite and black mining powder (the latter manufactured in Chile) are also used to a limited extent. The ore is trammed out of the mine through a main adit in one-ton cars by means of a three-phase electric haulage system (220 volts). It is then carried to the mill, 2630 m. distant and at 550 m. lower elevation, by two Riblet-system aerial tramways.

Water for the hydroelectric power is supplied through a flume, 30 in. wide by 20 in. high, and about 6000 ft. long, and a pipe line from 22 to 18 in. in diameter, which leads to three 42-in. Doble water wheels, two under 820-ft. head, and one under 840-ft. head, direct coupled to a 200-kw. 2200-volt alternating-current generator. Current is distributed about a mile and a half to one motor running under the same voltage, belted to drive an air compressor at the mine, and to various other motors (current transformed to 220 volts) for machine, blacksmith and pattern shops, and (110 volts) electric sample driers and electric-light system.

Chilean Labor Efficient

The following is an extract from the operating report for November, 1908. Costs are given in United States currency, and weights in dry tons of 2000 lb. The total cost of breaking 16,185 tons, including superintendence and general charges, was 41c. per ton. Upon the basis of 7304 tons extracted and milled, the costs per ton were distributed as per an accompanying table.

DISTRIBUTION OF COSTS PER TON.

Ore breaking	$0.31
General mine expense	0.06
Development	0.12
Underground tramming	0.02
Aerial tramming	0.06
Milling: Operation	0.27
Repairs (labor)	0.01
Repairs (materials)	0.09
General mill expense	0.05
Power	0.01
Sampling and assaying	0.05
General expense	0.23
Taxes, insurance and interest	0.04
	$1.32

The ore-breaking account includes much cutting out for ore pockets, sub-crosscuts, raises, and other work of a preparatory nature. More than one-half the labor was performed by contract. In the stopes contracts were let on the basis of the number of feet of hole drilled. The actual cost of the labor for one month was as follows: 164 man-days (9 hr.), with 2½ in. "New Ingersoll" air drills, drilled 5082 ft. at a cost of 2.025c. per ft. Aver

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Note—Paper read at the Spokane meeting of the American Institute of Mining Engineers, September, 1909.

[1] Eng. and Min. Journal, Dec. 7, 1907, pp. 1059-1062.

age amount drilled per man-day, 31 ft. 1008 man-days, by single-hand work, drilled 13,855 ft. at a cost of 8.2c. per ft. Average amount drilled per man per day, 13.8 ft.

Including all labor, both contractors and day-pay men employed for mining, there were 12 tons of ore broken per man-day. Since the above date a system of contracting for ore breaking by measurement of the ore broken has resulted in a considerable reduction of the cost for that item in the foregoing statement. Development was in the nature of drifts, crosscuts and upraises, with an average section of 4.53 sq.m., and, including all labor, supplies, explosives, mucking and tramming, the cost was $3.54 per ft. driven, or 78c. per cubic meter.

The amount of driving was 379 ft. with 876.75 man-days, making 13 ft. per month per man, or 0.433 ft. per day, and 1.96 cu.m. To give a concrete idea of what is considered to be good work, a contract was let for driving a main adit of a section of 6 sq.m. at a total cost of $3.15 per running ft. exclusive of drill-sharpening and repairs: 132.25 ft. were driven in 30 days. Payment of all labor accounts is made three times in each year, on Jan. 1, May 1, and Sept. 1. The workmen are permitted, however, to draw up to 80 per cent. of their balances at any given time—a custom of the country which leads to constancy of work and gives entire satisfaction. Wherever possible, a bonus is paid to encourage good steady work. The foregoing data indicate most conclusively the efficiency of Chilean labor.

According to the *Engineering News*, Oct. 14, 1909, the Panama canal excavation during September totaled 2,836,385 cu.yd., a daily average of 113,455 cu.yd. for the 25 working days, as against 2,755,178 cu.yd., a daily average of 105,969 cu.yd. for the 26 working days of August. The rainfall in September was 10.07 in. as against 9.28 in. in August.

A Portable Electric Air Compressor

An air compressor for special service is illustrated in the accompanying engravings. This machine is a complete electrically driven compressor outfit with motor, compressor and tank mounted on a truck. Such an equipment is a valuable adjunct to a mine for prospecting or other work in a part of the mine where the time and expense of laying a pipe line are not justifiable. Similarly, its uses at a prospect or where comparatively small amounts of work in different places are planned, are obvious.

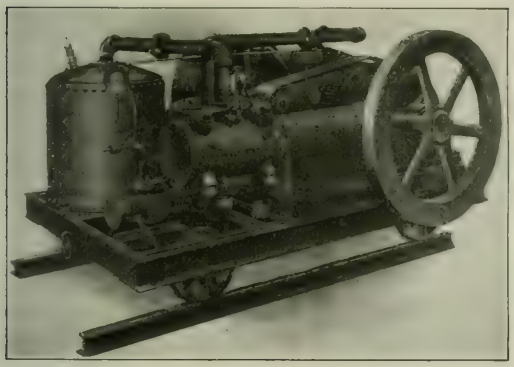
The compressor is of the standard single-stage type, made by the Sullivan Machinery Company, and the air cylinder is fitted with automatic poppet inlet and discharge valves, easily removable for inspection or cleaning. The air cylinder and heads are water-jacketed, the cooling water being supplied by a pump, mounted on the truck, and taking its power by chain and sprocket from the compressor crank shaft. This pump draws its water supply from any convenient source, usually tanks or barrels on a standard mine car. The air-inlet opening is covered with a screen to keep foreign substances from entering the air cylinder, and an unloading device is attached to this opening, arranged so as to shut off the supply of air, thus cutting down the amount of power used, whenever the air pressure in the receivers reaches the desired limit.

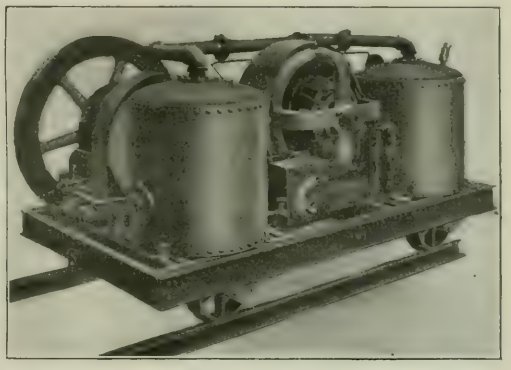
The motor is of the shunt-wound continuous-current pattern, and may be arranged for any desired voltage. It is fitted with a main-line switch and fuse connection, mounted on a slate base, and a starting rheostat, with the necessary wiring and connections between the two.

One compressor of this type, which has been built and supplied for coal-mining service, has a 10x12-in. air cylinder, furnishing about 175 ft. of free air per minute, at 150 r.p.m. The horsepower of the motor is 25, which easily maintains an air pressure of 86 lb. in the receiver. This capacity is ample to operate two small reciprocating rock drills or several hammer drills.

The air discharge from the compressor is delivered in series to two vertical receivers. Two receivers are employed, first, to keep down the hight of the machine, and second, because a single horizontal receiver would not permit the necessary compactness of arrangement, and the proper relation between the positions of the compressor and motor.

The motor and compressor are bolted firmly to a cast-iron sub-base, which, in turn, is bolted to a structural steel frame mounted on the trucks. In case a track is not available, wheels with wide tires may be substituted for those with flanges and the outfit hauled on the floor or ground.





PORTABLE ELECTRIC AIR COMPRESSOR

The record in loading iron ore has been made by the steamship "W. E. Corey" which took on 10,311 tons in 39 minutes at Two Harbors recently, according to the *Iron Trade Review*. The cargo had all been arranged for beforehand, 9311 gross tons of Pioneer ore having been placed in 33 pockets of the new steel ore dock, these pockets corresponding to the 33 hatches of the steamer, and the balance of 800 tons held in Summers ore cars over the pockets. The loading commenced at 2:17 p.m. and by 2:56 p.m. the 10,311 gross tons (mine weight) had been poured into her hold and the chutes raised to the dock. It required but 24 minutes to run the 9,311 tons of ore that the pockets contained and the remaining time of 15 minutes was required in dumping 800 tons, or 18 cars. It will be noted that the "Corey" did not have to shift.

A correspondent states that the lake about three miles northwest of Oroville, Wash., supposed to be a borax deposit, has proved to be epsom salts. The lake is about 1000 ft. long and 200 ft. wide.

Utah Copper Quarterly Report

In the report of the Utah Copper Company for the third quarter of the current year, the executive committee states that the grade and character of the ores treated were somewhat improved during the quarter, the average copper content having increased to the extent of 1.15 lb. of copper per ton, notwithstanding that two of the steam shovels were worked most of the time in a low-grade portion of the orebody. Until about a year ago this part of the deposit was thought to be too low grade to be treated at a profit, but it has been found that on account of a slight improvement in grade and lower operating costs than previously expected, the company is now handling this material at a fair margin of profit. The character of the ore with respect to its amenability to concentration improved in greater proportion than did the value of the ore, with the results that during the quarter in question the average recovery per ton was increased over 1.75 lb of copper, whereas the increase in copper content was only 1.15 lb. per ton.

Both reduction works continued in operation at approximately full capacity, with the exception that the Copperton mill in Bingham cañon was not in full operation during part of the months of July and August. The tonnage milled in the Garfield and Copperton plants during the third quarter was greater than that for the preceding quarter, the gross output of copper being 15,299,674 lb. as against 13,774,412 lb. About 100 tons more ore per day was milled during this quarter and this increased tonnage, together with the improvement in grade, accounts for an output of 1,100,000 lb. more copper than was contained in the ore treated during the previous quarter. The gross output of copper, however, was 1,525,262 lb. greater than during the second quarter, showing improved metallurgical results.

The total net profit for the third quarter was $721,083, of which $6015 was from rents, and the balance profit from mining and milling operations. At the close of the quarter, the company reports no copper unsold. In addition, all copper in transit and in process of treatment and refining which will become due for delivery up to Dec. 1 has also been sold.

Costs

The average net cost per lb. of copper produced at both plants, after deduction of smelting allowances, is given as 8.077c. as against 9.09c. per lb. for the second quarter, and 8.68c. per lb. for the first quarter. The report states that [illegible] the results of the Garfield plant alone, the net cost of the copper produced was 7.87c. per lb. The cost of milling at the Copperton plant was higher than that at the Garfield mill, and [illegible] the quarter under consideration this condition was responsible for the Copperton plant having run a portion of the time under short tonnage.

The Garfield mill produced over 90 per cent. of the total copper obtained, and the cost of the actual milling operation at the Garfield plant was slightly in excess of 47c. per ton; fixed and general charges increase these actual working costs by approximately 50c., so that the average total cost of milling at the Garfield plant was estimated at 52.10c. per dry ton. The average milling cost for both plants, including fixed and general charges, is given as 50.85c. per dry ton.

Actual mining of the ore at Bingham cost 15.39c. per ton. General expenses, together with development expense and the fixed charge per ton to retire prepaid stripping expense, amounted to 9.83c. per ton, making the total average cost of mining for the quarter 25.22c. per ton. The total average cost of mining and milling, including all general charges, development, maintenance, etc., was 82.07c. per ton, this being a reduction in working costs of nearly 3c. per ton as compared with the previous quarter.

Underground Mining Now Limited to Development

The tonnage of underground ore mined was reduced during the quarter to 14 per cent. of the total ore mined. At the close of the quarter, underground work was discontinued with the exception of a moderate amount of development work, and in the future all but an insignificant portion of the tonnage, coming from development, will be extracted by steam-shovel mining.

The physical condition of the mine is reported to be improving, and by the end of the year, it is expected that stripping will be so far advanced as to enable the company to produce ore of more nearly representative grade and character. During the last quarter, at least two-thirds of the output came from lower grade bodies on account of the better grade areas not having been completely stripped, so that a tonnage of clean ore could be secured from them.

Stripping operations continued throughout the quarter at an average rate of 151,000 cu.yd. per month, or a total of 453,000 for the quarter, equivalent to the complete stripping of about 4 acres of ground containing approximately 4,000,000 tons of ore. The average stripping cost per cu.yd. was 31.4c., this figure covering the entire cost of removal of capping, and transportation and disposition of it. The stripping charge, as explained in previous reports, is made against ore mined in such proportion that each ton shall bear its proper share of stripping cost, so that the entire cost of stripping is eliminated [illegible] operating profit. If the total expense of the stripping of [illegible] were had been charged against operations [illegible] of this [illegible] would have been a mining cost of about [illegible] per ton.

a figure the company has not yet been able to reach by any other method than that of steam-shovel mining. Attention is directed to this feature in order to indicate the distinct advantage and economy that will accrue from being able to permanently discontinue underground mining.

Some delay was experienced during the quarter by the failure of the railroad company to give satisfactory service in the transport of ore, but several new and larger locomotives are shortly to be put in this service. This with proposed improvements in the road bed, has relieved the company of any serious apprehension in the matter of moving its products.

Dominion Steel Consolidation

The long controversy between the Dominion Iron and Steel and the Dominion Coal companies is to be settled by a practical consolidation, the stock of the Coal company being purchased by a syndicate representing the Dominion Steel Company. In Montreal, Nov. 15, President James Ross, of the Dominion Coal Company, issued a statement that he had given a purchasing syndicate a 30-day option on his 50,000 shares common stock. The syndicate is composed of E. R. Wood and Sir Henry Pellatt, of Toronto, and W. M. Aitken and C. J. McCuaig, of Montreal. For his holdings Mr. Ross receives $95, payable as follows: $25 per share in cash in 30 days and the balance in 10 installments of $7 each per share, payable at intervals of three months during a period of 2½ years, with interest at the rate of 4½ per cent. payable quarterly.

The sale is contingent upon other shareholders being permitted to accept similar terms, if they should desire to do so, by depositing the certificates for their shares within 30 days with the Royal Trust Company at Montreal, duly assigned and indorsed in blank. If at the end of 30 days the syndicate should fail to make satisfactory arrangements to purchase the shares so deposited on similar terms, Mr. Ross has the right to cancel the agreement for the sale of his own shares and to terminate the negotiations with the syndicate.

Within two days after the announcement holders of 70,000 additional shares of stock decided to come into the agreement, and it is believed that there will be no difficulty in securing the remaining 30,000 shares. When the stock has been transferred arrangements will be completed for the consolidation of the two companies. This is an important transaction, involving the merger of the largest iron and coal interests in eastern Canada, besides terminating the long and expensive litigation arising out of the contracts between the two companies.

The closing of this agreement has caused the exchange of many cablegrams. It is rumored, for instance, that negotiations have been opened for the merger with the

Dominion companies of the Nova Scotia Steel Company and the Drummond interests in Quebec and Ontario; possibly also of the Lake Superior Corporation, with its steel works at the Sault Ste. Marie and its mines on the Mishipicoten range. So far, however, there is no positive confirmation of these reports, and they can be regarded only as indicating a possible result rather than one immediately probable.

The Calumet & Hecla

Will the Calumet & Hecla people come in? They will. They will not. They are receptive. They are not. Never was a rumor of a big copper deal without grave and altogether futile conjecture as to the attitude of the Calumet & Hecla interests. They are not in the least concerned. It is their business to produce and merchandize copper metal, and they attend to it strictly. It is the greatest of the older copper properties, and it is capitalized at the modest figure of $2,500,000. The shares are of the par value of $25 each, and in 20 years each share has received in dividends $750. The aggregate of dividend disbursements during 20 years has been $75,000,000, on a capitalization of $2,500,000. Why should the Calumet & Hecla ever "come in?" asks the *Evening Post*.

The New York Curb Market

The following notice was posted on the Curb bulletin Nov. 10:

"For the protection of the public complaints made in writing against any corporation or individual using the New York Curb market directly or indirectly will be investigated by the agency and referred to the proper authorities for suitable action.

E. S. Mendels,
Agent."

In explaining the notice Mr. Mendels said: "What we want to do is to drive the rascals off the Curb. Unfortunately the prosecution of sharp dealers involves considerable hardship for the out-of-town complainant, as the district attorney in most cases desires a personal interview with those who allege fraud, while the law itself requires that warrants must be signed by those who swear them out. This new rule will give me something tangible to work on. When a writer makes a direct accusation of fraud I send out a form letter in which I offer to bring him on free to New York to press the charge, while if the complaint is only a general one of treatment received I send it to the broker whom it concerns as a reminder. This method of dealing with correspondence from writers who assert that they have been abused has been in fact a part of the Curb agency's policy right along, and it is now put down in black and white for the first time as a sort of guarantee that the agent is willing to move for the redress of any wrongs which are susceptible of proof."

Transvaal Stope Drill Competition

The accompanying table gives the results of the Transvaal stope-drill competition with simple averages of distances drilled and air consumption worked out. The pressures used were not uniform up to September, but during that month they were more closely regulated, varying from 69.1 lb. per sq.in. on the Siskol to 60.1 on the Holman.

	Inches per minute.	Free air per foot drilled.
CHERSEN.		
Elimination	4.110	239.9
June 17-22	3.27	310.4
July 26	3.74	252.0
Aug. 19-31	2.16	256.6
Sept. 21-29	3.523	281.9
Average	3.36	268.1
SISKOL.		
Elimination	4.46	202.4
June 17-22	2.59	362.5
July 21	3.00	321.2
July 26	2.85	397.4
Aug. 19-31	3.21	317.66
Sept. 21-29	4.00	216.2
Average	3.35	302.89
HOLMAN 2¾-INCH.		
Elimination	3.12	385.14
June 17-22	2.47	646.3
July 21-22	3.75	346.0
Aug. 19-31	2.898	325.6
Sept. 21-29	2.55	445.4
Average	2.957	429.688
CLIMAX IMPERIAL.		
Elimination	3.52	235.65
June 17-22	3.03	337.1
July 21	2.55	318.3
July 26	3.04	329.1
Aug. 19-31	2.44	445.3
Sept. 21-29	2.52	313.0
Average	2.85	329.74.
NEW CENTURY 00.		
Elimination	2.33	276.6
June 17-22	2.19	358.8
July 21-26	2.13	351.7
Aug. 19-31	2.77	253.3
Sept. 21-29	2.70	330.6
Average	2.424	314.2
HOLMAN 2¼-INCH.		
Elimination	2.40	376.2
June 17-22	1.85	452.5
July 21-26	2.38	397.5
Aug. 19-31	2.33	285.5
Sept. 21-29	2.45	368.0
Average	2.282	375.94

The distance drilled is about the same for the Chersen and the Siskol, but the air consumption of the former was only 268 against 303. These are the only two drills which cut more than three inches per minute.

The Paper Trade

In mining stock promotions of a particular sort the certainty of results is beautiful, says the perspicacious *Evening Post*. The public puts up the money, the promoter puts the money in his pocket, and the property (if there was one) is blandly forgotten. It is a regular business with a vernacular of its own. The language is that of production; its meaning is subtraction. The promoters themselves conform to no type. They may be sleek and smug, or thin and silent, but all of them are very free spenders of other people's money. "Hello," says one, "What are you doing?" "I'm copper mining," says the other, "and what are you doing?" "I'm copper mining, too." "I thought you were silver mining?" "I was, but the Cobalt game got rotten." And the kind of mining they mean is mining the Curb market.

International Congress of Mining and Metallurgy

The next International Congress of mining, metallurgy, applied mechanics and practical geology will be held in the last week in June, 1910, at Düsseldorf, Germany, under the auspices of the Rhenish-Westphalian mining industry. This appointment is in pursuance of the action taken by the last International Congress, which was held in Liége, Belgium, in 1905. The work of the congress will be taken up in general and sectional meetings, and there will be visits to scientific institutions and industrial works. Inquiries for information should be addressed to the Committee of Organization of the International Congress, 3-5 Jacobistrasse, Düsseldorf, Germany. There are two presidents and two secretaries of the congress, representing respectively mining and metallurgy. For metallurgy, Friedrich Springorum is president, and E. Schrödter, secretary. They are president and secretary, respectively, of the Verein Deutscher Eisenhüttenleute. For mining, Bergrath Kleine, of Dortmund, is president, and Bergassessor von Loewenstein is secretary.

The mining section will consider groups of questions divided into nine heads, as follows: (1) Shaft sinking. (2) Methods of working and mine supports. (3) Hoisting and haulage. (4) Mine drainage. (5) Risks arising from firedamp, coal dust and underground fires. (6) The mechanical preparation of coal and ore. (7) Recent practice in mine surveying. (8) Statistics. (9) Sanitation and hygiene.

The program for the metallurgical section is included under six heads, as follows: A, Production of Pig Iron; B, Production of Malleable Iron; C, Iron and Steel Manufacture; D, Testing of Iron and Other Metals; E, Economics of the Iron Industry; F, Advances in the Metallurgy of Non-Ferrous Metals. In the section of applied [illegible] will be considered relating to [illegible] used for mining and metallurgy. Included among these are the [illegible] of blowing [illegible] and steel works, methods of driving rolling mills, central electric power stations, rolling mill [illegible] for mining and smelting work.

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November 13	9,500
November 20	9,500

None sent free regularly, no back numbers. Figures are bare, net circulation.

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The Copper Deal

It seems that after all we are to have a big copper deal unless plans go wrong. The matter apparently is in charge of a power to which Wall Street doffs its hat in respect. No one knows yet what is going to happen; perhaps not even the power knows. Ideas as to who are concerned are clearer. Amalgamated, Cole & Ryan, and the Guggenheims are the interests which are to be brought together. The questions are how, when and where? We have heard a lot of guesses, but the conundrum is too deep for the ordinary mind. One thing is certain: Wall Street scents a deal that promises profit in the discounting thereof.

Connellsville Coke

The production of coke is so intimately connected with the iron and steel output that it furnishes an index to the course of those industries. This is especially the case in the Connellsville region in Pennsylvania, which supplies the blast furnaces and steel mills of Pittsburg and surrounding districts. The production of the coke ovens there is carefully compiled for each week by the Connellsville *Courier*, and from its statements is compiled the following table, which gives the average weekly tonnage made in each month of the current year.

January	265,205	June	308,600
February	266,396	July	361,540
March	249,669	August	401,297
April	233,151	September	423,062
May	265,040	October	439,559

The total production reported for the 10 months ended with October was 13,835,012 tons. For four months the output remained about at the level of 1907, even falling below it in March and April. In May it began to rise and from that on the increase was steady, until in October it reached a point even above that of 1906 and the earlier part of 1907. Thus far in November there has been a further gain. At the present time production is held down, not by any lack of demand, but by a short supply of labor. A large part of the men employed in the Connellsville field are foreigners, who are not held by any ties of property or association. In the lean times of 1908 many of them drifted away, some going into other occupations or fields, and some even returning to their native countries. Many have returned, but not all, now that there is a demand for their work. The operators are seeking to recruit their forces, and have promised that with the new year there will be advances in the wage scales to the level of 1907. This will involve an increase of about 15 per cent. in the wages now paid; but this is fully covered by the advance in the prices of coke which has been brought about by the increased demand.

The St. Paul Mine Accident

The accident at the St. Paul coal mine at Cherry, in the northern Illinois field, resulting in the loss of nearly 400 lives, appears from the telegraphic accounts to have been the result of an apparently trivial piece of carelessness—if any carelessness in a large coal mine can be called trivial. Until more definite accounts can be obtained, it is impossible to comment on the accident intelligently; but it seems probable that there was no great explosion of gas or dust. There may have been minor explosions, but they were the result of the fire which destroyed the approaches to the shaft and cut off the men in the mine from all chance of escape. In so large a mine it seems as if there should have been a second opening. Had one existed most of the loss of life could have been avoided.

As in nearly all such great accidents, there was a most commendable, though unavailing, display of heroic courage by the rescue parties. The nature of the accident made their efforts useless, but they were made as a forlorn hope and deserve praise accordingly. We hope to have soon a full account of the accident and its probable causes.

A Canadian Steel Merger

The purchase of the stock of the Dominion Coal Company by the Dominion Iron and Steel Company, noticed elsewhere, ends a long and costly litigation, and strengthens the position of the Steel company by giving it control of its fuel supply, which it has not heretofore held. The transaction has given rise to reports of an extensive merger, which is to include the Nova Scotia Steel Company, the Drummond interests in Quebec and Ontario, and the Lake Superior Corporation at the Sault Ste. Marie. Such a combination would hold even a stronger position in Canada than the Steel Corporation has

in the United States. Our Canadian neighbors seem to have taken to mergers and combinations lately; but it is at present impossible to say positively whether these reports are only surmises, or are based on actual negotiations. The most that can be said is that they forecast a result which is not at all improbable.

The Smelter Smoke Question

The persistent agitation of the farmers in California on the subject of smeltery fumes, particularly in Shasta county, indicates that this matter must receive definite attention from the managers of smelting plants in that section. Indeed they are keeping it prominently in mind. The closing of the smeltery of the Mountain Copper Company at Keswick, several years ago, caused that community to alter its attitude toward its smelting industry, but only after the plant had ceased operation. This method, while successful in abating the smoke, was unsatisfactory both to the smelting company and to the community, which afterward sought to have operations resumed. The situation in Utah is somewhat similar. Many of the farmers of the Salt Lake valley, after a bitter struggle to close the smelting works, are glad that their market will be partially restored by the modification of injunction obtained by the United States Smelting Company, which is now taking steps to construct a baghouse and extensive flue system preparatory to resuming the smelting of copper ores.

The overcoming of the fume difficulties, both in its lead and copper smelteries, by the neutralization of the acid gases and the baghousing of the fumes is a noteworthy technical achievement for the staff of the United States Smelting Company. Although the method is not of universal application, there are doubtless other smelting plants where conditions are sufficiently similar to permit an adoption of a modification of the method developed at Bingham Junction. The Mammoth Copper Mining Company is in fact now making plans to install a similar system at its works in Shasta county, California. Where there is a market for sulphuric acid and suitable ores are treated, as in Tennessee, the production of acid is undoubtedly the most profitable way of disposing of the smoke problem, but most smelting plants are situated where other methods must be devised.

California is now producing about 166,000 bbl. of petroleum daily, which is about 10,000 bbl. a day more than is being consumed, and it is estimated that there are about 18,000,000 bbl. in storage. Some of the oilfields, as for example, Coalinga, in Fresno county, are showing a reduced output, while others are increasing. The Santa Maria fields, in Santa Barbara county, are now yielding about 700,000 bbl. per month. Prospecting still continues in most fields, though the withdrawal of large tracts by the Secretary of the Interior is having some effect in preventing the posting of locations to hold oil lands. The lands withdrawn extend from Mount Diablo southeast several hundred miles and embrace almost all tracts that could possibly hold oil. Those who were drilling on public lands before the withdrawal of the lands consider themselves secure in their rights. There is doubt, however, of future results of this withdrawal where no discoveries had been made prior to the issue of order.

When the report of the United States Steel Corporation for the September quarter was published there was unfavorable comment because there the unfinished orders on the books showed less increase than had been expected. This, however, was hardly based on a knowledge of the facts. The total of unfinished orders is less than in some preceding quarters when business was not really as active as at the present time. The reason is that the corporation has restricted its contracts and has refused to accept two classes of orders, one being those running far into next year, and the other being orders from jobbers which partook of a speculative nature. The object of the corporation, apparently, has been to restrict that class of business and also to be in a position to take advantage of increasing demand by some advance in prices.

Comment has heretofore been made on the position of the Lehigh Coal and Navigation Company which owns what is practically the only large block of anthracite lands outside of the control of the roadroads. Some time ago nearly all the stock of the company was pooled in anticipation of a sale of the property. The transaction was not completed, and the pool then formed is now about to expire by its limitations. The managers, who are directors of the company, recommend that it be extended for five years more, though no negotiations are pending for a sale at present. They also recommend that the selling price be raised from $135, as by the present agreement, to $175 per share of $50 par value. Evidently they do not think that the value of anthracite mines and lands is depreciating.

The strike of the Amalgamated Association of Iron and Steel Workers which has been in progress since last July has thus far had no result. Agreements were made by the association with some independent producers, as was noted at the time, but the American Sheet and Tin Plate Company, against which the strike was chiefly directed, has remained firm in its support of the open shop. The latest development is that the company has commenced to dismantle two or three of its large union works which have been closed through the strike, and is removing the machinery to some of the other plants which have always been non-union.

Some of the difficulties attending coalmine management in Pennsylvania, are shown by the statement in the latest report of the State Bureau of Industrial Statistics that 67.3 per cent. of the men employed in the coal mines in 1908 were of foreign birth. In the anthracite field there were 89,165 foreigners out of a total of 134,992; in the bituminous mines 92,295 out of 134,648. It is no easy task to handle this great mass of foreign labor and to enforce the observance of rules; especially as many of the men understand the English language imperfectly, or not at all.

A significant fact is that the official returns made in the principal steel-making countries this year for the first time give a separate line to steel made in the electric furnace. This is the case with Germany, France and the United States, although Great Britain has not yet followed the example. The quantities made, though still small, are appreciable, and the statistical authorities of the different countries have apparently been convinced that steel-making in the electric furnace has come to stay.

Views, Suggestions and Experiences of Readers

Comments on Questions Arising in Technical Practice and Debatable Points Suggested by Articles in the Journal

CORRESPONDENCE AND DISCUSSION

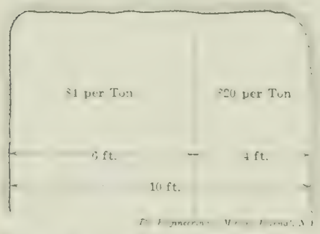
Working Costs

In the JOURNAL of Sept. 25, 1909, I noticed an article upon operating costs on the Rand, and the editorial remarks following. The article to which I refer emphasized the fact that relatively low per-ton costs are not necessarily coincident with the best commercial results. The editorial indorsed this view and recited its recognition by certain copper companies resulting in a change in their accounting methods to show costs per pound of copper instead of costs per ton of ore, in order to avoid the evil results of managers' efforts for per-ton cost records.

It is easily demonstrated that cost per unit of metal is quite as fallible a reference as cost per ton of ore, and as one of these references is almost invariably used by [illegible] should [illegible]

ciencies of two mining operations upon unit costs alone may be justified, two conditions are essential: (1) The economic and physical conditions must be identical; (2) the operating methods must be such as will show the maximum of profit when the orebodies shall have been exhausted. The first of these conditions is practically never met with, and the second is rarely attainable even with management of the highest order, incapable of seeking unit cost records at the expense of ultimate outcome.

It follows that in nearly all cases a unit cost difference between two operations should be regarded by managing directors as by the intelligent operator, simply as a signal for investigation and not as a basis for passing judgment. Experienced operators will agree that the comparative investigation indicated generally calls for the exercise of technical and business ability [illegible]



BLACK'S MANAGEMENT:

Average cost $6 per ton dry, breaking 10 ft. wide.
1 ton at $20.00 = $20.00
1.5 ton at 4.00 = 6.00

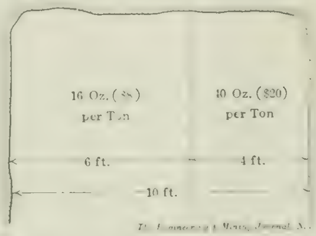
2.5 ton at 10.40 = $26.00 revenue
2.5 ton at 6.00 = 15.00 cost

2.5 ton at 4.40 = $11.00 profit

WHITE'S MANAGEMENT:

Average cost $7 per ton dry, breaking 4 ft. wide.
1 ton at $20.00 = $20.00 revenue
1 ton at 7.00 = 7.00 cost

1 ton at 13.00 = $13.00 profit



BROWN'S MANAGEMENT:

Average cost $6 per ton dry, breaking 10 ft. wide.
1 ton at 40 oz. = 40 oz. = $20.00
1.5 ton at 16 oz. = 24 oz. = 12.00

2.5 ton at 25.6 oz. = 64 oz. = $32.00 revenue
2.5 ton at $6 = 15.00 cost

2.5 ton at 25.6 oz. = 64 oz. = $17.00 profit
Cost per oz. silver = $15 ÷ 64 = $0.234

GREEN'S MANAGEMENT:

Average cost $7 per ton dry, breaking 4 ft. wide.
1 ton at 40 oz. = 40 oz. = $20.00 revenue
1 ton at $7 = 7.00 cost

1 ton at 40 oz. = $13.00 profit
Cost per oz. silver = $7 ÷ 40 = $0.175

COMPARISON OF OPERATING COSTS AND PROFITS

same linear advance of stope back being assumed for each operator, and the figures representing revenue. Thus Black shows as operating cost $6 per ton and a total profit of $11; White shows as operating cost $7 per ton and a total profit of $13; Brown shows as operating cost $0.234 per oz. silver and a total profit of $17; Green shows as operating cost $0.175 per oz. silver and a total profit of $13. Black achieves low cost per ton by breaking ore which does not pay; Green achieves low cost per ounce of silver by leaving ore of low grade which would break to a profit.

What proportion of directors accustomed to per-ton costs would doubt that Black was White's superior in operating efficiency, and of those accustomed to unit of metal costs, what proportion would hesitate to declare Green a better manager than Brown?

These common errors of the heads of mining operations afford opportunity and temptation to managers to serve their reputations at the expense of the stockholders, and this very thing is being done every day on properties which are worked "to the books." *Per contra*, the operator who will not over-equip his mine, nor cut development work, nor designedly stope ore which does not carry itself, nor leave profitable ore of low grade, nor compromise in any fashion with his struggle for the unattainable final maximum of profit, will often suffer when his results are judged by unit costs alone. The treatment of the subject discussed suggests a similar simple demonstration of the unreliability of comparisons based upon current profit and loss results.

CORTLANDT E. PALMER.

Nov. 9, 1909.

Calumniating a City

There appeared in one of the New York papers on Sunday morning, Nov. 7, a lurid description of surface cavings in Scranton, Penn. [illegible] in the suburbs of Scranton [illegible]

in their denunciations of the capitalistic greed that robbed the pillars under their small properties. I am not blaming them for being angry. They had a right to be angry. In my opinion the thing could have been prevented and ought to have been prevented by operating companies that were making relatively large profits out of the mines. I have said so in a former article in the JOURNAL, and I now repeat it. At the same time, the destruction alleged to be brought by caves was unconscionably exaggerated even by the local press. I said then and I say now, that a fire of even moderate dimensions in the heart of the cities of Scranton, Wilkes-Barre, Pittston or Carbondale, would be infinitely more destructive than the loss of property caused by the most serious subsidence that ever took place, or that will or can take place in these cities or in their immediate neighborhoods. The loss of property occasioned by the caves has been, I repeat, insignificant, and should be less so in the future with precautions that would cost comparatively little to put into effect. Something has already been effected in that way, and there seems to be a disposition on the part of the operators to undertake voluntarily a great deal more of it.

The article in the Sunday paper gave a mendacious account of the character of the subsidences that took place in West Scranton. In fact, nothing happened that is alleged to have happened there, except the fact that there were subsidences. But in a daily paper, one does not expect and one does not get scientific accuracy of details in matters of this kind. It is not the text of this outrageous article that has chagrined and disconcerted the people of Scranton. It is the abominable illustrations accompanying the article that has aroused the indignation of all, even of people whose homes have been more or less injured by the subsidences. These illustrations are not accurate or nearly accurate representations of the conditions of the district in which the caves took place, even at the time of the disaster.

For instance one of the photographs represents a house or barn toppling into a mine cave. Now, as a matter of fact, this picture is a photograph of a subsidence that took place over eight years ago in Olyphant, a borough six or seven miles as the crow flies from the city of Scranton. Another photograph has been faked in such a way that a subsidence of very small dimensions is represented as a section of a cemetery through which the tombstones and monuments are dashing into the yawning cavity that leads into the bowels of the mine. A glance at the photograph will show these toppling tombstones and monuments have been interpolated into the original photograph. Not an incident of the kind ever happened in Scranton, or within miles of it, if indeed, anything of the kind ever happened in the anthracite regions or elsewhere. I have made inquiries of the cemetery officials where this incident is represented to have taken place, and they assured me that not a coffin nor a corpse has left its resting place so far as they know of or could discover.

One of the photographs represents what appears, or at least what is stated to be a section of the tracks of a street railway. This is an abandoned section of temporary tracks on which small gondolas laden with ashes for an ash dump were dragged by a mule. If I am not mistaken, one of the photographs is placed on edge, so that a small cave appears in the paper as if it were a portal to an inferno. In another picture the pillars are represented as being almost a mile apart. Two-fifths of the coal in the anthracite mines in the Lackawanna valley is still in the pillars. Pillars are the residuum of the breasts, and there are thousands of them where this article represents them as having been "robbed."

One of the officers of a coal company said to me: "There is no truth in three-fourths of the asservations made in the article and the illustrations that accompany are monstrous perversions of the incidents that appeared superficially in the subsidences that took place in West Scranton. I was there shortly after they occurred, for our mines were affected, although our property was not directly under this section of the city. The situation looked appalling enough when the section affected stood in raw contrast to that which escaped. But even a superficial investigation showed that appearances were altogether deceptive, and that with the exception of a few homes that were thrown out of plumb and a few fissures in the earth, in reality nothing serious had happened or was likely to happen in that section. A public school was the only building that could not be restored to as good condition as ever for a few hundred dollars, for where a squeeze once occurs, it is a rare thing for another to take place there; the squeeze acts as a brace to the surrounding property. I do not wish to dwell on this, but what I do maintain is that while subsidences will occur over the worked-out superficial veins this caving will be on a small scale, and with some precautions on the part of the operators these should neither be frequent nor serious."

I was shown a telegram by Alderman W. S. Millar, of Scranton, which he received from his daughter on the morning following the publication of the article to which I refer. The young lady, who lives in Brooklyn, was evidently greatly disturbed when she wrote the dispatch, for she wanted to know if her father's home was outside the zone of the subsidence, and whether her friends and family had been in any danger. The caving in West Scranton occurred three months ago, but this girl (a Scranton girl) read the article as if it were the immediate news of an awful catastrophe, something between an earthquake and a dynamite explosion. There is not the slightest doubt that thousands of other people, less likely to be informed upon the matter, read the article and appreciated the illustrations in the same light. It appears that people living in this city have received scores of communications inquiring into the extent of the disaster that has befallen or threatens the city, and these letters were written in good faith, but, of course, in complete ignorance of the situation.

The article is an outrage perpetrated against the people of a great industrial center and against the material reputation of the city itself. There is no excuse, much less a palliation for its publication. A telegram to any responsible citizen of Scranton would have set the editor of this Sunday supplement absolutely right on the situation in Scranton, and in the neighboring cities, if he had cared to learn the truth.

P. M. GREER

Scranton, Nov. 10, 1909.

Copper Converter

Referring to Charles F. Shelby's article in the JOURNAL of Oct. 23, 1909, describing a modern type of barrel converter for copper matte, I wish to bring to the notice of readers of the JOURNAL that similar considerations led me to design a converter with spherical shell. An additional feature, more valuable than the increased life of the lining, is the arrangement of the tuyeres in such a manner as to generate a vortex in the fluid matte for the purpose of increasing the air efficiency in the copper converter, which at present is very low. This would result in a more rapid oxidation of the charge, hence a reduction of the time required for blowing. As a later development I intend to use a non-corrosive lining and feed silicious ores through the nose of the converter. This type of converter is covered by U. S. Pat. 832,065, of Oct. 9, 1906.

HERBERT HAAS

San Francisco, Cal., Nov. 9, 1909.

A prospector in South Australia, according to *Bulletin* No. 8 of the Department of Intelligence, must mark his claim with a post at each corner. Each post must be not less than [illegible]

Details of Practical Mining

Notes of Interest to Prospectors and Operators of Small as Well as Large Mines. Things That Have to Be Done in Everyday Mining

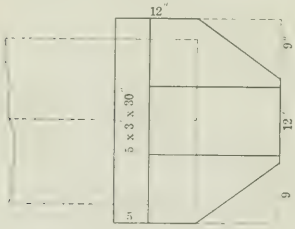
REPORTS FROM EXPERIENCE

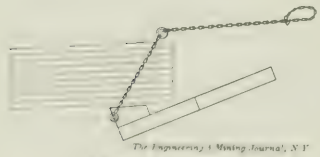
Readers of the JOURNAL are invited to contribute to this department. Articles should be brief, thoroughly practical, and preferably illustrated by drawings or sketches. Our draftsmen will prepare properly any kind of a pencil sketch that is intelligible. Something that is an old story in one district may be quite unknown in another. Articles accepted and published are suitably paid for.

A Scheme for Transporting Lumber

BY W. F. DU BOIS*

The accompanying illustration shows a contrivance that was very useful to me in transporting lumber. The wagon road ended ¾ of a mile from the mine where





A LUMBER "LIZARD"

I wished to put up an office and mine buildings. The slope from the end of the road to the mine was between 30 and 40 deg., so that it was impossible to go down with a wagon. The "lizard" used is 2½ ft. wide, 2 ft. long and made of 2-in. plank. On the top is a piece of pine 3x5 in., beveled so that it is 3 in. thick on the back and 1½ in. in front and spiked to the 2-in. plank with 20d. nails. The first planks or boards to be hauled are spiked on top of the 3x5 in. piece with 20d nails and the successive layers of boards nailed to each lower layer. After 18 or 20 boards, 18 ft. long were securely spiked, an ordinary 10-ft. log chain was put around the boards, back of the 3x5-in. plank. The end of the chain was fastened to a singletree by a grabhook. One horse could easily pull the load down the back of the ridge to the mine. On arriving at the mine the chain was thrown off and each board pried loose. The chain and singletree were hung on the harness and a boy carried the lizard as he rode the horse to the lumber pile after another load. The lizard lasted twelve loads. Four trips a day were made.

*Mining engineer, Quincy, Cal.

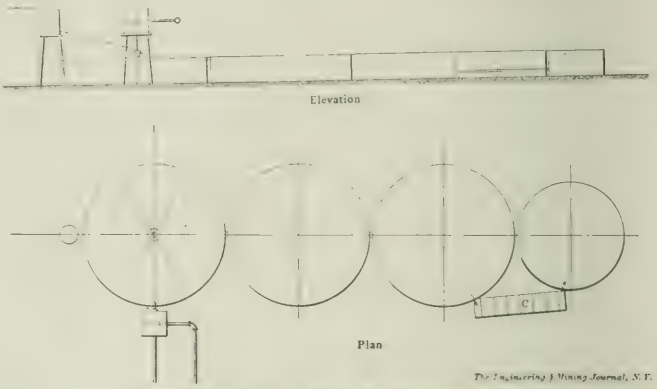
Stamp Drop Sequence

The order of stamp drop sometimes makes a great difference in the capacity of a stamp mill. At the Gold Cross mill of 100 stamps at Hedges, Cal., the drop of 100-lb. stamps on rather friable ore was 1 4 2 3 5. This sequence gave an even splash, even distribution of ore on the dies and a good discharge. As an experiment, the drop of 10 of the 100 stamps was changed to the so-called standard drop, 1 3 5 2 4, with the result that the battery men immediately complained. These 10 stamps gave more trouble than all the others together.

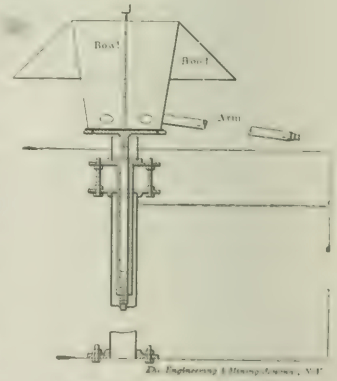
With the numerous modern cam fastenings, it is possible to try both drops by merely having the cam shafts drilled or flatted (as the case may be) for both sequences. This can be done by the manufacturer without the slightest injury to the shaft and at little or no expense. The change from one drop to another can then be made in two hours after the mill is built and it is desired to experiment with the second order of drop.

Water Softening

In many of the mining districts in Western Australia the only available water for boiler feed contains a large amount of scale-forming constituents. Gordon F. Dickson, in the *Journal* of the Chamber of Mines of Western Australia, Aug. 31, 1909, describes a process of water softening, and says that with a comparatively small expenditure a plant can be erected that will give excellent results.



GENERAL ARRANGEMENT OF WATER SOFTENING PLANT



DETAILS OF DISTRIBUTION

The accompanying plan shows the arrangement of a plant in use at the Northern mines, Lawlers. The chemical receiver *B* is capable of holding a supply of dilute chemical reagent, the flow from which is

regulated to last 24 hours. The first or separating tank is fitted with a central column in which is a spindle and bowl of the Butters automatic distributor type, and into this the hard water, after passing through the heater *A*, is delivered, where it mixes with the required quantity of solution fed from the chemical receiver *B*. The distributor has six arms, each perforated with a number of holes at equal distances and placed at an angle of 45 deg. below the center line of the pipe, through which the combined water and chemical solution is sprayed into the tank. The rapid circulating motion of the arms causes a certain agitation which allows of complete mixing, and quickly effects a separation of the solids.

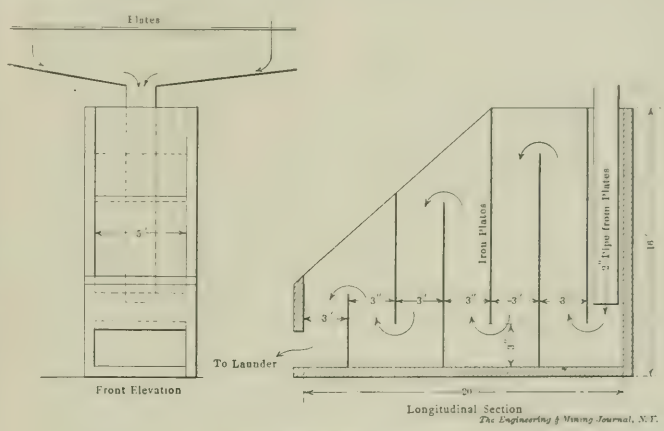
To provide for thoroughly cleansing the pipes of any adhering scale the ends of the distributor arms are fitted with ordinary screw plugs. By removing these daily, and passing a light iron rod through the pipes, the latter are kept perfectly clean. To prevent the water from getting on the bearing surfaces of the spindle and bowl, a hood is fitted around the top of the bowl, which carries off any water that might overflow and be liable to cause incrustation on the working parts. Besides the increase in temperature gained from passing the hard water through the heater *A*, exhaust steam is also led into the separating tank, and the temperature is further raised to 160 deg. F. This removes a percentage of the carbonates of lime and magnesia contained in the water, and further effects a complete blending of the chemical reagent with the hard water.

The water overflows from the first to the second tank, where the principal settlement takes place, thence to the third tank for further settlement, after which it passes through the filter *C*, where any of the precipitate that has passed the settling tanks is caught and any oil introduced with the exhaust steam is removed. The water before treatment contains 16 deg. total hardness, 5 of which are permanent and 11 temporary. After treatment, daily tests show the total hardness of the water to average less than 2 deg. Analysis of the water shows the following constituents in parts per 100,000: Organic and volatile (including CO_2), 6.07; silica, 7.81; ferric oxide and alumina, 3.63; calcium sulphate, 8.30; calcium carbonate, 4.57; magnesium carbonate, 9.40; sulphuric oxide, 1.80; chlorine, 7.32; total, 48.90.

The softening of the water is effected by the addition of 10 lb. of caustic soda per 24 hours for 19,000 gal. of feed water. Samples of water taken from the flow entering the boiler-feed tank show, on analysis, only traces of lime and magnesia. The plant has been in operation for four months and, except for occasional stoppages to remove the accumulated precipitate from the tanks and the brief time required each day for cleaning the distributor arms, it has worked continuously and has given the utmost satisfaction, at a trivial cost for labor and maintenance.

An Amalgam Trap

A form of amalgam trap that is giving good satisfaction on sands heavy in sulphides at the Laurentian mill in Gold Rock, Ontario, is illustrated by the accompanying drawing. The baffles are iron plates, adjustable in hight above bottom of box, sliding in grooves cut in the wood sides of the box.



TRAP FOR COLLECTING AMALGAM

ARRANGEMENT OF HOLES FOR BLASTING WITHOUT REMOVING DRILL

A Method of Blasting in Stopes

The method of drilling and blasting used in many shrinkage stopes of California is worthy of far wider application than it receives. It can be employed in any stope where the muck from one round of holes is not depended upon to furnish a foundation for the bar or column for the next round. It may be used in either wide or narrow stopes.

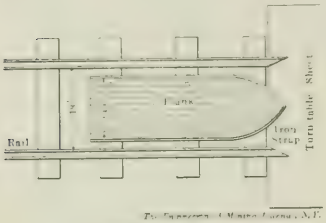
As in the accompanying illustration, only the rows of holes, *a b c*, are blasted, the remainder being left until the next shift. In this manner the machine is always well behind the shots and need never be torn down on account of blasting. It is torn down only when all the holes possible from the set-up have been drilled, and the troublesome and useless labor of carrying the drill and rig over timbers and muck in search of a safe place to leave it is avoided.

By this method there is no lost time on the part of the machine runner and the only drawback to the system is the fact

that the breaking powers of each hole will depend upon the efficiency of a number of unblasted holes before it. However, this argument has its foundation more upon fear than upon any real uncertainty a good miner feels regarding the breaking of his round.

Mining Track Frog

The cheap, simple but effective device shown in the accompanying figure is used in some of the Utah mines for guiding the

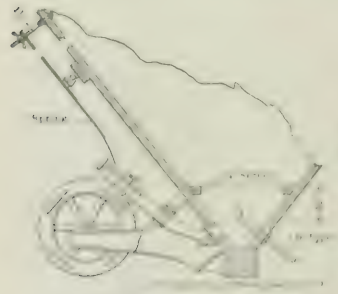


TRACK AND FROG

wheels of mine cars to the rails when passing from a smooth floor or, for example, from a turntable. It is composed of a piece of 2-in. plank, 15 in. wide (if used with 18-in. track) and 2½ ft. long. One end is cut into a rounding point and the edge of the plank is protected by a piece of strap iron, 2 in. wide, nailed on. The device is then spiked down between the ends of the rails, with the point toward the turning place, leaving enough space between the edges and the inner sides of the rails for the flanges of the wheels to pass. Unlike most other devices for this purpose, this contrivance does not get battered out of shape, does not require a blacksmith to make it, and never fails in its duty.

Lime Emulsion Feeder

A convenient and automatic scheme for feeding lime to a cyanide mill where it is



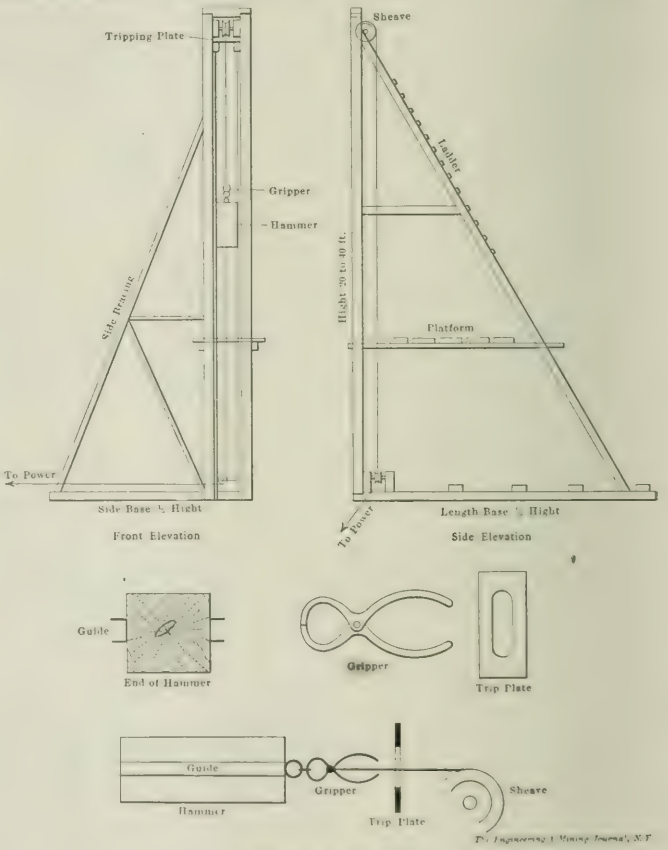
conical-bottomed wood or iron tanks, each to have a capacity of 12 hours' supply of lime when diluted, 10 to 1, with water. The point of each tank is provided with a valve which is opened at intervals for short periods, being held shut at other times by a spring as shown. A tiny jet of air in the point of the tank will maintain the lime emulsion at a constant consistency.

The lime should be slaked in one tank (with hot water, of course, since this method gives much the best results), and then diluted while the other tank supplies the plant. A [illegible] screen is provided in the [illegible] cooperating rock, which is to [illegible] all lime and which [illegible] by the valve. Second lime [illegible] each day is prepared [illegible] the second [illegible] and [illegible] the feeding plant.

[illegible]

A Homemade Pile Driver

The pile driver illustrated by the accompanying sketch may be entirely constructed at any camp, no matter how remote. It may be mounted on a scow or set up on runners in the usual manner. In cold countries it is generally used in winter when it can be set on the ice. A donkey engine or horsepower may be used; in either case the power may be applied from the shore if necessary. The



DETAILS OF PILE DRIVER

piles may be guided by wood frames built for the purpose, sliding on the guides.

When the hammer is raised, the curved arms of the gripper are engaged by the small opening in the plate, thus keeping the jaws open and releasing the hammer. After each blow, a rope running on the sheave [illegible] the gripper to the long [illegible] the hammer. The hammer consists of a piece [illegible] long [illegible] 18 in. square.

[illegible]

New Publications

LO ZINCO. By Roberto Musi-Boy. 3.50 lire. Ulrico Hoepli.

POCKET MANUAL OF THE ENGINEER'S SOLAR TRANSIT. 25c. Keuffel & Esser Company.

THE TIN FIELD OF NORTH DUNDAS. By L. K. Ward. John Vail, Government Printer.

NEVADA'S MINERAL RESOURCES. Compiled by E. E. Stuart. State Printing Office, Carson City.

CONCRETE. By John C. Trautwine, Jr., and John C. Trautwine, 3rd. John Wiley & Sons.

DIE SPEZIALSTAHLE IN THEORIE UND PRAXIS. By Walter Giesen. 3 marks. Craz & Gerlach.

ELEMENTS OF MACHINE DESIGN. By Dexter S. Kimball and John H. Barr. $3. John Wiley & Sons.

ALTERNATING CURRENT MOTORS. Third Edition. By A. S. McAllister. $3. McGraw-Hill Book Company.

A TEXT BOOK OF PHYSICS. Second Edition. Edited by A. Wilmer Duff. $2.75 P. Blakiston's Son & Co.

LES POUSSIERES DE HOUILLE. By J. Daniel. *Annales des Mines*, February, 1909. 3 fr. 50. H. Dunod and E. Pinat.

TRANSACTIONS OF THE AMERICAN INSTITUTE OF CHEMICAL ENGINEERS. Vol. I. 1908. D. Van Nostrand Company.

DIE KUPFERERZLAGERSTAETTEN IN NORDAMERIKA. By Leonhard Odendall. Kölner Verlagsanstait und Druckerei, A. G.

DIE ENTWICKLUNG DER DEUTSCHEN EISENINDUSTRIE IN DEN LETZTEN JAHREN. By F. Wüst. M. 1.50. Wilhelm Knapp.

FIFTH BIENNIAL REPORT OF NORTH DAKOTA GEOLOGICAL SURVEY. By A. G. Leonard, State Geologist. State Geological Survey.

ESTUDIOS JEOLOJICOS I TOPOGRAFICOS DEL DESIERTO I PUNA DE ATACAMA. By Lorenzo Sundt. Sociedad Nacional de Mineria.

IRON ORES, SALT AND SANDSTONES. W. Va. Geol. Sur., volume IV. By G. P. Grimsley. $2. I. C. White, State Geologist.

DIRECT AND ALTERNATING CURRENT TESTING. By Frederick Bedell, assisted by Clarence A. Pierce. $2. D. Van Nostrand Company.

THEORETICAL ELEMENTS OF ELECTRICAL ENGINEERING. By Charles P. Steinmetz. Third Edition. $4. McGraw-Hill Book Company.

TABLES AND OTHER DATA FOR ENGINEERS AND BUSINESS MEN. Compiled by Charles F. Ferris. 50c. University of Tennessee, Knoxville.

THE OFFICIAL YEAR BOOK OF NEW SOUTH WALES, 1907-1908. By John B. Trivett, Government Statistician. W. A. Gullick, Government Printer.

SECOND APPENDIX TO THE SIXTH EDITION OF DANA'S SYSTEM OF MINERALOGY. By Edward S. Dana and William E. Ford. $1.50. John Wiley & Sons.

LAVORAZIONE E TEMPERA DEGLI ACCIACI INDURIMENTO SUPERFICIALE DEL FERRO E CEMENTAZIONE. By Arturo Masseuz. 2 lire. 1909. Ulrico Hoepli.

COLORADO GEOLOGICAL SURVEY: FIRST REPORT, 1908, with accompanying papers. By R. D. George, State Geologist. The Smith-Brooks Printing Company.

DIE HERSTELLUNG VON HOCHPROZENTIGEM FERROSILIZIUM IM ELEKTRISCHEN OFEN. By Waldemar Pick and Walter Conrad. M. 6.60. Wilhelm Knapp.

THE GEOLOGY OF THE MIKONUI SUBDIVISION, NORTH WESTLAND. N. Z. Geol. Surv., Bull. No. 6. By Percy G. Morgan. John Mackay, Government Printer.

THE GEOLOGY OF THE QUEENSTOWN SUBDIVISION, WESTERN OTAGO DIVISION. N. Z. Geol. Surv., Bull. No. 7. By James Park. John Mackay, Government Printer.

THE MANZANO GROUP OF THE RIO GRANDE VALLEY, NEW MEXICO. U. S., Geol. Surv., Bulletin 389. By Willis T. Lee and George H. Girty. Government Printing Office.

PROCEEDINGS OF THE FIFTH ANNUAL CONVENTION OF THE NATIONAL ASSOCIATION OF CEMENT USERS. Volume V. Edited by the president. Published by the association.

THE ORE DEPOSITS OF SOUTH AFRICA. Part II. The Witwatersrand and Pilgrimsrest Goldfields and Similar Occurrences. By J. P. Johnson. Crosby Lockwood & Son.

THE PREVENTION OF INDUSTRIAL ACCIDENTS. No. 1—General Pamphlet. Prepared by Frank E. Law and William Newell. 25c. The Fidelity and Casualty Company of New York.

THE YAKUTAT BAY REGION. Physiography and Glacial Geology, by Ralph S. Tarr. Areal Geology, by Ralph S. Tarr and S. Butler. U. S. Geol. Surv., Professional Paper 64. Government Printing Office.

GEOLOGICAL REPORT UPON THE GOLD AND COPPER DEPOSITS OF THE PHILLIPS RIVER GOLDFIELD. By Harry P. Woodward. DESCRIPTION OF THE CRYSTALLINE ROCKS OF THE DISTRICT. By E. S. Simpson and L. Glaubert. W. A. Geol. Surv., Bull. No. 25. Fred W. Simpson, Government Printer.

THE DEEPER GEOLOGY OF THE NETHERLANDS AND ADJACENT REGIONS WITH SPECIAL REFERENCE TO THE LATEST BORINGS IN THE NETHERLANDS, BELGIUM AND WESTPHALIA. By W. A. J. M. Vanwaterschootvandergracht, with CONTRIBUTIONS ON THE FOSSIL FLORA, by W. Jongmans. 40 marks. Institute for the Geological Exploration of the Netherlands.

EIGHTEENTH ANNUAL REPORT OF THE BUREAU OF MINES, 1909. Vol. XVIII, Part I. By L. K. Cameron.

Contents: Statistical review: mines of Ontario; iron ranges of Hipigon district; iron range north of Round lake; Black Sturgeon iron region; Bog iron on English river; geology of Onaman iron range area; iron formation of Woman river area; Lake Abitibi area; Lake Ojibway; last of the great glacial lakes and classification and nomenclature of Ontario drift.

INDIANA: DEPARTMENT OF GEOLOGY AND NATURAL RESOURCES. Thirty-third annual report, 1908. By W. S. Blatchley, State Geologist. Office of the State Geologist.

Contents: The coal deposits of Indiana: a supplemental report to the one issued in 1898. Report of the State mining inspector for the year 1907. A soil survey of Dubois, Crawford and Perry counties. A soil survey of Daviess county. The petroleum industry in Indiana in 1908. Report of the State supervisor of natural gas for 1908. The stratigraphic and faunal relations of the Waldron fauna in southern Indiana. The mammals of Indiana.

SUGGESTED RULES FOR RECOVERING COAL MINES AFTER EXPLOSIONS AND FIRES. By W. E. Garforth. $1.50. D. Van Nostrand Co., New York.

This book is offered to the coal-mining public in the hope that the suggestions contained therein will prove of service in saving life, relieving suffering, recovering victims and restoring mines for regular work. The volume contains a detailed description of the plan followed in rescuing victims from the Altofts colliery, after the explosion at that mine. The author shows how the work of opening up the Altofts pit might have been rendered safer if the use of portable breathing apparatus had been known in 1886, as it is at the present day. The book is particularly valuable in that few writers have attempted to treat this subject in a complete and detailed manner. Among other subjects treated in the book are the following: Suggested precautions to be taken before an accident, appointment of emergency officials; preparation of mechanical and other special appliances, safety and electric lamps, etc., ventilation, fan drift, separation doors, etc.; sections and plans of shafts and underground workings for the use of explorers; instructions to workmen, need of special knowledge and training for rescue work, and suggestions should men be entombed; equipment of rescue stations and requirements of the portable breathing apparatus—danger attending use of apparatus with untrained men.

Personal

Mining and metallurgical engineers are invited to keep THE ENGINEERING AND MINING JOURNAL informed of their movements and appointments.

P. McCardell recently returned to Kingman, Ariz., from a survey trip of 30 days.

E. C. Thurston sailed from New York, Nov. 6, on his way to Peru on professional business.

J. E. Spurr, of New York, was in Monte Cristo, Wash., recently, on professional business.

F. C. Fuchs, of Lima, Peru, is in the goldfields of southern Peru and expects to remain there until December.

Quincy A. Shaw has returned to Boston after an extended visit to the mines of the Lake district of Michigan.

Senator Simon Guggenheim has returned from Europe. Daniel Guggenheim has also returned from abroad.

H. W. Kane, a Gilpin county, Colo., operator, is making a business visit to Pittsburg and other Eastern points.

F. N. Flynn, of Globe, Ariz., has been appointed metallurgist to the Arizona Copper Company, Ltd., at Clifton, Arizona.

W. T. Cronkright, of Moundsville, W. Va., has been appointed receiver of the Bituminous Coal Company, of America.

Alexander Agassiz and his son Rudolph have returned to Boston after a visit to the Calumet & Hecla properties in Michigan.

Forbes Rickard, of Denver, has been making an examination of mining property in Gilpin county, Colo., in the interest of Eastern people.

William H. Warren, of Richmond, Va., has been chosen president of the Argus Gold Mining Company, operating in Fluvanna county, Virginia.

Foster Milliken, of New York, formerly president of Milliken Brothers, Inc., has severed his connection as assistant to the receivers of that company.

R. Beaumont, who is connected with the Consolidated Goldfields of South Africa, Ltd., has been visiting iron mines on the Mesabi range in Minnesota.

Thomas Kelshaw, recently with the Mill Creek colliery at Buck Mountain, Penn., has been appointed inspector of the Coxe collieries of the Lehigh Valley Coal Company.

G. W. Metcalf, formerly of Salt Lake City, Utah, has been appointed superintendent of the Mammoth Copper Company smelting plant at Kennett, California.

Robert Linton, of Atwater, Linton & Associates, has been appointed general superintendent of the Sierra Mining Company, with headquarters at Ocampo, Chihuahua, Mexico.

E. P. Lord has resigned his position as general manager of the Dominion Iron and Steel Company to become general manager of the recently organized Canada Cement Company.

W. B. Ramsdell, president of the Casados and Tenamache mining companies, is in Hostotipaquillo, Jalisco, Mexico, with a party of investors and capitalists from Chicago.

James Devlin, for years superintendent for the H. C. Frick Coke Company, at the Bessemer plant, near Mount Pleasant, Penn., has just returned from a four months' trip to Ireland.

Walter Unzicker is making an inspection trip to various cyanide camps in the southern part of Mexico. His address for the next month will be at the University Club, City of Mexico.

Herbert H. Taylor, for 10 years past with the New Kentucky Coal Company, has been elected president of the Taylor Coal Company, with mines in Williamson county, Ill., and office in Chicago.

W. L. Cooper, manager of Robert W. Hunt & Co.'s European business, sailed from New York, Nov. 10, returning to London after the completion of his annual business trip to the United States.

F. H. Harwood has resigned his position as coal-traffic manager of the Illinois Central railroad, to become vice-president and general manager of the New Kentucky Coal Company, with office in Chicago.

Edward McCool has been appointed superintendent of the Monongahela River Consolidated Coal and Coke Company's shops at West Monongahela, succeeding C. S. Davies, who is now master mechanic.

William Riggs has assumed charge of the Monongah mine of the Monongahela River Consolidated Coal and Coke Company, as superintendent, succeeding George W. Peterson, who is superintendent at the Bunola mines.

Warren Bogue, formerly manager of the Salt Lake branch of the Mine and Smelter Supply Company, has become purchasing agent for the Boston Consolidated Company, in place of A. R. Scott, who has resigned to attend to his private interests.

Governor Henderson, of the Yukon Territory, recently arrived at Ottawa, and reports that the quartz-mining industry is making progress. One mill is in operation and others will be installed next season and promising discoveries of ledges have been made.

Dr. Richard Moldenke, Watchung, N. J., secretary of the American Foundrymen's Association, who attended the Copenhagen meeting of the International Society for Testing Materials in September, returned home recently after an extended tour through Europe.

James White, who has been Dominion geographer since 1884, has been appointed secretary of the Canadian Commission on the Conservation of National Resources. R. E. Young, late Canadian superintendent of railway lands, succeeds to the position of Dominion geographer. Mr. Young has left for England to attend the International Geographical Congress to be held in London next month.

As the guests of Charles M. MacNeill, a party left Colorado Springs Nov. 6 for a three weeks' tour to inspect copper properties, including the Utah Copper at Bingham, Utah, the Ray Copper, at Kellerman, Ariz., and the Nevada Consolidated, at Ely, Nev. The party consists of Charles Robinson, of Boston; Charles Hayden, Henry M. Blackmer, K. R. Babbitt, A. Chester Beatty, J. G. Hopkins and J. P. Cobb, of New York; W. Hinckle-Smith and R. A. F. Penrose, of Philadelphia, and M. Ferlaud, of Paris, France, with Mr. MacNeill and his Colorado Springs associates.

Obituary

Thomas Greene Bush died suddenly at Birmingham, Ala., aged 62 years. He was born in Alabama and educated at the University of that State and the University of Mississippi. For some years he was in business at Mobile, but early became interested in the development of coal and iron in the State, and removed to Anniston, becoming president of the Woodstock Iron Company and later of the Shelby Iron Company. In 1898 he removed to Birmingham, and later became president of the Alabama Consolidated Coal and Iron Company. He retired from that company in 1905, but remained president of the Shelby Iron Company, the Coosa Pipe and Foundry Company and the Imperial Coal Company. For nearly two years also he was one of the receivers of the Southern Steel Company. Captain Bush, who earned his title by service in the Confederate Army, was highly esteemed by his associates, and by the men who worked under him. He was much interested in labor questions, and was a member of the Nobel Foundation Fund for the promotion of industrial peace, an appointment made by President Roosevelt.

Societies and Technical Schools

Mining and Metallurgical Society of America.—The headquarters have been moved to the School of Mines, Columbia University, New York.

Practical Mining Captains' Association of the Mesabi Range.—This association held its first annual meeting at Duluth, Minn., Nov. 27. The officers are: President, T. J. Nicholas, superintendent Mohawk mine, Aurora; vice-presidents, W. J. Stewart, C. M. Carr, Interstate Iron Company, Virginia, Minn.; secretary, J. R. Foyle, mining captain, Albany mine, Hibbing, Minnesota.

Special Correspondence from Mining Centers

News of the Industry Reported by Special Representatives at San Francisco, Butte, Denver, Indianapolis, Salt Lake City, Goldfield and London

REVIEWS OF IMPORTANT EVENTS

San Francisco

Nov. 13—It is difficult to keep exact track of the rich developments being made in the mines of Alleghany, Sierra county, or even those at Forest, in the same county. This is an old mining region which has come into notice again within the last two years since the opening of the Tightner mine. After that, when attention was attracted to the district, and mine after mine was opened, one rich strike after another has occurred. The camp seems to be "making good" all along the line. Most, if not all, of the mines are opened by tunnel and it is no poor man's camp for this reason. A strike of unusually rich ore was recently made in the Sixteen-to-One mine. In the district several rich orebodies have been discovered in the quartz mines within two years and there are now mills running on the Red Star, Rainbow, El Dorado, Omega and Gold Canyon mines. Some of the mines have been sending specimen rock to the smeltery or crushing it in mortars. There would be more stamps dropping had not the water supply this year run short. The Tightner does not expect to cut its vein in the lower crosscut tunnel before Jan. 1. The Oriflamme has disclosed a new vein. The Twenty-one expects to strike its rich chimney soon and the Andy Fitz company is drifting on a 2-ft. vein of ribbon rock. A new mill is being built for the group of claims on Bear creek under bond to John Andrews.

The 10 years of litigation over the Harrison gulch townsite case in Shasta county, Cal., has come to an end at last by an amicable agreement between the Victor Power and Manufacturing Company, owning the Bonanza Mining Company's property, and the property owners of the town. The company obtained a patent for its mining claims which cover a good part of the townsite, and the large property owners have paid to the company a substantial consideration and taken a lease for five years at a nominal rental. The courts have sustained the contentions of the mining company, giving it ownership of the disputed townsite.

An interesting injunction suit is pending in the oil regions of Kern county, Cal., which will probably turn upon the question of whether the filing of a mineral claim on oil land gives the locator any preference right to possession in advance of the actual discovery of oil. If the negative is held, any number of persons may go upon the ground and explore for oil, the advantage resting only with the one who actually finds the oil first. A corporation called the National Oil and Gypsum Company has obtained a temporary injunction against certain individuals who entered upon the disputed ground and began to explore for oil. The company filed on the land in October, 1906, and in October, 1909, began to bore for oil. Then the other men came in and also began boring for oil on the same ground. A good many companies have taken up "gypsum claims" in order to hold oil ground and there is much complaint from the oil men in consequence.

The Standard Consolidated Mining Company, of Bodie, Cal., for years the largest producing mine in Mono county, has inaugurated a leasing system on its properties in addition to the usual work on company account. The hill on which the property of the company is located has many veins, and a number of them carry ores which 20 years or so ago were considered worthless, but which under present conditions will pay a profit.

E. C. Harder, of the United States Geological survey, has been making an examination of the iron-ore deposits in the Eagle mountains in the northern portion of Riverside county, Cal. These deposits cover an area of about eight miles in length and a mile and a half in width. The ore is of good grade but none of it has thus far been utilized. There are no railroads in that section, which is a very dry one, with much hot weather. Besides the main deposit there are other deposits not so rich.

It is estimated that the production of crude petroleum in California for the first nine months of 1909 is 42,195,950 bbl., an increase of about 9,000,000 bbl. over the corresponding time in the previous year. The storage has also increased by over 2,000,000 bbl. Contracts are now being made by the large companies for five years at 50c. per bbl., which seems to be considered a fair price by producers. The dividends for September by companies listed on the stock exchanges amounted to $533,875, making a total to date of $20,574,644, and this without counting the dividends of unlisted companies.

The Brunswick Mining Company, which has been operating in Nevada county for some years, is sinking a new shaft which is to reach a vertical depth of 1200 ft. It is at the opposite end of Grass Valley district from the Central shaft of the North Star mines and is expected to prove that the mineral zone of the district is not confined to a small area.

The Excelsior Water and Mining Company, holding lands and mines in Yuba, Placer and Nevada counties, is about to rehabilitate its entire system so as to bring it up to date. The system has been allowed to deteriorate in late years. Now a large rock and cement dam is being built on the South Yuba river below the Rome powerhouse to take the place of the old wood dam. After this the company's ditches will be improved. Ditches have recently been completed to carry water to the Golden Dream mine three miles below Pleasant Valley on the Yuba river. Ditches have also been built to carry water to the new venture at the Posey Canyon mine, near Rough and Ready, Nevada county. There are also other plans in view looking toward the extension of the water system.

It is common report that the Associated Oil Company has succeeded in making contracts with several companies in the Kern River oilfield to deliver oil for a period of five years at 50c. per bbl., which is less than the prevailing spot price of late. The producers seem to consider this a safe and fair price. This company is enlarging the pumping plants along the main pipe line from Mendota to Port Costa. An additional boiler and plunger pump will be placed at each station.

The Oro Fino quartz mine adjoining the Mt. Shasta four miles west of Shasta has been placed under bond to the Stauffer Chemical Company, of San Francisco.

Denver

Nov. 15—In the Cripple Creek district, vague rumors are being circulated as to a proposed sale of the Golden Cycle mine and mill for $12,000,000, the story being accompanied, as usual, by hints of a tremendously rich strike in the 1300 level. There are said to be 3300 miners now at work in the district, and that the Nov. 10 pay day gave them upward of $350,000. The Wild Horse mine is producing about 1000 tons per month, the ore running from $3.50 to $20 per ton in gold. The Gaylord mill, on Ironclad hill, and the Gold Issue mill, on Carbonate hill, are credited with a clean up which gave two retorts worth $10,000. The Gaylord mill is on the Jerry Johnson company's estate, and this mine is credited with a production last month of 1200 tons of ore of an average of over $20 per ton, and 1000 tons of $3.50 ore, which it is claimed is being treated at a

[illegible] company's mill. Fowler Gu[illegible] [illegible] and manager. The Gold [illegible] is [illegible] from the Vindicator [illegible] Gold hill, and last month treated [illegible] tons of ore. Doeple is in charge [illegible] mill. The [illegible] mine, of Battle mountain, and under the business section of the town of Victor, is a close corporation, and has always been close-mouthed as to its production, but it is reported in the district that the monthly report to the stockholders states that during October, among other shipments, one car was shipped which returned $75,000, and another $68,000, i.e., 45 tons averaging $3177 per ton. The El Paso Gold King, in Poverty gulch, is producing about 30 tons of [illegible] gold ore daily. It is under lease to Owen Roberts, and employs 45 miners. The Chicken Hawk, of the Kanuka company, on Guyer hill, is sending out a car load of [illegible] gold ore per diem.

In the Silverton district, a large body of copper pyrite and galena, carrying gold and silver, is said to have been opened in the Tantallon vein of the Peerless San Juan Company, in Minnie gulch. The last quarterly report of the Camp Bird mine shows a gross production of $924,750 in gold.

In the Russell Gulch district of Gilpin county, a strike of very rich ore is reported in the Wellington mine of the King Bee company. It was made in a lateral from the Newhouse tunnel, at a depth of 1300 ft. below the surface. It is further stated that an average of 14 samples showed $174 per ton in gold and silver.

A third tunneling machine is to be given a working test in granite near Golden; this one is a battery of 48 drills, in point of fact. Vigorous advertising of the stock of this hitherto untried and unproved machine has been done, the chief burden of which was, "Hurry up and buy the stock now, as after the trial, it is sure to advance," or words to that effect. It is to be hoped for the sake of those who have already purchased this stock, and in the interests of tunnel driving generally, that the trial will prove the machine able to do all that has been claimed for it.

In the Georgetown district, the announcement is now made that the mill of the Western Metals Company will be ready to treat ore in 90 days. This is the first mill to be completed in Colorado under the "Malm" process, which is claimed to be eminently suited to the Georgetown district ores, many of which are lead-zinc intimately combined, and difficult of separation. In the words of the promoters, this plant embodies the latest development suggested by the operation of the Hunter plant at Golden, Montana, and similar plants in Canada, Mexico and Australia. The process is an adaptation of the Alternative principle in which the metallic ore is supported by soluble chlorine salts and solely on takes up by a solution with water and thereafter precipitated [illegible] the recovery of gold, silver lead and copper being the metallic forms. Zinc is recovered by electrolysis, as is also the chlorine used in the primary operation. Chlorine gas is produced by electrolysis of common salt, giving as a by-product caustic soda.

The companies in the Aspen district represented by D. R. C. Brown and those controlled by D. M. Hyman have united to sink the Free Silver shaft 200 ft. or more, to develop both properties at depth. The electrical equipment to take care of the heavy pumping is now being installed. This equipment will unwater all of the main claims of the valley portion of the district and will also relieve the claims on the higher ground from water and enable their resumption. The chief properties which will be affected by this drainage extend on the north from Middle Farm and on the south to Tourtelotte park and includes the following properties: Mineral Farm, Park-Regent, Bushwhacker, Johnson and Arkansas, Della S., Free Silver, Smuggler, Mollie Gibson, Argentum-Juniata, Aspen, Durant and the properties on West Aspen mountain, and also the Franklin, Deep Shaft, Trainor and probably as far as the Mary B. In the properties extending from the Park Regent to the Durant there is known ore and the prospects for good production are promising. The territory in which is the Midnight and Little Annie mine will not be affected by the pumping. Frank Henry, who has been exploring for the Aspen contact, 14 miles north of Aspen, has cut it with the tunnel. The results have not yet been announced. Important results are reported on the south and in the Taylor park region. Galena ore has been found on Italian mountain and the Doctor and Levisa and other claims are looking better. At Ashcroft the Tam O'Shanter mine is being worked and several old properties between Aspen and Porphyry are operating. Generally the prospect is very encouraging for increased activity in the Aspen district.

The Georgetown Tunnel Company has increased its capitalization from 1,000,000 to 5,000,000 shares of $5 each. A tunnel is being driven into Columbia mountain, and it is stated that contracts have been obtained from the owners of over 70 mines, in which they agree to prosecute work through the tunnel when their veins shall have been intersected. If the owners do not work their veins, the Tunnel company reserves the right to do so on a royalty basis. If this tunnel should be continued to 10,000 ft., as now projected, all the early great producing veins of Columbia, Democrat and Republican mountains will be intersected at depths varying from 500 to 2000 ft. This is the tunnel in which the much advertised Sugrues rock-boring machine was installed, and subsequently withdrawn after having been proved a failure.

A suit has been brought in the United States circuit court by English people against B. Stanley Revett, manager of the Reliance Gold Dredging Company, of Breckenridge, in Summit county, and C. W. Franklin, attorney. An accounting is asked for by the plaintiffs from the defendants as to how $43,000 of the former's money has been spent. It was subscribed for the purchase of claims and equipment of the same with machinery.

Butte

Nov. 13. Butte Coalition has declared a quarterly dividend of 25c. per share due Dec. 1. This is the first dividend declared since December, 1907, when a dividend of 15c. per share was paid. While the extensive development work and surface improvements which have taken place at the Coalition properties during the last two years have necessitated the expenditure of considerable money, yet it is a general belief that the company is at present in a position to pay considerably more than the dividend just declared and it is thought that a comfortable surplus is being created. Practically all the dead work of improvements has been done, and the company's Rarus, Tramway and Minnie Healey mines are now in good shape and should steadily increase their production, which at present averages about 1600 tons per day.

The long drift connecting the shafts of the Amalgamated company's Mountain View and West Colusa mines on the 1800-ft. levels was completed last week. The distance from shaft to shaft is about three-quarters of a mile. The drift was run for ventilation purposes and also for conveying the mine water from the Mountain View to the West Colusa and from there to the Leonard where it will be pumped to the surface. At the West Colusa mine the ore bins are being rebuilt and enlarged. Breaking ground for a new electric substation near the Anaconda mine was begun last week. This station will supply the power for all the air compressors used in the Amalgamated mines. At the Badger State the shaft is now down 1405 ft. A station has been cut on the 1300 ft. level and crosscuts started north and south.

At the Gagnon mine, the new three-compartment perpendicular shaft is down nearly 300 ft. It will be continued to the 2200 ft. level, which is the same depth as the present incline shaft now in use. With the recently discovered increase in grade of the ore deposits on the lower levels of the Gagnon, the management decided that the present hoisting facilities were inefficient. The ore is now hoisted through the incline shaft by means of 3 ton skips and the engine is of an old pattern, making it impossible to hoist over 800 tons per day. With the new perpendicular shaft and a modern hoisting engine the output may be easily increased to from 1200 to 1500 tons. The

fire at the Anaconda mine is under better control now than for some months previous. The ore from the upper levels is hoisted from the Anaconda shaft and approximates about 240 tons per day. The ore mined from below the 800-ft. level, amounting to about 500 tons daily, is hoisted through the shafts of the adjoining St. Lawrence and Never Sweat mines.

Salt Lake City

Nov. 13—The affairs of the Newhouse Mines and Smelters company seem to be in a fair way to be straightened out and work at the mines and mill resumed. The assets of the company have been purchased by the Trust Company of America at foreclosure sale for $500,000. The South Utah Mines and Smelters has been formed under the laws of Maine with a total capitalization of $4,300,000 to own and operate the former assets of the Newhouse company under a reorganization. Of this capitalization $1,300,000 will be in 6 per cent. income bonds convertible into stock at $5, the par value. Of the 600,000 shares of capital stock 260,000 shares will be reserved for the bond conversion. For the purposes of this re-organization 558,332 shares of the Newhouse Mines and Smelters stock was exchanged for the new and $1,272,000 in bonds of the old company were also deposited.

A recent special meeting of the stockholders of the American Flag Mining Company of Park City, 90 per cent. of the stock represented, voted unanimously to re-incorporate the company under Nevada laws and to increase the capitalization from 500,000 to 1,000,000 shares, par value $1. The entire increase of stock is to be treasury stock and is to be used in retiring the outstanding bonds, in paying for the Constellation group recently purchased, and in raising money for development.

Bingham is producing more ore than ever before in its history and the Denver & Rio Grande has purchased new equipment to handle the output which goes to Garfield at the rate of a train every two hours. Besides new steel ore cars, this equipment consists of eight new Mallet compound locomotives, each three times as powerful as any of the locomotives now in use.

At the annual meeting of the East Tintic Development Company at Provo M. M. Kellogg and Ralph Kellogg headed contending factions for the control of certain policies of the company. A compromise was effected by which neither will go on the board but Ralph Kellogg retains his position as manager of the mines. No further trouble is expected.

Jesse Knight, of Provo has been in Ely, with engineers and is reported to have taken over the controlling interest in the Carbonate Ely Copper Company for the avowed purpose of supplying sufficient ore to enable him to reopen the Tintic smeltery which has recently closed. The Salt Lake smelters secured long-time contracts with the mines which supplied the Tintic plant. The Carbonate Ely is capitalized for $1,000,000 and was organized two years ago to operate in Sawmill cañon, 35 miles south of Ely. The group consists of 14 claims and the copper ore carries gold and silver.

Cobalt

Nov. 15.—The recent break in La Rose still excites much interest, and there is a good deal of criticism of the new board of directors. The president, Mr. McGibbon, states that he is satisfied that with a greater outlay for development work and progressive management, the situation would soon right itself. The heavy shipments from this property are still being continued, and as the Muggley concentrator will shortly be in a position to treat the La Rose dump at the rate of about 100 tons a day, this will be an additional source of revenue to the company. The report of the management states that the ore reserves amount to about five million ounces, which would probably net nearly two million dollars. Among the properties of the consolidation which are reported to be looking better are the Princess and University, but the latter at the present time is unable to be worked on account of the lack of power.

The developments at the Buffalo mine have shown that the cyanide process as applied to the slimes has been entirely successful, and as a result during the coming week a shipment of about 30,000 oz. of bullion will be made. So far the mill has been running considerably under its capacity, but it has been demonstrated that the saving by the cyanide plant has been about 5000 oz. a month. The consumption of cyanide has been much less than was expected, amounting to only about four pounds per ton of ore treated. The mill is now running by electric power brought from Hound chutes, and the capacity will be much greater.

Toronto

Nov. 15.—An important improvement in the navigation of the Montreal river will be begun this winter. A retaining wall or dam will be built at Latchford, which will raise the level of the river 12 ft. covering Park rapids with navigable water. By some additional work Flat rapids can also be obliterated, and a clear stretch of navigable waterway obtained extending 40 miles from Latchford to Mountain Chutes. The dam will be composed of concrete, 300x12 ft. and will cost $80,000. A large amount of freight is going up the river this season. There are 12 steamers on the route as compared with four last year and they are unable to handle the traffic as large accumulations of freight are at Latchford awaiting shipment. Owing to the high cost of handling at the portages the rate from Latchford to Elk Lake is $1 per 100 lb. The projected improvements are expected to reduce this by one-half.

Contrary to an announcement recently made, it is now stated officially by the Public Works department of Ontario that the new provincial road from Elk Lake to Gowganda will be completed this month. Railway construction on the branch of the Canadian Northern in Ontario between Sudbury and Port Arthur is proceeding rapidly, and will make Gowganda more accessible. A station to be named Gowganda Junction, situated about 30 miles northwest of Sellwood, to be opened before Dec. 1, will be the present terminus of the line, and a good road for wagons and sleighs is being cut through to Gowganda proper—distant 40 miles. This will shorten the haul by team considerably.

A strong agitation is on foot among those interested in the Elk Lake, Gowganda, Maple Mountain and other silver-mining camps lying west of Cobalt for the extension of the Temiskaming & Northern Ontario railway into that district. When the matter was recently urged upon Hon. Frank Cochrane, Ontario minister of mines, he replied that when the mines showed what they could do in the way of ore shipments the government would be able to determine the question. The mine owners have concluded to make a practical demonstration of the need of transportation facilities, by making shipments to the smelters of about 30 carloads of ore of a minimum value of 1000 oz. to the ton, as soon as the winter roads are in condition. The ore in some cases will have to be teamed 50 miles before it can be loaded on the cars. The camps interested are expected to contribute as follows: Maple Mountain, two carloads; Elk Lake and Silver Lake, 13 carloads; Miller Lake, eight carloads, and Gowganda Ridge, nine carloads. A number of other mines not included in the above estimate may also be represented. It is estimated that last winter the sums paid for freighting in getting in machinery supplies, etc., for Elk Lake and Gowganda amounted to not less than $1,000,000. In the Montreal River and Gowganda mining divisions upward of 9000 claims have been recorded and the traffic of the approaching winter in forwarding plants, materials and supplies is likely to be fully equal to that of last season.

The new government peat briquetting plant, designed by Swedish engineers, has been installed at Alfred, Prescott county, by Dr. Eugene Haanel, Canadian director of mines. It will be in full operation next year and about 300 men will be employed in connection with the work.

Increased development in mineral production in the Lake McMurray district is expected as soon as the Athabasca & Great Western railway, connecting Edmonton with Fort McMurray, is completed. The railway is being undertaken with a provincial subsidy of [illegible] and is expected to be completed in the spring of [illegible]

years. In addition to gas and oil products table salt will be obtained from the rich deposits there, and a great potassium industry is among the possibilities.

The provincial-government officials have have succeeded in extinguishing the fire at the gas well at Pelican Portage which had been burning for 13 years.

Mexico

Nov. 14—Alfredo E. Rodriguez, of Saltillo, Coah., manager of the famous Cigarrera mine in Chihuahua, is reported to be investigating the possibilities of a zinc smeltery at Torreon, or at the coal-fields of Sabinas, Coah. Mr. Rodriguez is a prominent capitalist of the northern part of the republic, also a member of Congress from Coahuila, and if the project is found to be favorable, substantial support from the government would be given as well as assistance from prominent financial interests in Mexico City. The highest production of zinc ore was in 1907, which amounted to practically 100,000 tons exported to the United States and about 15,000 tons shipped abroad. Any advantage in the way of reduced freight rates or absence of duty would increase the production materially, and it seems to be merely a question of costs of smelting and marketing the product.

The better rates obtained for silicious ores has been the cause of the opening up of at least one mine in the immediate neighborhood of Durango. The Lucia Mining Company (lately the San Luis Mining Company), of Panuco de Coronado, Gabriel, have in the last two months opened up the San Gonzalo and San Luis mines and are shipping a carload of ore per day; this is picked ore, the second-class ore is at the present time being dumped, awaiting the installation of a new concentration and cyanide plant which the company hopes to erect in a short time. The management is in the hands of W. Thomas Moore, formerly assistant manager to the San Luis Mining Company.

Work on the railway to the timber lands west of Durango is to begin in November; when once started it is hoped that the line may be continued to Mazatlan. What may be looked upon as a hopeful sign is that a large contract has been let to the Pearsons for the making and deepening of the present harbor of Mazatlan. The line to the timber lands will be constructed by the National Railway Company and the interest on the money expended will be guaranteed by the state government and Compañia Maderera.

The mines at Zacatecas, at Las Mesas, state of Vera Cruz, and owned by the Compania Minera Eugenia Mexicana, have been closed since the recent death of William Vogel, manager. A [illegible] report of the affairs of the company is [illegible] way and it will probably be some time before operations are resumed.

[illegible] is being continued at the mines of the Teziutlan Copper Company, and a large tonnage of high-grade copper ore is being blocked out. The 300-ton smeltery, one of the best equipped in Mexico, is ready to be blown in, but no definite time for the resumption of operations has been set.

Paris

Nov. 6—With the holiday period ended, there are now signs of a revival of the mining business. The first part of 1909 was unsatisfactory as regards the location and financing of new enterprises. However, during the year the existing companies in which the Paris public is interested have done fairly well. The Compagnie Française des Mines de Bor operating a copper property in Servia has obtained excellent results. The net profit was about $300,000 on a capital of only $1,200,000. The production of blister copper in 1908 was 3300 tons, and the company will produce for 1909, 5000 tons. The production at the present time is very nearly 400 tons of copper per month. The cost ranges between $180 and $200 per ton. The 36x200-in. water-jacket furnace erected this year is now in full blast, and is giving good results.

Explorations for gold deposits in France have been continued during the year at numerous places near La Lucette, where a prospect is being explored by Chappee et Fils, manufacturers of Le Mans. Near La Bellière at Montrevault, much work has been done by the Consolidated Goldfields of South Africa under the direction of Harold Macandrew. The most important undertaking is in the central part of France, where the Société de Recherches Minieres Française is developing two new mines granted by the government and has made application for other properties at Montebras, where a company is working a tin property, two low-grade gold veins were discovered in connection with tin deposits, which yielded from 2 to 7 grams of gold per metric ton. Work is now being done to ascertain their value. The Montebras company is under the same management as La Bellière and Ste. de Recherches Minères Française. The latter company reports that it has milled in 1908, 45,400 metric tons of ore, yielding 313 kg. of fine gold by amalgamation. The ore is now entirely treated by amalgamation and cyanidation with a recovery of over 90 per cent. The capacity of the mill has been more than doubled and is now yielding 260 tons daily. This resulted from an addition of thirty 1500-lb. stamps to the forty 1650-lb. stamps already used. The company is expected to produce $[illegible] of gold per month.

The dredge built for the Société du Spitzkop (Mozambique) [illegible] Durban. It was erected and in [illegible] toward to the property from St. Lucia da Mouro, where it was built [illegible] and of concrete blocks.

The 25-stamp mill of the Mines de l'Andavakoere in Madagascar was started Sept. 1 and is in successful operation. The production of gold by the natives from grinding rocks and panning for September was nearly 220 kg.—a record. In two years these mines have produced 2½ metric tons of gold without any machinery. Official results of the stamp mill are awaited with interest.

London

Nov. 8—The prospectus has been issued of a new company called the Amalgamated Zinc (De Bavay's), Limited, formed to acquire the business and undertaking of De Bavay's Treatment Company, Ltd. The capital of the company is £500,000 in £1 shares, of which 250,000 will be allotted, fully paid, to the vendors, 122,500 are offered for subscription, and 122,500 are held in reserve. The company acquires the De Bavay patents for separating by flotation parts of the constituents of ores and other solid bodies from the remainder thereof, as well as mills, plant and machinery, and a large dump tonnage at Broken Hill. The contracts taken over include agreements for the sale of concentrates produced by the company for the next 10 years, as follows: For 1910 to 1912, 90,000 tons per annum; for the following seven years, 70,000 tons per annum.

Regarding past results the prospectus states that for the six months ended June 30, 1909, 47,370 tons of tailings of an average grade of 18.3 per cent. zinc, 3.7 per cent. lead and 3.4 oz. silver, were treated for a production of 14,646 tons of zinc concentrates assaying 48.6 per cent. zinc, 6.1 per cent. lead and 5.8 oz. silver; and 256.5 tons of lead concentrates assaying 13.8 per cent. zinc, 54.6 per cent. lead, and 23.4 oz. silver. With spelter at £21 12s. 1d. the profit was £17,427. On a production of 100,000 tons of zinc concentrates the annual profit expected is from £130,000 to £145,000.

A new mill, which will cost £100,000, is now in course of erection and will have a capacity of from 6000 to 7000 tons of tailings per week. This mill is expected to be completed about March or April. It is reported that the new issue has been fully subscribed.

A colliery explosion, in which 26 men lost their lives, occurred recently at the Darran colliery, near Bargoed, South Wales. The disaster was exceptionally distressing owing to loss of five members of the rescue party whose self-sacrificing heroism has stirred the feelings of the public. The rescuers who were overcome by afterdamp were William Bowen, general manager; David Lewis, under manager; William Edwards, contractor; David Morgan, overman, and Gomer Griffiths, [illegible]. The men do not appear to have been equipped with respiratory apparatus, and it is perhaps due to this neglect that the lives of so many brave men were sacrificed.

Mining News from All Parts of the World

New Enterprises, Installations of New Machinery, Development of Mines and Transfers of Property Reported by Special Correspondents

THE CURRENT HISTORY OF MINING

Arizona

COHISE COUNTY

Wolverine & Arizona—Work on the drift through the Warren into the Georgia claim has failed to disclose any orebody, and has been discontinued. The future work will be on the orebody in the main tunnel and connecting it with the Uncle Sam workings of the Copper Queen for an outlet for the ore. Much of the exploration work for the past year has been paid for by ore shipped, but an assessment is planned for future work.

MOHAVE COUNTY

Tennessee—The property at Chloride will be unwatered and operations resumed at the mine and mill. A zinc-ore-treatment plant will be installed. James H. Hurin is in charge.

YUMA COUNTY

Clara Consolidated—George Mitchell, president of the company, announces that the railroad from Bouse to Swansea will be completed by Dec. 1, and that the smeltery may be blown in on Christmas day.

PIMA COUNTY

Imperial—The October copper output was between 600,000 and 700,000 lb., a small decrease.

YUMA COUNTY

Cove—This group owned by Amos Adams is under bond to a New York company. It is in the Castle Dome district, in which district there is a decided revival of activity.

YAVAPAI COUNTY

Arkansas & Arizona—The company is prospecting its property near Jerome with diamond drills.

California

AMADOR COUNTY

Fremont Consolidated—At this property, Drytown, 80 men are employed, and the 40 stamps are crushing about 6000 tons monthly.

BUTTE COUNTY

Bills—On this mine at Kanaka peak, Doctor Burke, the owner, is running three tunnels. A pulverizer is to be put in to crush the low-grade rock.

CALAVERAS COUNTY

Ariel—In this mine, Mokelumne hill, John Casey has cut a lead of good ore in the tunnel.

Blue Bell—The mine near Glencoe will be reopened by F. M. Stern, C. H. Willey and W. D. Stewart, of San José.

EL DORADO COUNTY

Stuckslager—This mine at Lotus is being reopened by W. B. McKenney, of Sacramento.

INYO COUNTY

With the cessation of work at the Greenwater-Death Valley mine the once thriving camp becomes deserted. The orebodies at the 1000-ft. level were so small that further development was not considered advisable.

Skidoo—This company continues to ship bullion and the mine workings are in a better grade of ore than usual.

Casa Diablo—The electric-power plant of this company has been started.

NEVADA COUNTY

Pittsburg—At this Nevada City mine the 10-stamp mill is running steadily.

Zeibright—P. H. Patrick, leasing this mine in Bear valley, has 15 men at work and the mill is running.

Rough and Ready—This mine, at the town of the same name, is under bond to H. M. Black, who is arranging for a mill.

Gold Mound—It is expected that E. I. Field, of Denver, president of the company, will give orders to resume work on this mine at Grass Valley.

SIERRA COUNTY

Omega—This gravel mine at Forest, W. G. Sharwood, manager, is yielding large nuggets, some of them over $200. The ordinary pay gravel runs from $10 to $12 per ton, and the mill is crushing 100 tons per day.

Sherman—This quartz mine at Alleghany, R. H. Case, manager, has struck a rich shoot in the tunnel. The mine was recently started.

California—The gravel mine near Howland flat has been bonded to George Roderig and George Helmrich, of Davenport, Iowa.

Rock Creek—At this mine, Forest, owned by Elmer Mott and M. Morrison, work has been started. It is thought that this mine will tap the same channel as the old Bald Mountain Extension Company.

Amethyst—The ore struck in the mine at Forest runs high in rich sulphurets.

TUOLUMNE COUNTY

Tarantula—Machinery has been ordered T. J. Russell, manager.

Mangante—This property at Jamestown is being developed by the Central Mother Lode Mining Company.

Colorado

CLEAR CREEK AND GILPIN COUNTIES

Seven-Thirty—The shaft, which is 1000 ft. deep, and which, with its drifts, contains 500,000 cu.ft. of water, has been tapped by a drill hole driven from the top of an upraise from the Burleigh tunnel, about 1500 ft. from its portal. This historic mine has produced several millions, but has been long idle, owing to the water. Work will now be resumed. The manager is G. W. Tarkington.

LAKE COUNTY—LEADVILLE

Progressive—This mine, on Canterbury hill, is reported to have struck 8 ft. of ore which assays 155 oz. silver and 57 per cent. lead.

SAN JUAN DISTRICT

The Gold King is being rapidly put in shape to operate again under full capacity by the new manager, Charles Gagner. At the Gold Prince, 40 stamps are dropping and large amounts of rich concentrates and crude ore are being sent to the smeltery, under the management of J. O. Campbell. The Hercules mine, which suspended operations during the railroad blockade, is dropping its stamps again and producing its usual amount of gold and concentrates, under the new manager, Walter H. Bunce.

Forty eight cars of concentrates were shipped from Ouray in October. This and the shipments from the Genesee and San Antonio from Red mountains represent for Ouray county an output of about 15,000 tons for the month.

Tomboy—The October crushing was 8500 tons yielding bullion, $47,500, and concentrates, $19,700. The expenses were $41,500, leaving $25,700 profit.

Boston & Silverton—This property, at Silverton, including the 100-ton mill, has been purchased by the W. B. Lowe Mining Company. The same company also controls the Arpad mine and mill on King Solomon mountain and the Silverton smeltery.

TELLER COUNTY—CRIPPLE CREEK DISTRICT

Trilby—The report to the stockholders shows $750,000 worth of ore developed and awaiting treatment in the mill now in successful operation. Ore is expected at 1500 ft. to which the shaft will be sunk.

Jo Dandy and New Haven—The companies have compromised the suit over trespass and will consolidate.

Abe Lincoln—The monthly output will be increased from the 300- and 400-ft. levels. John Sharpe is lessee.

Idaho

BONNER COUNTY

Idaho Yellowstone Lead Mining Company—The smelter is again in full operation to June 1, now that the receiver has been discharged. Machine stamps and an additional furnace will be installed. J. Herbert Anderson is manager.

COEUR D'ALENE DISTRICT

Chicago Lead Company—The Chicago tunnel, near Murray, now in 1500 ft., will be continued.

Hercules—Work has been resumed on this group in Burke. H. I. Day, owner of the Hercules, is in control.

Standard Lead Company—At a special stockholders' meeting it was decided to transfer the holdings to a company to be organized by A. J. Richardson and James L. Brice, of Los Angeles, who will effect a consolidation with other properties in the district and with a copper mine in San Bernardino county, California.

Rex—A Duluth company will operate the property on a 15 per cent. royalty and will sink a shaft 500 feet.

Jack Waite—The property has been sold to Patrick Burke, of Murray.

Illinois

An explosion in the mine of the St. Paul Coal Company, at Cherry, Bureau county, on Nov. 13, resulted in a large loss of life at present undetermined, but certainly between 300 and 400. The entrance was sealed in hopes of extinguishing the fire, but on reopening it to take up the work of rescue the fire was renewed and the recovery of those in the mine was entirely prevented, although heroic attempts were made. The fire is reported to have originated in the mine stable where some hay became ignited from an open torch, which was being used while the electric-light system was being repaired.

Indiana

BOWLDER COUNTY

Five tons of shells were completed in the field during the last week.

PIKE COUNTY

Four oil wells were completed in the Oakland district during the week. Each are producers and will aggregate 150 bbl. per day. The first shipment of oil was made from the district Nov. 8, the pipe connection being just completed to the Ohio Oil Company. Operations drilling taps for more in the field and others will be begun at once.

Kansas

Mineral Gage—Ore came in the Gabbro mine last week for the first time. The ore was in a vein of blue quartz, and assays showed from 6 to 10 per cent. lead. The vein will be worked through the tunnel to the south, and others will be opened as opportunity. The prospects are "more encouraging than ever."

and each will be of 400 tons capacity and be built together near the three-compartment shaft. A central power plant will supply electric power to the mill. A. O. Eilseng, of Joplin, Mo., is manager.

Bonner-Quapaw—The new mill being built on the old Mission mine is rapidly nearing completion and the mine is being placed in shape to furnish the necessary production.

Kentucky

CARTER COUNTY

Dixie Coal and Coke Company—This company at Morehead is completing plans for the development of 3000 acres. The construction will be in charge of W. J. Von Borries of the Harris Engineering Company, Louisville.

PIKE COUNTY

Marshall Coke Company—Work has been begun on a battery of coke ovens at Hellier. This is the first attempt to make coke in the Marrowbone field.

Michigan

COPPER

Lake—A mill test at the Franklin mill yielded 60 lb. of copper per ton of rock stamped. The rock came from the third level and from the face of the drift.

Superior—A compressor has been delivered. Shipments of 325 tons are being made daily to the mill and this will be increased to 600 tons. The rock continues to yield about 25 lb. per ton. No. 1 shaft is sinking below the twelfth level.

Franklin—The enlarged hoisting plant at No. 1 Pewabic shaft has gone into commission.

Wyandot—Drifting on the amygdaloid lode, recently exposed in the crosscut from the 700-ft. level continues. The drift to the north is showing encouraging results, but the south side is carrying little copper.

Hancock—No. 2 shaft is down 2300 ft. Interbed in trap stocked with copper which is believed to indicate proximity to the sought No. 3 lode. Work on the enlargement of the surface equipment is progressing satisfactorily.

Tamarack—Sinking has been resumed. Mass rock at 1500 ft. has been reached and good ground is being exposed.

Lake Shore—No. 2 shaft has reached the fifteenth level and has opened some fine ground. No. 3 shaft is below the seventh level and is sinking good stamp rock to the lowest workings. This property will be ready for regular shipments upon the completion of the rail which is being rushed locally from the Wisconsin Central.

Quincy—Stoping has been resumed in the footwall of the lode in the neighborhood of No. 2 shaft, which is temporarily shut down at No. 2 shaft.

Copper Range—The commissioners have decided to open the Champion mine, which is to be worked through the tunnel to the south. Other mines will be opened as opportunity. The prospects are "more encouraging than ever."

intention of closing the mill, as five years' ore reserves are developed.

IRON

Leaders—This mine at Antoine lake, Menominee range, will ship 90,000 tons this season. Development work will be continued during the winter.

Holmes—The Buffalo & Susquehanna company is exploring this property in section 6, 43-32 near Crystal Falls.

Negaunee—Three old-time iron mines near Nagaunee will resume operations. They are the Milwaukee and Davis mines, controlled by the Breitung interests, and the Lucy, under contract to the Cleveland Cliffs company.

Missouri

LEAD AND ZINC DISTRICT

Ohio Valley—This company, operating the new mine south of the Wilson at Spring City, W. H. Hancock, manager, has completed the mill. This mine has developed ore below the regular blanket formation.

Prussian—This mine on the land of the Old Dominion company, near Joplin, has finished sinking for the lower ore run.

MADISON COUNTY

Madison Land and Lead Company—On account of failure to pay interest due on bonded indebtedness, this company has passed into the hands of a receiver. The bonds amount to about $400,000, and there are other debts amounting to nearly $100,000. Appraisers are at work, and their report will be ready for publication in the near future. The company has a 500-ton mill, and mineral lands at Fredericktown, Missouri.

Montana

BROADWATER COUNTY

Rock Friday—William Bennett is the owner of this property in the Radersburg district. A 1000-ft. drift is being run on the 400-ft. level. The drift is now in 235 ft., and of this 170 ft. is in ore.

JEFFERSON COUNTY

Rose—R. A. Bell, the owner of the property, six miles from Alhambra, has cut a 2-ft. vein in the shaft at 30 ft. The shaft will be sunk to 200 ft., and an 100-ft. tunnel run to cut the vein.

Golden Horse—At a meeting of directors the following officers were elected: Gus Hadek, president, D. W. McIntyre, vice-president, R. M. Ostranch, treasurer, and E. A. Lion, secretary. The company has purchased 10 quartz-mill claims in the Cardwell district, four miles northeast of Whitehall. Several tunnels have been run.

Minnesota—[illegible]. The shaft is now [illegible] and the work is carrying a vein in the gray lime [illegible].

LEWIS AND CLARK

A [illegible] has been made by the

300-ft. level. Two feet of lead-carbonate-silver ore has been exposed, and the vein has not yet been fully uncovered.

MISSOULA COUNTY

Big Elk—In the upper tunnel there has been encountered a 3-ft. vein of copper ore.

Monitor—Shipments have been begun from the 700-ft. level. It is the intention to sink the shaft to 1000 ft. A delay in shipment has been caused by installing a new pumping plant.

Nevada

ESMERALDA COUNTY—GOLDFIELD

The Goldfield Consolidated Company, joining with other companies in the district, has asked the court for an injunction restraining the local assayers from purchasing any ore or ore products without first giving due notice to the companies. The proceeding is attracting much attention.

Goldfield Consolidated—During October the Consolidated mill treated 20,100 tons, an average of 680 per day, which returned a net profit of $580,000. This is the largest profit in any one month since May, and is accounted for by the discoveries in the Clermont shaft, where ore of excellent milling grade was mined during the entire month.

ESMERALDA COUNTY—RAWHIDE

King-Heisner—The directors have decided to put in an additional 20-stamp mill to supplement the present mill using Huntingtons.

Mint Lease—The shaft is down 450 ft., and is sinking to 1000 ft. The high-grade ore is being shipped to Hazen.

LYON COUNTY

Overland—The shaft at this mine at Silver City will be sunk from 700 ft. to 800 ft. J. W. Phillips is superintendent.

NYE COUNTY

Mayflower-Pioneer—The shaft at Pioneer has reached 210 ft., and is being sunk. Jack Aylwood is manager.

Bullfrog National Bank—E. Boyd, former superintendent of this property at Rhyolite, has secured a lease on it, and will start work.

NYE COUNTY—ROUND MOUNTAIN

Round Mountain—Nov. 2 there was filed an application in court by the Round Mountain-Red Top Mining Company and the Round Mountain Sphinx Mining Company requesting that they be allowed to make an underground survey of the Round Mountain mine. The district judge took the matter under advisement. The president of the Round Mountain company stated that the company had been careful to act within its property rights.

Round Mountain-Blue Jacket—Morgan, Stovelt & Cook leasing upon this acreage have made the first shipment to the mill of the Toquima company.

Round Mountain Combination—Holland & Meehan leasing from this company have made a 150-ton shipment to the Toquima mill.

Toquima—The mill of this company is treating some custom ore, but the reserves of the mine are sufficient to keep the mill running for the winter, and the future policy of the company will be to do this mainly.

NYE COUNTY—TONOPAH

The production from the Tonopah district for the week ended Nov. 6, was 4898 tons, estimated value $122,450.

Montana-Tonopah—The main north crosscut upon the 765-ft. level has been driven 2311 ft., and the breast is still in rhyolite.

Tonopah—During October the largest tonnage ever treated in the history of the mill was run through. A total of 15,100 dry tons of ore was treated having an average content of $19 per ton. The output for the month was $215,000 in bullion and $56,000 from concentrates. The average extraction was 91 per cent.

Tonopah-Belmont Development—All underground work was suspended in order to make surface improvements. The ore bins are being raised and a new Crane ore washer installed.

STOREY COUNTY

The Comstock Pumping Association has given directions to lower the water in the C & C shaft to the 2650-ft. level. As a consequence the Ophir will sink a winze to the 2400-ft. level.

WASHOE COUNTY

Selby Mining Company—Arrangements have been made to increase output of mine and mill at Jumbo.

WHITE PINE COUNTY

Boston-Ely—The shaft is now 1035 ft. deep and has developed a sulphide-ore zone. The company has funds to carry on the work until Jan. 1. when it is probable an assessment of 25c. to 50c. a share will be called.

New Mexico

GRANT COUNTY

Chino—The October report of development shows 189 holes drilled and assayed of which 152 were in ore, the average thickness of which is 81 ft. The estimated developed tonnage to Nov. 1 is 6,341,598 tons having an average assay of 2.46 per cent. copper.

SANTE FE COUNTY

Boston-Cerrillos—The company has made an important zinc strike at the property at Los Cerrillos. A 200-ton mill is on the ground and $200,000 has been spent on improvements.

Ohio

Neff Coal Mine—The tipple and surface buildings of No. 1 mine at Neff were burned Nov. 10, causing a loss of over $100,000 and closing the mine for the present.

Oklahoma

The Standard Oil Company has compromised its controversy with the State by organizing the Oklahoma Pipe Line Company to build an 8-in. line to carry oil to the Standard refinery at Baton Rouge, La. Construction will begin at once, and it is expected that oil will be running by Feb. 1. The company will be under the supervision of the State Corporation Commission, which has authority to regulate rates, and will be exclusively a common carrier and will not buy oil.

The Miami camp is realizing about $15,000 a week and has two or three more mills ready to run.

Mason—This company is pumping out the mine in the Baxter-Quapaw camp and has installed Foust jigs in the mill.

Hannibal and St. Joe—This company at Baxter is pumping and will soon have the mill running.

Oregon

BAKER COUNTY

Mohrwood—Much development has been done on this property in the Greenwood district, disclosing a 3-ft. vein of ore.

Listen Lake—Sinking machinery has been installed to continue the shaft now in oil at 200 ft.

Success—The company will carry on development all winter.

SNOHOMISH COUNTY

Monte Cristo—These mines, which have been closed for two years, will be reopened on a large scale, using water power instead of steam for the mill.

STEVENS COUNTY

Southern Republic—The Princess Maud shaft has been unwatered and work resumed.

Tungsten King—A concentrator is being installed on this property on which a new vein was recently discovered.

South Dakota

Sagamore—Arrangements for the resumption of diamond drilling on the property near Custer are being made by I. W. Herber, president.

Cristoforo Colombo—This company, composed of Italians from Omaha, will develop the property in Strawberry gulch near Deadwood.

Lakota and Transvaal—Work on these properties in the Rochford district will be undertaken by Charles Swanson.

Tennessee

Ducktown Sulphur Copper and Iron—The new 180-ton acid plant has been in operation since the latter part of June. The Mary mine, which is being developed extensively, is producing the bulk of the ore smelted. The East Tennessee, one of the early mines of the "Basin," is also being developed in the deeper levels.

Utah

Beaver County

Red Warrior—Ore for shipment is being taken from the 80-ft. winze from the 300-ft. level, sufficient to keep three ore teams busy hauling to Milford. Development work in ore is going ahead also on the 100-, 200- and 300-ft. levels.

Cedar-Talisman—In the Talisman workings a very profitable body of zinc ore is being opened up which in carload lots runs 44 per cent. zinc. In the Cedar workings a silver-lead ore is being developed in a 60-ft. winze from the 100-ft. level and the 500-ft. level is being driven under the ore.

Blackbird—The large territory of this company is being prospected by churn drills.

Juab County

Provo—On the 300-ft. level, carbonate ore has been encountered by leasers. This discovery confirms the conviction that the limestone formation on the east side of the district has similar possibilities to the westerly lime formation which gave the district the Centennial Eureka, Eureka Hill, Grand Central and other big mines. Del Roberts is in charge.

Uncle Joe—This company has just acquired the stock of the Copper Jack company and will start to prospect the Copper Jack group with churn drills. This group is in the Erickson district west of Eureka. J. H. Weber is manager.

Eagle & Blue Bell—Shipments for November will be 600 tons. The 900-, 1000- and 1100-ft. levels are looking better and preparations are being made to sink the shaft to 1200 feet.

Mammoth—On the 2100-ft. level, after being for some time in a lean part of the vein, a new lead has been opened which shows promise of shipping ore.

Tintic Standard—At 654 ft. the shaft has passed entirely out of the limestone and has entered quartzite which is the ore bearing formation here. Other favorable indications encourage the management to expect to cut the orebody soon.

Tintic Combination—Work is to be resumed and a steam hoisting equipment installed. B. H. Bullock is manager.

East Tintic Development—This company, operating in East Tintic under direction of Ralph Kellogg, is crosscutting on the 330 ft. level to the east to get under the orebodies above from which they have shipped 18 cars of ore since July 1. On the 500 ft. level a station is being cut and a drift east for the same orebody will be started.

Iron County

Good Spring Mining and Smelter Company—The power plant at Modena is under roof and ready for machinery and will be in commission Dec. 8.

Big Fourteen—Fred Snow, of Manti, has taken a lease on the gold and silver mine at Statler and will resume operations.

Salt Lake County

Utah Copper—The production for the third quarter ended Sept. 30, was 15,299,786 lb. of copper compared to 13,774,412 lb. for the preceding quarter and 12,000,925 lb. for the first quarter of the year. The cost of the copper produced is stated to be 8.077c. per lb. It is expected that action will be taken relative to increasing the Garfield mill to 10,000 tons per day.

Ohio Copper—The new mill of 2000-tons capacity is nearly ready for operation.

Hilpert Group—L. Hilpert, after 15 years work on his claims near the mouth of Little Cottonwood cañon, during which he has driven by his own labor a tunnel 1000 ft. long, has encountered between 2 and 3 ft. of ore running $100 per ton in gold. The vein is supposed to be the faulted vein which the Wasatch Utah company has opened. The strike was on the Yellow Jacket claim.

Big Cottonwood Copper and Gold—The tunnel of this company, which is in 700 ft., giving 600 ft. vertical, has encountered commercial ore. Nicholas Treweek is manager.

Summit County

Scott Hill—The company has decided to continue work throughout the winter and drive a tunnel to the contact from which higher up several good shipments have been made. The property was formerly the Copper Apex. This tunnel was made necessary by the heavy flow of water.

American Flag—This company will install an electric pumping plant. George H. Rathman is manager.

Daly-West—The orebody encountered on the 1700-ft. level has been drifted on for 300 ft. and shows mill ore. The production of the mine will be increased to 600 tons and another shift will be put on at the mill. The Daly-West is drained to the 2100-ft. level by the Ontario tunnel and development between the 1700- and the 2100-ft. levels is to be vigorously pushed.

Silver King Consolidated—The station on the 1500-ft. level has been completed and a gallows frame has been erected at the winze and a cage substituted for the bucket. Work will now be resumed in the ore.

Nelson Queen Consolidated—This company in the Elkhorn district has overcome its financial troubles, purchased machinery and active development will be resumed.

Wisconsin

Bariboo Iron District

The United States Steel Corporation is preparing to embark upon important mining operations in this district. The company has done extensive exploration work for several years, and has developed sufficient ore to justify extensive operations. The Illinois mine of the International Harvester Company has shipped since the opening of the district in 1903, 350,000 tons.

Canada

British Columbia

Tacoma Company—Shipments of ore from the Marble Bay mine are being maintained at the rate of 1200 to 1500 tons per month. The ore ranges gross from $10 to $30 per ton and is chiefly bornite with gold and silver. The occurrence of bornite ore in large quantity at nearly 1000 ft. depth is of interest. Alexander Grant, Van Anda, Texada island, is manager.

Granby—The smeltery received during October 107,932 tons of ore, of which 105,458 tons was from the Phœnix mine of the company.

Nova Scotia

Dominion Coal—The strike is officially over, the company having announced that no more men are needed. There are 5500 men at work of whom 3000 are underground. On Nov. 9, 9391 tons were mined, this being the highest figure reached since the strike.

Ontario-Cobalt

King Edward—The dynamite-thawing house at this mine blew up, but no serious damage was done.

North Cobalt—A shipment of high-grade ore will be made in a few days, the first shipment from this section since the Green-Meehan ceased shipping, two years ago.

Nipissing—During the season 24 new veins have been discovered by surface prospecting.

Michigan-Cobalt—A new vein carrying some silver has been discovered on the 85 ft. level.

Little Nipissing—A shoot of high-grade ore has been discovered in the diabase formation, a continuation of the vein on the 105 ft. level, drifting east toward the lake. This is considered a most important discovery for this property.

Ore Shipments—The shipments for the week of Nov. 6 from Cobalt were as follows: La Rose, 340,287, Right-of-Way, 136,361; McKinley-Darragh, 43,582; O'Brien, 64,000; Nipissing, 65,560; total, 649,790 pounds.

Mexico

Chihuahua

Sierra Consolidated—This company, which lately acquired the defunct Greene Gold-Silver properties in the Ocampo section, has started operations. P. M. Atwater is manager, Robert Linton, superintendent. The work will consist of putting in shape the old workings preliminary to development.

Rio Plata—The 25-stamp mill is running full capacity, as is the 75-ton cyanide plant. On the 5000 tailings the cyanide mill is making a saving of over 90 per cent. The October output was 36,000 oz. silver from concentrates and 20,000 oz. from cyanide cleanups.

Dolores—The company has announced

an increase in dividends of from 12 per cent. to 18 per cent. effective Jan. 1. The total paid to shareholders is $750,000.

Democracia—Work has been resumed at this Santa Eulalia property under direction of L. M. Terry.

Americana—Shipments of lead ore amounting to three cars weekly are being made from this property at Terrazas. Felix McDonald is the shipper.

Lago—This zinc mine in the eastern part of the state is again sending out shipments of high-grade zinc ore, as is also the Faivre property in the same section.

El Rayo—Recent developments on this mine at Santa Barbara has been most satisfactory. A new orebody has been proven between the San Jose and Petite tunnels much ahead of the former ore and the ore now being mined for the mill, at which an extraction of about 84 per cent. is being made. George A. Schroter is engineer.

DURANGO

Velardeña District—The smeltery is giving a flat rate on silicious ores instead of the penalty of 21 to 25 centavos a unit. The American Smelters Securities Company is doing extensive development on its properties. Two diamond drills are on the San Lorenzo group. Experiments are under way with the zinc ores and concentrates of the camp. The smeltery is running full capacity and there is a report that another copper furnace will be added.

Hileta—This company has a mine adjoining the Terneras of the Securities company. It is developed by three shafts to 300 ft. and two tunnels on the vein, are 1600 ft. long. The veins are not wide but have long oreshoots, one being 500 ft. Carter Barker is manager.

Buena Vista Camp—Considerable activity is reported in this section to the east of Chinacates on the Tepehuanes-Durango branch of the National. The ores are gold-silver. The main operators are the Hancock-Loving Venerable Company and Brackett & Casteen, although work is under way on several other newer denouncements. At the Santa Cruz property of the first-named company a cyanide plant is in course of erection and others are planned.

Promontorio—This mine is being operated successfully. An 80-ton plant for concentration and cyanidation is installed and is producing silver and gold, and lead concentrates. The mine has a large quantity of ore blocked out. Maximiliano Damm is owner.

GUANAJUATO

Guanajuato Amalgamated Gold Mines—The court has approved the plans for the discharge of the receiver and the company will be in control again in a short time. Operations are being carried on at the mine in the La Luz district.

JALISCO

Lawson Development—This enterprise has suspended operations in the Mascota district and will abandon the field. A 30-ton custom reduction plant, recently completed, will be sold. In addition to this plant and the silver-gold mines, the company owns cinnabar deposits and a furnace.

Amparo Company—A contract has been let for sinking the 3-compartment shaft 300 ft. deeper to 1100 feet.

Cinco Minas—F. A. Ross, recently at Hedley, British Columbia, is at the Cinco Minas to make a report to the Daly interests on the development accomplished. A payment on the purchase price of 530,000 pesos is due in January.

Lupita—A cyanide plant will be added to the Lupita works in the Mascota district. Milling will be resumed within a few months.

Esperanza—H. H. Cross and H. W. Young will install a cyanide annex at the small reduction plant of the Esperanza gold mines in the Piginto camp.

Bramador—French interests have acquired extensions of old producers of the Bramador camp, and are treating some ore in the old reduction works.

OAXACA

Humboldt Mining Company—This Boston Company operating the Humboldt mine in Taviche has secured control of all of the properties of the Commonwealth company in the same camp.

Santa Catarina—This mine on the Southern railroad near Oaxaca is not at the present time operating. The tailings are being successfully retreated under a contract. The adjoining property, the Santa Sofia, is developing and blocking out ore.

SONORA

Creston Colorado—The returns from this mine of the Mines Company of America, for the quarter ended Aug. 31, show bullion receipts of $237,445 and a profit of $40,589.

Esmeralda—This mine in the Altar district in charge of F. C. Emery, has made a strike of silver ore.

San Miguel—Superintendent E. J. Schrader will have the mill in operation by Jan. 1.

Cordova—According to E. F. Gray, manager of the Great Northern Development company, operating eleven mining camps in the Copper River country, the Copper River & Northwestern is completed 110 miles out from Cordova.

TAMAULIPAS

Californian interests are negotiating for the Rancho Limón, a tract of 1,000,000 acres along the Tampico branch of the National. Seepages of oil have been observed in several localities within the ranch, and the primary object of the venture will be the search of oil. The price of the property is stated to be $2,500,000.

Africa

TRANSVAAL

Gold production in October is reported at 602,416 oz., being 3969 oz. less than in September, and 15,328 oz. less than in October, 1908. This is the first month this year which has shown a lower return than 1908. For the 10 months ended Oct. 30 the total was 6,077,790 oz., or $125,627,919; an increase of 300,187 oz., or $6,204,865 over the corresponding period last year.

Australia

NEW SOUTH WALES

The general strike of the miners in the Newcastle and adjoining districts continues to spread. Coal shipments have ceased entirely, and there is already a scarcity of coal in Sydney and other towns.

Gold production of the State in October was 25,212 oz. fine, an increase of 424 oz. over October, 1908. The total output for the 10 months ended Oct. 31 was 201,870 oz., or $4,172,653 this year.

Broken Hill Proprietary Company—For October this company reports production of 295,088 oz. silver, 6034 tons lead and 48 tons antimonial lead—nearly all from purchased ores. There were also produced 7601 tons zinc concentrates, containing 163,161 oz. silver, 588 tons lead and 3475 tons zinc.

WESTERN AUSTRALIA

The gold output reported from the State of Western Australia in October was 131,209 oz., being 13,709 oz. less than in September and 5171 oz. less than in October, 1908. For the 10 months ended Oct. 31 the total was 1,371,752 oz. in 1908, and 1,328,024 oz.—or $27,450,256—in 1909; a decrease of 43,728 oz. this year.

Great Boulder—A cable report is that the surface plant at this mine was on fire Nov. 10. The fire on that date had spread rapidly, and it was impossible to say how much damage had been done.

South America

CHILE

Braden Copper—The equipment for increasing the capacity of the old concentrating mill from 250 tons to 400 tons has been shipped and much of the machinery for the new mill, which is to have a capacity of 1000 tons, has been ordered. The Power and Mining Machinery Company will supply two No. 7 gyratory crushers, two No. 5 gyratory crushers, two sets 48x18 rolls, six sets, 36x15 rolls. This equipment will be installed in a separate building in which the ore will be dry crushed to 7 mm. and then taken by conveying belts to the concentrating mill. Jigs, tables, chilean mills, and vanners will be used, but some of the details regarding the concentrating equipment have not yet been decided. The main office of the company in Peru has been moved to Rancagua; Frank Langford, manager. The New York office is at 165 Broadway.

ARGENTINA

Famatina—The company's smeltery is now in operation.

Metal, Mineral, Coal and Stock Markets

Current Prices, Market Conditions and Commercial Statistics of the Metals, Minerals and Mining Stocks

QUOTATIONS FROM IMPORTANT CENTERS

Coal Trade Review

New York, Nov. 17—The coal trade in the West is steady and reports are very good. The trade is a little disturbed by the rush to get coal up the Lakes, but this will soon pass over. Business is good both in steam coal and for domestic fuel at all the large distributing centers.

The Eastern bituminous trade continues good. A good deal of trouble is being experienced from car shortage and seaboard deliveries are seriously delayed. A short supply of cars is causing some complaint in the West also, but does not appear to be bad as on the Eastern lines.

The anthracite trade is good. Just at present there is a considerable quantity of coal being shipped to Buffalo for the Lake trade, but otherwise there is no special movement. Operations at quite a number of collieries are still curtailed by the short supply of water due to the unusually dry season.

There has been heavy buying of the stock of the Pittsburg Coal Company which cannot be traced to any particular source, and this has given rise to all sorts of rumors. One report, coming from Philadelphia, is that it is proposed to consolidate the Pittsburg Coal Company with the Consolidation Coal Company. This has been denied by officers of the last named company. In Pittsburg the favorite theory is that the buying is in the interest of the Steel Corporation. Neither of these reports appears to be based on any positive information.

The announcement by the Pocahontas Collieries Company that it has organized a selling company of its own and has taken its agency away from the firm of Castner, Curran & Bullitt, who have held it for a long time, has caused some surprise in the trade, and there is a good deal of speculation as to the object of the change.

Ohio Coal Rates—The Ohio Railroad Commission has taken up again, after nearly three months' intermission, the complaint of the southeastern Ohio operators charging discrimination in rates against the Wheeling & Lake Erie and other railroads. Hearings will be continued for some time.

Coal Traffic Notes

Receipts of domestic coal at San Francisco nine months ended Sept. 30, were 1,004,848 tons in 1908, and 248,153 in 1909, decrease, 82,885 tons.

Shipments of coal by water from Seattle and Tacoma, Wash., nine months ended Sept. 30, were 411,094 tons in 1908, and 267,713 in 1909; decrease, 143,381 tons.

Receipts of coal at St. Louis, nine months ended Sept. 30, were 4,844,173 short tons in 1908, and 4,801,663 in 1909; decrease, 42,510 tons.

Coal and coke tonnage Chesapeake & Ohio railway, three months of fiscal year July 1-Sept. 30, short tons:

	Coal.	Coke.	Total.
New River	2,043,768	88,008	2,131,776
Kanawha	1,493,056	7,470	1,500,526
Kentucky	86,019	.....	86,019
Connecting lines	16,307	11,562	27,869
Total	3,639,150	107,040	3,746,190
Total, 1908	3,088,427	71,832	3,160,259

Total increase, 585,031 tons, or 18.6 per cent. Deliveries this year to points west of mines, 1,877,794 tons coal and 44,040 coke; points east, 407,947 tons coal and 63,040 coke; tidewater, 1,351,904 tons coal.

Coal receipts at Boston, 10 months ended Oct. 31, as reported by Chamber of Commerce:

	1908.	1909.	Changes.
Anthracite	1,464,123	1,415,007	D. 49,116
Bituminous	2,652,641	2,963,200	I. 310,559
Total domestic	4,116,764	4,378,207	I. 261,443
Foreign	312,348	192,953	D. 119,395
Total	4,429,112	4,571,160	I. 142,048

The foreign coal comes chiefly from Nova Scotia and the large decrease is due to the labor troubles there.

The following statement of coal tonnage passing over the Poughkeepsie bridge into New England has been filed with the Public Service Commission of New York. It covers the fiscal year ending June 30:

	1907-8.	1908-9.	Changes.
Anthracite	905,294	1,464,107	I. 558,813
Bituminous	60,640	320,450	I. 259,810
Coke	3,721	21,990	I. 18,269
Total	969,655	1,806,547	I. 836,892

This shows that a considerable tonnage has been diverted from the old routes by Long Island sound since the bridge was reconstructed.

New York

Anthracite

Nov. 17—The anthracite market is again a little improved, although the weather has not been especially favorable. Nevertheless local dealers are putting in more stocks and presumably their customers are doing the same. Shipments are reported to be increasing and the collieries are more generally on full time.

Schedule prices for large sizes are unchanged at $4.75 for lump and $5 for egg, stove and chestnut, all f.o.b. New York harbor. For steam sizes quotations are: Pea, $3@3.25; buckwheat, $2.25@2.50; No. 2 buckwheat or rice, $1.75@2; barley, $1.35@1.50; all f.o.b. New York harbor.

Bituminous

The soft-coal market continues to improve, and more orders are coming in from Eastern territory. There is a good deal of activity at the mines, but it is due rather to demand from the West, which is strong now on account of the approach of the close of navigation on the Lakes. Coal is being rushed through to the Lake Erie ports as fast as possible, which is rather delaying shipments to the seaboard. Locally the Far East and the Sound ports are taking coal pretty well, and all-rail trade is good. Some complaint is coming from the Sound ports about delay in unloading vessels and in getting cars away from the wharves, but this does not seem to be much worse than the usual delay on the New Haven road.

Car shortage is getting to be a serious matter, and is worse on account of the demand for Western shipments. On the Baltimore & Ohio the situation is particularly bad, but all the roads are suffering more or less, and it is impossible to get coal to the seaboard as fast as it is wanted. Transportation is also irregular, mainly on account of shortage of locomotives.

There is practically no change in prices, but coal is more firmly held and dealers are not so much inclined to make concessions to secure trade as they have been.

Coastwise trade is pretty good, and rates are again a little firmer. For large vessels from Philadelphia charters are now taken at 85c. per ton to Boston, Salem and Portland. Small vessels from New York harbor points command 65c. to points around Cape Cod.

Birmingham

Nov. 15—Coal production in Alabama is increasing steadily, despite the fact that there is need for miners and mine laborers. The efforts to bring men in for the work in this State are meeting with more or less success but still there is need for much more labor. The demand for coal and coke is holding strong. The coal production will be increased considerably when new mines under development now have progressed far enough to produce coal.

Chicago

Nov. 16—A cold wave over the greater part of Chicago territory has caused a general increase in sales of coal and strength-

ened, though it has not advanced, prices, which threatened to sag somewhat under the influence of continued warm weather. Dealers expect a much better condition this week on all kinds of domestic coal. Sales of steam coal continue large and steady and the market is not over-supplied to any extent. Receipts of Western are well adjusted to the demand. Fine coals alone show any real weakness.

Illinois and Indiana lump and egg bring $2@3; run-of-mine sells for $1.75@1.85, and screenings for $1@1.15 per ton.

Hocking is steady at $3.15; smokeless continues relatively strong, though not so firm as most other coals, lump and egg bringing $3.60@3.80 and run-of-mine $3.05 @3.15. Youghiogheny ¾-in. gas sells for $3.15 and Pittsburg No. 8, in the same size, for $2.55. Predictions of car shortage continue to be made in the trade, but no serious trouble is yet generally felt. Anthracite is in better demand with the change in the weather, and has moved fairly well during the last week.

Cleveland

Nov. 15—Pushing through Lake shipments is the cry the present week, and local trade gets little attention, though demand is good.

The Ohio mine operators will meet here Dec. 7. This is preliminary to a general meeting of the four competitive States, which will be held later.

Prices are firmer. Middle district coal brings $1.40 at mines for 1¾-in., $1.15 for ¾-in., $1.05 for run-of-mine and 70c. for slack; 70c. being added for Cleveland delivery. No. 8 district is $1.35 for 1¼-in., $1.05 for ¾-in., 95c. for run-of-mine and 60c. for slack, all at mine; 90c. being freight to Cleveland. Massillon domestic is $2.95 for lump and washed nut and $1.50 for slack; all f.o.b. Cleveland.

Indianapolis

Nov. 15—The coal trade in this State, after passing through two weeks of strenuous activity, appears to be enjoying a little breathing spell—due perhaps to the mild weather prevailing. Orders at the mines are not so heavy as a fortnight ago, but the fact remains that all the mines are working steadily and the production is still considerably ahead of the facilities for shipment.

The coal market has a good tone in every respect. Local dealers in Terre Haute and other cities have adopted an advanced scale of prices for the winter trade. The dealers explain that this is done because prices have been advanced at the mines, although the operators say there has been no advance since early in October.

Pittsburg

Nov. 16—The flurry in coal is over and asking prices have receded to a normal level, about 10c. above the market of a month or six weeks ago. Lake shipments are still heavy, but the season is nearly over. We quote Pittsburg district coal at $1.15@1.20 for mine-run at mines, and slack at 65@75c. at mine.

Connellsville Coke—The coke market has squarely settled down to a waiting game all along the line. There is about 200,000 tons a month of furnace coke to be bought for next year, but the consumers are manifesting no anxiety whatever. Practically nothing has been done for three weeks and it does not look as if anything would be done for some time, as the market is almost bare even of inquiries. Operators are standing their ground pretty firmly, quoting $2.90@3 for furnace coke on contract, but in the past month there has been a slight weakening in the tone in that operators who formerly asked above $3 would now be content with that figure, and others who quoted $3 would now take $2.95 or $2.90. The foundry-coke market is quiet for next year, and for neither grade is there much inquiry for spot.

We quote standard Connellsville furnace coke at $2.90 for prompt or contract, prompt foundry at $3@3.25 and contract foundry at $3.25@3.50 at oven.

The *Courier* reports the production in the Connellsville and lower Connellsville region in the week ending Nov. 6 at 455,055 tons, a gain of 4000 tons over the previous week, and shipments of 5012 cars to Pittsburg, 8083 cars to points west of Pittsburg and 790 cars to points east of Connellsville, a total of 13,885 cars, or 500 cars less than in the preceding week.

St. Louis

Nov. 15—The local market has been losing strength steadily ever since the first of the month. The continued warm weather, which is most unseasonable, has, of course, slowed down the demand from dealers, in fact the yards are practically at a standstill now. The demand from even the country to the west is slow and little new business has come in during the week. A number of dealers are asking for some relief on contract coal, as they are unable to handle their full tonnage under present conditions.

The industrial situation on the other hand seems to be improving. Steam plants are nearly all running full time and a number of them are preparing to work double shifts. All steam plants in this vicinity are complaining that they are having trouble in getting sufficient labor, which is a marked contrast to conditions which prevailed all summer. The falling off in demand of the domestic market and the increase of the industrial situation has braced up the market for steam sizes, such as screenings and nut coal. The demand from the Northwest continues strong and operators of high-grade mines in southern Illinois are away behind with orders, and are getting better and better prices right along. The only mines that are affected by the local depression are those situated in the inner groups which are tributary to St. Louis.

The car situation throughout the entire State seems to be getting worse and worse. Not only has the Carterville field had a poor week's run but every road in central and northern Illinois has also been short of equipment. In fact the whole State of Illinois as an average did not run more than half time last week.

Carterville 6-in. lump or egg is bringing $1.75 at mine or $2.42 St. Louis. No. 1 nut is $1.50 at the mine or $2.17 St. Louis. Screenings are 30c. at mine or 97c. per ton St. Louis. Franklin county 6-in. lump and egg are strong at $2 per ton mine or $2.67 St. Louis; while 3-in. nut is $1.55 at mine of $2.22 St. Louis. Staunton Mt. Olive or Springfield district 6-in. lump is worth $1.50 per ton mine or $2.02 St. Louis; 3-in. lump is now $1.25 at mine or $1.77 St. Louis. Nut coal is worth 85c. mine or $2.22 St. Louis. Staunton, Mt. lump is worth $1.20 mine or $1.72 St. Louis, while 2-in. lump is $1 mine or $1.52 St. Louis. Screenings are worth little or nothing at the mines and the poorer grade can be had for the freight in St. Louis. Steam nut coal is bringing 35c. at mine or 87c. St. Louis. Carterville No. 1 washed is $1.75 mine or $2.32 St. Louis.

The anthracite market is in poor condition and practically the same as it was last week. Chestnut coal is as scarce as ever.

Foreign Coal Trade

German Coal Trade—Exports and imports of fuel in Germany, nine months ended Sept. 30, metric tons:

	Exports.	Imports.	Excess.
Coal	16,767,860	8,690,855	Exp. 8,077,005
Brown coal	25,406	6,060,877	Imp. 6,035,471
Coke	2,519,363	493,980	Exp. 2,025,383
Briquets	1,172,386	150,476	Exp. 1,021,910
Total	20,485,015	15,396,188	Exp. 5,088,827
Total, 1908	19,402,203	15,866,080	Exp. 3,536,123

The coke exports this year included 28,011 tons to the United States.

German Coal Production—Coal production of German Empire, nine months ended Sept. 30, metric tons:

	1908.	1909.	Changes.
Coal	111,391,925	110,635,897	D. 756,028
Brown coal	48,892,403	49,704,071	I. 811,668
Total mined	160,284,328	160,339,968	I. 55,640
Coke made	15,836,933	15,775,206	D. 61,727
Briquets made	13,641,513	13,879,301	I. 247,788

Of the briquets reported this year 11,023,020 tons were made from brown coal, or lignite.

Welsh Coal Market—Messrs Hull, Blyth & Co., London and Cardiff, Wales, report prices of coal as follows on Oct. 30: Best Welsh steam, $4.08; seconds, $3.84; thirds, $3.60; dry coals, $4.02; best Monmouthshire, $3.48; seconds, $3.30; best small steam, $2.16; seconds, $1.68. All prices are per long ton, f.o.b. shipping port, for cash in 30 days, less 2½ per cent. discount.

Iron Trade Review

New York, Nov. 17—Comparative quiet seems to have settled over the iron and steel trades this week. Although business may still be considered very good, there is less rush to purchase material, and buyers seem to be satisfied for the present. The large steel companies also are not anxious to sell beyond the first quarter of next year, at the present time. Some contracts have been made, but the placing of business for periods later in the year is apparently delayed by both parties.

Pig iron partakes of the generally quieter tone. Sales continue to be made of foundry and there is a good deal of inquiry for basic iron. Furnaces, however, are not pressing for orders running beyond the first quarter or at most the first half of 1910. Some canvassing is going on for orders for foreign pig iron along the seaboard, and it is said that attractive offers of some large tonnages have been made.

In finished material, the heaviest business now under consideration is in sheets and tinplates. The principal producers have announced that an advance in these articles will be made Jan. 1 next. Some structural steel and shapes have been taken and some good orders for buildings and for steel cars are noted, which will require a considerable tonnage.

It is positively stated that no action will be taken on Lake Superior iron-ore prices before Dec. 1. There is a good deal of talk of an advance of 50c. in prices at Lake ports, and it is quite probable that this will be made for next season.

Lake Superior Iron Ore—Shipments of iron ore from the Lake Superior region in October were 6,625,801 tons, being about 425,000 tons less than in September, chiefly on account of stormy weather which delayed vessels. For the season to Nov. 1 the total shipments were, in long tons:

Port	1908.	1909.	Changes.
Escanaba	2,746,116	4,930,971	I. 2,184,855
Marquette	1,177,730	2,507,712	I. 1,329,982
Ashland	2,019,948	3,136,275	I. 1,116,327
Superior	2,098,649	5,747,434	I. 3,648,785
Duluth	7,904,568	11,850,018	I. 3,945,450
Two Harbors	4,996,004	8,002,854	I. 3,146,790
Total	21,780,072	36,265,334	I. 14,505,262

The total to the corresponding date in 1907 was 17,011,801 tons, or only 776,527 tons more than this year.

The Cleveland *Iron Trade Review*, from which the figures above are taken, has begun also to report the receipts at the lower ports. For two months, September and October, these were: Lake Erie ports, 11,325,[illegible]; Lake Michigan ports, [illegible]; total, 13,[illegible],150 tons.

Republic Steel Corporation—The stockholders have voted to authorize the issue of $[illegible] in 6 per cent. five-year notes, secured by pledge of stocks owned by the company. The money is to be used to pay for extensive additions to the mills at Bethlehem, and for development of the company's iron-ore holdings.

Baltimore

Nov. 19—Exports for the week included 1835 tons steel rails to Australia. Imports included 3300 tons spiegeleisen and 200 tons silicospiegel from Great Britain; 500 tons manganese ore from Antwerp, 1000 tons from Middlesboro, England, and 6700 tons from India; 9000 tons iron ore from Cuba; 1377 bars lead from Antwerp.

Birmingham

Nov. 15—There is not much selling going on but the Southern pig-iron market remains firm. There is a healthy production in the Southern territory. The only delay heard of now is in business placed several months ago when the prices were much under those now prevailing. Efforts to find if concessions are being made on the $15 per ton rate for No. 2 foundry, have been in vain. The larger manufacturers announce positively that $15 is the price for delivery during the first half of the coming year. The Alabama make in November promises to exceed that of October, when this State was given credit for 176,266 tons.

The cast-iron pipe plants continue to melt a large amount of pig iron. The pipe is being shipped out in all directions.

At the steel plants there is steady activity. Besides rails, about 6000 tons of plates and bars are being produced monthly in this territory. The announcement that the American Steel and Wire Company, a subsidiary of the United States Steel Corporation, will erect a big plant in the Birmingham district on property recently purchased by the Tennessee company causes interest.

Chicago

Nov. 16—The iron market continues quiet but firm. Sales of pig iron are steady and widely distributed, but are not for large amounts, the tendency of the melter continues to be to buy three to six months ahead, with contracts running into the third quarter steadily increasing and a little quick delivery iron in demand. Southern iron is selling at $14.50@15 Birmingham ($18.85@19.35 Chicago), and is nearer to a stage of dullness than Northern iron, which at $19@19.50 continues strong. Inquiries are good and the situation generally is such as to cause expressions of confidence for the future from furnace agents. It is the expectation of some of those acquainted with the trade that the present quiet will last up to the first of the coming year because of the disposition indicated by melters to run closely to their immediate needs until that time.

Sales of iron and steel products continue large and extend to practically every branch of the trade. Coke is very strong with both Connellsville and Wise County selling at $5.50 Chicago.

Cleveland

Nov. 16—Ore arrivals continue to be heavy. The Cleveland receipts in September and October were 2,046,327 tons. These were exceeded by two other Lake Erie ports, Ashtabula with 2,782,257 and Conneaut with 2,118,142 tons.

Pig Iron—The market is rather quiet for the time being on foundry and basic pig. Furnaces are not willing to take second-half orders yet. Quotations are firm at $17.75@18 for basic; $18.25@18.50 for No. 2 foundry; $17.25@17.75 for gray forge; $19.50@20 for Lake Superior charcoal.

Finished Material—There is some inquiry for steel billets. Bars are in demand and early deliveries are not to be had. The mills are holding back on orders for the second half of next year.

Philadelphia

Nov. 17—After a few days of quiet, consumers of basic and forge iron are again endeavoring to place orders for more remote delivery on account of the hardening tendency in prices. The consumption of all kinds of pig iron has increased beyond early autumn anticipations and buyers are, therefore, more anxious to provide against emergencies. No recent large orders for basic pig have been definitely placed. Foundry irons are difficult to obtain for early delivery. Southern furnaces are holding iron at top prices. A few customers have asked for assurances that their December orders will be booked at current rates and half promises have been given at that effect. Basic iron is hard to get at any price and it is quoted at $19 nominally. Both Northern and Southern forge are quoted at $18. No. 2 foundry was offered today at $19.75. Some contracts have been booked at 50c. less.

Steel Billets—The concerns using billets have been working up their stock faster than was anticipated and there is some difficulty in getting deliveries of steel recently contracted for.

Bars—Prices have been advanced on all recent business in small lots, about $2 a ton. In some cases premiums have been offered for spot delivery. Both country and city stores have been cleaning out stocks rapidly.

Sheets—Sheets have been advanced again in both wholesale and retail lots in consequence of the improving demand. Inquiry reveals the fact that stocks at most of our distributing centers are next to nothing.

Pipes and Tubes—The accumulation of orders at mills continues and this territory is now absorbing fully one-half more than a year ago. The higher level of prices is easily maintained.

Plates—The advance in plates in western markets has been followed by light advances here. A few belated buyers are

glad to offer premiums on small lots. Small lots of tank and boiler plate are selling from $2 to $3 a ton over two weeks ago.

Structural Material—While there are rumors relating to large transactions soon to be closed nothing definite has transpired worth noting. The usual run of small orders is spoken of, and an advance of about $2 a ton has been established.

Steel Rails—The sales reported by railmakers for the week relate mainly to small orders for light sections. A large rail business is in sight.

Scrap—No change has occurred in the market. Prices remain as they were last week. The larger dealers are quite busy gathering up material which they have contracted to deliver.

Pittsburg

Nov. 16—Strictly new business continues light with the steel mills, but producers welcome the condition as it offers the hope of catching up with business, while consumers are so well covered that new buying at this time, with mill capacity sold for months ahead in most lines, would necessarily be largely of a speculative character.

There is no decrease in the volume of specifications on old contracts. As a rule these specifications are in excess of current output, and they are so heavy partly because buyers must take advantage of low-priced contracts which expire with the year and because they wish to make sure of getting deliveries as needed.

On Nov. 12 the American Sheet and Tin Plate Company announced advances approximating $2 a ton on tinplates and black sheets and $3 a ton on galvanized material. The advances were as follows: Tinplates, $3.50 to $3.60 for 100-lb. cokes; blue annealed sheets, 1.70 to 1.75c. for No. 10 gage; box annealed sheets, 2.30 to 2.40c. for No. 28 gage; galvanized sheets, 3.35 to 3.50c. for No. 28 gage; corrugated roofing, No. 28 gage, 2½-in. corrugations, painted, $1.60 to $1.70 per square; galvanized, $2.85 to $3 per square.

Pig Iron—Sales of bessemer pig iron since the first of the month exceed 50,000 tons. The Jones & Laughlin Steel Company took 20,000 tons on Nov. 11, half from the Bessemer Pig Iron Association and half from W. P. Snyder & Co., for delivery over two or three months, while other consumers took about 30,000 tons, some of the purchases having been made early in the month, but not hitherto reported. These sales were all at $19, Valley, at which the market seems to have been pegged by the large producers. They could have obtained somewhat higher prices, but seem to fear the results of any further advance. The $19 price was first done Oct. 11, the market having advanced from $16.75 since Sept. 1. A prominent merchant producer has bought several lots of iron at above $19 and is reported to have paid as high as $19.50 in one instance. Demand for foundry iron has been light, and the market has been somewhat disturbed by the aggressive selling, at cut prices, of a merchant furnace on the outskirts of the Mahoning valley, this interest having even shaded $17, while $17.25 has been the minimum of practically all other sellers.

Current quotations at Valley furnace are: Bessemer, $19; basic, $17.25@17.50; foundry, $17.25@17.75; malleable, $17.50@18; gray forge, $16.25@16.50 per ton.

Steel—On Nov. 12, concurrent with the American Sheet and Tin Plate Company's announcement of advanced prices, the Carnegie Steel Company announced that its price would be $30, Pittsburg, on such sheet-bars as it might be able to spare for first quarter. The market for early delivery had been about $28. None of the mills had been openly selling for first quarter, being doubtful about the price and uncertain whether they would have much tonnage to spare, but the Carnegie announcement is accepted as setting a price for such delivery. Odd lots of sheet-bars for early delivery have been far from scarce, but as mills are well covered for the time being they have found no market except with mills willing to carry them on this rising market. Billets are quoted nominally at $27, Pittsburg, but are hard to get at that figure. The Maryland Steel Company is reported to have sold 45,000 tons of bessemer billets for shipments west as fast as they can be produced, and it is possible that the tonnage is being taken by Steel Corporation subsidiaries.

Ferromanganese—The market continues to strengthen. No definite information has come out as to how much the Carnegie Steel Company has bought, but it is known that it has taken a considerable tonnage. The market is strong at $44.50@45 for prompt and $45.50@46 for next year, f.o.b. Baltimore.

St. Louis

Nov. 15—The market for pig iron has continued to be strong though the actual amount of business closed has been light, owing to the fact all the largest contracts for the season have been closed, and all furnaces are pretty well sold up for the first half. A number of buyers have been in the market for small lots. Prices for delivery for the first half remain unchanged and are $15@15.25 per ton Birmingham or $18.75@19 per ton St. Louis for No. 2 foundy. All of the foundries and tinplate mills in Granite City and the manufacturing suburbs of St. Louis are now on full time and expect to run without interruption until their regular annual shut down next summer.

Iron Ore—The call for Missouri ore is keeping pace with the advancing iron market and it is in strong demand at $3.75 per ton f.o.b. St. Louis, for 50 per cent ore.

Metal Markets

New York, Nov. 17—The metal markets show activity in several directions. The copper market is agitated by reports of a combination of the producers in some form. Sales have been large.

Gold, Silver and Platinum

UNITED STATES GOLD AND SILVER MOVEMENT

Metal.	Exports.	Imports.	Excess.
Gold:			
Sept. 1909..	$ 7,546,442	$ 2,350,958	Exp. $ 5,195,484
" 1908..	3,974,391	4,767,051	Imp. 792,660
Year 1909..	97,272,834	31,105,193	Exp. 66,167,641
" 1908..	68,937,380	38,427,973	" 30,509,407
Silver:			
Sept. 1909..	4,385,532	3,261,397	Exp. 1,124,135
" 1908.	4,198,286	3,370,591	" 827,695
Year 1909.	43,289,116	33,240,530	" 10,048,586
" 1908.	38,781,380	30,792,704	" 7,988,676

Exports from the port of New York, week ended Nov. 13: Gold, $1,304,000, chiefly to Brazil; silver, $960,907, to London and Paris. Imports: Gold, $114,885, from Australia, Central and South America; silver, $35,028, from Mexico and the West Indies.

Gold—The demand for gold on the open market in London was good but not pressing, and the price was 77s. 9d. per oz. for bars and 76s. 4d. per oz. for coin. The Bank of England took most of the gold offered. In New York more gold was taken for South America, a total of $3,000,000 being reported this week.

Platinum—Business is reported active, especially with the jewelry trade. The price remains unchanged, dealers still asking $29.50 per oz. for refined platinum and $33.25 for hard metal. No offers of outside metal are now heard.

Our St. Petersburg correspondent writes, under date of Oct. 28, that there has been a further advance in prices. At Ekaterinburg quotations are 5.25 rubles per zolotnik for crude metal, 83 per cent. platinum—equal to $19.74 per oz. At St. Petersburg the nominal quotation for crude metal is 22,000 rubles per pood, but sales have been made at 22,250 and 22,500 rubles—the latter equal to $22.05 per oz. A further increase is expected, and reports from Paris show increased demand.

Silver—The market has been steady, fluctuations being within ⅛d. The Indian export season is become active, and the stock of rupees in the treasury is being reduced. In the next few months probably large withdrawals will be made, and then the prospect of the Indian government buying silver will be materially nearer. The situation would then call for serious attention. The chance of such action, however, is not in the near future.

SILVER AND STERLING EXCHANGE

Nov.	11	12	13	15	16	17
New York....	50¾	50¾	50¾	50¾	50¾	50¾
London....	23¾	23¾	23¾	23¾	23¾	23¾
Sterling Ex..	4.8725	4.8745	4.8735	4.8740	4.8725	4.8740

New York quotations, cents per ounce troy, fine silver; London, pence per ounce sterling silver, 0.925 fine.

Exports of silver from London to the East, Jan. 1 to Nov. 4, as reported by Messrs. Pixley & Abell:

	1908.	1909.	Changes.
India.....	£ 8,208,563	£5,282,400	D. £2,926,163
China.....	516,400	1,555,200	I. 1,038,800
Straits.....	164,885	82,800	D. 82,085
Total... ..	£ 8,889,848	£6,920,400	D. £1,969,448

Indian exchange in London, 16.03d. per rupee.

Copper, Tin, Lead and Zinc

Nov.	Copper. Lake. Cts. per lb.	Copper. Electrolytic. Cts. per lb.	Copper. London. £ per ton.	Tin. Cts. per lb.	Lead. New York. Cts. per lb.	Lead. St. Louis. Cts. per lb.	Zinc. St. Louis. Cts. per lb.
11	13 @13¾	12⅞ @13	58¾	30⅜	4.35 @4.37½	4.22½ @4.27½	6.20 @6.25
12	13 @13¾	12⅞ @13⅛	58⅞	30⅜	4.35 @4.37½	4.22½ @4.27½	6.20 @6.25
13	13 @13¾	12⅞ @13⅛	....	30½	4.35 @4.37½	4.22½ @4.27½	6.20 @6.25
15	13⅛ @13⅞	13 @13¼	59	30¾	4.35 @4.37½	4.22½ @4.27½	6.22½ @6.25
16	13¼ @13½	13⅛ @13¼	60	30¾	4.35 @4.37½	4.22½ @4.27½	6.22½ @6.25
17	13⅛ @13⅝	13⅛ @13⅜	59⅞	30⅜	4.35 @4.37½	4.22½ @4.27½	6.22½ @6.25

London quotations are per long ton (2240 lb.) standard copper. The New York quotations for electrolytic copper are for cakes, ingots and wirebars, and represent the bulk of the transactions made with consumers, basis, New York, cash. The prices of casting copper and of electrolytic cathodes are usually 0.125c. below that of electrolytic. The quotations for lead represent wholesale transactions in the open market. The quotations on spelter are for ordinary Western brands; special brands command a premium.

Copper—During the week of Nov. 11 to 17 the market has been dominated by the prospect of a consolidation of certain large producing interests, with talk of a curtailment of production as a result thereof. It is generally recognized that manufacturers the world over have allowed the producers to carry the stocks during the last year or so. Now that there appears to be prospect of a corrective, even if it be artificial, to a vexing statistical situation there has been manifested a disposition to lay in supplies. This, together with speculative buying, has resulted in a very heavy business during the week. Sales both for home trade and for export have been on a larger scale than for a long time past. The aggregate for the week has doubtless been upward of 50,000,000 lb. What proportion has been to manufacturers and what to speculators it would be difficult to say. The sales have been made by all of the large producing interests and some of them claim to have now disposed of their production for two or three months ahead. Although sellers have advanced their prices from day to day, the demand continues unabated and the close is firm at [illegible] for Lake copper, and [illegible] for electrolytic copper in cakes, wirebars and ingots. Casting copper is quoted nominally at [illegible] cents.

Copper sheets are now 18c. base, ten large lots. Full extras are charged, and higher prices for small quantities. Copper wire has been advanced ¼c. to 14¾c. base, carload lots at mill. Business is excellent.

In spite of a further increase in the visible supply of 3500 tons, the standard market has been active and firm throughout the week, and closes at £59 17s. 6d. for spot, and £61 for three months.

Refined and manufactured sorts we quote: English tough, £63 10s.; best selected, £62 10s.@£63 10s.; strong sheets, £74 10s@£75 10s. per ton.

Exports of copper for the week from New York and Philadelphia were 7143 long tons. Our special correspondent gives no exports from Baltimore.

Tin—The London market, as well as the domestic market, has been active and firm during the past week. Among dealers on this side and consumers, a good deal more interest for the metal was shown than for a long time past, and prices in this market have again reached the import basis. The statistical position of the metal is a very favorable one, and the supply of spot material will, at the present rate of consumption, decrease rapidly. At the close, London is cabled at £139 12s. 6d. for spot, and £141 12s. 6d. for three months, while tin in this market can be bought at about 30¾ cents.

Arrivals of Bolivian tin ore and concentrates at Hamburg, Germany, in October are reported by Messrs. Robertson & Bense at 786 long tons.

Shipments of tin from the Straits Settlements in October were 4542 long tons in 1908, and 3801 in 1909; decrease, 741 tons.

Lead—The market is unchanged at 4.22½@4.27½c. St. Louis, and 4.35@4.37½c. New York. The nominal price of the American Smelting and Refining Company for desilverized continues to be 4.40c., New York.

The London market has shown a better tone, and closes firmer at £13 2s. 6d. for Spanish, and £13 5s. for English lead.

Spelter—There has been sufficient inquiry to maintain the market at the last prices, and the close is steady at 6.37½@6.40c. New York, and 6.22½@6.25c. St. Louis.

New York quotations for spelter on Nov. 11 to 13, inclusive, were 6.35@6.40c.; Nov. 15 to 17, inclusive, 6.37½@6.40 cents.

East price for zinc sheets is 8c. per lb., f.o.b. La Salle-Peru, Ill., less 8 per cent discount.

The market abroad is holding its own, the close being cabled at £23 5s. for good ordinaries, and £23 10s. for specials.

Silesian Spelter Market—Paul Speier writes from Breslau, Germany, under date of Oct. 27, that the market continues steady, with little change. Quotations are 46.75 marks for ordinary brands and 47.75 marks per 100 kg. for refined brands—equal to 5.05c. and 5.15c. per lb.—f.o.b. works in Silesia. Zinc sheets are 50@61 marks per 100 kg., base price at works; equal to 6.05@6.58c. per lb. Zinc dust is in better demand for export, and is quoted 43.50 marks per 100 kg.—4.7c. per lb.—in large lots, boxed, f.o.b. Stettin.

Other Metals

Antimony—Dealers look forward to better business and some advance in quotations after the close of the year; but at present the market is dull, and prices are unchanged. Cookson's is quoted at 8⅜@8½c. per lb.; Hallett's 8¼@8⅜c.; U. S., 7⅞@8c.; outside brands, 7⅝@7¾c. per pound.

Aluminum—The price of aluminum continues unchanged at 20@23c. per lb. for ingots. The higher price is that asked by the American producer.

Quicksilver—Business is good and the market continues strong. In New York the quotation is $52.50 per flask of 75 lb. for large lots, early delivery; for small lots 72@ 75c. per lb. is asked by jobbers. The San Francisco quotation is $50.50@51.50 per flask for domestic orders, and $2 less for export. The London price has again been advanced and is now £9 15s. per flask, with jobbers asking 2s. 6d. more.

Magnesium—The price of pure metal is $1.50 per lb. for 100-lb. lots f.o.b. New York.

Nickel—Large lots, contract business, 40@45c. per lb. Retail spot, from 50c. for 2000 lb. lots, up to 55c for 500-lb. lots. The price for electrolytic is 5c. higher.

Cadmium—Current quotations are 65@70c. per lb. in 100-lb. lots at Cleveland, Ohio. In Germany 450@475 marks per 100 kg., at factory in Silesia.

Zinc and Lead Ore Markets

Platteville, Wis., Nov. 13—The base price paid this week for zinc ore was $50@50.50 for 60 per cent zinc. The base price paid for lead ore was $50 per ton.

SHIPMENTS, WEEK ENDED NOV. 13

Camps.	Zinc ore, lb.	Lead ore, lb.	Sulphur ore, lb.
Platteville.....	430,980	.....	264,900
Mineral Point...	398,000	.....	.....
Highland	347,500	86,100	.....
Galena.	314,000	.....	.....
Benton.	244,900	.....	240,000
Days Siding.	176,000	.....	.....
Cuba City.....	155,910	88,750	112,460
Shullsburg.....	145,000	.....	.....
Rewey.....	84,000	.....	.....
Linden.....	.....	.....	60,310
Total..... .	2,285,290	174,850	677,670
Year to Nov. 13.....	121,643,055	8,139,645	13,566,185

In addition to the above there was slapped to the roasting plants, Mineral Point and Galena, and to the electrostatic separator, Platteville, 1,658,570 lb. zinc ore.

Joplin, Mo., Nov. 13—The highest price paid for zinc sulphide ore was $54 per

ton, the assay basis price ranging from $50 to $53 per ton of 60 per cent. zinc. Zinc silicate ore sold on a base price of $27@28, and with the higher grades not loaded out the best price was $30 per ton. The average price, all grades of zinc ore, was $48.30. Lead ore sold as high as $56 per ton until today, when it dropped to $53. The larger part of the shipment was on the higher level of prices and the average price was $54.88 per ton. The week-end zinc market was an anomaly, as prices had declined to $52 high base Thursday evening, with a large tonnage sold at a decline of 50c. to $1 per ton, but on Friday a couple of buyers crossed one another and before night the $53 base price was bid.

Continued heavy rains daily are fast putting mines out of commission, and the output, already decreased this week, will be still smaller next week. Five mines have been inundated by Center creek, and the heavy rains tonight, it is feared, will inundate mines along Spring river.

SHIPMENTS, WEEK ENDED NOV. 13.

	Zinc, lb.	Lead, lb.	Value.
Webb City-Carterville	3,227,490	901,730	$107,097
Joplin	1,563,570	368,060	50,657
Miami	622,820	294,140	21,790
Galena	742,170	88,160	20,980
Prosperity	473,630	183,850	17,132
Granby	800,200	2,000	13,132
Oronogo	217,970	182,880	13,085
Badger	379,700	3,770	9,782
Alba-Neck	390,350	.....	9,759
Spurgeon	359,150	50,240	8,628
Jackson	299,410	.....	7,335
Quapaw	291,360	.....	7,138
Zincite	191,210	.....	4,971
Sarcoxie	171,240	.....	3,858
Carthage	149,560	.....	3,739
Aurora	189,550	.....	3,564
Duenweg	138,700	6,800	2,997
Carl Junction	68,570	.....	1,770
Stott City	55,160	.....	1,434
Purdy	35,070	.....	490
Totals	10,463,880	2,081,630	$309,861
46 weeks	522,410,070	78,635,930	$12,654,093

Zinc value, the week, $252,739; 46 weeks, $10,506,675
Lead value, the week, 57,122; 46 weeks, 2,147,418

MONTHLY AVERAGE PRICES

Month.	Zinc Ore. Base Price. 1908.	Zinc Ore. Base Price. 1909.	Zinc Ore. All Ores. 1908.	Zinc Ore. All Ores. 1909.	Lead Ore. All Ores. 1908.	Lead Ore. All Ores. 1909.
January	$37.60	$41.25	$35.56	$38.46	$46.88	$52.17
February	36.63	36.94	34.92	34.37	49.72	50.50
March	36.19	37.40	34.19	34.71	49.90	50.82
April	35.40	38.63	34.68	37.01	52.47	55.63
May	34.19	40.06	33.39	37.42	56.05	56.59
June	33.06	44.15	32.67	40.35	60.48	57.52
July	34.55	43.06	31.67	41.11	59.90	53.74
August	36.53	48.25	33.42	44.54	60.34	57.60
September	37.63	47.70	34.44	44.87	54.59	56.11
October	37.95	49.50	33.28	45.75	52.63	55.02
November	39.13	.....	35.02	.....	54.53	.....
December	42.75	.....	39.63	.....	49.68	.....
Year	$36.63	.....	$34.31	.....	$53.93	.....

NOTE.—Under zinc ore the first two columns give base prices for 60 per cent. zinc ore; the second two the average for all ores sold. Lead ore prices are the average for all ores sold.

Petroleum

Petroleum production and shipments as reported by the *Oil Investor's Journal* for the month of October, in barrels of 42 gal. each:

	Production.	Shipments.
Oklahoma	3,631,488	3,620,685
Southeast Texas	696,840	780,876
Louisiana	244,500	235,530

Oklahoma stocks on Nov. 1 were 50,775,398 bbl. New producing wells completed in October were: Oklahoma, 133 oil and 5 gas; southeast Texas, 21 oil and 1 gas; Louisiana, 4 oil and 1 gas well.

Chemicals

New York, Nov. 17—The general market is still quiet, but some inquiries are being received, which indicate a slight improvement in business.

Copper Sulphate—There is no special activity in this article, and prices are unchanged at $3.95 per 100 lb. for carload lots and $4.20 per 100 lb. for smaller parcels.

Arsenic—Sales have been small, but some inquiries have been received. Futures are a little weaker, current quotations being 2.75c. for both spot and futures on white arsenic.

Nitrate of Soda—Business has been rather dull, and there is no life in the market. Spot nitrate is a little weaker, being offered at 2.07½c. per lb. Futures, however, are still held at 2.10c. for all positions next year.

Potash Salts—Exports of potash salts from Germany, nine months ended Sept. 30, metric tons:

	1908.	1909.	Changes.
Kainit, kieserit, etc	505,086	542,396	I. 37,310
Potassium chloride	107,220	142,023	I. 34,803
Potassium sulphate	32,532	40,901	I. 8,369
Pot.-magnesium sul.	91,352	91,111	D. 241
Total	736,190	816,431	I. 80,241

Of the total exports the United States took 309,489 tons in 1908, and 367,262 tons in 1909; an increase of 57,773 tons.

Mining Stocks

New York, Nov. 17—At the opening of the week the general stock markets were rather irregular with some inclination to weakness. As the week advanced trading became more active, especially in the copper stocks, and the volume of business increased. Amalgamated Copper and American Smelting and Refining were especially strong and were leaders in the trading. The coal-road stocks were also largely dealt in throughout the week. Amalgamated Copper reached $94 per share, the highest reported for a long time.

In Philadelphia and Pittsburg there was heavy buying of Pittsburg Coal issues. No one seems to know who the purchasers of these stocks were.

The Curb market, like the Stock Exchange, was rather weak at the commencement, but became much more active and stronger later. The feature of the week on the Curb was the heavy dealing in the copper stocks, and the advance in all vance in prices, amounting almost to a boom. This was based on the current reports of a merger or consolidation of copper companies which was to serve the purpose of regulating production and advancing prices of the metal. The denial of some of these reports made little difference to the market. The Cobalt stocks were stronger on some good dividend announcements.

The Standard Oil Company has declared a dividend of $10 for the fourth quarter of the year. This makes a total of $40 per share for 1909, the same amount as last year.

Boston, Nov. 16—Copper shares are receiving a larger amount of attention than for a long period, as a result of the tentative plans to form a big copper combination. Speculation has been mainly in the Amalgamated, Cole-Ryan and Guggenheim issues and some very pretty market movements have been witnessed. Public interest is on the increase and a few days more like those seen yesterday and today would bring a good-sized following into the local market.

Amalgamated has been the big card and has risen a point daily or from $87.25 to $94.12½. This stock is reported to have been accumulated from $80 up by inside interests. North Butte hung fire around $60 but made a good start yesterday and touched $64.75 today. Butte Coalition has had good market action right along. Its high was $33.62½, ex-dividend, which represents almost a $5 advance during the week. Utah Copper had a sharp spurt from $51.50 to $59.62½ on limited trading in this market.

Although the Lake Michigan stocks have been laggards in the late rise, both Lake Copper and Superior recorded sharp advances. The former rose $4 to $42, which is its record. Superior spurted $3.50 to $00.25, which is also its record price.

Other strong spots have been Nevada Consolidated, which rose $3 to $30.50; Parrot rose $2 to $30.75; Utah Consolidated $2.75 to $47; Giroux $1.87½ to $11.75; North Lake $1.37½ to $8.37½; Boston Consolidated $2.75 to $17.25 per share.

Curb trading has also picked up. Ohio Copper has been the late feature with a rise close to $6. Cumberland Ely rose to above $9. Massachusetts Coal and Power is a new Curb issue with sales at $2.50@$2.75. This represents a coal property located at Mansfield, this State. There are 307,525 shares issued and 132,475 in the treasury.

Los Angeles (Cal.), Nov. 2—Realizing the value to the mining interests of the Southwest of a permanent mineral exhibit, practically all of the railroads running or operating lines in Arizona, Nevada, New Mexico, Colorado, and Old Mexico have agreed to participate with the Los Angeles Chamber of Mines in an exhibit to be

semble in Los Angeles a mining and oil exhibit, which will be second to none in the United States. The Pacific Freight Tariff Bureau has been instructed to include in the next tariff a provision granting a free rate on all ore and oil specimens consigned to the Chamber from points on their lines and intended for exhibition purposes.

STATISTICS OF COPPER.

Month.	United States Product'n.	Deliveries, Domestic.	Deliveries for Export.
I	112,135,200	51,862,624	38,499,797
II	103,700,817	43,578,118	30,968,496
III	117,058,661	48,871,964	59,191,043
IV	113,574,292	47,546,010	65,110,111
V	118,356,146	61,163,325	70,542,753
VI	116,567,493	60,591,116	70,966,457
VII	118,277,603	75,520,083	75,018,974
VIII	120,597,234	59,614,207	48,382,704
IX	118,023,139	52,105,955	50,077,777
X	124,657,709	66,359,617	56,261,238
XI	.....	.....	.....
XII	.....	.....	.....

VISIBLE STOCKS.

	United States.	Europe.	Total.
I	122,357,266	124,716,480	247,073,746
II	144,130,045	118,574,400	262,704,445
III	173,284,248	117,140,800	290,425,048
IV	182,279,902	115,024,000	297,303,902
V	183,198,073	114,050,320	297,248,393
VI	169,848,141	127,352,960	297,201,101
VII	154,858,061	150,928,960	305,787,021
VIII	122,596,607	171,492,160	294,088,767
IX	135,196,930	197,993,600	333,190,530
X	151,472,772	210,224,000	361,696,772
XI	153,509,626	222,566,400	376,076,026
XII	.....	.....	.....

Figures are in pounds of fine copper. U. S. production includes all copper refined in this country, both from domestic and imported material. Visible stocks are those reported on the first day of each month, as brought over from the preceding month.

Monthly Average Prices of Metals

SILVER

Month.	New York. 1908.	New York. 1909.	London. 1908.	London. 1909.
January	55.678	51.750	25.738	23.834
February	56.000	51.472	25.855	23.706
March	55.365	50.468	25.570	23.227
April	55.505	51.428	25.133	23.708
May	52.795	52.905	24.377	24.343
June	53.663	52.538	24.760	24.166
July	53.115	51.043	24.514	23.519
August	51.683	51.125	23.858	23.588
September	51.720	51.449	23.877	23.743
October	51.431	50.923	23.725	23.502
November	49.647	......	22.933	......
December	48.766	......	22.493	...
Total	52.864	......	24.402	.....

New York, cents per fine ounce; London, pence per standard ounce.

COPPER

	New York. Electrolytic 1908.	New York. Electrolytic 1909.	New York. Lake 1908.	New York. Lake 1909.	London. 1908.	London. 1909.
January	13.726	[illegible]	13.901	14.280	[illegible]	[illegible]
February	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]
March	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]
April	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]
May	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]
June	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]
July	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]
August	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]
September	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]
October	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]
November	[illegible]		[illegible]		[illegible]	......
December	[illegible]		[illegible]		[illegible]	...
Year	[illegible]		13.424		59.902	....

New York, cents per pound. Electrolytic is [illegible]. London, pounds sterling, [illegible] for standard copper.

TIN AT NEW YORK

Month.	1908.	1909.	Month.	1908.	1909.
January	27.380	28.060	July	29.207	29.125
February	28.978	28.290	August	29.942	29.966
March	30.577	28.727	September	28.815	30.293
April	31.702	29.445	October	29.444	30.475
May	30.015	29.225	November	30.348	
June	28.024	29.322	December	29.154	
			Av. year	29.465	

Prices are in cents per pound.

LEAD

Month	New York. 1909.	New York. 1909.	St. Louis 1909.	London. 1908.	London. 1909.
January	3.691	4.175	4.025	14.469	13.113
February	3.725	4.018	3.868	14.250	13.313
March	3.838	3.986	3.835	13.975	13.438
April	3.993	4.168	4.051	13.469	13.297
May	4.253	4.287	4.214	12.938	13.225
June	4.466	4.350	4.291	12.600	13.031
July	4.744	4.321	4.188	13.000	12.563
August	4.580	4.363	4.227	13.375	12.475
September	4.515	4.342	4.215	13.125	12.781
October	4.351	4.341	4.215	13.375	13.175
November	4.330	.....	......	13.538	...
December	4.213	......	......	13.166	....
Year	4.200	......	......	13.439	.....

New York and St. Louis, cents per pound. London, pounds sterling per long ton.

SPELTER

Month.	New York. 1908.	New York. 1909.	St. Louis. 1908.	St. Louis. 1909.	London. 1908.	London. 1909.
January	4.518	5.141	4.363	4.991	20.563	21.225
February	4.788	4.889	4.638	4.739	20.875	21.563
March	4.665	4.757	4.527	4.607	21.075	21.438
April	4.645	4.965	4.495	4.815	21.344	21.531
May	4.608	5.124	4.458	4.974	19.906	21.975
June	4.543	5.402	4.393	5.252	19.000	22.000
July	4.485	5.402	4.338	5.252	19.031	21.969
August	4.702	5.729	4.556	5.579	19.350	22.125
September	4.769	5.796	4.619	5.646	19.563	22.906
October	4.801	6.199	4.651	6.043	19.750	23.200
November	5.059	......	4.909	......	20.875	.
December	5.137	......	4.987	......	20.625	.
Year	4.726	....	4.578	.....	20.163	.

New York and St. Louis, cents per pound. London, pounds sterling per long ton.

STOCK QUOTATIONS

NEW YORK Nov. 17

Name of Comp.	Clg.
Alaska Mine	‡.11
Amalgamated	92⅞
Anaconda	52¼
Balaklala	‡2 5/16
British Col. Cop.	7¼
Buffalo Mines	3½
Butte Coalition	33
Colonial Silver	‡5/16
Cum. Ely Mining	9
Davis-Daly	6¼
Dominion Cop.	7
Douglas Copper	1⅜
El Rayo	2½
Florence	2⅞
Foster Cobalt	‡.32
Furnace Creek	‡.05
Giroux	11[illegible]
Gold Hill	1¼
Goldfield Con	7 1/16
Granby	101
Greene Gold	‡½
Greene G. & S.	‡9
Guanajuato	2
Guggen Exp.	239
Hanapah	‡15
Kerr Lake	8[illegible]
McKinley-Dar	.84
Miami Copper	17[illegible]
Micmac	[illegible]
Mines Co. of Am.	[illegible]
Montezuma of C. R.	14
Mont. Sho. C.	1[illegible]
Nev. Utah M. & S.	1
Newhouse M. & S.	[illegible]
Nipissing Mines	10[illegible]
Old Hundred	[illegible]
Silver Queen	30
Stewart	[illegible]
Tennessee Copper	[illegible]
Tri-Bullion	[illegible]
United Copper	[illegible]
Utah Apex	[illegible]
Utah Copper	[illegible]
Yukon Gold	5

‡Last quotation.

BOSTON Nov. 17

Name of Comp.	Clg.
Adventure	5¼
Allouez	58½
Am. Zinc	37½
Arcadian	5
Arizona Com.	45
Atlantic	11⅞
Boston Con.	17
Calumet & Ariz.	103
Calumet & Hecla	675
Centennial	39¾
Copper Range	83½
Daly-West	9¼
East Butte	12⅜
Franklin	17¼
Greene-Can	14
Hancock	15
Isle Royal	26
Keweenaw	3[illegible]
La Salle	16
Mass	6¼
Michigan	6[illegible]
Mohawk	63
Nevada	29
North Butte	63[illegible]
Ojibway	6¼
Old Colony	‡50
Old Dominion	55½
Osceola	160
Parrot	30¼
Quincy	87
Rhode Island	10¾
Shannon	16[illegible]
Superior	64
Superior & Bost.	14[illegible]
Superior & Pitts.	17[illegible]
Tamarack	66
Trinity	11
U. S. Smg. & Ref.	56[illegible]
U. S. Sm. & R. pd.	53
Utah Cons.	46[illegible]
Victoria	4
Winona	6[illegible]
Wolverine	149
Wyandotte	2[illegible]

‡Last quotation.

N. Y. INDUSTRIAL

Am. Agri. Chem.	48⅝
Am Smelt & Ref.	101½
Am.Sm. & Ref., pf.	112¼
Colo. Fuel & Iron.	49
Federal M. & S., pf.	91
National Lead	89
National Lead, pf	‡110½
Pittsburg Coal	25½
Republic I. & S.	47¼
Republic I. & S., pf	105¼
Sloss-Sheffield	91
Standard Oil	‡685
U. S. Steel	90½
U. S. Steel, pf.	126¾
Va. Car. Chem	49⅞

BOSTON CURB

	Low.
Ahmeek	210
Chemung	15⅞
Chino	8¾
Gila	9⅜
Indiana	7¼
Mason Valley	1¼
Ray Central	2¾
Ray Con	23
San Antonio	8
Yuma	1⅝

Furnished by Hornblower & Weeks, N. Y.

ST. LOUIS Nov. 13

N. of Com.	High.	Low.
Adams	.40	.30
Am. Nettie	.09	.07
Center Cr'k	1.80	1.60
Cent. C. & C.	85.00	84.00
C. C. & C. pf.	84.00	83.00
Cent. Oil	105.00	100.00
Columbia	9.00	7.00
Con. Coal	18.00	17.00
Doe Run	115.00	105.00
Gra. Bimet	28	.26
St. Joe	12.50	11.00

LONDON Nov. 17

Name of Com.	Clg.
Dolores	£1 10s 0d
Stratton'sInd.	0 3 3
Camp Bird	1 7 3
Esperanza	3 0 0
Tomboy	0 18 9
El Oro	1 5 3
Oroville	0 11 3

Cabled through Wm. P. Bonbright & Co., N. Y.

NEVADA STOCKS. Nov. 17.

Furnished by Weir Bros. & Co., New York.

Name of Comp.	Bid.
COMSTOCK STOCKS	
Belcher	80
Best & Belcher	55
Caledonia	.32
Chollar	.22
Comstock	‡.33
Con. Cal. & Va.	80
Crown Point	‡98
Exchequer	‡43
Gould & Curry	24
Hale & Norcross	35
Mexican	1 17
Ophir	1.35
Overman	42
Potosi	42
Savage	.45
Sierra Nevada	40
Union	49
Utah	.07
Yellow Jacket	93
TONOPAH STOCKS	
Belmont	70
Extension	47
Golden Anchor	..
Jim Butler	11
MacNamara	.27
Midway	13
Montana	75
North Star	‡.02
Tono'h Mine of N.	6.62½
West End Con	21
GOLDFI'D STOCKS	
Adams	‡.01
Atlanta	10
Blue Bell	.02
Booth	10
C.O.D. Con	.06
Columbia Mt.	.06
Comb. Frac.	44
Cracker Jack	‡.01
Dia'dfield B. B. C.	.01
Florence	2.25
Goldfield Belmont	04
Goldfield Daisy	05
Great Bend	.03
Jumbo Extension	.12
Kendall	‡02
Lone Star	‡.02
May Queen	04
Oro	.02
Red Hill	03
Sandstorm	‡.05

Name of Comp.	Bid.
Silver Pick	08
St. Ives	05
Triangle	‡.01
BULLFROG STOCKS	
Gibraltar	‡02
Homestake King.	‡01
Mont. Shoshone C.	1 75
Tramp Cons	.04
MISCELLANEOUS	
Cumberland Ely.	8.81¼
Giroux	11.62½
Greenwa'r Copper	07
Nevada Con	28.87½
Nevada Hills	.75
Navada Smelting.	.75
Nevada Wonder	.60
Nevada-Utah	1 18¾
Penn-Wyoming	...
Pittsburgh S. Pk.	68
Ray Central	2.50
Ray Con	22.75
Round Mt. Sphinx	‡05

COLO. SPRINGS Nov. 17

Name of Comp.	Clg.
Acacia	.07½
C. C. Con	‡.03
Doctor	.08¼
Elkton	.71
El Paso	.61½
Findlay	10¼
Gold Dollar	‡14
Gold Sovereign	.04¼
Isabella	18
Jack Pot	‡.08½
Jennie Sample	.08
Jerry Johnson	.07½
Lexington	‡.01⅜
Mary McKinney.	‡.46½
Old Gold	.04
Pharmacist	.03¼
Portland	.83
U. G. M.	.08
Vindicator	.70
Work	‡06

Assessments

Company.	Delinq.	Sale.	Amt.
Alpha, Nev.	Nov. 11	Dec. 7	$0.05
Arcadian Copper	..	Mar. 1	0.50
Belcher, Nev.	Nov. 9	Nov. 30	0.10
Chollar, Nev.	Nov. 8	Dec. 1	0.10
Copper Chief, Utah	Oct. 30	Nov. 22	0.001
Crown Point, Nev.	Nov. 30	Dec. 20	0.10
Hancock Min.		Feb. 1	1.00
Hypotheek, Ida.	Sept. 30	Dec. 1	0.005
[illegible], Ida.	Oct. 30	Nov. 30	0.002
Mexican, Nev.	Dec. 6	Dec. 29	0.10
Missoula Copper, Ida.	Oct. 4	Dec. 6	0.01
Overman, Nev.	Nov. 9	Nov. 30	0.10
Potosi, Nev.	Nov. 12	Dec. 6	0.10
San Antonio Copper, Mex.	Dec. 1		1.00
Savage, Nev.	Nov. 10	Dec. 1	0.10
[illegible], Utah	Nov. [illegible]	Dec. 11	0.001
[illegible] M. & M., Ida.	Nov. 20	Dec. 20	0.002
[illegible] M. & M., Ida.	Nov. 20	Dec. 14	0.002
United Silver Lead, Ida.	Sept. 21	Nov. 20	0.001
Winona, Mich.	Dec. 1	Jan. 1	1.00
Yellow Jacket, Nev.	Nov. 18	Dec. 22	0.10

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Ore Dressing in the Coeur d'Alene District—I

Mining Dates Back to 1879; Bunker Hill & Sullivan Discovered in 1885. Geology of the Region and Nature of the Ores Treated

BY EDWARD S. WIARD*

All the important silver-lead mines of the Coeur d'Alene district are situated in an area of about 45 sq. miles. A square 6 miles on a side would cover all the important mines of the Canyon creek, Nine Mile creek and Mullan districts, and a square 3 miles on a side would amply cover all the mines in the vicinity of Wardner. The two rectangles are approximately 10 miles apart.

The present series of articles deals only with the metallurgical practice of the silver-lead mills of the mines in the rectangles mentioned. Lead ore has been found as far north in the district as Murray but the discoveries there as well as elsewhere outside of the two quadrangles mentioned are of minor importance. Copper ore of merchantable grade is mined in the Snowstorm mine. Gold quartz is mined and milled in the vicinity of Murray. An accompanying map shows the properties of the various companies in the district.

The Federal Mining and Smelting Company

The first mining work done in the district was begun in 1879 on the gold placers near Eagle. The Paymaster, the first gold-quartz claim in the district, was located Sept. 21, 1883. From the gold [illegible] Murray, where [illegible] were made, prospectors drifting into Canyon creek and the adjoining streams made important discoveries of silver-lead veins and by 1885 nearly all the principal mines in this area had been located. The great

BUNKER HILL MINE IN COEUR D'ALENE DISTRICT, IDAHO

*Mining engineer, Denver, Colo.

Bunker Hill & Sullivan mine at Wardner was discovered in 1885. By 1887 a narrow-gage railroad had connected Coeur d'Alene lake and river with Wardner and Wallace. The main line of the Northern Pacific railway skirts the northern end of the lake and the two railways were connected by small steamers. By 1890 the Northern Pacific railway had built a branch from the east to Wallace and the Oregon Railway and Navigation Company a branch to the same place from Tekoa on the west. The important Hercules mine was not discovered until 1901.

In 1903 the Federal Mining and Smelting Company was formed, absorbing the Empire State-Idaho M. and D. Company, of which the old Last Chance Mining Company was the nucleus, and the Standard and Mammoth mines as well as the Tiger-Poorman at Burke. In 1905 the Federal Company acquired the Morning mine near Mullan from Larson and Greenough. The Tiger-Poorman mine is now called by the Federal company the Burke mines. The Standard and Mammoth are designated as Mace mines 1 and 2, and the Last Chance mine as the Wardner mines. The old names are the ones most commonly used in the district.

A detailed account of the development of the district may be found in Professional Paper 62, U. S. Geol. Survey, "The Geology and Ore Deposits of the Coeur d'Alene District, Idaho," to which I am indebted for a number of the facts given above and for many of the geological statements which follow.

Geology of the District

In the general character here are only two [illegible] in the district. A [illegible] of [illegible] and [illegible] and argillaceous sediments of probably Algonkian age. With the exception of the Bunker Hill-Last Chance fissure the veins are nearly vertical. One wall and occasionally both are lacking. The Bunker Hill-Last Chance lode has a well defined footwall with a dip of 38 deg. It is possible that in depth ore may be found below this wall in the footwall country. In the Morning and You Like veins which are separated by about 1000 ft. of barren country rock, parting planes free from gouge are found near the veins but do not appear to have any distinguishable genetic connection with them. The Hunter mine has three shear zones or veins and these are supposed to be a continuation of the You Like shear zone.

The Morning Vein

The Morning Vein is shown in section in Fig. 1 of an accompanying drawing. The structure represented is typical also of the Hunter-You Like lodes. The section is drawn to bring out the metallurgical features of the vein or the difficulties encountered in milling the ore owing to the mode of deposition. The vein cuts the sedimentary formation at a slight angle on the dip and is nearly vertical. The quartzite partings shown in the section are the shattered and metasomatically replaced remnants of the country rock. The ore occurs in vertical shoots of as great a length as 1800 ft. and gradually fades out in the hanging- and footwalls. The economic width of the ore is from 3 to 40 ft. The section shows a portion of the horse inclosed by the vein. The quartzite partings have been exaggerated to show more clearly the structure of the vein. The ore is a dense fine-grained mixture of sulphides, chiefly galena and iron pyrites, accompanied by a gangue of siderite and minor amounts of quartz. As at Wardner the siderite has metasomatically replaced the shattered quartzite and the gangue in turn has been replaced by sulphides.

The problem of the mill is the prevention of lead losses on the jigs from pieces of quartzite lightly impregnated with siderite and sulphides, and the commercial separation of the fine-grained mixture of lead and iron sulphide. The ore contains but little zinc. Owing to the nature of the ore, sorting is not attempted. As sent to the mill the ore contains about 9 per cent. lead and 2 to 3 oz. silver. For every per cent. lead there is 0.33 oz. of silver. Owing to the large content of iron pyrites the mixed sulphides have a [illegible] appearance and are heavier than [illegible] ore broken in the Federal Company's mines. It is interesting to note in this connection that the streak of pure galena is navy blue and not blackish gray as reported in the textbooks.

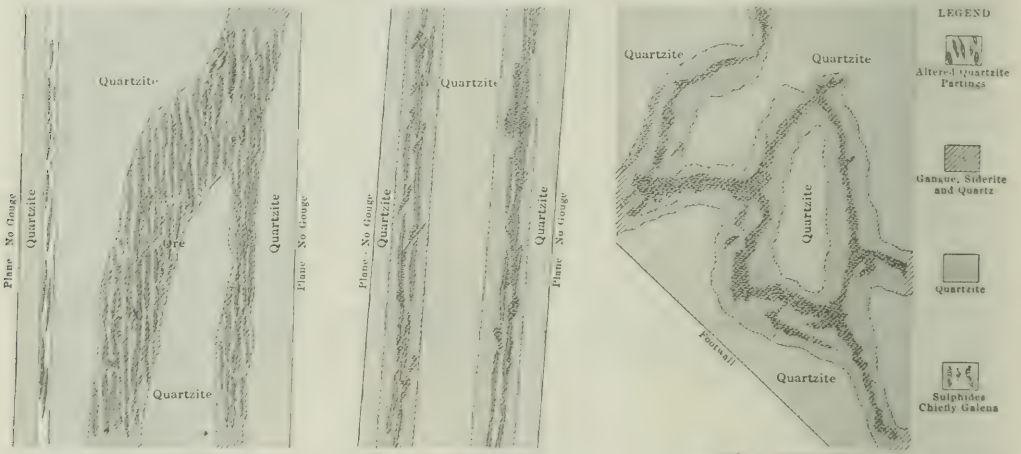

FIG. 1, Morning Mines FIG. 2, Mace Mines 1 and 2 FIG. 3, Wardner Mines

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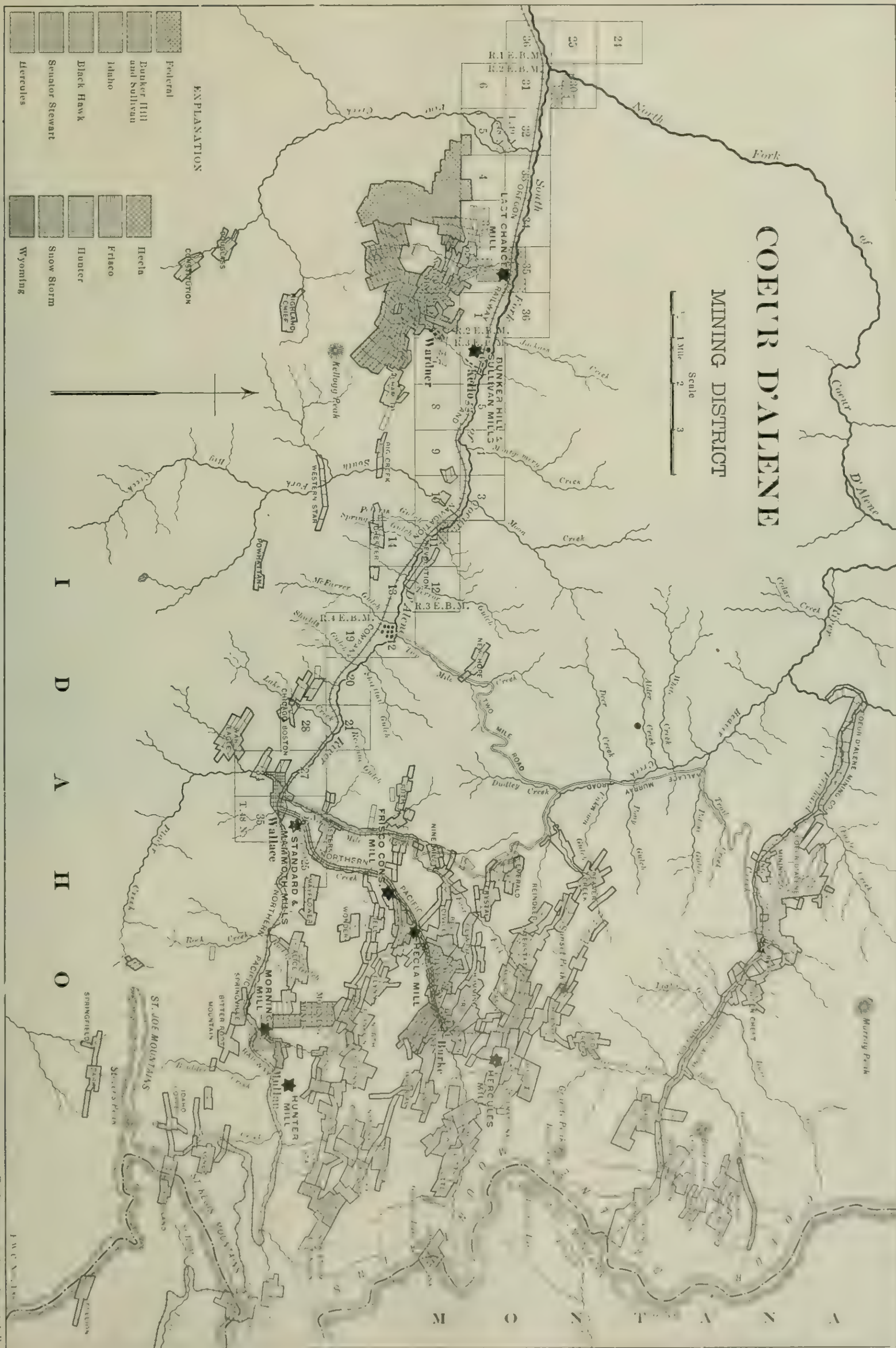
TYPES OF VEIN FILLING IN COEUR D'ALENE DISTRICT



MAP OF THE COEUR D'ALENE MINING DISTRICT SHOWING SITUATION OF MILLS AND PRINCIPAL MINES

The Frisco Consolidated company's claims are located on the supposed continuation of the Morning and Hunter veins. The Frisco mine was at one time a famous producer but owing to the impoverishment of the orebodies and the increasing amounts of zinc found with depth it was forced to close down. During a portion of 1907 and after some changes had been made in the mill it was operated more for the zinc than the lead contained in the ore. Toward the end of the year owing to the decrease in the price of spelter it was once more forced to close, but operations will probably be resumed when spelter again advances in price.

The Black Bear vein appears to be on the same line of fissuring as the Gem and Frisco veins, but is separated from the latter by a considerable horizontal displacement due to faulting. The ore in these veins does not, however, show any resemblance to that of the Black Bear vein. The ore of the latter vein is a very pure galena and there is little or no evidence of metasomatic replacement of the wall rock, the vein being a simple filled fissure. When this ore was treated years ago at the first Morning mill no difficulty was experienced in obtaining a high extraction of the lead and silver.

The Standard, Mammoth and Hecla Vein

The Tiger-Poorman mine, once a famous producer and with a shaft over 2000 ft. deep, has been shut down for a considerable period and resumption is problematical. The Standard, Mammoth and Hecla properties are located on the same vein, the Hecla portion being separated from the remainder by a fault. In the Hecla mine a greenstone dike younger than the vein accompanies it. The vein, which is a shattered zone, occurs on one or both sides of the dike and dips about 70 deg. There is little metasomatic replacement of the wall rock and but little siderite in the gangue. The ore contains little sulphide other than galena. In places between the quartzite partings the galena is 2 ft. wide. The ore is readily amenable to wet concentration. Considerable amounts of [illegible] ore are sorted at the picking plant in the shaft house.

A section of the Standard-Mammoth [illegible] the illustration [illegible] of the Morning [illegible] [illegible] structure of the [illegible]

ing vein but there is less metasomatic replacement, less siderite and considerably less iron pyrites. On the other hand the ore contains more zinc. Some trouble is experienced on the middlings jigs with zinc, but on the whole the ore yields well to wet concentration. As in the other mines in Canyon creek the ore shoots are vertical. The merchantable ore is from 5 to 15 ft. wide.

Zinc Saved at Success Mine

The Hercules mine is still in the zone of oxidation. The ore contains zinc but not in troublesome amounts. At the Success mine, formerly the Granite, the ore occurs in quartzite which has been intruded by a mass of monzonite. Ransome and Calkins regard this ore as formed by pneumatolytic action from the igneous rock. The ore is very zinky and the outlines of the orebodies irregular. A number of minerals assigned to pneumatolytic action are found associated with the ore. The ore is mined and milled principally for the zinc content.

It is an undoubted fact that the orebodies of the district become more base with depth. Ransome and Calkins regard the monzonite, large masses of which are exposed in Canyon creek, as the source of the ore in all the mines. Increase in zinc with depth is met in all the Canyon creek mines. Ultimately it may be expected all the mines will in depth reach conditions somewhat similar to those in the Success mine. With the exception of the Success Company none of the mines attempt to make any saving of the zinc, it not being thought possible to make a saving in the present state of the art of ore dressing. In time zinc may assume great importance in the district.

At a depth of 1900 ft. in the Bunker Hill & Sullivan there is no change in the character of the ore. The ore in this mine is, however, in a higher horizon than those of Canyon creek at present. The Standard-Mammoth ore is slowly becoming more zinky. As example of the percentages of zinc in the milling ore and mill products the following figures may be cited. The Last Chance jig concentrates contain about 2.5 per cent. zinc to 60 per cent. lead. The slime concentrates, being lower in grade, contain of course a larger proportion of zinc. The milling ore contains less than 1 to 8 or 10 per cent. lead. The Standard-Mammoth milling ore [illegible] contains about 2 per cent. [illegible] the same amount of lead as the Last Chance [illegible] and the [illegible]

The Mines at Wardner

At Wardner are the Bunker Hill & Sullivan and the Last Chance [illegible] Briefly the [illegible] described as a shattered [illegible]

shattered rock being replaced by siderite and sulphides on a gigantic scale. There is a footwall marked with gouge below which so far no ore has been found. The strike of the footwall is northwesterly and the dip 38 deg. to the southwest. The ore gradually fades out in the hanging-wall and profitable bodies of ore are found as far out as 300 ft. in a horizontal direction from the footwall. The ore occurs in masses of irregular shape which sometimes follow the course and dip of the bedding and more frequently break across it. These irregular masses form great shoots which in the Bunker Hill mine have a northwesterly pitch.

The course of the Jersey shoot in the Last Chance mine is nearly at right angles to the course of the footwall and has a southeasterly pitch. Fig. 3 of the accompanying illustration illustrates the mode of formation of the orebodies. The quartzite has been replaced by siderite and this by sulphides. In these iron, zinc and other elements except lead occur sparingly, over 90 per cent. of the ore hauled to the mills being quartzite, siderite and galena. In places the sulphides replace the quartzite directly, while in other places in the mines veins of pure siderite occur with little or no metasomatic replacement. These variations are not, however, a very marked feature of the deposition.

The center of the seams is usually nearly pure galena. At the confines the content of spathic iron increases and finally the ore consists of a mixture of quartzite and siderite, the latter having replaced the former, and in this groundmass are wiry and arborescent masses of galena. The tracery of the galena in the sideritic quartzite is often the most delicate imaginable, the limbs of deposited galena being often of hair-thickness and finer. It is this phenomenon which makes the Wardner ores the most difficult to treat by wet concentration of any in the district. It is difficult to prevent the escape over the tail boards of the jigs of material containing wiry patches of galena and having, with its associated gangue, but little greater specific gravity than the pure siderite or sideritic quartzite which it is desired to send to waste.

Low-grade Middlings at Wardner

The bulk of the jig middlings consists of siderite associated with [illegible] galena. This material is being reground and returned to the [illegible] [illegible]

without heavy loss, and the practice at the Wardner mills is to make a low-grade concentrate, the amount of lead in the fines shipped being increased by adding to the vanner concentrates a high-grade concentrate from the Wilfley tables, or to redress the vanner concentrates on Wilfley tables.

During the year ending May 31, 1907, the Bunker Hill & Sullivan Company shipped a middlings product from their jigs which amounted to over 13 per cent. by weight of the total ore shipments, but represented only about 2½ per cent. of the total value of the products shipped. The sale of this product was made possible by a low freight and treatment rate and the iron excess. The master shoots of the Bunker Hill-Last Chance lode occupy the whole width of the lode. Large masses of nearly pure galena are of frequent occurrence. During the year ending May 31, 1907, the crude ore obtained by sorting in the Bunker Hill mine amounted to 13.6 per cent. of the gross value of the total shipments.

The percentage loss in silver is greater than the lead loss in all the Coeur d'Alene mills. As in other camps, the reason for this may be found in the mode of deposition of the ore, the character of the associated minerals, or both. In most districts employing jig and table concentration to separate base sulphides from contaminating gangue and from one another, a greater loss in silver than in lead is due to the association of the silver with base sulphides of lower specific gravity than galena. Such is not the case in the Coeur d'Alene district for the sulphides other than galena contain but traces of silver or none at all.

At the Last Chance mill the jig middlings not infrequently used to run up to as high a ratio as 2½ oz. silver to 1 per cent. lead, whereas the original ore fed to the mill contained but 0.4 oz. silver to 1 per cent. lead. The feed to the Wilfley tables and vanners contained a higher ratio of silver to lead than the original ore, but lower than the jig middlings owing to the admixture of the middlings after regrinding with the fine portions of the stream of original ore passing down through the mill. Such a condition is bound to show a greater loss of silver for the whole mill even if it is admitted that the lead and silver concentrate with equal losses on the jigs and equal losses on the slime tables, though with a greater loss in the latter department as the following figures will illustrate.

Ratio between Silver and Lead

I will assume for argument that the ore as fed to the mill contains 8 per cent. lead and 3.2 oz. silver, this being a ratio of 0.4 oz. silver to 1 per cent. lead. In 100 lb. of the milling ore there would then be 8 lb. lead and 0.16 oz. silver. I will assume that 5 per cent. of this amount, or 5 lb., passes directly to the Wilfley tables and vanners, and of the remaining 95 lb., 10 per cent., or 9.5 lb., represents the weight of jig middlings. Assuming the extreme ratio given above, I will assign as the assay value of the middlings 12 per cent. lead and 18 oz. silver.[1] The material left available for jig concentrate or tailing weighs 85.5 lb. and contains 0.46 lb. lead and 0.066 oz. silver. The sands and slimes contain 0.008 oz. silver and 0.4 lb. lead from the 5 per cent. of original feed which passed directly to the tables and vanners, and 0.086 oz. silver and 1.14 lb. lead from the jig middlings which are added to it, making a total of 0.094 oz. silver and 1.54 lb. lead fed to the tables and vanners. If a saving of 60 per cent. is assumed on the tables and vanners and 75 per cent. on the jigs, the extraction of lead and silver in each department being considered equal, the total saving in the mill will be 1.02 oz. silver and 5.77 lb. lead per 100 lb. of lead ore, or about 72 per cent. of the lead and 60 per cent. of the silver. The common silver mineral in the district is argentite and it is so closely associated with galena that it is seldom or never seen as a separate mineral aggregate. The presence of tetrahedrite in the ores of the district is another source of silver loss. During some tests made by me with salt and Russell solutions at the Last Chance mill the ratio of silver in argentite form to that in tetrahedrite form in the slime tailings was found to be 3 to 1. Silver-bearing tetrahedrite occurs in all the ore of the district, though very sparingly in some of the mines. I am inclined to believe that there is a greater proportion of silver in tetrahedrite form in the Wardner mines than elsewhere in the district, and that at Wardner it is more associated with the wiry or metasomatic forms of galena than with the galena in the center of the fissures. Some tetrahedrite occurs separately, as notably in the Jersey shoot of the Last Chance mine, but as a rule it occurs so closely bound up with galena as to be undistinguishable from it.

[1] The reason for the high lead content assigned to the jig middlings will be explained in a later article of this series under "Jigs and Jigging."

TIGER-POORMAN SURFACE PLANT

STANDARD-MAMMOTH OPERATION

Increase of Silver Content in Metasomatic Zones

If we consider that the ratio of silver to lead is higher in the metasomatic zones adjacent to the center of the fissures which have been filled with galena ore of a high grade, we will have an explanation of the high silver content of the jig middlings. The metasomatic material is to a large extent spathic iron or sulphides mixed with spathic iron, and of a specific gravity midway between quartz and quartzite and galena.

At the Last Chance mill for a period of about two years the jig concentrates contained about 60 per cent. lead and between 23 and 24 oz. silver. During the same period the slime concentrates con-

tained on an average about 48 per cent. lead and nearly 23 oz. silver. In the first case there would be a ratio of something under 0.4 oz. silver to 1 per cent. lead, and in the second 0.48 oz. silver to 1 per cent. lead.

At the Standard-Mammoth mills for about two years the jig concentrate contained on an average 50 per cent. lead and 40 oz. silver, and the slime concentrate for the same period about 47 per cent. lead and 32 oz. silver. The ratio of lead to silver is about the same in both products and this might lead one to suppose that the jig and slime losses in silver were about the same percentage, but this is merely a coincidence, the feed being richer to the Wilfley tables and vanners and the silver losses being such as to leave the ratio unaltered. Also, as compared with the Bunker Hill or even the Morning vein, the amount of siderite and metasomatic replacement in the Standard-Mammoth lode is small. In the three mill products shipped by the Bunker Hill & Sullivan during the year ended May 31, 1907, the ratios were as follows: First-class concentrates, 0.4 oz. silver to 1 per cent. lead; middlings, 0.46 oz. to 1 per cent. lead; slime concentrates, 0.43 oz. to 1 per cent. lead.

Sequence of Subheads in Following Articles

The description of the milling methods will be taken up in the following order: (1) Transportation of ore to mill; (2) ore sorting; (3) general description of mills and milling processes; (4) mill framing and foundation; (5) bins and gates; (6) conveyers; (7) breakers; (8) rolls and accessory apparatus; (9) elevators; (10) trommels and screens; (11) jigs and jigging; (12) roller mills; (13) classifiers, classifying and settling tanks, outdoor settling tanks; (14) Wilfley tables and vanners; (15) launders; (16) water used in concentration; (17) zinc; (18) sampling and assaying; (19) loading concentrates; (20) tailings retreatment; (21) résumé.

Scattered through the text of the articles which have just been enumerated, and also in the form of dissertations at the end of some of them, will be found criticisms of the devices and ends used to effect concentration in the district. These criticisms are in no manner comparable to those which would appear in an engineer's report. If a machine in a mill is wrong in principle or out of date, etc., the question as to whether it should be removed and replaced by something better will often, if properly considered, lead to a remodeling of a group of machines or the whole mill, and improvements must be decided upon by the engineer after he has become acquainted with the financial and other policies of the company employing him and has measured the effect of such changes and their cost. I do not pretend to so complete a knowledge of the mills of the district. There are, however, many milling devices and methods employed in the district which are common to concentration mills all over the continent and which, though faulty or inferior, are being put into service in even the latest mills. I believe that some good will result from pointing out such devices or methods. I have made the drawings which accompany the sections from measurements taken in the mills.

Homestake Mining Company

The annual report of the Homestake Mining Company for the fiscal year ended May 31, 1909, shows a small increase in the tonnage milled over that of the preceding year. The grade of ore was also higher. The company crushed 1,505,302 tons for a bullion return of $5,725,047, an average yield of $3.803 per ton.

The report contains the statement of receipts and disbursements, the tonnage

OPERATING STATEMENT.

	Amount.	Per Ton Milled.
Proceeds from bullion	$5,725,047	$3.803
Foundry and miscellaneous	140,607	0.093
Total receipts	$5,865,654	$3.896
Mining expenses	$2,636,993	$1.752
Milling expenses	844,990	0.561
Deadwork	6,550	
Foundry and miscellaneous	176,793	
Tramways	30,774	
Water	86,152	
Office and general	171,908	
Bullion freight	10,236	
Taxes	81,772	
Total operating	$4,046,166	$2.687
Net earnings	$1,819,488	$1.209

milled, and a brief statement of the superintendent. Only a general estimation of costs can be made from this information, and the accompanying tables, compiled from the financial statement of the secretary, summarize the items given. No mention is made of the tonnage mined or ore reserves. It is to be regretted that a mine of the prominence of the Homestake

INCOME ACCOUNT.

Net earnings	$1,819,488
Balance from previous year	443,918
Total	$2,263,406
Timber lands	$60,602
Slimes plant construction	70,847
Property purchase	7,447
Spearfish plant	82,121
Dividends paid	1,365,000
Total payment	$1,586,017
Balance at close of year	$677,389

should not issue a report containing more than a mere statement of profit and loss.

Work has been begun on the new hydroelectric power plant on Spearfish creek, about 12 miles from Lead. More than four miles of this work will be by tunnel. The completed installation will cost approximately $1,000,000, and will require 18 months' time. It will reduce the charges for power materially. The whole cost for this plant is to be borne by the treasury without diminution of the dividend rate. During the year 10,741 ft. of drifts, 567 ft. of raises and 262 ft. of vertical shafts were excavated.

Mining in Southwest Virginia

Special Correspondence

None of the zinc or lead mines in southwest Virginia are in regular operation at the present time. Some zinc ore is being gleaned from the old Bertha workings and run through the soft-ore mill at Austinville, in Wythe county. The oxide furnaces of the Bertha Mineral Company, at Austinville, are being run on Bertha tails or "buck fat" ore dug from the bottom lands below the old mill.

Experimental work is still being carried on at the hard-rock mill pending the results of which the mines are idle. The problem at Austinville is to concentrate the disseminated zinc-lead sulphide ores with a reasonable recovery. G. M. Hicks is superintendent and W. O. Borcherdt, under whose immediate supervision the milling work is being conducted, is assistant superintendent. The company's zinc furnaces at Pulaski are being run, more or less continuously, chiefly on galvanizer's scrap and oxide from Austinville.

The Pulaski Mining Company is opening a large body of pyrrhotite near Chestnut Yards, in Carroll county, 50 miles from Pulaski. The company has had a core drill at work here for over a year. The mine, which is being worked as an open cut, supplies from four to six 30-ton cars daily to the company's sulphuric-acid plant at Pulaski. Possibly owing to the fact that the furnace of the Pulaski Iron Company is closed down for repairs there is quite an accumulation of the iron cinder at the acid plant.

The ore mines of the Pulaski Iron Company on Cripple creek are also closed down pending repairs of the furnace. The Dora furnace of the Virginia Iron, Coal and Coke Company, at Pulaski, is in blast; the Max Meadows furnace is idle. This company is conducting a number of soft-ore operations, and has several furnaces, including a couple of charcoal ones, in full blast. The Ivanhoe Furnace Company is working the Davy Crockett soft-ore mine of the Bertha Mineral Company on a royalty basis, and has put in a narrow-gage railroad from the mine to its furnace at Ivanhoe, in Wythe county, a distance of about four miles.

It is generally conceded that the available supply of soft ore from the region between Galax and Pulaski is becoming limited and that the furnaces will soon have to look elsewhere for their iron ores. The proposed extension of the Norfolk & Western beyond Galax into North Carolina would tap a rich mineral region which could supply large quantities of ore.

The Roosevelt Deep Drainage Tunnel, Colorado

Rapid Progress Made; Methods of Mining and Blasting; All Drainage Tunnels in the Cripple Creek Mining District Have Been Successful

BY RUFUS M. BAGG, JR.*

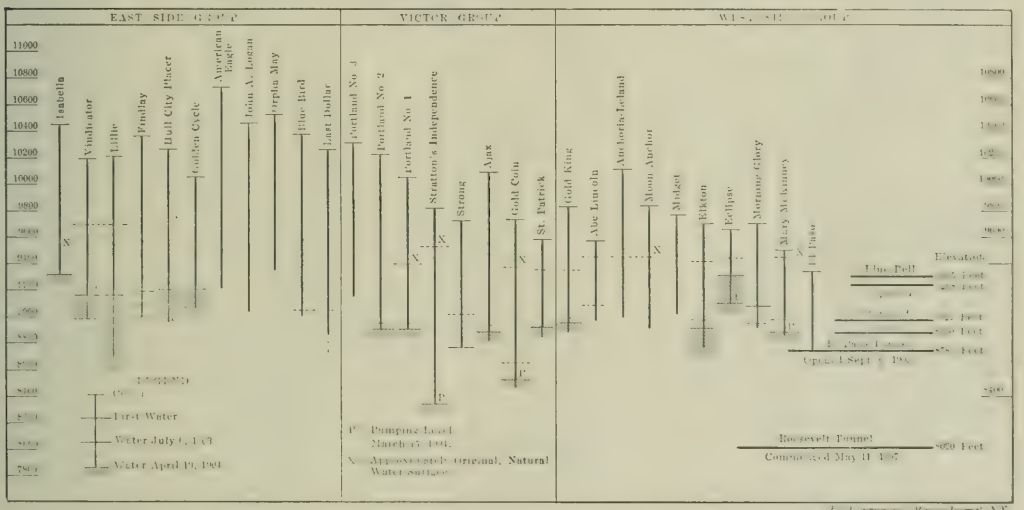
The country rock through which the Roosevelt drainage tunnel in the Cripple Creek district has already been driven more than two miles, is entirely of biotite-granite gneiss. In places the gneissoid character is pronounced and the foliation reveals itself in streaks and layers of biotite, roughly parallel, but never becoming strongly schistose. The pink orthoclase crystals are often porphyritic and occasionally attain a diameter of 2 to 3 in. Biotite and quartz form the holocrystalline ground mass of these large feldspars. Other minerals are present, as in typical Pike's peak granite, but the formation is very massive, homogeneous and more uniform in texture throughout the entire workings than the fine-grained granite type.

This coarse-grained granite forms the major portion of the broad plateau stretching southward from Cripple Creek, but the fine-grained granite becomes prominent in the region cut by the cañon of East Beaver creek. The same gneissoid character is well exemplified in Eight Mile cañon, where it shows the relationship to the massive granite. At the time of my visit (Aug. 25, 1909) the drainage tunnel had just crossed a small fissure through whose gaping walls a small stream of water is now flowing. Save for this recent flow, which probably marks the beginning of the drainage of the district yet to come, the tunnel workings are dry and the granite is exceptionally massive for gneissoid types and has but few joint planes.

High Explosives Used

The abundance of biotite (black mica) in the rock renders the granite elastic, and this elasticity interferes with the breaking of the rock. The method of overcoming this difficulty is to increase the per cent. of nitroglycerin in the blasting powder, and also to add gun cotton. Such an explosive shatters the rock much more effectively than the ordinary dynamite used in mining. A. S. Pearce, the superintendent, informed me that he was using powder composed of 92 per cent. nitroglycerin and 8 per cent. gun cotton. This compound he found the most satisfactory explosive for gneissoid granite. This explosive is used in the center cuts while lower-grade powder, some containing 40, some 50 and some 60 per cent. of nitroglycerin, is used for the balance of the ground.

The tunnel is 10 ft. wide and 6 ft. high, with the roof and sides well squared up throughout. The intermediate shaft is 607 ft. deep, and was sunk in solid granite from top to bottom. It hits the tunnel exactly, and from the bottom Mr. Pearce drove breasts both ways, to the south to meet the adit and to the northwest to cut under Beacon hill and into the Cripple Creek mining area. The junction of the two headings (the adit being driven in conjunction with the intermediate south drift) was made after the bore had extended about 2000 ft. south of the intermediate shaft. It was found that the alinement was exact and grade perfect, the junction being so accurate that unless one examined the direction of the drill holes it would be impossible to find where the two headings met. The grade of the tunnel has been kept as low as possible, with just slope enough to carry the water toward the adit. This is 3 in. in 100 ft. (¼ per cent.).



RANSOME'S DIAGRAM OF WATER LEVELS AND DRAINAGE TUNNELS IN THE CRIPPLE CREEK DISTRICT

Leyner drills are used and have been found satisfactory; they drill rapidly and do not get out of order readily. They use hollow drill steel, and water is fed to the cutting edges. The holes are 2½ in. in diameter at the collar and 1½ in. at the bottom; the depth is from 7 to 9 ft. Two men are required to run each large machine used in the heading, and three eight-hour shifts are employed. The ventilation of the tunnel is remarkably perfect, and is maintained by a 2 ft. pipe laid on the right side of the tunnel floor. The smoke from a blast in the tunnel breast issues from the tunnel shaft in about three minutes after traveling about 3000 ft. horizontally. All waste rock is now hoisted through the intermediate shaft. The

*Geologist, University of Illinois, Urbana, Ill.

buckets are automatically dumped into an ore car, and only one man is required at the surface to remove all the waste lifted from below. A 3x6 ft waterway is cut in the tunnel by a separate machine on the side opposite the track.

Time Required to Drain District

At the present writing the tunnel breast is directly under the summit of the first hill south of Beacon hill and between Gold and Arequa gulches. This tunnel ought to strike the phonolite plug of Beacon hill about 2400 or 2500 ft farther on. When the tunnel strikes this dike or plug and enters the volcanic zone to the northeast, the drainage of Cripple Creek mines will begin but it will require time to drain the district at so great a depth. It is thought that the tunnel will be finished within the next eight or nine months, and, unless some unforeseen difficulties arise in the work, it is likely to prove a record for this size tunnel in granite rock. The accompanying diagram shows the relative position of the bore holes used by Mr. Pearce in breaking ground at the breast of the tunnel, the numbers indicating the order of blasting. Twenty-six holes are drilled and these are so directed and fired that much of the waste is thrown to one side as it breaks, greatly facilitating its quick removal while the next shift is commencing operations.

Since the above was written the report of the boring for August and September has reached me, and Mr. Pearce states that his average during 10 months is 361 ft 4 in. per month. During the month of August he made 410 ft. This distance was drilled in spite of the fact that he lost 56 hours from the disabling of the electric plant, through washouts down the creek. In September, with a loss of 108 hours, he drove the heading 391 feet.

Other Tunnels

In conclusion, a brief statement of the existing tunnels of Cripple Creek may be interesting. Every tunnel driven in Cripple Creek for drainage purposes has been a success. This is also true of other tunnels of the district not driven for drainage purposes; for example, the Blue Bell tunnel, which was the first in the district. Its adit was in granite at an elevation of 9835 ft above sea level and about 15 ft below the original water level of the region. The tunnel had a maximum flow of 200 gal per min, and the flow continued for several years.

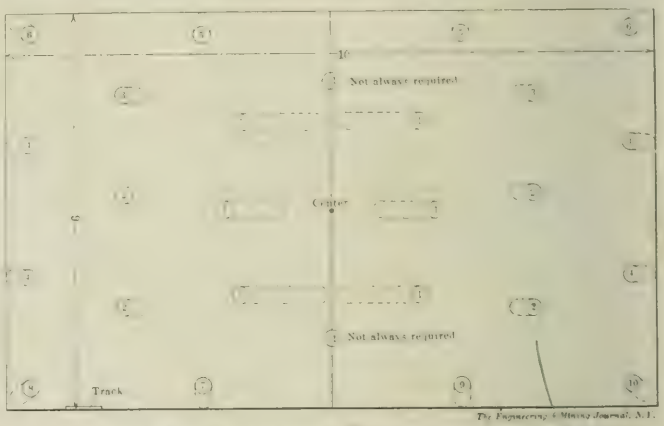
The Oshkosh tunnel cutting the granite at the great bend of Gold Hill has an elevation of 9288 ft and when seen 8 ft in length is reported to have had a flow amounting to 1000 gal per min. According to Lindgren and Ransome's Report (Professional Paper 54, U. S. Geol. Survey), the tunnel was entirely [illegible] with rich ore [illegible]. The [illegible] was [illegible] ft and the [illegible] of the Standard tunnel which had been under construction for about two years previous.

The Standard tunnel is in Gold run, west of Beacon hill, and lies at an elevation of 9027 ft. Its objective point was simply the volcanic plug of Beacon hill. When this tunnel struck the shattered phonolite zone a flow of from 16,000 to 18,000 gal per min was maintained for a long time. The ultimate length of this tunnel was 2800 ft., and it was of great value in lowering the permanent water level of Cripple Creek mines.

Still lower is the Newell tunnel which enters Grouse hill at 8430 ft., but it never reached the Beacon hill phonolite, and its face, although 110 ft lower than the Standard tunnel, never yielded such a large amount of water. The El Paso tunnel was, until the present Roosevelt project began, the lowest and most important drainage tunnel of the entire district. Its portal was at an elevation of 8783 ft., and its effect upon the water level of Beacon hill and adjacent mines was immediate.

Countryman and Jaquith estimated the total flow of this tunnel up to Jan. 1, 1905, at about 3,550,000,000 gal. of water. It is still discharging a large amount of water, showing that the overlying rock water is not yet exhausted. The accompanying water-level table is from Lindgren and Ransome's report (Professional Paper 54, U. S. Geol. Survey), with the addition of the position of the Roosevelt tunnel, not included in this report.

Work was begun on this tunnel May 11, 1907, when Lieutenant-Governor Harper pressed the electric button which started the machinery for drilling. The amount subscribed was $760,000. Shortly after the work commenced the contract was thrown up, but was resumed by A. E. Carlson at $8 per ft. The entrance of the tunnel is on Grouse gulch, below Cripple Creek, near a place known as "Windy Ridge."



METHOD OF DRILLING AND ORDER OF BLASTING, ROOSEVELT TUNNEL

Separation of Arsenic and Antimony by Means of Knorr Distillation Apparatus

By Walter C. Smith*

After having worked for several years under A. E. Knorr, formerly research chemist for the United States Metals Refining Company, and at present consulting chemist to the United States Smelting, Refining and Mining Company, and having had occasion to make many rapid and accurate determinations of arsenic and antimony, I take pleasure in describing the method devised and used by Mr. Knorr.

Apparatus

The apparatus consists of a dropping funnel *A*, a set of two or more flasks *D* and a condenser *G*. Mr. Knorr's arrangement is shown in the accompanying sketch. The funnel, flask, condenser and burner are mounted on an adjustable sleeve *K* sliding and turning freely on stand rod *J*. This arrangement permits of very rapid and easy change of beakers or receivers *L*. Under *D* is an asbestos shield *Q*.

The method is based upon the fact that there is a considerable difference between the temperatures at which arsenic and antimony will distil from chloride solution, or in presence of HCl. The arsenic and antimony must be present as the arsenious and antimonious compounds.

Procedure

Weigh up sample of material, transfer to flask *D*, add about 1 cc. H_2O and 10 to 12 cc. concentrated H_2SO_4, boil until sample has entirely decomposed. If sample is not readily decomposed by H_2SO_4, several additions of a few drops of HNO_3, or a little $NaNO_3$ often assist, organic

*Lowell, Grasselli, Ind.

matter can be destroyed in this manner. When HNO_3 or $NaNO_3$ has been used, or when sample contains oxygen, the arsenic and antimony are best reduced by the addition of about 5 c.c. of hypophosphorous acid and boiling, after fumes of H_2SO_4 appear, until the sulphur balls have disappeared, allowing to cool and adding 15 c.c. of H_2O.

When working on lead or copper bullions, refined metals, bismuth, etc., carrying low percentages of arsenic and antimony, one of the standard methods of removing excess of copper, lead, or bismuth, respectively, should first be used, and the arsenic or antimony in form of sulphides, or mixed with $Fe(OH)_3$ should be transferred to flask. In many cases a fusion with Na_2CO_3 and sulphur will often "break" a sample more rapidly than boiling with H_2SO_4. Separate heavy metals, as sulphides, and transfer together with paper to flask; add H_2SO_4, HNO_3, destroy paper, add hypophosphorous acid and boil until sulphur is all expelled; cool and add 15 c.c. of H_2O.

After the above preliminary treatment of the sample turn on water in cooling bath *H* and connect up apparatus as per sketch, moistening ground joints *C* and *F* with a drop of concentrated H_2SO_4, to prevent sticking when cold. Fill dropping funnel *A* with concentrated HCl. In warm weather or when acid in funnel *A* becomes too warm and causes gas to be liberated at stop cock *B*, add a very small amount of water to the acid in the funnel.

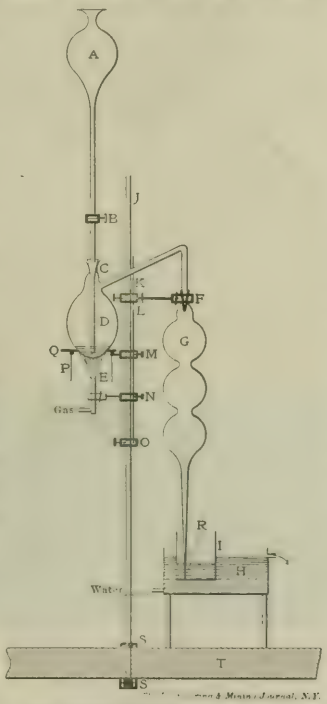
There are two methods for the arsenic separation: First, direct separation, for raipd work, and when sample is low in arsenic or antimony; not good for accurate work on compounds high in arsenic or antimony; always danger of contaminating arsenic with antimony. Second, double separation, for high arsenic and antimony compounds, and for very accurate work.

Direct Separation Method

Place 250-c.c. beaker containing 30 to 35 c.c. of H_2O under condenser in cooling bath *H*, so that end of condenser *R* just about reaches bottom of beaker. Light burner, and keep contents of flask agitated until boiling freely. This can be done by giving rod *J* a rotary motion.

When boiling freely and air is all expelled (steam will cause a sharp snapping sound in beaker *D*), open stop cock *B* and allow about 30 c.c. of HCl to run into the flask as rapidly as possible, without cooling enough to stop boiling. Regulate acid feed to two or three drops per second and allow apparatus to run in this manner for 10 to 15 min. Prepare new beaker with 30 to 35 c.c. of H_2O, then with left hand raise sleeve *K* and with right hand exchange beakers, returning them to original position. Beaker No. 1 should contain all the arsenic. Allow to run 5 min., change beaker and test for arsenic with H_2S. Continue with 5-min. tests as long as yellow As_2S_3 shows.

When arsenic is all over, cut down acid supply to one drop every 1 to 1½ sec. and run down until very faint white fumes of H_2SO_4 begin to show in flask and condenser. Increase acid two to three drops per sec., and regulate burner so that fumes of H_2SO_4 are barely visible. This is the indication of proper temperature for the distillation of $SbCl_3$. Dense white fumes of H_2SO_4 always mean that antimony will be contaminated with bismuth and copper if present. Run through from 1½ to 2 funnelfuls of HCl before making test. Change beaker *I*, run 10 to 15 min., change beaker, neutralize tests with NH_4OH,



THE KNORR DISTILLATION APPARATUS

acidify with HCl and test with H_2S. Continue until test shows no antimony.

The arsenic and antimony can be determined by titration, or precipitated as sulphides, washed with alcohol, carbon bisulphide and ether, dried and weighed. If any selenium is present it will appear with arsenic distillate causing a brick-red color. Precipitate selenium with SO_2, filter off and expel SO_2 by boiling on water bath.

Procedure for Double Separation

Instead of beaker *I*, as in direct method, use flask similar to *D*. Do not run in 30 c.c. HCl, but start off as soon as air is expelled by using two to three drops per second and bring to faint fumes. All the arsenic and the greater part of the antimony will be caught in two-thirds to three-fourths of flask full of distillate. Exchange beaker for flask, continue until 1½ to 2 funnels full of acid have been used and make tests as in direct method.

The flask containing arsenic and antimony is then connected to funnel and condenser and boiled down to 20 to 25 c.c., catching distillate in beaker. Start dropping in HCl, two to three drops per sec. for 5 to 10 min. All the arsenic will then be in beaker and antimony in flask. Add tartaric acid to latter and rinse into beaker. Combine with balance of antimony distillates and determine as in direct method.

The original still residue can be carried down to fumes of H_2SO_4, thereby expelling HCl and Cl. Then the Cu, Bi, Te, Fe, Ni, Co, Zn, etc., can be readily determined, with far greater accuracy than by using the sulphide separation for arsenic and antimony.

Application of Method

I have used this method on a variety of substances, some of which are copper bullion, refined copper, copper-furnace slags, ores, mattes, electrolytic-copper slimes, lead bullion, refined lead, lead-furnace slags, ores, leady mattes, hard lead, bismuth (crude and refined), flue dusts and alloys. The method is not satisfactory when tin is present. It is not an easy distillation to handle and requires constant attention, but after a few trials will give very satisfactory results.

The glass parts of this apparatus are made for Mr. Knorr by E. Machlett & Sons, 145 East Twenty-third street, New York City. They come in sets of one condenser, one funnel and six flasks, marked and ground to fit.

Avino Mines, Limited

In the first quarterly report of the Avino Mines, Ltd., operating in Gabriel, Durango, Mexico, the tonnage of shipping ore mined and sorted from April 28 to Sept. 21, 1909, is given at 2834 metric tons. Of this amount 2307 tons were shipped to smelteries, returning an average of 16.40 pesos per ton. The mine working costs are about 11.84 pesos. The sorting ratio is 2½ to 1.

Development work consisted of 163 ft., on levels Nos. 4, 6 and 6½. Experiments by H. E. Wood, Denver, led to the purchase of one of his machines for testing purposes at the mine. These tests will be on a scale of 30 to 40 tons per day and, should they prove satisfactory, a plant will be installed to handle 100 tons per day. The tests made were upon two lots and yielded results as follows: 30 mesh, gold recovery, 90.04 per cent.; silver, 69.56, copper, 78.76; 60 mesh; gold recovery, 56.68 per cent., silver, 80.71, copper, 84.30. The tailings from the Wood apparatus are to be tested and fed to Wilfley and Deister tables.

Notes on the Rainy River District, Ontario

A Canadian Gold Camp where Rich Seams and Pockets Occur in Connection with Milling Ore of Low Grade; Mines Well Equipped

BY W. L. FLEMING

This is the only gold camp of present importance in Western Ontario. It was discovered about 15 years ago and has been fairly active ever since, although at no time has there been anything that might be called a boom in the camp. Its history has been one of stock manipulation and uncertain mining methods, but the tendency now is to legitimately exploit the large bodies of low-grade ore that are here and to do away with the effort to make a showing from the rich pockets with a small mill.

Many failures are visible in the district, mines with an expensive and complete equipment lying idle while the buildings rot and the machinery rusts and becomes worthless. Some of these properties are believed to be good ones by the best mining men of the district, if they were properly handled. But under the methods by which they were operated, the mines never had a chance to show their value. It is the old story of mismanagement founded upon the idea that ore, once discovered, immediately justifies the erection of a plant whose capacity is limited only by the resources of the stockholders. A promising prospect is found and a vein of rich ore discovered in it. To sell the stock a mill and accompanying equipment of buildings, tramway, hoist, shops, etc., are built. Then, to operate the plant, in the prospectus so glibly promises, ore must be mined and hoisted as best it may, without regard to systematic, or, in fact, any development. The result is that the rich pocket is worked out, the mine is not in shape to handle at a profit the lower grade of ore that is left, and the stockholders, once fooled, are unwilling to advance further funds with a possibility of a repetition of the previous experience.

However, the properties that are working now are upon a different basis. They are in charge of capable superintendents and an effort is being made to develop the ore first and plan for its treatment afterward. No one looks to the high-grade ore for a working supply; it is held as incidental to the bodies of low-grade material. The future of the camp as a low-grade one is promising and the successful outcome of the work that is now being done should stimulate a resumption of work on the abandoned mines in the effort to open up the once despised low-grade ores.

Transportation

Western Ontario is generally a flat or gently rolling country, full of lakes and swamps, and heavily covered with brush and medium sized trees. The undergrowth is so dense that the South African term, "bush," is applied to the forests. Traveling and freighting, away from the railroad, is done in summer by canoes and small steamers or launches, any journey being readily made by canoe over the lakes and across the intervening portages. All freighting possible is left to be done during the winter months when the mercury often stands at 50 deg. F. below zero and sleds can be driven on the ice over the lake routes. All kinds of game and fish abound.

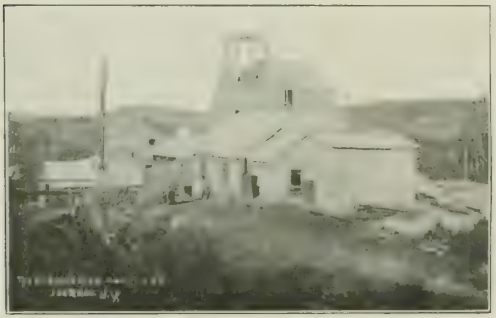
The town of Gold Rock is situated on a bay of Manitou lake and is reached by steamer from Wabigoon to Badloe's landing, 18 miles, and by team from that point, 6 miles. Wabigoon is a station of the Canadian Pacific Railway, about 200 miles west of Ft. William. The topography of the Rainy River district is somewhat rougher than the usual surface of Western Ontario, the hills rising to a hight of 150 ft. above the level of the lakes. All the mines are worked through shafts, either vertical or slightly inclined.

Fuel and Labor

Steam power is used at the mines. Cord wood is supplied at $1.25 per cord. The Laurentian mine is figuring on a water power from further up Manitou lake, but the distance is great and the cost of installation heavy. The pumping problem is not as troublesome as might be expected in such a locality. The Laurentian mine, with a depth of about 400 ft., handles 75 per cent. of its water from the 100-ft. level; the Paymaster, with 300 ft. of depth, yields only 7000 gal. per 24 hours. The mill water is all pumped from the lakes, the piping being buried 4 ft. underground on account of the severe frosts of winter.

There is no union among the miners, the wage scale being as follows, per 10 hr. shift: Machine men, $3.25; helpers, $2.00; muckers, $2.75; surface laborers, $2.50; engineers, $4; firemen, $2.75; amalgamators, $4; night millmen, $3.50; board and lodging, $5 per week. The only method of milling in the district up to the present time has been by stamp mills with inside and outside amalgamation.

A feature of the district that appeals to the visitor is the universal neatness and orderly appearance of the camps. The workmanlike aspect of the mine buildings and equipment, together with the fact that



PAYMASTER MINE, RAINY RIVER DISTRICT, ONT.

LAURENTIAN MINE AND MILL.

the work is in the hands of capable men augurs well for the future of a district that is still in the development stage.

Occurrence of Ore

The country rock of the district is a wide belt of a green diorite with a northeast and southwest trend. This diorite is highly silicious, so much so, in fact, that it is in many places nearly a quartzite. Masses of quartz occur in the diorite having a schistose structure. These masses are irregular in size, shape and extent, and from them small stringers of quartz run in all directions, some of which are quickly lost, and some pursue an irregular course to another quartz mass, branching and coming together again as they go, thus making a network of small quartz streaks through the country rock.

The workable ores occur in shear zones which have a northeast-southwest strike corresponding to the trend of the diorite. They are fairly regular in width and have a dip not far from the perpendicular. In these zones silicification has taken place strongly so that the white quartz and shattered fragments of diorite are intimately mixed. The gold occurs both free and in combination with pyrites in both quartz and diorite in these zones, the pyrites being of a low grade but abundant. Traces of platinum are found in all the ores.

The quartz is rich in places, some beautiful specimens having been found and visible free gold on fragments of rock not being uncommon. However, these rich ores are limited in extent and pockety. The future of the camp depends upon the exploitation and working on a large scale of the low-grade ores which form the content of the shear zones. It was the effort to work the mines for these high-grade streaks which brought disaster to many operations of the camp.

The shear zones are from 5 to 25 ft. in width. The rock is hard to a degree and "fitchery." All underground work is done by 3¼-in. machine drills. The ore is stoped by the shrinkage system, neither timbering nor waste filling being done. Shaft sinking is frequently done by contract; one such shaft was sunk more than 300 ft. without the use of a stick of timber, the miners contenting themselves with barring down any loose pieces of rock that might be seen as they went down in the bucket at the beginning of each shift.

Minnehaha Mine

The Minnehaha Mining and Smelting Company owns 2 claims, 67 acres, on the northeast shore of Minnehaha lake, between Minnehaha and Whitewater lakes. The steamer from Wabigoon touches at a dock on this property. The mine has been idle during the past year on account of litigation, but work is now being recommenced under Frank C. Dimmick. Geo. P. Good, of Detroit, is the consulting engineer.

There are several shallow shafts and surface cuts on the property, one such cut exposing a shear zone of considerable width. The main shaft is 112 ft. deep and is full of water, but it is claimed that a crosscut at the bottom has penetrated 12 ft. of vein matter. The work planned includes a drift tunnel from lake level to this shaft, the erection of shops, and the installation of a 2-drill compressor and machine drills. Supplies are now being laid in and preparations made for active work during the winter months. The company also contemplates the erection of a test mill after the design of Mr. Good. The mill is to contain a National ore pulverizer and a Pierce gold separator and amalgamator.

Volcanic Camp and Little Master

The Volcanic Camp comprises 1150 acres on Mud, Summit and Peak lakes. It is under option to Detroit people for the sum of $20,000 and representatives of the company are expected soon to decide upon the work to be done.

The shaft on the property is 318 ft. deep and about 150 ft. of drifting has been done. There are about 5000 tons of ore on the dump, all of which is said to be of milling grade, and, should the option be taken up, a mill will be installed to treat this ore. The mine is equipped with a geared hoist, boilers, 3-drill compressor and a diamond drill.

The Little Master is a fully equipped property just west of the Volcanic camp. All its work was done on the so-called Black vein which strikes through the ground of several companies and which has never yielded any encouragement upon prospecting.

Detola Development Company

This company, operating the Detola mine, owns 78 acres on the north shore of Mud lake. The shaft is 175 ft. deep, 250 ft. of drifting have been done at the 105- and 150-ft. levels and a station has been cut at 175 ft. Several veins have been opened by surface cuts but all the work has been done upon the one vein. Notwithstanding the fact that until now no effort has been made to mill or ship ore, the buildings and equipment on this property would do justice to a producing mine. Not that they are unduly elaborate, but are well designed, well built and well cared for. The equipment includes a 5-drill compressor, two 3¼-in. drills and a geared hoist.

Superintendent Dryden Smith is working a crew of 23 men, in 2 shifts, on development work, and expects to keep this number through the winter. The management is not satisfied that simple amalgamation with stamp mills is the best treatment for this ore, and experiments are being made to determine the process most suitable. The water is handled by two Knowles sinking pumps and a Hooker station pump.

The Paymaster Mine

The Paymaster mine has been working steadily on development for the last five years. It is owned by the Northern Development Company, Detroit, and is in charge of George Thow, a mining man with wide experience in California. This property is in first-class condition and its future is bright. It has 320 ft. of shaft and 1800 ft. of tunnels at the second and third levels. Although there are five veins on the property, all this work has been done on one vien which averages 29 ft. in width at the 300-ft. level. A still larger vein lies to the south, but it has not yet been prospected. A crosscut has been started to tap this vein and has been driven 200 ft. from the shaft.

The company is now erecting a 10-stamp mill equipped with 1000-lb. stamps and three Frue vanners. The concentrates are to be shipped to a smeltery. The stamps are expected to commence dropping Dec. 1. Mr. Thow states that this mill is being erected more with the idea of testing the ores than in the hope that it will prove profitable, and that himself and his company will be well satisfied if it pays the operating expenses. The mine is being developed with the expectation that it will justify equipment for operating on a large scale.

Sufficient ore has been opened up to operate 10 stamps for many years, and a two-years' supply is blocked out on at least three sides. The crew at present consists of 22 men, of whom 16 are on construction and 6 in the mine. This force is to be retained for working after the mill is completed. The property is equipped with a sawmill, shops, hoist and one side of a 10-drill Ingersoll compressor. The mine produces 7000 gal. of water per 24 hours, handled by a 6x4x6-in. Snow pump. A Northey pump, made by the Canada Foundry, of Toronto, is to be installed.

The Laurentian Mine

The Laurentian, owned by the Imperial Gold Mining Company, Ltd., is the largest in the district, and has been a producer for several years. No figures of its production are obtainable, but the capacity of the mill is 60 tons per 24 hours and the average extraction is not far from $5. R. B. Nickerson, the superintendent, also a California man, believes the Laurentian to be the equal of many mines on the Mother Lode, but does not believe in the advisability of continued working on the present scale. It is rumored that there is to be a change in the management of this property in the near future, and, in this event, it is hoped that the policy of working a large mine on a small scale will be abandoned. The equipment for the present capacity is complete and well kept up, even to a small farm which supplies some of the vegetables and hay used at the mine. The buildings are set in a line along a street; everything is kept in good condi-

tion, and a general air of competent superintendence prevails. The arrangement of the mine buildings is unique in that the mill is built on the hillside *above* the shaft house.

The ore is hoisted in a one-ton skip which dumps into a chute leading to a waiting two-ton skip on a track beside the shaft house. The geared hoist has a double drum, one drum of which operates the mine skip, and the other hoists the two-ton skip to the mill bin. From this bin the ore all goes to the rock breaker without passing over any screen or grizzly. The rock breaker discharges into a bucket elevator which empties into the mill bins.

The mill contains twenty 1000-lb. stamps, using hammered-steel shoes and dies. Height of drop, 6 in.; rate of drop, 100 per min.; screens, round punched with 100 1-mm. holes per linear inch; daily capacity, 600 tons. Back plates and chuck blocks are used inside the mortars, and splash, lip and apron plates on the outside. Below the plates a part of the stream of tailings is deflected to a Wilfley table used for sampling the concentrates. The tailings are heavy with pyrite and are said to contain $2 to $3 per ton in gold. The sulphurets are too low-grade to separate and ship to a smeltery, but the tailings are stored by dam and held for possible future treatment.

The compressor in use is rated at six drills, being one-half of a 12-drill machine. The drills used are 3¼-in., and in the stopes an average of six to eight 6-ft. holes are drilled per 10-hour shift, four machines breaking about 100 tons per shift. High grade ore has been taken from this mine in such quantities that a change room has been built, the miners being required to strip and pass under the watchman's eye. A crew of 25 to 30 men is employed. The shaft is 400 ft. in depth, and a winze has been sunk 80 ft. below this level. This winze is now in good ore.

The Big Master mine deserves at least passing mention on account of its large and costly equipment, now lying to rot and rust except for such movable objects as may be of use to some prospector. The equipment was put on too soon and the mine sacrificed to its "improvements."

Test of Monorail Car

A rail-car on the gyroscope monorail system was tested in London, Nov. 10. The car was 30 ft. long, 10 ft. wide and 13 ft. high, weighed 22 tons and carried 40 passengers. Full speed could not be reached on account of limited trackage, but the test was otherwise perfectly satisfactory. A speed of 30 miles per hour was attained and the loading of the car was from the roof not impeded.

The inventor is the personal car and engine of Commander Louis Brennan, who invented the Brennan torpedo. The car is mounted on four wheels set in line along a single track. The center of gravity is above the points of suspension, the balancing of the load depending upon two gyroscopes weighing about 1500 lb. each and running at a speed of 3000 r.p.m. This has been found more than sufficient to balance the car used at the test. A noticeable feature of the test was that a crowding of all the passengers at one side of the car caused a lifting of that side rather than a depression.

This system of transportation, it is claimed, will be widely adopted as it permits of high speed with perfect safety, construction costs of road are small, heavy grades and sharp curves are negotiated easily, and bridge construction is reduced to the simple matter of suspending a cable.

Use of Titanium in Making Steel Rails*

The use of titanium in making bessemer steel for rails has been fairly started on a commercial scale. Rails made in this way have received a test on the New York Central, and this year a number of trial orders have been given by both eastern and western lines. The method consists in the use of ferro-titanium, made in the electric furnace; this is an alloy of iron and titanium which combines readily with steel and by the reaction purifies and improves its physical properties. The process employed in this manufacture by the Titanium Alloy Manufacturing Company is covered by patents granted to Auguste J. Rossi, who has made a special study of the subject during the last 30 years.

Titanium has great affinity for nitrogen, and it is now believed that the amount of nitrogen retained in steel is large and thus has an important effect upon the physical properties of the metal. It is natural, therefore, that ferro titanium should be employed as a flux for cleaning iron and steel at the moment of casting or pouring from the converter, as ferro silicon and ferro manganese are employed. Sulphur and phosphorus do not appear to be reduced, but in combining with oxygen and nitrogen forming oxides and nitrides, titanium has an important action in removing impurities, forming with them a stable combination, which passes into the flux.

Thus the principal function of titanium alloy is to act as flux, and the cleansing effect results in increased solidity and purity, which have such an important influence on the mechanical structure of the steel, preventing breaking down under heavy rolling loads and reducing the wear due to abrasion which for the serious defects of ordinary bessemer rails.

Experiments covering 104 rails per cent. of titanium 5 to 7 per cent. of carbon and of other proportions from 3 to 4 per cent.; the balance is pure iron which has been electrically refined. In bessemer-steel manufacture it is the practice to add about 1 per cent. crushed ferro titanium in the ladle as the steel is poured from the converter.

The equivalent weight of titanium is 0.1 per cent. of the weight of the molten steel poured into the ingot mold, and the additional cost is now about $3.50 per gross ton of rails. It is claimed that this small proportion of ferrotitanium is sufficient to remove the bulk of blowholes and segregation usually found in bessemer ingots and produce clean, solid, good-wearing rail.

The first experiments with titanium alloy in rail manufacture were made by the Maryland Steel Company in November, 1907, and this was followed in 1908 by the Duquesne Works of the Carnegie Steel Company, the Cambria Steel Company and the Lackawanna Steel Company. During the last year the process has been used in a large number of rails.

The results of six months' service on a New York Central cross-over carrying a heavy tonnage show that the flange wear of titanium rails is only one-fourth that of ordinary Bessemer rails, and it is claimed that the average service in main line will be as three to one in favor of the titanium rail.

* A paper read before the *Railroad Club*, Nov. 12.

Operations of the United States Steel Corporation in the Birmingham District

SPECIAL CORRESPONDENCE

At the present date nearly all of the plants and ore mines of the Tennessee Coal, Iron and Railroad Company, in the Birmingham district are in operation. At Ensley the No. 1 furnace is being run on foundry iron, and the No. 2 is being rebuilt and enlarged; Nos. 3, 4, 5 and 6 are in blast. The openhearth plant and steel mill are in operation. The Alice furnace at Birmingham and the Nos. 1, 2, 4 and 5 furnaces at Bessemer are in blast.

The company is mining hard red ore from 14 slopes on Red mountain and besides supplying the furnace, immense stock heaps of ore are being accumulated at each of the three divisions on the mountain. In the Greeley district about 17 miles southwest of Bessemer, three brown ore properties are being worked. This district is supplying the greater portion of the soft ore used by the Steel Corporation furnaces in the Birmingham district. At Champion, 37 miles north of Birmingham, the company is also operating a soft ore property and has ore washer with a daily capacity of from 300 to 600 tons in operation. Flux is being quarried at Kelma 6 miles northwest of Birmingham, where two dolomite quarries are worked. Limestone is being quarried near Trussville, Alabama.

Power Plant Economics as Applying to Mining

By Hartwell Jalowick*

The conditions surrounding the development of steam for general mine use, whether for engines, auxiliaries or for pumping, demand that exceedingly low-efficiency apparatus be utilized. This poor economy, however, is not due to any lack of engineering ability on the part of manufacturer or designing engineers, but is merely due to the inherent characteristics of the class of machines as a whole. It is entirely unavoidable in any but large tandem or triple expansion installations. In corroboration of this I submit the following figures:

It is conservative to estimate that in mine installations over 95 per cent. of the steam used is consumed in the hoisting and pumping equipments, and it is a fact that this apparatus, particularly the pumps of the common type, is among the most uneconomical on the market. Next to the pump, in line with poor economy, comes the hoisting engine. To afford some tangible idea of the steam consumption of the different classes of equipment it is to be noted that the simple high-speed engine consumes between 32 and 43 lb. of steam per h.p.-hour, an automatic high-speed engine requires from 25 to 35 lb. and a compound Corliss from 22 to 30 lb. With pumping equipment in good to fair condition the steam consumption for the simple pump averages between 125 and 275 lb. per h.p.-hour, and the compound pump requires from 75 to 100 lb. and in rare instances may go as low as 65 lb. per h.p.-hour.

Assuming it requires 2545 heat units (B.t.u.) to produce one pump, engine, or other mechanical horsepower, and further that it requires approximately 966 heat units to produce 1 lb. of steam from and at 212 deg. F., it is calculated that the percentage of total to available energy utilized in the production of useful work, as applied to the separate cases noted above, becomes for the simple engine only a trifle over 7 per cent. for the automatic high-speed 8.80 per cent. and for the Corliss engine only 10.15 per cent.; in the case of the pumping apparatus these already low figures dwindle to approximately 1.32 per cent. for the simple pump and only 3.20 per cent. for the compound pump. Expressing the above results in terms of wasted energy it becomes apparent that from 93 to 87½ per cent. of the available energy is wasted by the reciprocating engine equipments, and that from 98½ to 96¾ per cent. represents the wasted energy for the pumping equipments.

From the above it may be expected that practically all steam-using apparatus will remain either extravagant or economical in the use of steam depending primarily upon the badness or the goodness of the original design. In other words, beyond the already economic design of the apparatus in question it becomes exceedingly difficult to say nothing of being expensive to better the originally designed economy of any particular steam-using unit; the best that can be expected is to keep the apparatus up and to maintain its already designated point of efficiency.

Remedy Lies in the Boiler House

It is quite evident, in view of the foregoing, that the general question involved in the important factor concerning power economy in the major degree lies beyond the motive power equipment, for, as has been pointed out, under the best of conditions the inherent economy as well as the thermal efficiency is exceedingly low, hence I will turn to the boiler plant equipment. In great contrast to the motive power equipment, it will be noted that here the question of "personal equation" becomes one of prime importance, in illustration of which the following data will be interest:

In the analysis of boiler equipments we find that 80 per cent. represents the efficiency which is often approximated but rarely ever quite reached in practice. This efficiency, attained by the use use of good anthracite coal, represents an equivalent evaporation from and at 212 deg. F. of approximately 12 lb. of water per pound of coal, and, accepting the common ratio of 445 lb. of coal being equivalent to 1000 lb. of wood, gives an equivalent evaporation of 5.34 lb. of water per pound of wood. Now, from data covering 16 installations over a wide range of territory, as reported by George H. Barrus, a recognized authority on boiler and engine tests, the average evaporation per pound of fuel was only 9.447, which, on the basis as outlined above, would indicate a boiler efficiency of approximately 63 per cent. These results, however, represent the common practice in the Eastern States where good fuel and more or less intelligent labor are both obtainable.

Data covering eight mining installations and three public utilities properties, all using wood or lignite as fuel, indicate the average boiler efficiency to be between 53.10 and 58.25 per cent., giving an average of a trifle over 49 per cent. It may, therefore, be safe and conservative to assume that a boiler efficiency of 50 per cent. is commonly attained in the industrial and mining installations of the Southwestern States and Old Mexico, where low grade fuel is, with rare exceptions, the only one obtainable, and where unskilled labor is by necessity used. At this efficiency, 50 per cent., the equivalent evaporation becomes 7.5 lb. of water per pound of coal, or 3.33 lb. of water per pound of wood.

Great Saving May Be Effected

From these results it would seem that a boiler efficiency of 70 per cent. would be comparatively easy of attainment, were the importance of the matter given more earnest consideration by the operators of such properties, and by this increase in efficiency the saving realized in fuel expense alone, with a given set of conditions would amount to about 28½ per cent.

SAVING PER 100 H.P. PER YEAR FOR BOILER EFFICIENCY ABOVE 50 PER CENT.

Boiler efficiency....	70%	66%	62%	58%	54%
Simple pump	$19,500	16,500	$13,200	$9400	$5000
Compound pump.....	8,000	6,800	5,550	3850	2050

which, at a fuel cost of $8.75 per ton for coal, or an equivalent of $3.50 per ton for wood—assuming an output of 100 h.p. per

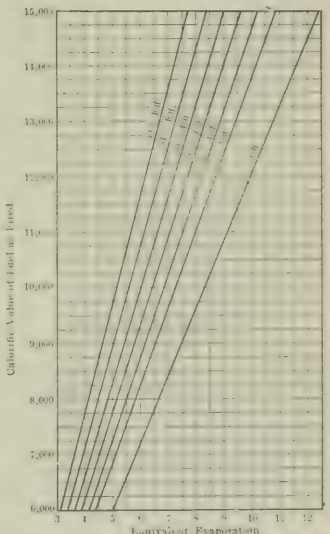


CHART SHOWING BOILER EFFICIENCIES

20 hour day, 300 days per year—gives the accompanying tabulated results.

In these calculations it is to be noted that no item of economy other than that actually realized in fuel saving has been included; it is, however, reasonable to suppose that high efficiency goes hand in hand with low maintenance and decreased depreciation, and further, that relatively [illegible] will result [illegible] the fact that [illegible] value, i.e., fuel [illegible] equivalent [illegible] equivalent [illegible] boiler efficiency [illegible] fuel, [illegible] be borne in mind that [illegible] the [illegible] and the [illegible] be realized by the application of [illegible] engineering to any given fuel, the [illegible] and [illegible] loss. As [illegible] pound

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of fuel, and boiler efficiency, the calculations having been made to correspond to the values of the table.

There is no one boiler or other equipment which is better than every other for every set of conditions, nor is there any one economic method which is better than every other for every set of conditions, yet considerable time and money are every day spent in the selection of boilers and engines, and at the same time, but little attention is paid to the economics of these equipments after their installation, even though the setting, the firing and the running of these equipments represent the three main factors of pure power economy and long life.

People in general are inclined to be a trifle slow in grasping possibilities which do not involve matters of great magnitude; however, the smaller details are gradually being given more and more attention and the time is not far distant when this question of economics in general will become a matter of prime importance. When, as I have illustrated, a saving in fuel alone varying from $2050 to $19,000 per year—depending upon conditions—is attainable with practically little or no expense, one wonders why this matter has not been given more general consideration. Yet the above brief outline only treats upon the possibilities relating to one small item in this vast field.

Transvaal Mine Labor

At the recent annual meeting of the Glen Deep Company, R. W. Schumacher, chairman of the company, submitted a statement of the labor employed in the Transvaal gold mines for a series of years. From this statement the following figures are taken, showing the number employed at half yearly intervals:

	Whites.	Negroes.	Chinese.	Total Colored.
1902, July	7,993	31,650		31,650
1903, Jan.	10,783	48,058		48,058
1903, July	11,873	68,217		68,217
1904, Jan.	12,811	75,027		75,027
1904, July	13,707	73,370	1,388	74,758
1905, Jan.	15,336	89,895	27,322	117,117
1905, July	17,170	103,623	43,191	146,814
1906, Jan.	15,582	93,933	47,166	141,099
1906, July	17,757	90,420	52,231	142,651
1907, Jan.	17,874	102,477	53,856	156,333
1907, July	17,907	110,822	51,472	162,294
1908, Jan.	17,522	133,515	33,819	167,334
1908, July	18,342	149,155	19,071	168,521
1909, Jan.	19,861	169,537	11,534	181,071
1909, July	22,021	171,100	5,360	176,460

Mr. Schumacher comments on this statement as follows: "It will be seen, for instance, that in January, 1903, or six months after the war, there were little over 48,000 natives at work on the gold mines throughout the Transvaal. In January, 1904, just before it was decided to import Chinese, the number had risen to 75,027. This position you will remember, had then become critical. Many mines were closed but they could not be kept closed, and all sorts of schemes at the time were discussed for the securing of more labor. Even in January, 1906, the position was very little better, for the number of natives employed was only 93,933, in spite of all efforts to recruit more. However, after January, 1907, when there were 102,477 natives at work, the numbers began to improve steadily, and the wastage caused by the gradual repatriation of the Chinese, which commenced in June of that year, was more than compensated by the influx of South African natives. It is interesting to note that the highwater mark reached in April, 1909, of 181,389 natives employed on the gold mines in the Transvaal was higher than any record up to the end of 1908 of both natives and Chinese combined, even including the period May, 1906, to August, 1907, when there were more than 50,000 Chinese here. These figures give an idea of the enormous improvement which has taken place in recruiting native labor for the gold mines since the periods of extreme shortage which already made themselves felt soon after the termination of the late war. It is true that a number of causes can be assigned for this improvement, such as the fact that bad times existed all over South Africa, which adversely affected all industries except gold mining, and put a complete stoppage to nearly all government and public works throughout South Africa, thereby releasing a large number of natives for work on the mines. It is also a fact that a number of recruiting fields, such as Natal, that are now open to us, were closed not long ago.

"But over and above these causes and others which undoubtedly exist, no impartial man can overlook the fact that since General Botha's government came into power in this colony it has done its utmost to assist the mines in their recruitment of labor. It would be ungenerous not to acknowledge this to the full, and not to admit that the Transvaal government has so far proved correct in its assurance that natives would be found to replace the Chinese which they decided to repatriate."

Mineral Production of the Philippines

The mineral production of the Philippines, as collected and reported by the Division of Mines of the Bureau of Science at Manila, has been as follows for two years past. Gold and silver are given in troy ounces, the rest in metric measures:

	1908.	1909.	Changes.
Gold, oz.	[illegible]	[illegible]	[illegible]
Silver, oz.	[illegible]	[illegible]	[illegible]
Copper, Kg.	[illegible]	[illegible]	[illegible]
Iron, tons	[illegible]	[illegible]	[illegible]
Coal, ton	[illegible]	[illegible]	[illegible]

The silver is recovered in connection with the gold. In following the figures given, small amounts of gold and lead are noted in the Government's quantities being impossible to [illegible]

The value of the structural materials reported was, in pesos: Building stone, 149,930; gravel, 171,360; sand, 35,000; lime, 20,000; clay products, 421,628; making 797,918 pesos—or $398,959—in all.

Texas May Stop Convict Mining

A despatch states that the penitentiary committee has recommended the immediate cancellation of the contract which the State of Texas has for working convicts in coal mines at Calvert, Tex., the following resolutions having been adopted:

Whereas, a subcommittee of the penitentiary committee, duly appointed by the chairman thereof, visited and inspected the coal mines near Calvert, Tex., in which 100 convicts are worked; and

Whereas, said committee made a thorough personal inspection of the condition existing in and about said mines and from their personal inspection, and from testimony of officers in charge of said camps and convicts working in said mines, they found the following conditions: That practically all the men in going to and from their daily work in the mines are forced to walk through mud and water, thereby wetting their feet, in which condition they are forced to work during the day; that some of the men were required to work in water, mud and slush from shoe mouth to half-leg deep and to do their daily task of mining seven tons of coal, which mud and water appears to affect in various ways the physical condition not only of the feet but of the entire physical person of the men thus subjected.

They found that the convicts upon coming out of the mines at night were not furnished with dry shoes, necessitating their going with wet feet to the mine prison building and remaining in that condition until such time as they could remove their shoes after the supper meal. They found that the clothes worn in the mines during the day and changed at night were usually wet, and that in winter the clothes were frozen and that the convicts put them on in that condition the following morning, in which condition men were forced to pursue their labors. They found several under the age of 21 years, yet lacking the full development of manhood required to do the daily task of seven tons. They found from hospital records, kept under the direction of the camp physician, that their employment in said mines is injurious and unhealthy; and

Whereas, we believe that the State of Texas has no moral or legal right to force men convicted of violation of the law to labor under such conditions, therefore be it

Resolved, that we urge the governor of the State of Texas, the board of penitentiary commissioners and superintendent of penitentiaries to cancel the contract with the Southwestern Fuel and Manufacturing Company.

Some Facts and Figures of Sorting on the Rand

Efficiency Greatly Increased by Double Sizing by Grizzlies; Ferreira Mine Saves $106,000 and the Crown Reef $46,800 per Year

BY L. D. HUNTOON*

The gold mines on the Rand, in South Africa, offer some of the best examples of the gradual development of preliminary hand sorting and what can be accomplished by carefully arranged plants. The annual reports of the mining companies contain detailed cost sheets and ore statements, an investigation of which will show the advantages to be derived. The ore is an auriferous conglomerate occurring as beds intercalated in greater part through a quartzite formation. The waste rock consists generally of quartzite, though in some districts slate occurs in addition. The waste rock, varying in amounts from 10 to 80 per cent., depending upon the thickness of the reef and the amount of barren quartzite intercalated in it, is readily recognized after washing. The quartzite in most of the mines contains too little gold to be of value.

Originally the waste was separated underground and used for filling. In most mines of the Rand this has been superseded by separating on the surface in ore-sorting houses, known as rock houses, only large pieces of barren rock being now left underground. The objections to sorting underground are loss of valuable ore due to the poor light, and loss of rich fines and dust covering the waste rock. It has been found by experience that the gold in the fines recovered from washing the waste rock on the surface will more than meet the extra cost of tramming and hoisting.

Double Sizing Employed

The rock houses are placed near the shaft and are independent of the mill. They contain one or more grizzles, breakers, picking floors, picking tables or belts and ore bins. Only a few years ago they were simple in construction, employing what is known as single-stage sorting. By decreasing the size of opening in the grizzly from 2½ in. to 1 in. it was found that the efficiency of sorting was greatly increased. This necessitated a closer sizing of the oversize and a second grizzly was introduced, making the process what is called two-stage sorting, where the sizes delivered to the sorters are 1 to 3 in. and sizes above 3 inches.

In this method, the ore first passes over a 3-in. grizzly, the oversize from which is washed and sorted. The undersize passes over a 1-in. grizzly and the oversize from this is washed and sorted, the undersize going to the bins. Coarse material consisting of waste rock and ore had formerly to be broken with hammers to liberate the waste; to further increase the efficiency and capacity, rock breakers have been introduced to break the coarse material, and sizing trommels to deliver the various sizes of ore to the sorting tables.

In the newer ore-sorting houses the ore as hoisted from the mines is dumped into bins adjacent to the headframe and having a sufficient capacity to permit of the sorting being done in the day time. From the bins the ore is transported by side-dump trucks to grizzlies set at angles of from 40 to 45 deg. A large number of grizzlies, varying in length from 13 to 15 ft. and about 3 ft. wide, are placed side by side depending upon the tonnage to be handled. At the Ferreira mine, handling 1000 tons of ore per day, the grizzlies are 13 ft. long by 70 ft. wide and placed at an angle of 40 deg. with 1-in. spaces between the bars. The oversize, amounting to 70 per cent., falls upon the sorting floor where it is thoroughly washed before sorting. Sorting floors are extensively used at the large plants. At the Ferreira mine the floor is 11 ft. wide, extends the full width of the grizzly, and is covered with ½-in. steel plate. Near the outer edge is a track for cars to transport the waste to the dump, and beyond this is the ore bin. The advantages claimed for large sorting floors are: the ore is tipped where desired; there is no congestion; no power is required; and every piece of rock and ore must be shoveled, resulting in a careful inspection.

Circular Picking Tables on the Rand

The ore sorting houses in the western States of this country avoid the necessity of large grizzly surfaces and heavy shoveling by discharging the grizzly oversize into bins which in turn feed the ore to stationary ore-sorting tables about 4 ft. wide and elevated about 3 ft. above the main floor. The ore can be washed as discharged from the bin if desired, and the waste rock and ore separated and rolled or shoveled into cars or bins without the necessity of lifting the material the hight of an ore car. After separating the waste on the sorting floors the remaining ore is broken, sized and delivered into bins which discharge, by shaking feeders, constant streams to picking tables or belts. At the feed end of the tables or belts the ore is again washed to recover the fines adhering to the waste rock and to clean the material for closer sorting. The washings from the sorting floors and tables are settled in ponds and the settlings, usually rich, are sent to the mill with the ore.

TABLE 1. COST OF HAND SORTING.

Year.	1889	1902	1903	1904	Average.
Per ton milled.	$0 192	$0.176	$0 23	$0 21	$0 21
Per ton sorted.	0 39	0 70	0 72	0 72	0 64

Shaking tables and picking belts are little used on the Rand. The shaking table, which is quite similar to a shaking feeder, has too small an area and the ore is of too great a depth to be efficient. The depreciation on the picking belt and its cost of installation is much greater than that of the circular table, resulting in the almost exclusive use of the latter. The circular table, spoken of so highly in the reports from the Rand, has been improved upon and gradually brought up to its present high state of efficiency by the mines in that district. Its outside diameter is about 25 ft. and the inside diameter about 17 ft., leaving an annular area 4 ft. wide for sorting purposes.

The surface of this sorting area is covered with steel and is slightly inclined toward a launder on the outer edge to re-

TABLE 2. COSTS PER TON MILLED.

Year	1889	1902	1903.	1904	1908
General				$0 031	
Transportation	$1 067	$0 093	$0 094	0 059	$0 180
Crushing	0 072	0 109	0 094	0 086	
Elevating		0 083			
Stamp milling	0 535	0 820	0 680	0 536	0 400
Retorting				0 014	
Conveying and classifying					0 094
Tube milling					0 153
Concentrating	0 207	0 329	0 113		
Cyaniding sands	0 380	0 688	1 100	0 890	0 480
Cyaniding slimes	0 174	0 539			
Total	$1 935	$2 661	$2 081	$1 616	$1 287

*Consulting mining engineer and professor of mining and metallurgy, Hammond Mining and Metallurgical Laboratory, Yale University, New Haven, Conn.

cess the wash water. The table is revolved by rack and pinion from below, near the outer edge, with a speed of about one revolution in 85 seconds. The ore is fed to the circular area by a shaking feeder, washed, and the waste rock picked out by boys around the outside and inside edges. The ore remaining on the table is discharged into ore bins or breakers by a plough placed just in front of the feeder. In the last few years an improvement has been introduced by subdividing the annular area into an upper and lower ledge. The ore to be sorted is delivered to the lower ledge and the discarded waste is placed on the upper ledge. By this arrangement the waste rock discarded can be inspected by the superintendent before it is finally discharged to the waste car or bin. The ore and waste rock are discharged from the ledges to their respective bins by ploughs.

the grizzly bars was lessened to ¾ in. a further profit of $1200 per month could be made after deducting 62c. per ton as cost of sorting the extra quantity and $125 per month as depreciation.

The cost of hand sorting will vary with the size of the ore and percentage of waste discarded. Table No. 1 shows the average cost for 4 years to be 21c. per ton milled and 04c. per ton of waste sorted. The cost per ton of waste sorted is much less than the cost of milling shown in table No. 2 for the same period. Tube mills have been installed within the last few years, reducing the total cost of milling as is shown for 1908, but not reducing the cost below that of sorting.

The greater the percentage of waste sorted, the greater the capacity of the mine or mill and the greater the value of the ore milled. This is well illustrated in Table No. 3 covering 17 years of operations. During this period 23.9 per cent

TABLE 3. RESULTS FROM PRELIMINARY HAND SORTING.

Period Ending	One Sent To Rock House. Tons	Hand Sorted Waste. Tons.		One Milled. Tons	Assays in Dollars. One Mined.	Waste Rock	One Milled	Increased Value. $	
September, 1891	12,054			12,054					
March, 1892	24,567			24,567					
March, 1893	7,784	9,017	15.6	18,777	19.38	0.78	22.69	3.31	17.08
March, 1894	70,212	22,[illegible]	32.8	17,213	21.16	0.94	30.52	9.62	14.10
December, 1894	66,[illegible]	29,750	44.7	36,781	19.33	1.06	33.76	14.43	74.66
December, 1895	90,080	38,1[illegible]	18.[illegible]	61,254	19.42	0.97	30.08	11.56	59.49
December, 1896	178,918	58,156	32.5	120,762	17.26	1.06	25.05	7.79	15.15
December, 1897	186,922	61,[illegible]46	32.9	125,326	17.35	0.19	25.01	7.69	41.10
December, 1898	219,940	88,227	40.1	131,713	15.47	0.83	21.93	8.46	62.85
December, 1899	141,858	46,690	32.9	95,168	14.76	1.08	21.64	6.88	46.60
Wait period									
December, 1902	74,511	15,079	20.2	59,432	12.68	1.34	15.56	2.88	22.71
December, 1903	200,581	48,750	24.3	151,831	11.40		15.30	3.90	33.20
December, 1904	286,413	65,606	22.6	220,808	11.10	0.98	14.20	3.10	27.90
December, 1905	309,316	71,816	23.3	237,500					
December, 1906	308,715	56,090	18.2	252,625					
December, 1907	306,272	37,679	12.3	268,603					
December, 1908	337,292	46,522	13.7	290,770	10.90	1.10	12.43	1.53	14.00
Totals	2,911,577	696,390	23.9	2,215,187					

Experience at the Ferreira Mine

The Ferreira Gold Mining Company, Ltd., has carefully investigated preliminary hand sorting on different sizes and has made changes in its sorting station from time to time until it has one of the most efficient on the Rand. What has been accomplished at this mine, since its inception, is shown in the four tables accompanying this article. These tables have been compiled from several of the late annual reports containing detailed ore [illegible]

[illegible] gradually been reduced from 2¼ to 1 in. [illegible]

[illegible]

of the ore sent to the rock house was discarded as waste thereby increasing the capacity of the mill 31.4 per cent. The value of the ore milled has been increased from 14 to 74.6 per cent., and the value of the waste rock discarded, about $1 per ton, is less than that of the tailings. The

in the reports, were computed from the tonnages given, the gold declared, and the percentage recovered.

The direct saving due to sorting in 11 years is shown in table No. 4. For the first 9 years the figures showing the total savings were extracted from reports, and for the last two they were computed. Sufficient data were not in my hands for the succeeding years to embody them in the table. The total direct saving after deducting all costs amounts to $1,167,000, equivalent to $106,000 per year or $1.06 per ton milled. The table shows the savings are about equally divided between the difference in the cost of milling and the cost of sorting, and the difference between the loss per ton milled and the assay of the sorted waste. Due to the war the property was closed down in September, 1899, and again resumed operations in April, 1902. The losses per ton milled for 1903 and 1904 were computed by deducting the gold declared per ton from the assay of the ore. The assays of the waste rock were taken from various reports, except those for 1903, which is the numerical average of the assays previous to this date.

Saving at the Crown Reef

At the Crown Reef mine a 25-it circular table was placed in operation April 1, 1897. During the first three months of operation the working costs amounted to 51c and maintenance to 43c, making a total of 94c per ton sorted. The annual report for the year ended March 31, 1898, after using the table one year, contains the following statistics:

Waste sorted, 39,304 tons, equivalent to 16.4 per cent.; cost of milling, $1.65; cost of sorting, 0.68; saving per ton sorted, 0.97; assay of tailings (sands), 1.32; assay of sorted waste, 1.00; saving per ton sorted, 0.32; total saving per ton sorted, 1.29; total saving for year, $46,800.

From the above reports it would appear that properties operating in the States can well afford to fully investi-

TABLE 4. TOTAL DIRECT SAVING DUE TO SORTING

Year	Savings on Milling Cost. Cost per Ton. Milling	Sorting	Saving per Ton	Total for Year	Savings on Tailings Loss. Loss per Ton Milled	Assay of Sorted Waste	Saving per Ton Sorted	Total for Year	Total Savings
1894	[illegible]					$0.78			$ [illegible],200
1895	[illegible]					0.91			[illegible],600
1896	[illegible]					1.06			71,400
1897						0.85			112,000
1898						1.[illegible]			146,000
1899						1.[illegible]			117,000
1900						0.85			204,000
1901	[illegible]	[illegible]	[illegible]	$ [illegible],000		1.08		$ [illegible],000	101,000
1902	[illegible]	[illegible]	1.00	[illegible]		1.00		11,000	45,500
1903	[illegible]	[illegible]	[illegible]	66,000	$[illegible].18	0.94	$[illegible]	61,000	127,000
1904	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	0.98	[illegible]	65,000	125,000
Total				$[illegible],000				$[illegible],000	$1,167,000

[illegible] the advisability of installing carefully arranged hand-sorting stations preceding tube mill. These plants may consist of at the preliminary breakers which

otherwise would be installed in the mill, and the ore delivered to the mill bins would be ready for fine crushing. At most mines the ore, as hoisted from the mine, is delivered into ore bins with possibly one grizzly to screen out the fines.

From the experience in South Africa this single-stage sorting can be greatly improved upon by the installation of two or more grizzlies delivering sized products to the sorting bins. The ore from the bins will be delivered by gravity to the sorters, reducing by about 10 per cent. the amount of labor required in South Africa. The cost of sorting a sized product which has been previously washed is much less and furnishes a better product than sorting mixed sizes, as is our common practice. The fines from most ores are of a high grade and should be washed from the waste rock before discarding. This can be accomplished with a spray at the gate of the bin before sorting. Circular tables also warrant careful investigation from the great success attending their use in South Africa.

Conservation of Mineral Lands

SPECIAL CORRESPONDENCE

Preparations are being made in Washington for an active winter's discussion of the question of Federal relationship to coal and mineral deposits. This issue will be forced to the front as a result of the so-called Ballinger-Pinchot controversy, which was only temporarily set at rest by the letter in which President Taft sought to dispose of the difficulties that had developed between the two men. The setting aside of the personal aspects of the controversy is, in fact bringing into higher relief the difference in the policies advocated by the contestants, as well as the difference between the point of view of Secretary of the Interior Ballinger and that of his precedessor James R. Garfield. The main question at issue is now seen to have been the same which was raised last winter in connection with several bills then presented to Congress—that of continuing the sales of coal and other lands owned by the Government or of leasing the lands with the right to mine on a royalty basis. Both President Roosevelt and Ex-secretary Garfield, as well as Chief Forester Pinchot, are known advocates of the leasing plan. The position of Secretary Ballinger in opposition thereto and in favor of the plan of outright sales has been brought into a clear light in connection with the Alaskan phases of the recent controversy, especially the disputed "Cunningham claims." Mr. Pinchot's immediate connection with the matter is seen in the fact that some of the most valuable coal lands are now comprised within the limits of the national forests reserves, and are therefore directly under his charge. Mr. Taft has already undertaken to propose to Congress some legislation on the subject of "conservation," which in this instance is understood to mean the question of mining legislation. What his position will be is as yet uncertain as he has not definitely expressed himself upon general lines of policy.

Whatever position is taken by the President, the bill embodying it will be fiercely contested as the parties to the debate are quite evenly matched in the legislative body. The large number of bills brought before Congress a year ago and designed to introduce the leasing system in connection with various kinds of mineral deposits assume a new significance when they are thus made parts of a general issue which is now possibly to receive at least temporary settlement one way or the other. That the subject will be forced upon the attention of Congress in a way that will perhaps lead to the beginning of a Congressional investigation into coal and other mining conditions in Alaska is now highly probable. The Glavis report upon coal claims in Alaska, which afforded the principal bone of contention in the contest of the past summer, going through the President's own hands and serving as the basis for the final dismissal of Mr. Glavis from the service, will be given to the public within a very short time, so that it will be in the hands of members of Congress at the opening of the session. It is not clear that the opponents of Secretary Ballinger can succeed in forcing a Congressional investigation or, having secured its initiation, can carry it through. Should they succeed in their effort, there is reason to expect that it will be made the vehicle for much argument against the further alienation of Government mining and water rights and that it will be sought to build up legislation upon the facts exhibited during the investigation. Should the investigation be blocked by the leaders in either house, the same line of argument will be developed in other ways.

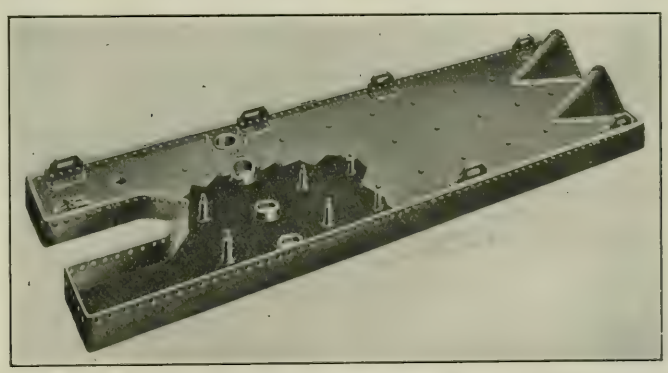
Unusual Treatment Problem

Owing to the fact that nearly one-half of the copper in the ores of the Panuco mines in the state of Coahuila, Mexico, is in the form of sulphate and black oxide, it has been necessary to work out a combined leaching and concentration method. The ore is low-grade and was opened up in an irregular manner to secure the high-grade ore which would stand wagon haul. The exposure of the sulphide ores, together with the effects of an underground fire, have made the alteration of the ore very extensive in the mine.

Elaborate experiments for the treatment of the ore have been made and it is hoped that before long a satisfactory method will be evolved. A short line of railroad connects the property with the National railroad. The mine belongs to the Continental Mining Company, of San Antonio, Texas, of which Arthur C. Tuttle is general superintendent.

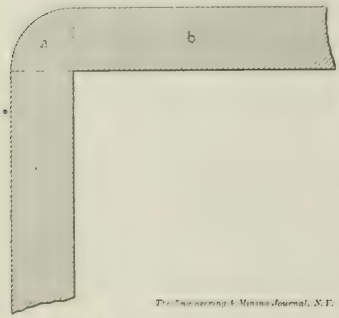
The Traylor Water Jacket

A blast-furnace water jacket without expanded nipples or rivets exposed to the cutting action of a charge of ore is one of the latest products of the Traylor Engineering Company, of Allentown, Penn. The two plates forming the jacket are pressed cold by a special 400-ton hydraulic press, and are then bolted or riveted together. By using the hydraulic press, three decided advantages are gained over ordinary methods for making water jackets. First, a uniform thickness of the plate; second, the side flanges are perfectly straight, and third, square corners are formed, allowing the plates to fit together closely when assembled. Wherever the edges of the plates are to be joined, they are brought together as shown in the drawing, where *b b* represents two plates. The space *a* is then filled with iron by the autogenous welding process. Thus, the two



NEW TRAYLOR WATER JACKET

plates are actually fused together forming a perfectly tight joint. It will be noticed in the photograph that the tuyere openings are an integral part of the lower plate, and that no stiffening bars, separators, or thimbles are required. Where necessary, the plates are stayed by the Hawkes patent stay bolts, making them as rigid as a boiler firebox. The jackets are tested



METHOD OF WELDING FURNACE JACKET

under an internal pressure of 25 lb. per sq.in., and are not weighted in any manner to prevent warping or irregular expansion.

In addition to welding the water jacket, all the bustle pipes for the furnaces are welded together, making them absolutely air tight. The flanges on the connecting pipe from the bustle pipe to the tuyeres are also welded to the pipe. This makes a minimum of joints and reduces the leakage of air to the smallest possible amount.

Liberty Bell Mine, Colorado

SPECIAL CORRESPONDENCE

Operations at the Liberty Bell mine, Telluride, are on a satisfactory basis and the daily output has reached 400 tons, at which figure it is being maintained. Construction, as far as planned, is nearly complete, and the new bunk house, offices and ore house at the Stilwell tunnel are said to be safe from any possible movement of snow.

The power equipment is now centralized in an underground transformer and compressor station. A single unit only of the electric hoisting system is to be installed during November. The tramway handles the output without difficulty in 2 shifts.

Milling work will be unchanged except for the possible addition of increased settling capacity and concentrating surfaces. The operation of six Deer continuous settlers during the last year has been entirely successful. Underground development, the product of which has been [illegible] in the mine of about 750 ft. per month, is [illegible] and [illegible] the year.

The Tyee Smeltery as an Outlet for Pacific Coast Ores

BY E. JACOBS

During twelve months ended August 31, 1909, approximately 45,000 tons of ore were smelted at the Tyee Copper Company's smeltery at Ladysmith, Vancouver island, British Columbia. The matte produced contained about 3,500,000 lb. of copper. This was the largest production of copper at these works in any period of twelve months since the company's fiscal year ended April 30, 1905. The aggregate output of copper at this smeltery since 1902 is estimated at about 22,000,000 pounds.

Ore supplies are drawn from an extensive district, from as far north as Latouche, Alaska, and south as far as Salina Cruz, Mexico, consequently operations are not now, as formerly, entirely dependent upon the ore production of copper mines on Vancouver island and adjacent coastal districts of British Columbia.

After the fall in the price of copper in October, 1907, only a few of the better-equipped and higher-grade mines continued to ship copper ore to the smelters through 1908. In 1909, however, notwithstanding that during the part of that year under review the average price of copper in New York has been but 12.97c. per lb., the production of copper ore in the district has gradually tended toward the earlier normal quantity, consequently smelting operations at the Tyee smelting works have been on a larger scale than during several preceding years.

W. H. Trewartha-James, general manager of the Tyee Copper Company, has lately expressed the opinion, based upon reports of mining engineers, employed by his company and of other engineers who have visited some of the coast mining camps, that the copper resources of Vancouver island and other parts of the Pacific coastal district are great. It will be only a matter of time and the necessary expenditure of money in development work, together with the exploration of comparatively large areas as yet not easily accessible, and the provision of means of communication between the coast and the hinterland, ere there will be opened up deposits of copper ores exceeding in size and value any yet exploited in the district.

SUPPLY OF ORE INCREASING.

The Tyee Copper Company during the last two years has been developing a number properties, some on Vancouver island and others situated at different parts of the coast district. While encouraging results have been obtained in several instances, none of these properties yet produce on a commercial scale. As, however, a commencement has been made to ship copper ores to this coast from such distant places as Korea and South America, a gradual increase in the supply of smelting ores is looked for. The better outlook for an increased ore supply, chiefly from the coast mines of British Columbia, southern Yukon and Alaska, and in small measure from distant foreign parts, has encouraged the management of the Tyee Copper Company to increase the capacity of its works by the installation of a second blast furnace.

The new Tyee furnace is 48x160 in. at the tuyeres, which are 6 in. in diameter and 22 in number. The blast is supplied by a No. 8 Connersville blower, capable delivering 14,000 cu.ft. of free air per min. at 2-lb. pressure. The blower is driven by a 12x24x30-in. cross-compound Corliss engine. This furnace was blown in last July, but it has not yet been operated to its full capacity, which is estimated at about 12,000 tons of ore per month, of course, dependent upon the character of the smelting mixture available. Taking the capacity of the old furnace at 8000 tons per month (it has smelted up to 330 tons per diem when running on a smooth mixture), the present total treatment capacity of the Tyee smeltery is about 20,000 tons of ore per month. Calculating the average recovery of copper, after allowing for slag losses, at 80 lb. per ton of ore, this would give a production capacity of 1,600,000 lb. of copper per month, or 19,200,000 lb. per annum, provided that sufficient ore could be obtained to keep both furnaces regularly in full blast.

The ore-handling arrangements at these works have been brought to a high degree of efficiency and economic working. The facilities for unloading ore arriving by water at the company's wharf are well ahead of present requirements, being equal to 1600 tons of ore per day; at short notice the plant could be made to handle an increased tonnage, additions that would be required not being important. Included in the hoisting appliances is an ingeniously contrived trolley, designed by W. J. Watson, smeltery manager. This trolley effectually does away with the customary jar occasioned by changing from vertical to horizontal movement of load when hoisting ore from a vessel, and repeated practical tests by continued use in ordinary ore-unloading operations have proved it well suited to the purpose for which it was designed.

Production of matte at Ladysmith is not yet sufficiently large to induce the Tyee Copper Company to install a converting plant, so the matte is shipped to the smeltery at Tacoma, Puget sound, Washington, to there be converted into blister copper and shipped thence to an eastern refinery.

Rescue Work at the St. Paul Mine

Pending the receipt of a full account of the accident at the St. Paul coal mine at Cherry, Ill., a brief review is given of the rescue work as outlined by the despatches up to the time of going to press. Upward of 300 miners were imprisoned in the St. Paul mine on Nov. 13, as a result of a fire starting from the ignition by an open torch of hay in the mine stable. At this writing, about 150 miners are still unaccounted for; 130 bodies have been found and 20 miners have been removed alive from the mine. Except those who escaped from the mine before the openings were blocked by smoke on Saturday, Nov. 13, no miners were removed alive until Nov. 20, one week later, when 20 miners who had walled themselves in in a large chamber off the second gallery, were brought to the surface alive. It is the opinion of those on the ground that there are others who followed the example of these men and who may yet be rescued.

The members of the first rescue party which entered the mine on the day of the accident, were lost with the exception of one man. That evening the main and ventilating shafts were sealed and on Nov. 14, rescue parties headed by R. Y. Williams, of the U. S. Geological Survey, and James Taylor, State mine inspector, made three descents without practical results. The rescue party was equipped with oxygen helmets and cylinders and on the first descent reached a depth of 60 ft. The shaft was filled with smoke, which the electric lanterns of the rescue party failed to penetrate. In the second descent a depth of about 300 ft. was reached, and on the third descent, the rescue party made a careful examination at the second level. The temperature in the shaft at this point was bearable but the atmosphere, without oxygen apparatus, was intolerable.

On Nov. 16, fire hose and engines were brought from neighboring cities and under the direction of Fire Chief Horan, of Chicago, water was turned into the mine. The temperature in the main shaft was reported at this time as 190 deg. F. a short distance below the collar. Later in the day the temperature in the main shaft was 111 deg., and in the air shaft, 68 deg. The following day two descents were made into the ventilating shaft and 20 dead bodies were found as the result of this exploration. At 5 p.m. it was decided to break the seal on the main shaft, this being followed by the belching of smoke from the shaft. The temperature was then about 90 deg. Shortly thereafter, a rescue party descended to the fatal second gallery, and though the safety lamps were not extinguished, the entrance was found to be blocked by mud and timbers.

On Nov. 19, five and one-half days after the accident, the first dead man was removed and on the succeeding day, the 21 miners who had walled themselves in in a large chamber on the second level were reached, and 20 of them were brought to the surface alive. On removing the débris from the trap door at the third east drift, a heap of bodies were found piled against the door, these men having evidently been killed by breathing the poisonous gases. On Nov. 22, 38 bodies were found in the east end of the second level. It was the opinion of the coroner's jury that these men had been dead less than 48 hours. A representative of the JOURNAL has been sent to the scene, and a full and authentic account will be given in a later issue.

Later—Practically all of the miners have been accounted for, and it is now almost certain that no more men will be saved. About 168 bodies have been discovered piled on and about a ladderway near the shaft in the lower level.

New England Coal Trade

A carefully prepared report just issued by the Committee on Fuel Supply of the Boston Chamber of Commerce gives some interesting details as to the consumption of coal in New England and the sources from which the supply is drawn. From this report we have compiled the accompanying table, showing the approximate quantity of coal delivered in New England in 1908, and the routes by which it reached that territory. The figures are in long tons.

COAL CONSUMPTION OF NEW ENGLAND

Receipts by Water.	Anthracite.	Bituminous.	Total.
Consumed at ports..	3,788,078	7,266,976	11,055,054
Reshipped by rail...	1,307,440	3,650,053	4,957,493
Total by water....	5,095,518	10,917,029	16,012,547
Receipts, all rail....	3,512,059	4,547,294	8,059,353
Total.....	8,607,577	15,464,323	24,071,900

The quantity entered above in the receipts by water as consumed at ports is undoubtedly too high, as it includes 2,065,000 tons of bituminous coal intended for the use of the railroads. There are no statistics to show how much of this was actually delivered to locomotives at the ports of entry, and how much was hauled to other points. Assuming that one-half of it was thus hauled, it would appear that 37.4 per cent. of the coal received by water was transferred to cars and hauled to other points by rail. The water receipts were 59.2 per cent. of the anthracite, 70.6 of the bituminous and 66.5 per cent. of the total coal. This large proportion is due to the extended coast of New England, the numerous ports, and the comparatively short haul from those ports to many or most of the consuming points. The low water rates from the coal-shipping ports over-balance the cost of the double transfer required.

The report makes a distinction between railroad and commercial coal—that is, the coal consumed in operating the railroads and that sold and supplied for domestic and factory use. These figures are as follows:

	Anthracite.	Bituminous.	Total.	Per Cent.
Commercial coal.....	8,607,577	11,074,323	19,681,900	81.8
Railroad coal..		4,390,000	4,390,000	18.2
Total.....	8,607,577	15,464,323	24,071,900	100.0

The quantity of anthracite consumed by the New England railroads is so small as to be practically negligible. It seems also safe to assume that at least 90 per cent.—probably more—of the anthracite received is for domestic consumption, few factories using anything but bituminous coal.

The origin of the bituminous coal used in New England is not given, but the receipts at Boston may, to a certain extent, be taken as typical. The total arrivals at that city in 1908, of domestic coal, were 1,776,401 tons of anthracite and 3,302,929 tons bituminous; a total of 5,079,330 tons, of which only 105,656 tons came by rail. The water receipts of bituminous coal were as follows:

	Tons.	Per Cent.
N. Y. and Philadelphia....	578,336	17.8
Baltimore and Washington	1,294,747	39.9
Newport News and Norfolk	1,367,479	42.3
Total.....	3,240,562	100.0

The receipts from New York and Philadelphia were mainly Pennsylvania coals— Clearfield and other central districts; those from Baltimore were from the Cumberland basin in Maryland and from Fairmont and adjoining districts in West Virginia; while the rest were Virginia and West Virginia coals. The imports of foreign coal at Boston last year were 370,709 tons, all but 509 tons coming from Nova Scotia. This is probably a very large proportion of all the Nova Scotia coal used in New England.

An interesting table shows the class of vessels carrying the coal delivered at the port of Boston in 1908; and here again Boston may be taken as typical of all the New England ports. The figures are as follows:

	Anthracite.	Bituminous.	Total.	Per Cent.
By steamers....	2,517	987,959	990,476	19.9
By sailing vessels.....	8,449	1,153,865	1,162,314	23.4
By barges.....	1,722,146	1,098,738	2,820,884	56.7
Total.....	1,733,112	3,240,562	4,973,674	100.0

This shows to what an extent the barges towed by sea-going tugs have taken the coastwise trade. They carry practically all the anthracite, most of those in that trade being owned by the coal companies. Sailing vessels still carry a good part of the bituminous coal; but steam colliers are taking a large share of it, and may be expected to take more when the Virginian railroad company carries out its plans of direct shipment. The average cargo delivered by steamers was 3931 tons each; by sailing vessels, 2801; by barges, 1457 tons.

Safety Fuses in France*

This paper embodies in a condensed form the facts ascertained in the course of an inquiry, instituted by the French Ministry of Public Works, into the utilization of safety-fuses, on account of certain accidents which had been attributed to over-rapid combustion of these fuses.

All the fuses employed in French mines are of home-manufacture, the annual output of the four factories in France where they are made averaging 30,610,000 yd. (in rolls of about 11 yd. or 10 m.). Rather more than two-thirds of this quantity is used up in the mother country, the rest finding its way to Algeria and the French colonies.

Whatever their source, the fuses may be ranged under various categories which have considerable mutual analogy, whether manufactured in France or in other countries. The method of manufacture, with the exception of some trifling details, seems to be much the same everywhere. The exterior envelop, in regard to the combination of the materials of which it consists, appears to admit of considerable variation: but the envelop, however it is made, seems to have no effect whatever on the rapidity of propagation of ignition.

This rapidity of propagation may vary with the chemical composition, the granular texture, and the hygrometric condition of the gunpowder in the fuse. It may also vary according to whether the fuse is freshly made or stale, or according to whether the latter has been kept in a dry place or a damp one, in a cool atmosphere or a heated one. It has been shown by the experiments that this variation may range in time, for fuses burning in the open air, between 40 and 150 sec. The general average, corresponding to the conditions obtaining on the whole in mining practice, would appear to be about 100 sec. in the open air, both for French fuses and for those from other countries which were subjected to identical tests.

A Comparison of Fuses

Mr. Loiret compared two fuses, first after they had been stored in a very dry place, and then after they had been exposed for a long time in a very damp part of the mine; he got for one of them 85 sec. and 100 sec. (or a reduction of 17 per cent.); and for the other 109 sec. and 150 sec. (or a reduction of 45 per cent.). Mr. Aron, by warming fuses in the sunlight or in a stove, got variations amounting to a maximum of 30 per cent. He found also, that when a fuse is burned in the open air and strongly pressed under foot, or squeezed in a vise, a loud explosion takes place when the ignition reaches the compressed portion, and generally too when the ignition leaves the compressed portion to travel farther on. Mr. Aron, assuming that energetic compression of the fuse might induce acceleration of the speed of ignition, placed a fuse within an iron tube, closed at one end by an iron slide and well stemmed with plastic material. He obtained in this way a speed acceleration of 500 per cent., or say a speed of at least 19 sec. per yard. These experiments were repeated in the live rock, under ordinary conditions of working, and with appropriate stemming, speed accelerations amounting to as much as 296 per cent. were obtained. The experiments made by Mr. Champy, assistant general manager of the Anzin Colliery Company, in the main confirmed Mr. Aron's results. From this it may be concluded that there is a general similarity between all the fuses obtainable in commerce, in regard to their speed of ignition; but the possibility of considerable variations in the normal speed of a given fuse is not excluded, owing to the intervention of such factors as its intrinsic character, its actual state at the time of use and the manner in which it is used, and especially the conditions and mode of stemming.

Attention Called to Defects

The defects to which attention is directed are of three kinds: (1) Defects involving too great a speed of propagation, and conseqently premature explosions which might prove particularly dangerous; (2) defects occasioning too slow a speed of propagation or else missfires, with results to be described rather as vexatious than as dangerous; and (3) defects causing lateral spurting. Notwithstanding the recent great fall in price (nearly 50 per cent.) of fuses, the investigation has shown that the defects enumerated above are no more frequent now than at any previous time; nor are the fuses of one manufacturer, on the whole, more open to criticism than those turned out by another.

Lateral spurting is declared to be a matter of interest and importance in the case of fiery mines alone. To what extent it is dangerous even there, is a question that can only be settled by direct experiment.

Passing over the defects which occasion miss-fires—and most factories are so equipped as to discover these by manual or by mechanical means—the report deals with the defects which, by exaggerating the speed of ignition, may cause premature explosion. It will be noted, however, that it has, in no case where an accident was really or supposedly assignable to this cause, been possible to establish beyond doubt that there was an actual defect in the make of the fuse. Subsequent experiments on the very same roll of fuse have only shown it to possess the normal speed of ignition. Whence it may be inferred that such accidents are more justly assignable to the conditions under which the fuse is employed; it has already been pointed out that these conditions, from those concerning the state of preservation of the fuse, to those concerning the stemming or the particular length employed, may involve variations, even in a quite normal fuse, sufficient to account for the most unpleasant surprises in the nature of premature explosions. Lengthening of the fuse might diminish the risk; but there is always a risk inherent in the use of any fuse, despite the immense progress which it has involved in the comparative convenience and security with which explosives may be handled.

At the Anzin collieries, about 0.5 per cent. of every delivery of fuse is tested in the dark (to ascertain whether there is lateral spurting). Fuses of too low or too high a speed, or which do not ignite with sufficient regularity, are left on the maker's hands. Various collieries in the Pas de Calais and in other parts of France also test the fuses on delivery.

The committee of inquiry was unanimously of the opinion that such tests should be made obligatory by ministerial decree, but appears to have been somewhat divided as to the particular formulas that should be set up as standards.

* Abstract of article published in *Annales des Mines*, 1907, Series 10, Vol. XI, pages 255-292.

Use of Fuels in Locomotives

Special Correspondence

The U. S. Geological Survey has completed, and will shortly distribute, a bulletin giving the result of experiments conducted during the past year with a view to contributing to the solution of the special problems of combustion in locomotive boilers. The bulletin has been compiled because of the fact that the coal used on the railroads of the United States is over one-fifth of the coal production of the country so that "any small saving that can be made effective * * * at once becomes an important factor in conserving the fuel supply of the nation."

Experiments for the purpose of dealing with the fuel question were conducted in the locomotive-testing laboratory of Purdue University and the coöperation of the Survey has consisted in detailing experts to assist the regular staff of the laboratory in the chemical and calorific work of the tests. These experts became responsible for the sampling of smoke-box gases, the cinders caught in the front end of the locomotive and the refuse caught in the ash pan. The experiments were carried on with two classes of coals, both of good quality. The following

table gives a general summary of the results obtained in the experiments, translated into terms of tons on the basis of an assumption that the roads annually consume 90,000,000 tons of coal.

SUMMARY OF RESULTS OBTAINED FROM FUEL BURNED IN LOCOMOTIVES.

	Tons.
1. Consumed in starting fires, in moving the locomotive to its train, in backing trains into or out of sidings, in making good safety-valve and leakage losses, and in keeping the locomotive hot while standing (estimated)	18,000,000
2. Utilized, that is, represented by heat transmitted to water to be vaporized	41,040,000
3. Required to evaporate moisture contained by the coal	3,600,000
4 Lost through incomplete combustion of gases	720,000
5. Lost through heat of gases discharged from stack	10,080,000
6. Lost through cinders and sparks	8,640,000
7. Lost through unconsumed fuel in the ash	2,880,000
8. Lost through radiation, leakage of steam and water, etc.	5,040,000
	90,000,000

As to this showing the experimenters conclude: The amount of fuel consumed in preparing locomotives for their trains, etc. (item 1), is dependent only to a very slight extent on the characteristics of the locomotive, being in large measure controlled by operating conditions, by the length of divisions, and by the promptness with which trains are moved. Under ideal conditions of operation much of the fuel thus used could be saved, and it is reasonable to expect that the normal process of evolution in railroad practice will tend gradually to bring about some reduction in the consumption thus accounted for.

The fuel required to evaporate moisture in the fuel (item 3) and that which is lost through incomplete combustion (item 4) are already small and are not likely to be materially reduced.

The loss represented by the heat of gases discharged from the stack (item 5) offers an attractive field to those who would improve the efficiency of the locomotive boiler. So long as the temperature of the discharged gases is as high as 800 deg. F. or more there is a possibility of utilizing some of this heat by the application of smoke-box superheaters, reheaters, or feed-water heaters, though thus far the development of acceptable devices for the accomplishment of this end has made little progress.

The fuel loss in the form of cinders collecting in the front end and passing out of the stack (item 6) is very large and may readily be reduced. The results here recorded were obtained with a boiler having a narrow fire box; the losses in the form of cinders would probably be smaller with a wide fire box. A sure road to improvement in this direction lies in the direction of increased grate area.

The radiation and leakage losses (item 8) may in part be apparent rather than real, owing to possible inaccuracies in the process of developing the heat balance. On the assumption that the values are correct as stated, however, it is not likely that under ordinary conditions of service they can be materially reduced.

Locomotive boilers are handicapped by the requirement that the boiler itself and all its appurtenances must come within rigidly defined limits.

Explosion in Anthracite Mine

SPECIAL CORRESPONDENCE

Five miners perished, Nov. 9, when they were imprisoned by a wall of flame which swept through the Auchinloss colliery of the Delaware, Lackawanna & Western Coal Company, at Nanticoke, seven miles below Wilkes-Barre, Penn. The flames were subdued by the rescuing party after a long struggle, and the five dead bodies were removed from the shaft. The mine officials took an inventory of the safety lamps used by the employees and found that two more men were within the affected region.

The blaze followed an explosion of gas in the Ross vein late that afternoon and spread with such rapidity that two miners were overtaken by the flames and were barely rescued by a force of mine workers, who wrapped their coats about their heads and dashed in for them. One of the miners was so badly burned that he died before he could be taken from the mine, and the other man cannot live.

Beyond the point where the explosion occurred were five mine workers, and these were cut off from the outlet to safety by the flames.

Difficulties in the Way of Improving Explosives in Use

SPECIAL CORRESPONDENCE

According to statements made by officers of the U. S. Geological Survey, one of the chief difficulties that is being encountered in the work of securing the adoption of permissible explosives in mines for the purpose of reducing the danger of accident is the attitude that is being taken by trades-union authorities. Three States have now officially adopted the list of permissible explosives which has been published by the Geological Survey as the result of its work in explosives testing—Pennsylvania, Alabama and West Virginia. These States, however, will be greatly hampered if the unions seek to deal with the matter through political channels. The position which is being taken by the union men according to the officials is that, inasmuch as the permissible explosives tend to shatter the coal considerably more than black powder would, they lessen the earning power of the miners, and are hence to be antagonized.

The California Coal-Mining Industry

SPECIAL CORRESPONDENCE

The coal-mining companies started in California in recent years seem to have been playing in "hard luck," as none of them have been productive and they have become involved in litigation. Even the older coal properties, such as those at Pittsburg, usually called the Mount Diablo mines, are doing little or nothing compared with previous activities. The most promising of the new companies was the Stone Canyon Coal Company, about 22 miles from Bradley, Monterey county, where the coal was supposed to be of much better quality, and in larger bodies than in other California coal mines. Considerable money has been invested in this property in development and machinery, and for a time the coal was largely advertised in the San Francisco papers as a material adapted for domestic production which could be bought for less than the imported coals generally in use in California.

The attempt to introduce the coal in large quantities was evidently a failure. A suit to have a receiver appointed, brought before the United States Circuit Court in San Francisco, resulted in the closing down of the mines, and now this is followed by a suit in the same court praying for a receiver for the Stone Canyon Pacific Railroad Company, which was built to carry the coal from the mine to the trunk-line road at Chandlor. There is nothing else for the railroad to do except to carry the coal from this mine, and the Guaranty Trust Company, of New York, asks the court to take cognizance of its claims on an auxiliary mortgage of $1,385,000 in case a sale of the road is made. The original or purchase-money mortgage fell due when the coal company failed to mine at least 200 tons of coal daily, and no interest has been paid on bonds amounting to $530,000. In fact, the mine was expected to furnish at least 1000 tons of coal daily, but this it has not done, no market for it having been found in the short time during which active operations have been carried on.

The Monterey Coal Company, whose properties are supposed to be on the same coal belt as that of the Stone Canyon Company, is also involved in litigation due to controversies among the stockholders. Some of the principal ones have bought up certain gas and electric and street railroad companies in towns in Monterey county, and it is their ultimate intention to make producer gas from their coal with which to generate electricity to be furnished to the towns in the county, and possibly later, to cities on San Francisco bay. Meantime no work of mining coal is being done at the mines

Review of Coal Mine Accidents in Europe

A book has recently been issued containing the report of a committee appointed by the British Royal Commission on Mines to inquire into the occurrence and prevention of accidents from falls of roof and side, underground haulage and shaft accidents. The report was prepared by the three mining engineers, R. G. S. Redmayne, chief inspector of mines, A. M. Lamb and W. Walker, who composed the committee. It contains much useful information regarding accidents in mines and their prevention, obtained from visits to a number of the principal collieries both in England and on the Continent. The report, which is liberally illustrated, forms a valuable textbook of modern practice as regards the special subjects treated.

Japanese Coal*

The amount of coal produced in Japan in the first half of the present year was 6,445,050 tons, an increase of 318,418 tons, or 5.2 per cent., as compared with the corresponding period of the last year. The output of coal in Hokkaido during the period amounted to 824,000 tons, an increase of only 20,000 tons as compared with the corresponding period of last year.

Latest report puts the amount of coal produced in Japan at over 13,000,000 tons per annum, nearly 60 per cent., or over 7,000,000 tons of which are mined in Kiushu. Of the total output of Kiushu, over 35 per cent., or nearly 2,500,000 tons, are exported to Singapore and the north. In other words, Kiushu, Miike, and other Japanese coals are at the present time swaying the Oriental coal market. The chief markets of Kaiping coal are Tientsin and the vicinity where nearly 300,000 tons are disposed of, and the remainder (1,200,000) is exported to Ching-Wang-Tao and South China generally as far as Hongkong and Singapore. Looking at the future of Fushun coal, its output is only 2000 tons per day, but the South Manchurian Railway company is planning to mine 5000 tons daily or 1,800,000 tons per annum from 1912 when Oyama and Tigo mines are opened. The company consumes 300,000 tons for its own railway and the regular customers take 35,000 tons per annum, and the remaining 1,465,000 tons must be disposed of in the foreign markets. In three years Kiushu and Kaiping coals would, of course, be competing in the Far Eastern market. Meanwhile, the output of Fushun coal produced in Kiao amounts to [illegible] per annum, and its output would be still greater in three [illegible] and may even [illegible] competition.

*[illegible] correspondence at London [illegible]

The cost of production of Fushun coal is cheaper than that of Kaiping coal, and still more so as compared with that of Kiushu coal. Therefore, Fushun coal would stand in the best position in the competition of the foreign markets so long as the freight of the above coals is the same as that of Fushun coal, and it would finally be the king in the East from Hongkong in five or six years from now.

An Excellent Market for American Coal in Chile

The American consul in Valparaiso reports there is an excellent opening for American coal in Chile. About 1,500,000 tons of foreign coal are consumed yearly in that country, of which England and Australia supply the greater part. The price on shipboard in Chile varies from $6.56 to $9.24 per ton.

Much complaint is heard because of the poor condition in which the American coal arrived in Chilean ports in the past. They say it is too fine and that it crumbles too easily, even though it does arrive in lumps, it does not stand handling. It would pay to study this trade, as Chile offers from $8,000,000 to $10,000,000 worth of coal business that American interests should share.

During 1908 the imports from the United States were 9691 tons in a total import of 1,599,614 tons, of which 544,018 tons were landed at the port of Valparaiso. There is no duty on coal.

Colliery Notes

It is reported that the output of coal in British India in 1908 was 12,140,026 tons; an increase of 1,022,538 tons as compared with 1907. More than 95 per cent. of the entire output was produced in Bengal. Indian statistics give the tons mined per year per person employed as follows: India, 101; England, 290; the United States, 596.

In several of the Illinois mines, where naked lights are permitted, acetylene pit lamps are being used instead of oil. These lamps cost the men $1 each and carbide is furnished at 10c. per two pound can. The expense for maintaining these lights is from 1c. to 1½c. per day, which expense is less than the cost of oil for the ordinary lamp. The acetylene lamps give off no smoke and consume less oxygen.

Judge Henderson, of the Pennsylvania Supreme Court, sets forth in an important opinion, the liability of coal companies which dump refuse and culm into a river that later floods private property and causes damage. The opinion is in the case of H. W. Pierce against the Lehigh Valley Coal Company and involves Judge Lewis of Luzerne county. Mr. Pierce sued on the ground that several acres of his land were ruined by culm washed onto it in flood time. He charges that the culm came from the Dorrance and Prospect collieries.

About 40 per cent. of all the coal produced in the United States is cut by machinery, while in England less than 10 per cent. of the output is machine mined. Many English operators claim that their coal seams are not favorable to the use of machinery, and the old system of undercutting by hand is generally practised. As the tendency of coal-mine managers everywhere is toward the saving of time and labor, it is certain that before long a machine will be designed which will undercut English seams satisfactorily. The antiquated method of undercutting by manual labor will then disappear quickly.

After many unsuccessful efforts to extinguish a mine fire that started 50 years ago in one of the Lehigh Coal and Navigation Company's mines in the Panther Creek region of Pennslyvania, it is believed that the problem has been solved. Flushing and flooding the burning area have failed to extinguish the fire, so the mine management undertook to separate the burning coal from the virgin territory by building a fireproof concrete wall, 12 ft. thick and 1050 ft. long. Building this wall was a tremendous task, for an open cut of such size was practically impossible. The plan pursued was to sink a series of shafts in exact line until the coal seam was reached. The foot of these shafts was connected, the wall built and the coal seam thus cut in two. It is estimated that when this work is finally completed the total cost will amount to at least $250,000. It is claimed that this expenditure will save 400,000,000 tons of anthracite coal.

Aluminum coated sheets in corrugated form, made by the Wilder Metal Coating and Manufacturing Company, Connellsville, Penn., have been specified for the new coal tipple of the Isabella Connellsville Coke Company, at Arensburg, Penn. The sheets made by this process were adopted after an exhaustive investigation by George S. Baton and Company, civil and mining engineers, Pittsburg. The company advises us that it was found, that the sheets were impervious to weather and atmospheric conditions around coking plants. The metal was placed in running mine water, together with copper. The sulphur water left only a shadow of the copper, while the aluminum coated sheet was not apparently injured. Several years ago pipe was thus coated and placed in a Connellsville mine where the sulphur water was the strongest, and after years of service it was found to be in perfect condition, having outlived three black pipes and apparently in condition to last again a long. It is recommended by the manufacturers that the metal be not painted, unless painting is desired, and they give a guarantee of 10 years' service without the metal showing any signs of corrosion.

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The St. Paul Mine Disaster

But little further is yet to be said of the terrible accident at the St. Paul mine at Cherry, Ill. The attention of the rescuing parties so far has been entirely taken up in the search for survivors and bringing out the bodies of the dead. From 75 to 80 bodies are reported as having been taken out up to the latest accounts. On Nov. 20, just one week after the accident occurred, a rescue party succeeded in forcing its way into a chamber in the workings where they found 21 men still living. As was to be expected, most of these men were in terrible condition; one died after being brought up to the surface, and several others are in a critical state. These men had either been working in the chamber, or succeeded in making their way there before it was closed off from the rest of the mine by a wall, and it is to this that they owe their escape from the fire and gas. They had lived for a week without food and with only very small quantities of water, which leaked through crevices in the walls of the chamber and which they were able to collect. The air, of course, soon became vitiated and their sufferings were very great.

Probably the only parallel to this rescue can be found in the great disaster at the Courrières mine, in France, in March, 1906, when over 1000 men were killed. In that mine 18 men were taken alive from a chamber 20 days after the accident occurred. They had managed to survive after terrible suffering, and were brought to the surface still living.

It appears that the second opening, or air shaft, of the St. Paul mine was only 300 ft. distant from the main shaft, and consequently it was closed immediately by the fire in the same way as the main shaft was. Had this second opening been at a greater distance it is probable that many lives might have been saved.

Calaveras Copper Company

A new offering to the public, this week, is 50,000 shares of the treasury stock of this company at $5 per share. The capital of the company is $5,000,000, divided into 1,000,000 shares, of which 550,000 are outstanding and 450,000 are in the treasury. There is also an issue of $450,000 of 6 per cent. bonds. The present sale of treasury shares is to provide working capital. After these have been allotted, says the prospectus, an active market for the stock will be made through the purchase and sale of the stock now held by those who have secured the property from the Ames estate; and it is the belief of these owners that the public will put a much higher value than par upon the stock when it is known that it can be obtained only in the open market. The prospectus further states that "when the new conditions" are established in the copper industry "a stock with the merit of Calaveras should return fair dividends upon a price of $35 to $45 per share."

The prospectus contains an engineering report by Josiah H. Trerise, who is a director of the company.

This company really possesses a mine, and the stories that are told as to its long and picturesque history are substantially correct. However, there are some points in the prospectus that are open to criticism. It is stated that refined copper will nearly always command on the Pacific coast a price of 1c. per lb. in advance of the Eastern market. This has previously been assumed by engineers who have examined this property, but G. McM. Ross, formerly manager of it, said in the JOURNAL of March 14, 1908, that this could not be done. On the contrary, a large production of refined copper on the Pacific coast would have to be sold at less than New York quotations

Mr. Trerise estimates that the mine has 400,000 tons of ore, averaging 4 per cent. copper, on the dumps and developed underground. The present plant is estimated to be capable of treating 300 tons of ore a day, producing about 8,000,000 lb. of copper per annum, the ore reserves being consequently about three years' supply. However, Mr Trerise goes on to reckon 10,000,000 tons of ore, averaging 3 per cent. copper, as "ore proven," though at first he qualifies it as "probable ore." Later on he considers it to be simply "ore proven" as distinct from the "developed ore," and he indicates that it will be an easy matter to increase the production to 17,000,000 lb per annum, and even to 35,000,000 pounds

The evidence adduced hardly gives us confidence in the proven character of the 10,000,000 tons ore, nor does our previous knowledge of the lean character of these deposits The mine has not, in recent years, produced anything like 8,000,000 lb

of copper per annum, and for a good deal of this time, even until recently, it has been idle. Surprise has been expressed that it should have been allowed to remain idle in view of the actual development of ore, and it is likely that the mine can, under good management, yield some profit, but that it can be quickly developed into a great copper producer we do not think the evidence is yet satisfactory, and we have our doubts as to its ability to produce at 8c. per lb. However, assuming this for sake of argument, there would be about $2 per share (issued) recoverable in three years from the ore developed on basis of 13c. copper, besides which there are the bonds, issued in part payment for the property to the Ames estate, to be taken care of. With respect to the 10,000,000 tons of "ore proven," the officers of Calaveras Copper Company are much too vague.

The Coming Copper Consolidation

The plans for this much discussed project have not yet been announced. We do not believe that they have been fully formulated. We do not believe that anyone outside of the principals knows precisely what is contemplated. However, guesses are the order of the day.

We surmise there will be a new holding company with a capital of preferred and common stock. This company will probably take over the mining interests at present controlled by Amalgamated and Cole & Ryan, together with Nevada Consolidated and Utah Copper Company, commonly known as Guggenheim interests, although the Guggenheims are not believed to be in control of Utah Copper Company. The copper mining interests of J. P. Morgan & Co., will probably be absorbed, and the recent behavior of the stock of Boston Consolidated indicates that it, too, may be taken in.

The new company will probably absorb the United Metals Selling Company and the International Smelting and Refining Company. We do not believe that the American Smelting and Refining Company and American Smelters Securities Company will be absorbed [illegible] because they [illegible] and the chief interest [illegible] in copper. However [illegible] may take over the [illegible] or may make [illegible] the disposal of the comparatively small amount of copper that will remain after the Nevada and Utah outputs have been taken away.

The new company is expected to control a large percentage of the copper production of North America, which means a large percentage of the world's production, and by a curtailment of output on its own account elevate the price for copper sufficiently to pay dividends on the present water plus the water that may be added; and convert into marketable form a good many securities that a good many persons are tired of keeping. It is argued that the manufacturers of copper will not mind a higher price, indeed will rather like it (of course the consumers don't count), so the project is quite philanthropic, but discussion of its beauties is obviously best deferred until we are permitted to behold them.

The Ely Central Affair

We have received a great many letters in approval of our exposure of the promotion of this company, which led to a fall in its stock from about 4¼ to about 1½. We have received only two letters in dissent. The writers of these, who were both purchasers of stock in the company, complain that we depreciated their investments. We should similarly depreciate an investment in counterfeit money, if we showed it to be counterfeit.

As for the Ely Central property, O. A. Turner, president of the company, in a public statement virtually admitted what we said about it. He admitted that the showings of ore in the Monarch and Clipper shafts are but "prospects," and that the continuation of the Nevada Consolidated orebodies has not been proved, but thinks that it may be proved on the strength of some geological theorizing.

Consequently we have reduced the claim for this property from a porphyry orebody of 33,000,000 tons (exceeding the development of Nevada Consolidated in its three mines after more than five years of work) to some prospects and a geological hypothesis. This was the shadowy basis upon which poor people were being led to buy the property upon a valuation of $5,000,000 to which it had been boosted from $1,000,000 in eight weeks. The deluded investors were simply taking the property off the hands of its tired owners at enormous profit to them and to some unprincipled "promoters." The part of the public money that was going into the property for development was a mere bagatelle—a pitiful $36,000—but the philanthropists conducting the operations were going to ask the public to supply $600,000 more, minus a rake-off, to try to make something out of its own $5,000,000 property.

The explorations that are now in progress may find a payable orebody and may not. Whatever be the result, it has nothing to do with the case. The latter pertains solely to the attempt to sell an unproved prospect at the price of a developed mine.

The Aluminum Company

The Aluminum Company of America has declared a stock dividend of 500 per cent., which will increase its capital from $3,200,000 to $19,200,000. The company is said to have been paying 12 per cent. upon its outstanding stock of $3,200,000. When the Payne tariff was under discussion, an officer of this company stated that the aluminum business had been only ordinarily profitable, dividends having been paid in but 11 years out of 20, and the average dividend for the 11 years having been only 8 per cent. on a very conservative cash capital, making an average return to the stockholder of less than 4½ per cent., while during 1908 no dividend was paid. Consequently, the company did not see how it could get along if the previous duty of 8c. per lb. on ingot aluminum was reduced by more than 1c. per lb. However, the tariff business is now out of the way, wherefore, conditions are obviously different.

Who Owns This Paper?

We have observed recently in some Nevada local newspapers the expression of an idea that the ENGINEERING AND MINING JOURNAL is owned, controlled or influenced by "the Guggenheims." This is no doubt as amusing to "the Guggenheims" as it is to us and our intelligent readers. The JOURNAL is owned by the Hill Publishing Company. The entire capital stock of the Hill Publishing Company is owned by its officers and employees, and they are owned by no one but themselves.

The Standard Oil Decision

The decision in the Standard Oil case, filed in the United States Circuit Court at St. Louis on Nov. 20, is one of great importance, not only to that company, but also to other mergers and combinations to which the anti-trust law may be held to apply. The case was heard in St. Louis in April last, but the proceedings began three years ago. The hearing was before a full bench, Circuit Judges Sanborn, of St. Paul, Van Devanter, of Cheyenne, Hook, of Leavenworth and Adams, of St. Louis. Judge Sanborn, of St. Paul, the presiding judge, wrote the opinion and the decree, in which all the judges concur.

The Decree

The Court supports the contentions of the government in the suit, and decides that the Standard Oil Company of New Jersey, the main defendant, is an illegal corporation within the terms of the law. It is ordered that the company be dissolved within 30 days and its assets distributed to their former owners, a perpetual injunction against the defendant being also granted.

It is not expected, however, that this decree will be carried into effect immediately. In a case of this importance an appeal will undoubtedly be taken to the United States Supreme Court, and some time must elapse before it can be heard and decided by that court.

The Case

The government filed its complaint in November, 1906, before the United States Circuit Court for the Eastern District of Missouri. The complaint was directed against the parent organization, known as the Standard Oil Company of New Jersey, with its various subsidiary corporations. It was also directed against seven individuals, John D. Rockefeller, William Rockefeller, Henry M. Flagler, Henry H. Rogers (now deceased), John D. Archbold, Oliver H. Payne, and Charles M. Pratt. The main company, its branches, and these individuals were charged in the complaint with having entered into an agreement, combination, and conspiracy to restrain trade and commerce among the several States, to monopolize the trade in petroleum, both in its purchase and its shipment and transportation by pipe-line steamships and by rail, also in the manufacture and refining of petroleum.

The United States asked for a perpetual injunction, and for the dissolution of the Standard Oil combination. Hearings were held in New York, Washington, Chicago, Cleveland and St. Louis, about 400 witnesses being examined. The testimony was voluminous and the arguments were also extended, the former filling over 10,000 printed pages, and the latter 300 pages.

A syllabus of Judge Sanborn's decision —in which the three other judges concur— is as follows:

The Decision

"Congress has power under the commercial clause of the Constitution to regulate and restrict the use in commerce among the several States, and with foreign nations, of contracts, of the method of holding title to property and of every other instrumentality employed in that commerce, so far as it may be necessary to do so, in order to prevent the restraint thereof denounced by the Anti-Trust act of July 2, 1890 (26 Stat. 29).

"Test of the legality of a combination under this act is its necessary effect upon competition in commerce among the States or with foreign nations.

"If its necessary effect is only incidentally or indirectly to restrict the competition, while its chief result is to foster the trade and increase the business of those who make and operate it, it does not violate that law.

"But if its necessary effect is to stifle or directly and substantially to restrict free competition in commerce among the States, or with foreign nations, it is illegal within the meaning of that statute.

" The power to restrict competition in commerce among the several States, or with foreign nations, vested in a person or an association of persons by a combination, is indicative of the character of the combination, because it is to the interest of the parties that such a power should be exercised and the presumption is that it will be.

"The combination in a single corporation or person, by an exchange of stock, of the power of many stockholders holding the same proportions respectively, of the majority of the stock of each of the several corporations engaged in commerce in the same articles among the States, or with foreign nations, to restrict competition therein, renders the power thus vested in the former greater, more easily exercised, more durable, and more effective than that previously held by the stockholders, and it is illegal.

"In 1899 the stockholders of the Standard Oil Company of New Jersey owned a majority of the stock of 19 other corporations in the same proportions that they owned the stock of the Standard Company, and those 20 corporations controlled by the ownership of the majority of their stock or otherwise many other corporations. Each of these corporations was engaged in some part of the business of producing, buying, refining, transporting and selling petroleum and its products, and they were conducting about 30 per cent. of the production of the crude oil and more than 75 per cent. of the business of the purchasing, refining, transporting, and selling petroleum and its products in this country. Many of them were engaged in commerce in these articles among the several States and with foreign nations, and were naturally competitive.

"During the 10 years prior to 1879 the seven individual defendants had acquired control of many corporations, partnerships, and refiners that had been competing in this business, had placed the majority of the stock of those corporations and the interests in property in business thus obtained in various trustees to be held and operated by them for the stockholders of the Standard Oil Company, one of the 19 companies in which the individual defendants were principal stockholders, and had thereby suppressed competition among these corporations and partnerships.

"In 1879, they and their associates caused all the trustees to convey their interests in the stock, property and business of these corporations to five trustees, to be held, operated and distributed by them for the stockholders of the Standard Company of Ohio. From 1879, until 1892, they prevented these corporations and others engaged in this business, of which they secured control, from competing in this commerce by causing the control of their operations and generally of a majority of their stocks, to be held in trust for the stockholders of the Standard Company of Ohio, and, from 1892, until 1899, they accomplished the same result by a similar stock-holding device, and by the joint equitable ownership of the majority of the stocks of the corporation."

It will be seen that the right of the government to bring suit under the law is not questioned, and that the main contentions involved in the original complaint are upheld.

Progress of Transvaal Stope Drill Competition

By E. M. Weston*

The underground trials in connection with the competition for drills weighing under 100 lb. for a prize of £4000 given by the Transvaal government and the mining interests have now been proceeding since the middle of June. A table of results until Oct. 1 was published in the Journal of Nov. 20, 1909. Several interesting conclusions can be drawn from the results already published. It will be seen that the number of competitors has now been reduced to six, and of these six only one is a hammer drill. The two American hammer drills, the Waugh and the Murphy, soon retired. The Climax Imperial, built largely in imitation of the general design of a piston drill, alone survives, and the records show a comparatively poor performance.

The agent for one of the American drills expressed the opinion that the present conditions of underground labor and supervision were unsuitable to the employment of any water feed drill using hollow steel. Great difficulty was experienced in getting drill steel, especially hollow drill steel, properly tempered to stand, and in obtaining a continuous supply of water to the working stopes. He claimed that meffi

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cient miners damaged machines and hose, and that when the machines were in use the consumption of water was excessive because it was not intelligently used.

PISTON DRILLS SUPERIOR

This agent has abandoned his endeavors to introduce a water-feed hammer drill and has turned his attention to the design of a suitable piston drill. Generally speaking, the tests with new piston drills against new hammer drills as described in an article in the JOURNAL of May 15, 1909, showed that the piston drill was, if anything, the more effective machine, using less air to do a given amount of boring; this appeared surprising and the results of these trials will make mining engineers on the Witwatersrand loth to try any new water-feed hammer drill in the future.

With skilled labor and under conditions in which the steel used could be carefully retreated and the temper drawn, and with an adequate and continuous supply of water free from acids, their greater portability and the ease with which drills may be changed would enable hammer drills to hold their own with piston drills, but here these conditions do not exist. The ordinary air-feed type of hammer drill using solid steel is, however, being successfully introduced by the Waugh Drill Company, and this machine is doing good work in putting up raises and bore holes, and greatly reduced the cost of this work in several mines. The liberal use of vanadium steel for anvil blocks has done much toward making this type of machine reliable.

The Konomax drill, described in the JOURNAL of May 1, and May 15, 1909, has the distinction of boring rocks with the minimum expenditure of power of any known machine, but it failed in the competition for apparently two reasons: (1) It was not powerful enough, with a cylinder diameter of only 2 in. and a stroke of only 4 in., to compete with drills having a 2¾ in. cylinder and 6 in. stroke; (2) owing to its requiring water under pressure it was at the same disadvantage as the hammer drills in many respects.

FINAL RESULTS STILL DOUBTFUL

With regard to actual footage drilled per machine underground, full particulars have not yet been made public. The drills average only about 30 ft. per shift, though as much as 132 ft. has been drilled in a 9-hour shift by two machines of the Siskol type. The two Holman drills are supposed to be leading in total footage, but the air consumption is somewhat above that of the Chersen and Siskol drills.

As, however, all these figures giving air consumption depend largely on the number of new parts that have been put in to replace worn parts, and as the ground in some mines is more favorable for attaining high footages than others, the final results are scarcely based on practice. One thing is clear, however, and that is that the Siskol type of piston drill for small stopes will not be a machine weighing only 100 lb. and will probably not make any pretense of being a one-man drill. The Siskol drill, which is of German make, presents some novel features of design which I hope to describe in a future article.

The Tariff on "Scrap"

In the JOURNAL for Nov. 6 comment was made on the tariff provisions on scrap iron and steel, and on the Treasury Department decision that under the new law no scrap iron or scrap steel is entitled to classification under paragraph 118 unless it is unfit for use until reduced by heat from a solid to a fluid state; therefore, that scrap iron or scrap steel which may be remanufactured by being subjected to heat and then rolled or hammered to the form desired is not scrap within the meaning of the new paragraph. On this question the *Iron Age* comments as follows:

INTENT OF THE LAW

It may have been the intention of the framers of the new act to provide a separate duty for scrap imported for rolling or hammering into a new product after passing through a heating or busheling furnace. But the fact remains that such material cannot come in as scrap. Customs officials at Washington, while not willing to make any ruling in the absence of a definite issue, intimate that in the case of any lot of scrap brought in for remanufacture without melting, duty would be imposed under one of the various classifications in the metal schedule apart from paragraph 118. In the iron trade one view taken since the question came up for discussion is that resort must be had to the "dragnet paragraph," No. 480, providing that "there shall be levied, collected and paid on the importation of all raw or unmanufactured articles not enumerated or provided for in this section, a duty of 10 per centum *ad valorem*, and on all articles manufactured, in whole or in part, not provided for in this section, a duty of 20 per centum *ad valorem*."

POSSIBLE REGULATIONS

On the other hand, the Treasury Department may take the view regarding certain importations, heretofore classified as "scrap," that they must pay the same duty as that provided for new material in the same form. If rerolling rails, for example, or old locomotive tires bought to be rolled into shovel plate, should be assessed the same duty as for new rails or new tires, their importation under some conditions would be out of the question. In the case of old rails the duty would thus be $3.92, or 8 cents less than the old duty on scrap. Old tires, under such a ruling would be assessed 1½c. a pound, an absolutely prohibitory duty.

As the matter stands, importers of scrap that is not intended to be melted in the foundry cupola or in the basic open-hearth furnace are entirely at sea as to the amount they must pay to get the material into the country, and naturally will be wary of trading with foreign sellers. And even in the case of certain scrap brought in for remelting there is no assurance that the customs collector will decide that it is "fit only to be manufactured by melting." Since rulings are made only as cargoes come in, the importation of old material promises for some time to partake of the uncertainties of a lottery.

The Pacific Smelting and Mining Company

The consolidation of the Douglas Copper Company and the Mexican Exploration & Mining Company and their allied interests in Sonora, Mexico, promises to bring renewed and increased activity to the important southern Sonora mining region. The first company owned the El Cobre copper-gold-silver mines and the smeltery at Fundicion, 20 miles from El Cobre on the railroad, and the other company had extensive government exploration concessions, under which it had already partly developed several mines. The Anita mine of the El Cobre group is opened up to 900 ft. and in all about 2000 ft. of development has been done. It has blocked out a fair tonnage of silicious gold-silver-copper ore. The smeltery, designed for 1000 tons daily capacity, has a 350-ton unit now completed. It was built by a subsidiary company, owned by the Douglas Copper Company, under a government concession which gave the company the equivalent of about 4½ per cent. on the gross output. The company also owned a railroad concession, timber rights and a lime-flux deposit carrying $1 in gold and silver.

The Exploration company had mining concessions to 1,500,000 acres on the west side of the Yaqui river, north of Cumripa. Numerous locations have been made on this land by the company, in all more than 50, and several of them have been satisfactorily developed. The company also had interests in other mining companies, developing within the concessions. The mines of the Exploration company are expected to supply sufficient base ore to permit of the economic treatment at the Fundicion plant of the silicious ores of El Cobre mines. The Cananea, Yaqui River & Pacific railroad is now built along the east side of the Exploration company's concession. The smeltery is on the south extension of the road from the Yaqui river.

The new company has a capital of $6,000,000 common, and $2,000,000 7 per cent. cumulative preferred stock. There is in the treasury of the company $1,300,000 of the common and $800,000 of the preferred stock. Theodore Douglas, who was largely interested in both of the original companies, is president of the new company.

Details of Practical Mining

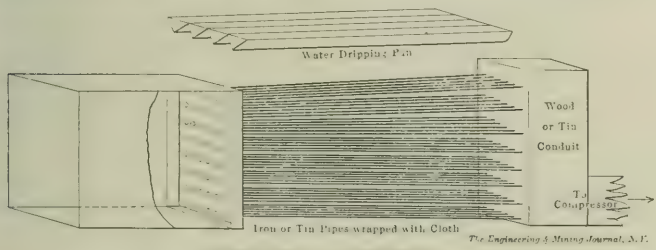
Notes of Interest to Prospectors and Operators of Small as Well as Large Mines. Things That Have to Be Done in Everyday Mining

REPORTS FROM EXPERIENCE

Readers of the JOURNAL are invited to contribute to this department. Articles should be brief, thoroughly practical, and preferably illustrated by drawings or sketches. Our draftsmen will prepare properly any kind of a pencil sketch that is intelligible. Something that is an old story in one district may be quite unknown in another. Articles accepted and published are suitably paid for

Compressor Precooler

Compressor efficiency can be materially increased in warm weather by a simple and inexpensive precooler. It should be emphasized in the beginning that water or moist air should have no chance to mix with the compressor suction. The accompanying drawing shows how the cooling nest of tubes should be connected by wood or light iron conduit to the suction valves of the compressor. The nest of pipes can be made up of odd sizes of iron, or even tin or galvanized-iron speaking tubes can be used. If water is worth saving it can be pumped back at slight expense, though the flow should be regulated to just the quantity required to keep the pipes wet. These should be wrapped with thin cloth and should be placed in the open, preferably where prevailing winds or drafts will cause a maximum evaporation.



PRECOOLER FOR AIR COMPRESSORS

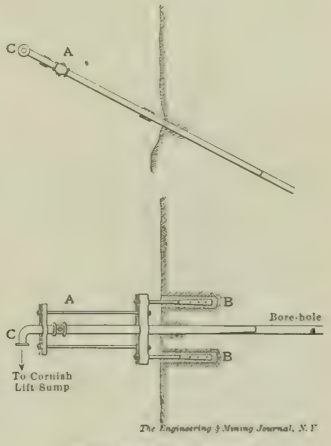
As an extreme example of the efficiency of this arrangement, the following may be stated: The difference between the temperatures of wet and dry thermometers at a large plant in California in summer has reached 40 deg., the difference between 110 and 70 deg. This difference in the temperature of compressor intake amounts to over 8 per cent. The arrangement shown in the sketch precludes the saturation of the air with water, as recently complained of in South Africa, where precooling by spraying water directly into the intake was attempted. In fact, if the temperature of the water supply is below the dew point, and an abundance is available, water will actually be condensed out of the air as drawn to the compressor and can be drawn off from the bottom of the cool-air conduit.

Stopping the Flow of Water from a Drill Hole

Several years ago a bore-hole in the Great Fingall mine, Western Australia, was put out in an easterly direction from the No. 7 plat of the Armstrong shaft; depth of level from surface was 536 ft.; inclination of bore-hole, 27 deg. from the horizontal; total depth of bore hole, 747 ft. At a depth of approximately 500 ft. a flow of salt water was encountered, which produced 6000 gal. per hour. When drilling operations were concluded it was decided to control the flow of water, and the following method described by G. C. Klug in the *Journal* of the Western Australia Chamber of Mines, was employed:

A piece of 1½-in. steam pipe 5 ft. long was tapered for half its length from its full diameter at the middle to 1 11/16-in. at the end, the metal at this point being 1/32 in. thick; the other end of the pipe was threaded to receive a 1½-in. plug-cock.* The tapered end was forced into the bore-hole and held in position by means of clamps and bolts which had previously been cemented into holes drilled into the surrounding rock as shown at *B* in the accompanying sketch. This proved effectual in sealing the bore-hole itself, but when the water was shut off, leakage of water took place through fissures in the surrounding country. Owing to the gradual increase of water finding its way into the lower levels, it was found necessary to "take up" as much water as possible in the upper levels, and in order to assist matters in this direction, the plugging of the bore-hole was decided upon.

A double-ram Cameron pump having cylinders 7-in. diam., rams 4-in. diam. and 6-in. stroke, was erected close to the bore-hole, and the delivery pipe was connected up to the 1½-in. pipe at *C*. An ordinary cyanide case was used for a suction sump, and into this a water pipe was led. Compressed air at a pressure of 80 lb. per sq. in. was used to drive the pump. The suction sump was filled with water, the plug-cock *A* opened, and the pump started. The sump was kept three-quarters full of water, and pine sawdust was gradually added to the water, which was kept well agitated. When about one cubic foot of sawdust had been pumped into the hole, it was noticed that all leakage from the face of the rock had stopped. As the sawdust was intended only to temporarily stop the larger cracks, the pump was stopped, the sawdust removed from the sump and clean water pumped for a few minutes into the hole. Portland cement was now added to the sump in such quantities as to form approximately a mixture of 25 per cent. cement and 75 per cent. water, and this was pumped into the bore-hole in the same manner as the sawdust, cement being added as required. At first, the pump worked quite freely against the pressure encountered, but as the hole filled with cement, the pressure gradually increased until it was necessary to assist the pump by barring the fly wheel round. When one cask of cement had been used it was found impossible to force any more into the hole



DRILL HOLE AND FITTINGS

The cock *A* was then closed and after standing four days, it was opened, when it was found that the water had been completely stopped, and there is now no leakage whatever through the surrounding country.

Quarter-turn Belts

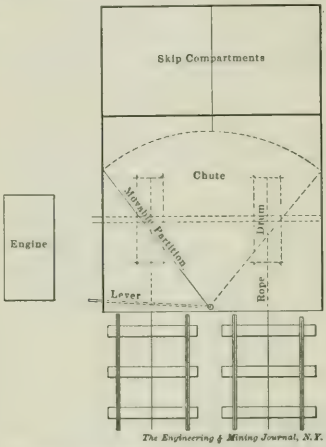
Quarter-turn belts are often a source of much annoyance, trouble and delay. This, when caused by the unequal stretching of belt edges, can be neatly and permanently avoided by putting a half turn in the belt

QUARTER TURN BELT LACED WITH HALF TWIST

before lacing it, as shown in the sketch. When run this way both sides of the belts are alternately on the pulleys and both edges alternately take the stretch of the quarter turn. Theoretically, the hair side of a leather belt alone should touch the pulley, but the extra strain of the quarter turn, especially with wide belts, large pulleys or short centers, warrants this departure from [illegible] practice. With rubber belts the advantage of this half turn is particularly noticeable and the life of the belt is [illegible] that of the operator is [illegible] more pleasant.

Movable Partition for an Ore Chute

The accompanying illustration shows, in plan, a movable partition, 2½x6 ft., made of ½ in. sheet steel, reinforced with angle iron. It is pivoted at the lower end with a vertical axis extending below the chute to which a lever is attached to shift the partition. It is used in the double chute from the skip so that ore from both skips may be delivered into one car without changing the position of the car. Tail-rope haulage, with two reversible side-



LOADING ARRANGEMENT AT THE PEWABIC MINE

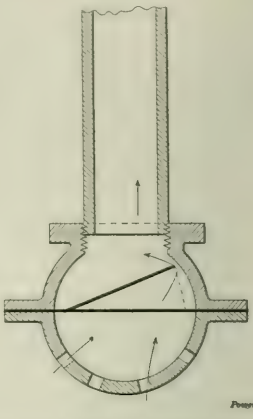
dump cars, is used. Each track is operated independently, and no switching is necessary. The winding drums are operated on one shaft by friction clutches.

Keeping Miners' Time

In mines where the system of time keeping by having the employees carry numbered tags during working hours is employed, an additional check upon the time is afforded with practically no more trouble, by having the men deposit these checks again at the level stations. The men take their checks from the file board in the office on coming into the shaft house, and upon reaching the level stations from which they go to work, hang them upon the proper nail on a small file board. Upon going off shift they again take their tag depositing it, upon reaching the surface, in a box placed for the purpose in the office. By this means, the mine boss can check the time as shown on his own record by simply referring to the file board at the level stations, and this, together with the record kept by the [illegible], gives three [illegible] each [illegible] time.

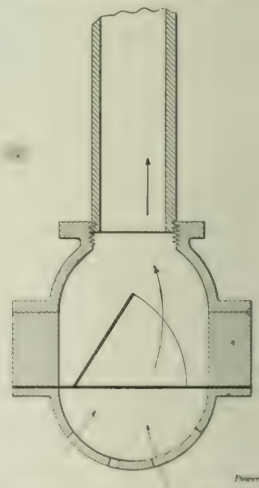
Effect on Economy of a Poorly Constructed Foot Valve

The ordinary foot valve consists of an upper half tapped to receive the suction pipe, a lower half with apertures to admit water, and between them a leather gasket, part of which forms a flap, as shown by



FOOT VALVE SHOWING OPENING THROTTLED

the heavy line in the accompanying drawings. A method of correcting a defect in such a valve is described in *Power*, Nov. 2, 1909. This valve was screwed to the bottom of the suction pipe of a centrifugal pump; when in operation a vacuum gage in the suction line showed 20 in. of vac-



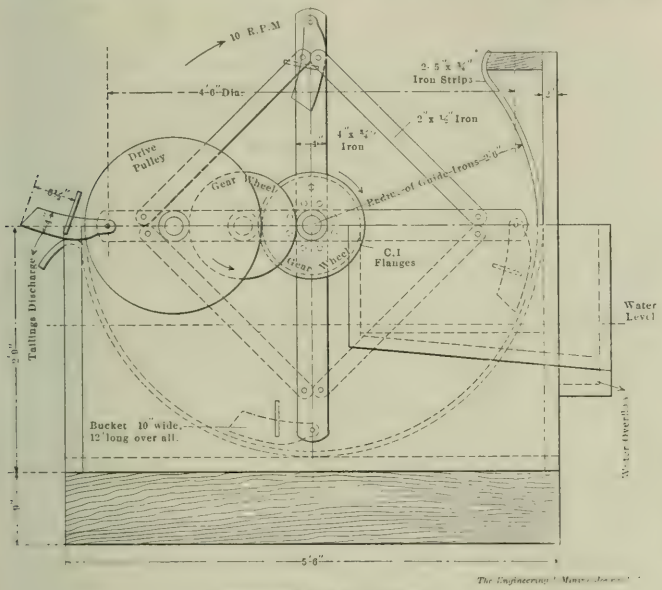
FOOT VALVE WITH CASTING BETWEEN THE HALVES

uum, which was too high, considering that the length of suction pipe was only 6 ft. It was thought the apertures admitting water were throttling the flow and the lower half of the foot valve was left off, but there was no improvement.

On further examination it was found that the flap, when open, rested its edge on the surface of the valve and practically shut off the flow. This was corrected by fitting a casting between the two halves, allowing plenty of room for the flap to open. The vacuum gage then showed only about 2 or 3 inches.

Dewaterer for Jig Tailings

The dewatering device shown in the accompanying illustration is adapted from the type sometimes used to handle the product from log washers. It was formerly used, in the mill of the Bertha Mineral Company, at Austinville, Va., to handle the tails from a Hancock jig and gave good results when operated with fairly coarse material; a large proportion of slimes or mud caused too great a consumption of power. The details of construction are shown in the drawing. The dewaterer is fed from the side, the material being scooped up as the frame turns and delivered over the discharge lip. The buckets being made of perforated metal allows the material to drain as it is elevated. Run at 10 r.p.m. the apparatus has a capacity of about four tons per hour

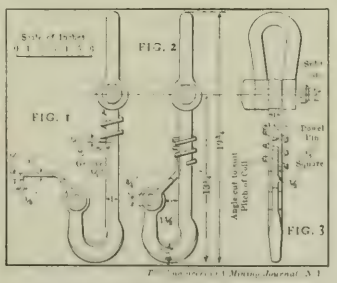


DEWATERER FOR JIG TAILINGS

Safety-hook for Sinking

A safety hook devised for use in connection with shaft-sinking operations at the Chaffers gold mine was recently described by J. Boyd Aarons in the *Queens. Gov. Min. Journ.* This hook is used in the sinking of the new shaft, and is designed to facilitate the speedy exchange of the empty for the full bucket and providing, at the same time, a safe means of attaching the bucket to the winding rope.

The three figures illustrate the construction of the hook. Fig. 1 shows the hook open in position for detaching the bucket; Fig. 2 shows the hook closed; Fig. 3 is a front view of the hook showing in section the closing device, which consists of a helical coil engaging a dowel pin and closing over the pivoted portion of the hook.



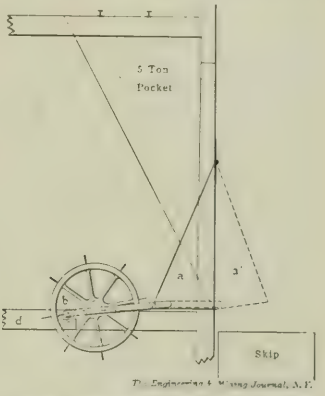
SAFETY-HOOK FOR SHAFT SINKING

The hook and coil are made of steel, and while hot the coil is shaped round the hook. The dowel pin is riveted into the hook, but it would be better if the pin were part of the forging. The ends of the pin, on which the pivoted portion of the hook turns, are riveted. The total weight of the bucket used on this hook, when filled with rock, is approximately 800 pounds

Loading Device for Skips

A pocket that holds one skipload, 5 tons, is made of sheet iron, and built in the side of the shaft as shown in the accompanying illustration. The pocket is the width of the skip and over the front is a hood which is held in place by a hinge at the top and a bar connected with a wheel at the bottom. This hood forms about ¼ of the front of the pocket and by revolving the wheel it can be opened to the position indicated by *a'*.

The wheel is 3 ft. in diameter and is



LOADING DEVICE FOR SKIPS, CHAPIN MINE

provided with handles the same as a steering wheel. When the hood is closed, the crank-shaft pin is a little off center and it is impossible for the ore to open the hood. As the wheel is revolved the connecting bar *b* is raised above the center, and the weight of the ore forces the hood open. As soon as the ore is all out, the weight of the hood is sufficient to close itself by gravity. A lug *c*, on a second beam parallel to *d*, acts as a bumper for the bar *b* to close against. The beam *d* supports the wheel and axle The time required for loading a 5-ton skip is 3 seconds The axle of the wheel extends the width of the hood and has a crank on the opposite end, also connected with the hood so that both sides of the hood are securely held in place.

Cyanide Tanks

All tanks in a cyanide plant, except those to contain solution returned from precipitation sumps, should be provided with bottom discharge doors of generous dimensions when built. Sooner or later it will be necessary to clean out such tanks With slime settlers, agitation tanks, battery and supply tanks, nothing is so convenient as bottom discharges, nor so expensive as raising slime over the edge of the tank

Personal

Mining and metallurgical engineers are invited to keep THE ENGINEERING AND MINING JOURNAL informed of their movements and appointments.

Etienne A. Ritter, of Denver, Colo., is examining mines near Sumpter, Oregon.

H. G. Douglass, for 25 years engaged in mining in California, has gone to Honduras.

Hennen Jennings has returned to his home, 2221 Massachusetts avenue, Washington.

Victor Rakowsky has returned to Duluth, Minn., from a two months' examination of claims in Oklahoma.

Reiji Kanda, professor of mining in the University of Tokyo, Japan, has been visiting Goldfield, Nevada.

P. E. Van Saun, chief engineer for the Mill and Smelter Engineering Company, of New York, has returned from Nevada.

A correspondent would like to have the address of P. A. Sperry, mining engineer, until recently editor of *Mining Science*, of Denver, Colorado.

E. B. Gage, president of the Tombstone Consolidated Mines Company, Limited, and allied companies, has resigned on account of failing health.

Fred Matthew has been appointed manager of the Hinds Consolidated properties in the Santa Barbara district, Mexico, succeeding O. E. Slinack.

George D. Blood announces that he has resumed general practice in mining engineering, with office at 307 Herald building, Salt Lake City, Utah.

E. P. Merrill has resigned as director of the Real del Monte y Pachuca Company at Pachuca, Mexico, and C. W. Van Law has been appointed to succeed him.

Arthur Winslow, of Boston, was in Goldfield., Nev., several days recently inspecting the workings of the Consolidated mine, in which he is interested.

C. A. Overstrom, professor of mining at the Utah State University, has severed his connection with that institution for the purpose of reentering the mining field.

John Edward Clennell passed through New York this week. He is on his way to Mexico to take charge of the cyanide works at the Minas Prietas in Sonora.

Thomas P. Schwanger, recently with the Carpenter Steel Works at Reading, Penn., has been appointed superintendent of the Cardenas Iron Works at Cardenas, Cuba.

H. M. German, recently superintendent of the Rapid Mining and Manufacturing Company, has been appointed instructor in metallurgy in the South Dakota School of Mines at Rapid City.

[illegible] J. Long has resigned his position as general manager of the Parral & Durango Railroad in Mexico in order to devote his time to the Peñoles Mining Company in [illegible].

Lieut.-Col. John Carson, president Crown-Reserve Mining Company, and Samuel W. Cohen, general manager of the company, have been in New York on business for the company.

John G. Flynn, formerly of Goldfield, Nev., has been appointed superintendent of the mines of the Santa Cruz Mining and Milling Company, operating about 60 miles from Mazatlan, Sinaloa, Mexico.

A. H. Reed has resigned as engineer with the Independent Phosphate Company, Columbia, Tenn., to accept the position of local manager of the Rosiclare Fluorspar and Lead mines, Rosiclare, Illinois.

Charles C. Linthicum, professor of patent law in Northwestern University law school, has been appointed general patent counsel for the United States Steel Corporation, succeeding the late Thomas W. Bakewell. He will have his office in Chicago.

L. R. Budrow, who for some years was manager of the mines of the Michoacan Railway and Mining Company in Angangueo, Michoacan, Mexico, has been appointed manager of El Tigre Mining Company, operating the Lucky Tiger mine in northern Sonora.

Judge J. H. Reed, vice-president of the East Butte Copper Mining Company, chairman of the executive board of the Carnegie Steel Company and a director of the United States Steel Corporation, recently made a visit to Butte, Mont., to inspect the East Butte properties.

W. A. Prichard, of the City of Mexico, has severed his connection with the English company which he has represented for several years, and is now doing a general engineering business in Mexico. He is also developing on his own account some gold and silver mines in the State of Sinaloa.

Powell Stackhouse, president of the Cambria Steel Company for a number of years, will, it is announced, retire from that position at the next annual meeting. He purposes withdrawing from active business altogether. His successor will be Charles S. Price, now vice-president and general manager of the company.

Weed & Probert have completed the examination of the property of the Propriety Mines Company, Arizona. Doctor Weed is now on his way to Phoenix, Ariz., on professional work, and F. H. Probert is visiting the mines of the Superior & Boston Copper Company, at Globe, Ariz., of which he is consulting engineer.

J. R. Finlay, of New York, well known as a consulting mining engineer, who has previously been in charge of large mining operations in Idaho, Colorado and Missouri, has been appointed general manager of the Goldfield Consolidated, succeeding J. H. Mackenzie, who resigns because of the demands of his private interests. Mr. Mackenzie will however continue to act as consulting engineer for the Goldfield Consolidated and will remain on its board of directors.

Obituary

Thomas J. Morgan died at Wellston, O., Nov. 13, aged 62 years. He was an extensive coal operator in the Jackson county field, and owned several mines.

Eli Emory Hendrick, president of the Hendrick Manufacturing Company, died at Carbondale, Penn., Oct. 25. He was widely known and respected.

Albert W. Young, of Cleveland, O., died at Detroit, Mich., Nov. 17. He was born at Youngstown, O., and early entered the coal industry. He was an officer of the Sheppler Gas Coal Company and the Youghiogheny Coal Company, and when those companies were merged in the Pittsburg Coal Company, he remained for a time with the consolidated concern. Later he organized the Glens Run Coal Company, with which he had since remained.

Armstead B. Baxter and James Callahan, both pioneers in the oil region of western Pennsylvania and for many years partners and large oil operators, both died Oct. 21, one at Pittsburg and the other at Oakdale, Penn. Mr. Baxter was 58 years old and was born in Pittsburg. Mr. Callahan was born in Rochester, N. Y., and was 50 years old. Both were well known to oil men all over the country and had operated in West Virginia and Oklahoma as well as in Pennsylvania.

Societies and Technical Schools

American Institute of Chemical Engineers—A program has been issued for the annual meeting, to be held in Philadelphia, the Hotel Walton being headquarters. On Dec. 8 there will be a business meeting and two sessions for reading of papers, besides a visit to the University of Pennsylvania. On Dec. 9 the day will be taken up by visits to a number of important plants in Philadelphia and vicinity. The annual dinner will be held in the evening. On Dec. 10 there will be a final business meeting and two sessions for papers and discussion, besides a visit to the Trenton potteries. The papers promised for the meeting, besides the address of Prof. Charles E. Munroe, the president, on "The Chemical Industries of America," include a number on various topics, among which are: "Natural Draft Gas Producers and Gas Furnaces," by Ernest Schmatolla; "Manufacture of Carbon Bisulphides," by Edward R. Taylor; "Chemical Composition of Illinois Coal," and "Heat Efficiency of Smokeless Combustion and Heat Absorbing Capacity of Boilers," by A. Bement.

Special Correspondence from Mining Centers

News of the Industry Reported by Special Representatives at Butte, Denver, Salt Lake City, Goldfield, Cobalt and Toronto

REVIEWS OF IMPORTANT EVENTS

San Francisco

Nov. 20—The quartz mines of Amador county are doing well. The Bunker Hill is paying regular dividends and each stamp of the mill is turning out about $1400 per month. The Kennedy is in good ore, notwithstanding its great depth, and the Argonaut is also doing well. The Fremont Consolidated is on a paying basis and has completed its repairs and paid for all the damages from the fire in the shaft. The Amador Gold Mining Company will increase the mill on the Bay State. The old Wildman and Mahoney mines will soon resume and the Keystone will be sunk deeper.

The Spring Valley mine at Cherokee, Butte county, at one time a large producer by the hydraulic method, will soon be started up as a drift mine. The Cherokee Gold Gravel Company has been organized by L. L. Green, E. C. Wilson, A. M. Wilson, W. M. Taylor, all of Oroville, and M. J. Green, of San Francisco. The gravel channel lies under Table mountain. At this mine the largest diamonds found in California were discovered.

W. S. Kendall, of Folsom, Sacramento county, has brought suit against the El Dorado Gold Dredging company to terminate a lease held by the company on his land near Fair Oaks. He claims that they did not continue to carry on mining operations steadily as agreed. The El Dorado Company failed to make any money with its dredge and finally sold out to the Natomas Consolidated, which now owns the dredge and the lease on the ground.

A company has been formed in Chicago to take over the Champion Mining Company property at Nevada City. George F. Fitzgerald is manager of the new company. Work is to be carried on through a new central shaft. On the different properties there are 140 stamps. The old company has done nothing for some years as it did not have the capital.

The Bald Mountain Extension drift mine at Forest, once a large producer, has been placed under bond to O. A. Harlan, of Alleghany. Plans are made for the development of the mine. There is a long bedrock tunnel and from this upraises will be made to tap the known channel. A large area is still virgin.

Denver

Nov. 20—In spite of the stormy weather which has visited the East Argentine district during the past few days, tieing up the Argentine Central railway, thus making shipments impossible, the various lessees on the properties of the Waldorf company, continued operations with their usual activity, 30 men being at work in the Tobin tunnel alone. It is stated that there are 2000 tons at this working, awaiting the reopening of the railway.

Arrangements have been affected for the sinking of the Topeka shaft, in Russell district, Gilpin county, an additional 100 ft., making the total depth, when this new work is completed, 1038 ft. The bottom levels have been cleaned out, new underground equipment installed, and development of the lower workings is to be prosecuted vigorously.

It is reported by the manager of the Lamartine mine, near Idaho Springs, that the various lessees on this property have now about 20 men employed, the operations being confined to the tunnel level. The concentrator which has been at work —successfully, it is claimed—on the dump ores, has been closed for the winter.

Regular shipments are being made from the Gold Dirt mine at Empire, the average yield of the ore being said to be from 5 to 6 oz. gold per ton.

A strike is reported as having been made in the main tunnel of the Golden Sun mine, on South Boulder creek, about two miles above Rollinsville, in the northern end of Gilpin county, the ore being zinc-lead. This company has been at work for about three years driving a long crosscut tunnel to intersect the veins at depth.

It is stated by officials of the Denver, Laramie & Northwestern railway, now under construction between Denver and Greeley, that if weather conditions continue favorable, this new railroad will be in operation to the latter place in about a month.

The Commercial Coal and Coke Company, organized two years ago, and operating in a small way at Strong, Huerfano county, has secured additional working capital, and will soon commence construction of 200 coke ovens and a new washery at Sopris. F. D. Heath, of Denver, is vice-president.

Butte

Nov. 21—At the meeting of the stockholders of the North Butte Extension Development Company, the following were elected directors: C. S. Goldsboro, John Detjean, Curtis Wiggs, John L. Lockwood, D. S. Harding, David Angus, F. L. Thatcher. Dudley A. Tyng & Co., who made a fight to secure control of the board, were defeated. As a result of this election the company's treasury will recover in the neighborhood of 100,000 shares of stock. These shares are alleged to have been appropriated by former directors, and these former directors have now offered to return the stock to the company.

The East Butte company has decided not to operate the new pump on the 900-ft. level as the price of copper does not justify the expense. The company is working the Parrot slag dump. At the Pittsmont mine, of the company, the operations are mainly on the 800-ft. level, though work is being done on the 1000- and 1200-ft. levels. From the 800-ft. to the 600-ft. levels, a raise has been run in ore averaging 4 per cent. copper. In addition to the company's ore the Pittsmont smeltery is treating 55 tons daily from the Sarsfield mine and ore from the Snowstorm in Idaho.

Salt Lake City

Nov. 21—The first train from San Francisco over the Western Pacific arrived here Nov. 10. Regular freight traffic will begin Dec. 1. The Nevada Northern from Ely, which crosses the Western Pacific at Shafter, has announced a new rate of $3 on ore not to exceed $25 per ton from East Ely, McGill and Cherry Creek to Salt Lake. It is predicted and expected that this new railroad will immediately revive shipping from several properties in the Ely and Duck Creek districts. The Cherry Creek section has just resumed operation with a 100-ton mill, producing a lead and a lead-zinc concentrate for which Salt Lake is the natural market.

The Ely Amalgamated Copper Company has been incorporated by Salt Lake interests to operate claims near the Steptoe smeltery, McGill, Nevada.

The Cole-Ryan interests are reported to be completing arrangements for opening offices at Salt Lake as the western center of their activities. They are reported to have made overtures to both the Ohio Copper and the Boston Consolidated companies for their outputs and are making a very determined effort to get a foothold in Bingham.

The Garfield smeltery is receiving a shipment of high-grade copper ores from the operations at the new copper camp of Contact, Nev. A large tonnage of fluxing ore is also being mined by the American Smelting and Refining Company at Eureka, Nev., which is also being shipped to Garfield.

The United States Smelting, Refining

and Mining Company is reported to have made a contract for the total output of the Valley View group at Bannock, Nev. The treatment charge is $5 per ton, the freight rate is $4.50. In addition there is the hauling charge of $5 from Bannock to Battle Mountain on the Southern Pacific.

Indianapolis

Nov. 22—The mine disaster in Illinois has aroused the Indiana authorities. W. S. Blatchley, State geologist and head of the mining-regulation department, says there are 50 mines in Indiana where a similar catastrophe might be reasonably expected to occur at any time. In order to reduce the danger, Mr. Blatchley will at once take up with James Epperson, chief mine inspector, a plan for compelling the mine owners to remedy dangerous features. Mr. Blatchley said, as he understood conditions, the death and injury of the Cherry mine men is due to the fact that their only means of exit from the mine was shut off by the flames, at the foot of the shaft. In this mine, as in most of the mines in Indiana, there are two means of exit, the main shaft and the air shaft, a short distance away. The fault lay in the fact that the main shaft and the air shaft were too close together.

Mr. Blatchley said similar conditions exist in nearly all the big mines in this State. The average distance of the air shaft from the main shaft is less than 300 ft. A fire at the base of the main shaft in any of these mines would prevent the men reaching the air shaft, and with the means of egress shut off, they would be caught in a trap with a fire on one side and a blind wall of coal on the other. Escape would be hopeless unless the fire could be extinguished before the mine became filled with smoke and deadly gas.

Mr. Blatchley said he had long advocated a plural system of mine exits and that he would now see what can be done toward compelling the mine owners to supply them. "If it cannot be done under the present laws, I will go before the next legislature and seek to have a law enacted by which it can be done. My general plan is that the mines should be equipped with a main shaft and an air shaft, as now, and that in addition, the entries, or passageways leading to the working rooms, should be equipped with exits at distances not to exceed a quarter of a mile. In the mines of the State, these entries often run for more than a mile from the main shaft, almost always in two directions, and frequently in four. I would have all the main entries equipped with these exits."

Mr. Blatchley said he expected that his suggestion would light fire in this state, but if this can be brought to see that it would be made not only as a humane measure, but as an economical one, as well, he feels sure he can carry it through.

While it would be well to remember that Indiana is liable to duplicate the Illinois disaster any day."

Philip Penna, secretary of the Indiana Operators' Association, in commenting on the Illinois disaster said that the disaster was due to human negligence and as long as men are such as those who did not hurry the miners out of danger, the talk of the use of modern appliances for saving life in the mines is idle. Mr. Penna said that Indiana mines are not so dangerous as others and that if miners, bosses and superintendents comply with the rules and the laws there need be no sacrifice of life.

Nome, Alaska

Nov. 10—The excitement prevailing on the Seward peninsula over the recent gold strike on the Iditarod in the Innoko district will produce an activity over a large area for the winter months, greater than has stirred Alaska since the Klondike excitement. Nome miners have made preparations for the long trail journey from Norton sound to the Iditarod, and a rush equally great will be made from the Tanana and points about Seward. All districts not presenting favorable opportunities for winter mining work will send large representations into the interior. The Iditarod diggings were discovered by mere accident. Three prospectors traveling down the Yukon last May in a rickety makeshift craft, whose motive power was generated by an antique boiler, heard that the United States marine inspectors were on their trail. Knowing that their boat would not be able to stand inspection, as none of them was a licensed pilot or engineer, they turned up the little-explored Iditarod river to hide. A few days later they struck gold.

Nearly every good property in the Tanana camp hoists from two shafts instead of by the old method of one only. It is appreciated that the quicker the gold can be gotten out, the quicker it will be working for the owner, and the crews are at work continuously.

Operations in the Nome district for the summer were hindered to a very great extent on account of the lack of water. However, it is expected that next year will see a resumption of work on a better basis. The gold is there, and if the usual methods will not prove successful, dredges will be installed, which will admit of continued work even if the season should again prove to be a dry one.

The Stewart River Gold Dredging Company at Dawson, will install one of the largest dredges ever operated in Yukon placers, and expects to have it ready for next season. D. A. Matheson is superintendent. Nome is a new strike on Ruden creek has been brought by this creek in any days. The diggings are shallow, not more than 12 to 15 ft. from the surface of bedrock.

Cobalt

Nov. 22—Crown Reserve has been the center of interest lately on account of the rapid drop in the stock, and many rumors concerning the condition of the mine were current. No shipments were made from that property for three weeks, but it is believed that the mine is in excellent physical condition, and shipments of high-grade ore have been resumed. It is undoubtedly true that production from the main Crown Reserve vein has been very heavy, but there are a number of smaller high-grade veins sufficient to keep up the output for some time to come. At present selling price of the stock the developed area of the Crown Reserve represents a value of $1,000,000 an acre.

An important deal was closed in the Lorrain district when a syndicate concluded the purchase of the Newman claim. This property is situated a short distance from the Wetlauffer mine, and one of the largest and best veins in this section was discovered there. It has been traced on the surface for 200 ft., and shows native silver. A company known as the Bellellen Silver Mines, Ltd., will be formed to develop the claim. The continuation of the high-grade ore in the veins of the Wetlauffer at depth has had a good deal of influence on this sale.

The annual report of the City of Cobalt company has just been issued and shows that during the past three months the production has been much greater as compared with the rest of the year. During the year the company shipped a total of 730 tons of ore, which returned 456,000 oz. of silver. It is interesting to note that the royalty paid to the Temiskaming & Northern Ontario Railway Commission was $69,772, and that $17,000 is still due.

One of the most important sales in the Gowganda district in this season was made a few days ago, when the Crawford property, which adjoins the Reeves-Dobie, was sold for $100,000. Uptodate little work has been done on the property, but there are several good surface showings of silver, and it is stated that some of the Reeves-Dobie veins run into it. For the last six months few deals in mining properties were made in this section, as after the big rush of last winter it was difficult to get anyone to invest money in the north.

Toronto

Nov. 20—The fourth sale of mining lands in the Gillies limit by tender was completed Nov. 16, resulting in the disposal of 37 out of the 55 lots advertised for the aggregate amount of $372,462, or an average price of $482 per acre. No bid of less than $2000 for a lot was accepted. The prices were higher than those received at previous sales, the rich discoveries on the Waldman property having attracted buyers.

According to a report on the coalfields of Manitoba, Saskatchewan, Alberta and

eastern British Columbia by D. B. Dowling to the Geological Survey of Canada, the total coal resources of the area included are estimated as follows: Anthracite, 400,000,000; anthracite and semi-anthracite, 860,000,000; bituminous and some semi-anthracite, 43,070,000,000; coal (lower grade and lignitic coal), 21,000,000,000; lignite, 78,160,000,000; total 143,490,000,000 tons.

Sales in the new gold district of Porcupine lake are being made daily, the general price being around $1000 per claim. An important deal was negotiated lately when Herbert Fale sold four claims in Tisdale township to an eastern syndicate for $20,000. Options have also been taken on two other claims. The four claims are said to have a continuation of the Wilson vein, which the engineer sent up by the Ontario government to report on the district, claims to be the largest he has seen.

The reopening of the White Reserve mine in the Maple Mountain district has given a fresh impetus to work in this section. The White Reserve is a private corporation, and was closed down for a few months owing to internal trouble among the owners. Shortly before operations were suspended they shipped out eight tons of ore, which assayed over 5000 oz. to the ton. There are three high-grade surface showings on the property, on which a small amount of work has been done, but now operations will be actively carried on, and it is expected that they will be making regular shipments. Several other companies operating in this district have started work.

Mexico

Nov. 21—The new mining law is before the senate. Senator Cacho made a speech opposing several sections but was voted down. The bill will be voted on article by article and probably will be enacted.

In the Batopilas district, Chihuahua, work is being held pending the settlement in London of details whereby the Batopilas Mining Company may organize subsidiary companies to operate over 250 acres of mineral land. The new cyanide plant of this company at the Hacienda de San Miguel is operating satisfactorily. The Gold Mines Company, Tres Hermanos, Santa Cecilia and others of the Tres Hermanos group have been consolidated and a mill is being erected. A London organization will investigate La Abundancia group about 25 miles northeast of Batopilas. This district is now accessible by rail from Chihuahua via the Orient railroad. Chihuahua capital will explore the new field discovered near Carichic. Work has been temporarily suspended on La Gloria and Nueva Australia. The Batopilas company has just concluded a survey of the Batopilas river within its property lines, and the survey shows a fall of 1000 feet.

What appears to be the first effort on the part of the National Railways of Mexico to secure control of the Mexican Railway or force that line to accept a pooling agreement, occurred last week when the National lines issued a circular announcing a reduction of their passenger rate to Vera Cruz and return from 24.50 pesos to 5 pesos. The Mexican Railway, an English corporation, is the only competing line and as a result of this move the common stock immediately dropped one and one-half pounds on the English market. The continuation of the policy will undoubtedly have a depressing effect on English investments here in general.

The railroad policy in Mexico, while not antagonistic to the mining interests, has virtually that effect in many cases. Large low-grade lead and copper producers are worth more generally to the country than all the bonanza properties put together. The employment of native labor is on a large scale, the capital invested larger, the freight delivered to the railroads is heavily increased, and the custom smelters have fewer furnaces idle and a corresponding increase in labor force. There are several low-grade properties, particularly copper, and a large number of prospects with promise of developing into this class, which could be operated at a small margin of profit, or at least the attempt would be made, if the railroads in such cases would meet the miner with a reasonable concession, or make a ruling allowing a rebate on a fixed minimum tonnage under a fixed ton value on the metallic contents. For this reason the Guggenheims and other custom-smelting companies are indisposed to consider the acquisition of new holdings, and low-grade ores providing carriers for dry ores are, as a rule, a much more valuable asset to a custom-smelting company than to mining companies. The railroads have ever evinced a short-sighted policy in their attitude to the miner, and apart from the low prices of copper and lead in the market, is the greatest obstacle to the operation of low-grade properties near enough the railroads to avoid wagon or mule freighting. Now that the government is interested in the railroads, and such organizations as the Chamber of Mines and Instituto Mexicano de Minas y Metalurgia are taking up the broader economic factors of the mineral industry, it may be that this subject in due time will be properly presented to the railroad commission, and, indeed, the subject is already up as one of several to receive early investigation.

Not a little new American capital has been withheld from the country during the first half of the year on account of the political agitation; but it is worthy of note that not at any time during this period was there any stop in the steady stream of European capital Mexico-bound. But a few weeks after the Guadalajara political troubles an English firm took 2,000,000 pesos of state paper, and another English house began negotiations for the La Blanca and Santa Gertrudis mines, of Pachuca, at 15,000,000 pesos.

The mines of La Portilla, Cardeneña, Peñones and San Ramon in Durango are all making regular shipments of first-class ore to the Monterey and Torreon smelting plants. As it is three days' ride over a hard mountain trail to Tepehuanes, the nearest railroad point, such ore has to be of good grade and will run at least 20 kg. silver and 300 grams gold per metric ton, occasional shipments running much better. The Llanitos Mines Company is now installing a hydroelectric plant and air drills and will do vigorous prospecting and development. The most important improvement in the district is the remodeling of the San Ramon mill. For several years this has been run as a dry-crushing, chloridizing, roasting mill, using both cyanide and "hypo" to extract the metal. Now it is being changed to a wet crushing and cyanide mill, with concentration on Wilfleys and canvas tables. Tests on large lots have shown a higher extraction can be obtained by this method with decreased costs. An air compressor has been installed and will be used for agitating slimes and for elevating slimes and solution. The mill will be running soon. The San Ramon company has a large amount of high-grade milling ore broken and waiting treatment, besides large ore reserves of this grade. The mill will also purchase custom ores, of which several thousand tons are available. Donald C. Scott, of Chicago, is manager of the San Ramon mine and mill, and Edmund Shaw, of El Paso, has charge of the remodeling of the plant, and will operate it when this work is done. The La Portilla company has been making tests for some time with a view of erecting a treatment plant and the Llanitos company will shortly build a mill.

Many gold placers have been discovered in the region of Miahuatlan 20 miles southeast of Ejutla, Oaxaca.

London

Nov. 16—The prospectus has been issued of a new mining company to work a number of copper and silver-lead mines in the valley of Fuencaliente, province of Ciudad Real, Spain. The name of the company is the Spanish Mines Consolidated and the capital offered for subscription is £35,000 in 7 per cent. first-mortgage debentures. The engineers of the company, J. W. Richmond Lee and W. F. Anderson, report that the mines can be worked on a very profitable basis. The vendor is a company called Spanish Mines, Ltd., which has acquired options to purchase the properties of the San Bartolome Silver Lead Mines, Ltd., of the La Corona Copper Mining Company and of the Manchegan Mines, Ltd., all of comparatively recent formation, as well as properties belonging to certain individuals. The new company is, therefore, one in which the interests and consideration are prominent features.

Mining News from All Parts of the World

New Enterprises, Installations of New Machinery, Development of Mines and Transfers of Property Reported by Special Correspondents

THE CURRENT HISTORY OF MINING

Alaska

Valdez—Practically all of the real property of the Reynolds-Alaska Development Company with the exception of the mining claims and a large amount of the personal property has been sold by the United States marshal to satisfy the claims of the Valdez Bank and Mercantile Company.

Ketchikan—The Rush & Brown mine shipped 950 tons of copper-gold ore to Tacoma Nov. 4.

Arizona

Development Company of America—This company has purchased the Saddle Mountain properties at Christmas in Pinal and Gila counties, and will operate them under the form of a subsidiary company called the Gila Copper Sulphide Company. The Development company has also secured the control of the London-Arizona Copper Company, with properties adjoining the Saddle Mountain in Gila county. The negotiations were carried on by F. M. Murphy, president of the Development company, and Victor L. Mason, secretary. The Development company is interested in the project to build a railroad from the terminus of the railroad built by the Imperial Copper company, a subsidiary of the Development company, to some deep-water port in Mexico, on the Gulf of California.

Gila County

Arizona Commercial—The smeltery at Globe is turning out about 20 tons of matte daily. Sulphide ore is supplied from the Copper Bell mine. The development work is [illegible] the sixth level. John F. Penberthy is in charge.

Southwestern Reduction—The McGaw shaft is now at the fourth level and crosscutting to the Great Eastern orebody began. Exploration work is being carried on in the Gardner [illegible]. William G. Rice is president.

Hayden—A rich silver strike has been made in the property, two miles from Globe. It is owned by Hudson Thomas, and is said to be a large producer.

Greenlee County

Clifton Mining—A company organized at Houghton, Mich., Willard J. Smith, president, has acquired the property near Morenci. Work will be pushed on the Kratzer [illegible] acquired by the [illegible] of the Consolidated Arizona Copper Company.

Pima County

Tombstone—The company is continuing development at Newton. An aërial tramway will be installed to connect with the railroad, four miles distant. W. V. Lander is manager.

Yavapai County

Consolidated Arizona Smelting Company—The treasurer has submitted a statement of Nov. 10, showing cash on hand, $285,800. The expenditures on development and new construction since reorganization amount to $18,938. It is stated that the property is in effective condition and that smelting operations will begin soon after Jan. 1 with full capacity.

Arkansas

Red Cloud—This mine at Dodd City is making 15 tons daily of concentrates in the mill, treating about 125 tons of ore.

California

Kern County

Ferris—J. B. Ferris has formed a syndicate to work his holdings in Caliente district. Machinery will be installed.

Pearl—The mine at Caliente has been placed under bond to W. H. McCarthy, of Los Angeles, and crushing machinery will be installed.

Mariposa County

Mountain King—This mine on the Merced river, above Bagby, continues to yield very high-grade ore.

Monterey County

Gilded Queen—The mine, discovered in Los Burros district by H. F. Melville, is being opened.

Placer County

Grandall—The new owners of this mine at Ophir will commence work at once. There is a mill and hoist on the mine but other machinery will be added. F. B. Norton is superintendent.

Gopherne—This mine at Ophir has its new electrically driven mill in full operation.

Cross Lake—At this mine, three miles [illegible] Newcastle, the tunnel will be extended and an opening made to tap the channel.

[illegible]—W. P. Hammer has bought this mine at Ophir and also the Lawrence, Grass Hill [illegible] and adjoining properties. Grading has commenced on the new [illegible] mill.

Plumas County

Laughlin—A strike has been made in the mine near Greenville. The lode is found in the tunnel is 8 ft. wide.

Shasta County

Sisson—This company at Sisson has struck a body of sulphide ore while crosscutting in tunnel No. 3.

Sierra County

Great Divide—The company is ground a rich strike of quartz has been made. Compressors and air drills have been installed.

Hunch—S. B. Gracier, of San Francisco, states that a lower tunnel will be started in this mine at Alleghany.

Indian Hill—At this mine eight miles from Camptonville, the large and smaller flumes have been completed.

Chipps—At this mine, Sierra City, Lawrence Holly, superintendent, 12 stamps are dropping.

Colorado-Yellow Jacket—This mine at Alleghany has been sold to C. C. Crary and J. C. Spencer.

Siskiyou County

Schwab—This company will pump from the Klamath river to a reservoir for hydraulicking.

Bear Creek—The mine at Soulsbyville has closed to make repairs. Ore is developed on the 300 and 700 levels. S. A. Knapp is in charge.

Confidence—From this mine at Confidence high-grade ore is being taken out.

Ocean—The run on the old dump is up to expectations. The tramway has been completed and sinking commenced.

Draper—This mine near Soulsbyville has installed an electric power plant auxiliary.

Czarina—E. D. Brigham is superintendent of this property at Etna Mills, in place of H. S. Severman, resigned. The new 10-stamp mill has been completed and many improvements are being made.

Gem Pan—This group at Oro Fino, owned by Jeff Carter, has been bonded.

Tuolumne County

Mack—At this mine, Big Oak flat, M. Jacobs, superintendent, additional stamps will be put in commission.

Mellin—These river claims across the Tuolumne near Jacksonville are to be opened by a company. A dam will be built to turn the river and get at the "potholes."

Tiger—The 40-stamp mill continues running in good ore, and drifting from the 600-foot level is still being carried on.

[illegible]—At this mine on Mormon creek, under lease to Hudson and Barbanetti, high-grade gravel has been struck.

Colorado

Fremont County

Copperfield Consolidated—The company has 1000 acres in the Red Gulch mining district. The development work, amounting to 8000 ft., is mostly within 275 ft. of the surface. A 500-ton concentrator is planned. J. B. Conger, of Denver, is president.

Gunnison County

Lead King—The property at Crystal is being opened up by J. W. Deane. The Black Queen is also operating.

Lake County—Leadville

A. Y. & Minnie—The railroad switch has been completed to the dumps and the lessees are shipping 50 tons daily of a fair grade of zinc ore.

International—Development work in the orebody at the 1250-ft. level is all that is being done at this property in the Ten Mile district for the present. Work is being rushed on the mill, which it is expected will be running by February. When the mill starts, the mine will be in a position to supply it with 150 tons daily.

Park County

North Star—A company has been formed to drive the North Star tunnel to drain the mines of the Consolidated Montgomery district. J. H. Meyers, of Denver, is in charge.

San Juan District

The output of the Silverton district for October was 4075 tons, 2175 tons being crude ore, and the remainder concentrates, the heaviest production of crude ore coming from the Gold King, and that of concentrates from the Gold Tunnel (Highland Mary). This output will, it is expected, be doubled in November.

Mono-Baltic—The machinery for the smeltery in the Red Mountain district, is *en route* from Durango. This is to be a 250-ton plant

Silver Ledge—The mill and tramway machinery was started last week on a trial run to effect the necessary adjustments before steady operations are begun.

Champion—This mine, on Sultan mountain, reports a strike of gold-silver-lead ore in a 4-ft. vein on which drifting has been carried on for several weeks.

Teller County—Cripple Creek

The biggest lease ever granted on a producing mine in the Cripple Creek district was recently executed when the Isabella Gold Mining Company turned over to T. B. Burbridge, of Denver, and the Western Investment Company 65 acres of Isabella ground on Bull hill for two years, on a graded royalty. The lease covers the following properties: Empire State, Emmas 1 and 2, Comet, Tom Thumb, Sully, Snow Bird and Jack Rabbits Nos. 1 to 5.

El Paso—Over 150 miners are employed on the mine, on Beacon hill, by the company and its 45 sets of leasers. It is stated that two strikes of ore running $25 to $30 per ton have been made at the extreme north end of the company's territory, in an upraise from the third level of the El Paso shaft.

Golden Cycle—The mine, which has been closed for a month for repairs, has resumed operations at full capacity.

C. O. D.—This mine, in Poverty gulch, has reëntered the ranks of producers, lessees having recently made two shipments of ore of fair grade.

Portland—The carpenter shop and sawmill were destroyed by fire on Nov. 16, entailing a loss of $10,000, covered by insurance.

Pride of Cripple Creek—Material has been delivered for the new orehouse on Ironclad hill, and the work of construction will be pushed as speedily as possible. Manager Johnson is quoted as saying that the shoot encountered at the 500-ft. level is developing into one of the strongest and richest orebodies in that section of the district. The mine is being worked under lease.

Georgia

Douglas County—Villa Rica

Sulphur Mining and Railroad Company—Owing to the scarcity of labor during cotton-picking time the mine is being operated only on day shift. About 75 men are employed and daily shipments of about three cars of pyrites are being maintained. V. E. Hill is manager.

Idaho

Idaho County

Plans have been completed for a 20-ton custom mill and sampling plant at Elk City. Cyanidation and stamps will be used. M. F. Tytter is in charge.

Lemhi County

Oriole—The company is developing the Mountain Boy claim in the Texas district. Hugh Ferguson is in charge.

Shoshone County

Silver Lead—The company has purchased the stock of the Rex on Nine Mile. The compressor will be overhauled, a sinking pump installed and a contract given for sinking 500 ft. deeper.

Paragon Consolidated—On this property near Murray, the No. 5 Chicago tunnel, in 1400 ft., is being continued.

Black Horse—The mill will have an initial capacity of 100 tons daily, with rolls to handle 400 tons per day if the plant is enlarged.

Belmont—At a meeting of the stockholders, the par value of stock was increased from 10c. to $1 per share. The option on the claims given to a Spokane syndicate has been extended six months

Snowstorm Extension—At a stockholders' meeting it was voted to turn over the entire property to a Los Angeles company

Snowstorm—A contract with a California smeltery has been closed and shipments increased to about 6000 tons per month.

Monarch—The flume has been completed and operations at the mill resumed. An ore sorting plant and ore bins are being constructed.

Illinois

Bates Brothers Coal Mine—This mine near Kewanee has been closed by a rush of water from a new drift. The water broke in suddenly and filled the mine before measures could be taken to handle it.

Gilchrist & Alden Coal Company—This company has just completed its new mine at Mather, on the Rock Island Southern road. The mine is equipped for an output of 1500 tons of coal per day.

Indiana

A deal has been closed whereby W. P. Easton and Virgil Roberts became the owners of the Bennie mine, one mile north of Linton. The transfer includes a number of acres of land under which the coal has been leased, and this land will be developed by the new owners.

For the first time in two years advertisements for miners and laborers are being posted in Clinton, and are appearing in the local papers. A new coal shaft is being sunk, another has just been completed and is ready to begin operations, and a gang of 100 men is busy laying track for switches to the new mines.

The committee appointed by the Indiana Operators' Association some time ago, to promote the movement for the establishment of an appliance station where oxygen, helmets, etc., may be kept, will meet in Terre Haute this week to take up the matter. The Illinois disaster has demonstrated the necessity for such a station.

Iowa

Avenue Top—Negotiations for the sale of this zinc mine at Dubuque are under way. The mine is being unwatered.

Kansas

There is a great scarcity of miners in the Galena district and several hundred could be put to work if they could be obtained

Lookout—This company at Galena has unwatered the large leases down to the 100-ft. level and mining is active. South of the Memphis depot there has been developed a rich mine and also east of this. This tract has been under water for 10 years and the draining was only accomplished with centrifugal pumps.

Atchison Coal Mine—This mine, at Atchison, was sold Oct. 25, at receiver's sale, to S. R. Beebe, for $22,500. A new company will be formed and the mine reopened.

Michigan

Copper

Superior—This mine will increase rock shipments to the Atlantic mill from 300 tons daily to 600 tons. Openings from No. 1 shaft continue in the same rich formation.

Osceola—The company has encountered a copper bearing lode in No. 3 drill hole at 60 ft., believed to be the same as opened by the shaft sunk several years ago to a depth of 450 ft. The drill hole is 2000 ft. south of the shaft.

Gratiot—Before the end of the year, rock shipments will be made to the Calumet & Hecla mills.

Franklin—No. 1 Pewabic shaft is to the 27th level and a plat is being cut preparatory to crosscutting to the lode. Extension of the drifts from the 22d level are showing good ground. Three drifts have been extended into the Rhode Island tract with the same results. No. 3 shaft is sinking on the lode at 1200 feet.

Winona—The arrival of machinery for the stamp mill has facilitated the work. The portion of the concrete dam recently washed out can be repaired without causing any delay.

Calumet & Hecla—The last quarter of the large regrinding mill has gone into commission, making a total of 48 chilean mills and 196 Wilfley tables in service handling 1500 tons of sands daily. All conglomerate rock coming from the properties now controlled by this company will be stamped in its mills, and all rock from the Osceola and Kearsage amygdaloid lodes will be stamped in the Tamarack and Osceola mills.

Copper Range—The company will not take over the land in sections 7 and 8 which it has had under option from the St. Mary's Mineral Land Company. Much diamond drilling has been done on these lands, but results have not been made public.

La Salle—No. 1 shaft on the Caldwell tract is down 900 ft. and is coming into better rock. No. 2 Tecumseh shaft is down below the second level. As soon as the new addition to the Allouez-Centennial mill is ready, a mill test will be made.

Quincy—Both shafts are down to the 1250-ft. level and sinking will be temporarily suspended and attention given to proving the lode.

Iron

Pewabic—The company will seek an [illegible] between the [illegible]

Michigan Iron Mining Company—The [illegible] at Iron River will [illegible] the Stanton Vein [illegible]

Wisconsin—The [illegible] mining the Mac[illegible] Council [illegible] Carbonate [illegible]

Minnesota

A company represented by J. J. Rogers, of Lincoln, Neb., is exploring for iron on a 7000-acre tract in Cass, Todd and Morrison counties.

The development under way on the Mesabi range is greater than at any time in the history of the district. The Steel corporation is spending over $2,000,000 at Hibbing and Chisholm in stripping.

Missouri

Edwin M. White, of South Yarmouth, Mass., and C. C. Norton, of Boston, have purchased for $385,000 about 23,000 acres known as the American lead and baryta property, near Potosi.

Eastern Lead Company—The company's plant at Mine La Motte is closed and will remain so for some time. R. B. Magrath, Poughkeepsie, N. Y., is secretary.

Joplin Zinc-lead District

Silver Star—The contract has been let to J. G. Marcum, of Joplin for a large mill on these mines of H. Gundling at Stotts City. The ground has been unwatered and the mines are running a central pumping plant.

Mary E.—The mine at Spring City has about been sold and a mill will be erected. It has developed one of the best prospects of the camp at a deeper level than the blanket formation.

Gibson—This mine which has had a fine record in the past has found good ore in the bottom.

Hamilton—This company of Joplin, A. J. Smith, manager has bought 160 acres south of the Herald mine at Cave Springs and is preparing to drill and develop.

C. C. Playter—A prospect drill is at work on the 160-acre tract south of Spring City.

Wollfsheart—The mill of this company, near Duenweg, is completed and the ground is ready to produce.

Montana

Butte District

Butte Balaklava—The first shipment of ore has been made. Raising the third compartment of the shaft from the 500-ft. level to the surface is progressing.

Bonny Copper—The shaft is down 175 ft., and sinking at the rate of 100 ft. per month.

Butte & Superior—The assay of ore taken from the 1000-ft. level gives 57.0 per cent. zinc, 25.9 oz. silver, 0.4 per cent. copper and 0.6 per cent. iron.

Vogan Hill—W. D. Coburn, Walter Larson and J. L. Templeton are developing this ground. A vein of quartz carrying gold has been uncovered. Stoping will begin soon. Shipments are being made to East Helena.

Carbon County

Butcher Creek Oil—Thomas Cruse has struck petroleum 15 miles west of Red Lodge.

Jefferson County

Montana-Corbin—The shaft has been unwatered, and when the new compressor has been installed sinking will be resumed.

Independence—The tunnel is in 200 ft., and more carbonate ore has been exposed.

Corbin Copper—Four cars of ore were shipped recently.

Calumet & Corbin—The company operating the Minnesota mine shipped its first car of ore to East Helena recently.

Missoula County

Iron Mask—At 700 ft. a strike has been made of 18 in. of shipping ore.

Sanders County

Monitor—A tunnel nearly a mile long will be driven on the property to tap the ore at 2210 ft. The management expects to make 300 ft. per month. The ore is now hauled to Saltese, five miles distant. The tunnel will do away with this hauling.

Nevada

Churchill County

Nevada Hills—A car of high-grade ore has just been shipped from this property at Fairview. Manager W. H. Webber expects to maintain shipments of like ore and the company is planning the erection of a mill, but the capacity and nature of the plant will be determined, when development has been further advanced.

Fairview-Eagles—A new ore house has been erected and steady shipments are being maintained. The shaft sinking is progressing steadily and as soon as the additional lift is completed crosscutting will be started toward the vein.

Esmeralda County

Combination Fraction—All work upon this property has been temporarily shut down, and the mill is no longer being operated. The oreshoot, shortly after the payment of the dividend, began to grow smaller and the management of the mine decided to close for the present. H. S. Stark is manager.

Atlanta Mines—The shaft of the Garrison or Precious Metals lease at Goldfield has reached 650 ft. A promising quartz vein has been cut. It is the intention of the management to sink to 750 ft. before doing any lateral work, and none will be done at that level unless developments warrant. The company is prepared to sink 1000 ft. if necessary.

Nancy Davidson—The easterly crosscut from the shaft at Goldfield is now entering the footwall of the vein, which gave such good returns on the surface. Surface work has proved the vein to be continuous for 1000 ft. John I. Hawkins is manager.

Jumbo Extension—The Goldfield Annex Company operating a lease upon this company's acreage at Goldfield has cut a well defined vein at 600 ft. It is the opinion of the manager that it is the extension of one of the veins cut in the Clermont shaft of the Consolidated company, on its eastward dip. The lease has two years to run from Nov. 1, 1909, and it is the intention to sink to 1000 ft. D. E. Lane, J. W. LaFoe and J. W. Dunphy have been granted a lease upon the Gold Coin claim of this company.

Florence-Goldfield—During the month of October the mill treated 4056 tons of an estimated value of $110,000. The tonnage treated was held back somewhat by the old crusher, which was badly worn; it has been replaced by a new gyratory of greater capacity and the ore treated per month will now increase. An excellent body of milling ore has been opened on the 480-ft. level of the Little Florence workings. Work is being extended in order to get into the block of ground formerly worked by the Reilly lease, as a large body of good ore is already blocked out in that portion of the mine. Work has been resumed upon the Gatzen lease, by the former lessees. Although it is against the policy of the company to grant new leases this one was again given to the old lessees on account of their already having spent so much money.

Nye County

The Tonopah production for the week ended Nov. 13, is 4877 tons having an estimated value of $121,925. The tonnage from the various mines being as follows: Tonopah, 3200; Montana-Tonopah, 927; McNamara, 550; West End, 200; total, 4877 tons.

Round Mountain—Bullion returns for October were $41,000, the largest in the history of the property. Two ore shoots have been discovered, one on the 600-ft. level having a width of 16 ft., and another upon the 700-ft. level entirely in virgin ground. These discoveries will double the known ore reserves.

Bonnie Clare—A. J. Trumbo, manager of the New Bonnie Clare Mining Company has closed contracts with the Nevada-California Power Company for a branch line. Machinery has been ordered to increase the capacity of the mill from fifty to one hundred tons per day, and it is expected to have it installed by Jan. 15, 1910. As soon as the improvements are made the company will accept custom ore in order to afford an outlet to the ores of the camp.

Storey County

Crown Point—This Comstock company has announced that it will continue work on the 100, 300 and 1200 levels where good ore has been opened. Lower levels will be developed as the water permits.

White Pine County

Nevada Consolidated—The company has announced that the date for the exchange of Cumberland-Ely stock in order to participate in the forthcoming dividend of the company is Dec. 1. The basis is 3¼ shares of Cumberland-Ely for one share of Nevada Consolidated.

Oklahoma

The Baxter camp is showing more signs of life than it has for over two years. Nearly all the mills are either running or preparing to run.

Mascotte—This mine at Quapaw will have a mill in the near future.

Big Jack—This mill at Quapaw has resumed after a long shutdown.

Oklah—This mine at Quapaw has developed one of the best prospects in the camp and has proved up its drilling with its shaft.

Peoria—E. E. Gordon, of Carthage, has reopened the old lead mines at Peoria and this camp will soon be producing.

Pennsylvania

Anthracite Coal

Lehigh Coal and Navigation Company—The board has recommended that the stockholders renew the property-protective voting trust for five years from March 1 next, with $175 per share, instead of $135, as the minimum price at which stock put in trust may be sold. It was also agreed that Lewis A. Riley should be added to the number of trustees.

Bituminous Coal

The county court of Washington county has confirmed an order made by the district mine inspectors directing the use of locked safety lamps in the Manifold mine of the Youghiogheny & Ohio Coal Company. The case is of importance as determining the power of the inspectors to make such orders.

South Dakota

The conflict between the Homestake management and the labor unions is becoming acute, and it is reputed that the mine may be closed. The company has brought a suit against the labor union for $10,000 damages, and posted anti-union notices.

Utah

Beaver County

Revenue—A high-grade silver-lead ore is being sacked from the tunnel on the Cliff vein. The west drift from the cross-cut tunnel shows a full face of ore.

Red Warrior—On the 400-ft. level the ore has widened from 2 ft. to 6 ft and carries lead and silver. The drift to the north has traversed 75 ft. of ore.

Harrington-Hickory—The station pump for 500 ft. is being installed. As soon as the shaft is sunk below this level ore shipments will be resumed.

Silver King—This group in the Mineral range has been acquired by Henry E. A. Riebling and associates, of Denver, and plans for development are being mapped.

Box Elder County

Homber—This company, operating near Brigham City, is shipping its first carload of graphite. It is said to be 90 to 98 per cent. pure and will be disposed of locally. T. J. Yates is manager.

Juab County—Tintic District

Iron King—The work being carried on through the shaft has been discontinued to enable the tunnel, now in 1700 ft., to be driven faster to reach the main orebody, which it is expected to encounter in 800 to 1000 ft. The tunnel is finally to be driven to connect with the shaft, a distance of 5000 feet.

Opohongo—Shipments of two carloads per week are being maintained.

Utah Consolidated—The raise from the 300-ft. level has passed through white limestone similar to that encountered by the Uncle Sam before it reached the ore.

Iron Blossom—Drifting from the 1300-ft. level has disclosed indications of nearing the ore. Good ore is being mined on the 1100-ft. level. The shaft will be continued to 2000 feet.

Chief Consolidated—October shipments netted $7316. Regular shipments of 50 tons per day are being made.

Salt Lake County—Bingham District

North Utah—The double-compartment shaft is 175 ft. below the main tunnel. A station is being cut preparatory to drifting north and south to get under two ore-shoots already opened in the tunnel.

Utah Consolidated—The concrete foundations for the aërial tram from the mine in Carr Fork cañon to the International smeltery at Tooele, four miles distant, are completed and towers are being erected at the rate of five per day. The company is under contract to deliver 1000 tons of ore per day beginning April 1, 1910, but will fill the smeltery bins before that date. Eight hundred tons per day are now being shipped to Garfield.

Summit County—Park City District

Daly-Judge—While driving on the 1200-ft. level, on a fissure parallel to the first one encountered on this level, a new streak of high-grade ore has been found which carries less zinc than the other ores of the mine. The three-mile tunnel from the Snake creek side of the range to the company workings will be started soon. The buildings at the tunnel mouth have been completed and the Knight power plant which is to furnish the power is nearly complete. Between two and three years is the estimated time for driving the total distance. Competitive bids for the work will be received.

Washington County

Reef—At the bottom of the old incline, which is down 400 ft., a shaft has been sunk and a rich streak of ore encountered. Henry Welte, Silver Reef, is the manager.

Vermont

Vermont Copper Company—A gas explosion recently occurred in the long brick flue between the blast furnace and the chimney on the hillside, blowing out a section of about 100 ft. Fortunately no one was hurt. The company at first endeavored to smelt pyritically, but is said to have been disappointed in the result, especially as to the amount of coke required. The furnace was then put on heap-roasted ore. It is said that everything was running smoothly when the explosion occurred.

Washington

FERRY COUNTY

Copper Key—Operations will be resumed in a short time, and carried on more extensively than before.

Oversight—A new body of ore has been found at 80 feet.

Paragon—John A. Wilson, of Spokane, and O. M. Matthews, of Northport, have obtained control of this property, and will begin development.

Bonanza—This property, abandoned for several years, is again making good, and regular shipments are being made. Frank J. Davy, Colville, has charge.

OKANOGAN COUNTY

Apex—The company is in the market for a power plant for the mine. James P. Blaine, Chesaw, is superintendent.

Wisconsin

ZINC-LEAD DISTRICT

The mill and roaster of the U. S. Zinc Corporation has been sold at court sale to the Baldwin interests, which will place it on a property near the Kennedy at Hazel Green.

Lyght—Eastern men represented by Julius Wilde, have purchased the mine at Platteville and resumed.

Red Jacket—The mine, at Centerville, has been released to B. W. Logan.

Dickson-Oettiker—The company is installing a small milling plant on the Dickson forty, east of the St. Rose.

Canada

BRITISH COLUMBIA

Northern Mines—The Copper Queen and Cornell mines, held under working option from the Van Anda company, are being operated by this company. Doctor Tanzier, Van Anda, manager.

Little Billy—A steam-power plant, boiler, hoisting engine, and four drill compressor are being installed. James I. Taylor, Van Anda, is manager.

Malaspina—The tunnel is in 250 ft. Alfred Roper, Van Anda, is manager.

ONTARIO—COBALT

Shipments of ore from Cobalt for the week ended Nov. 13 were as follows: Crown Reserve, 61,720; Drummond, 19,[illegible]; Kerr Lake, 18,[illegible]; La Rose, 48,[illegible]; McKinley-Darragh, 46,700; Nipissing, 449,[illegible]; North Cobalt, 40,000; O'Brien, 64,053; Temiskaming, 60,000; Trethewey, 75,000; T. & H. B., 60,225; total, 1,880,443 pounds.

Hargrave—The No. 3 vein of the Kerr Lake mine, for which search has been made on the Hargrave property for a year, has been cut at the 375-ft. level.

Temiskaming—The stamp mill is completed and 30 stamps in place, and everything ready for the installation of the rest of the plant. The rock will be crushed to ¾-in. mesh and taken to the mill over an aërial tramway for 487 ft. to the mill, which stands on rising ground.

Cobalt Lake—A wide vein showing leaf silver has been struck in the crosscut 28 ft. north from the drift at the 190-ft. level near the McKinley boundary. The ore appears to be low grade.

Trinity-Cobalt—This property has been sold for $12,000.

Cobalt Lake—A 30-in. vein containing high-grade ore has been discovered on the 190-ft. level.

Argyle—This property is again to resume, having been closed down on account of litigation.

Mexico

CHIHUAHUA

The Chihuahua and Potosi mining companies have resumed shipments of zinc from the Santa Eulalia mines, as has the Calera company in western Chihuahua. The Lago zinc properties are also shipping calamine ore. All of these shipments are to the United States.

El Rayo—The results for October were: Ore crushed, 4500 tons; value of products shipped, $44,391; operating profit, 26,061. The extraction was 80 per cent.

Batopilas—The company's output for September was 42,088 oz. of silver. The output for eight months is 831,332 ounces.

COAHUILA

Torreon Smeltery—The copper converter is working satisfactorily treating 30 tons of matte daily. E. Harms, superintendent.

GUANAJUATO

Guanajuato Consolidated—The October crushing was 7384 tons and the estimated gross value of mill output 111,100 pesos, and the estimated profit, 37,500 pesos; development work done, 290 feet.

HIDALGO

The Santa Gertrudis deal will be closed duly as far as the British interests are concerned. It is understood that certain Mexican stockholders are opposing the deal notwithstanding that a contract has been entered into and 200,000 pesos deposited by the buyers to bind it. The reports of dissatisfaction on the part of the purchasers are unfounded.

La Blanca—A new vein has been cut in the lowest level to the south.

MEXICO

Esperanza—October returns showed 15,202 dry tons crushed, and returns from bullion and concentrates $196,136. The estimated profit is $75,472. Development work done, 1040 feet.

El Oro—October crushing, 25,888 tons, yielding bullion $215,090. The working expenses were $107,360, and expenditure on development, $26,400, leaving a mining profit of $81,330, to which was added earnings from the railroad of $6000.

Mexico Mines—Crushed in October, 10,920 tons yielding bullion $108,460. The working expenses were $35,300, and expenditure on development $11,500, leaving profit of $61,660. In addition 25 tons valued at $8000 were shipped direct to smeltery.

SONORA

Calumet & Sonora—The south drift at the 300-ft. level of the Chivera shaft shows the orebody to be of greater width than it was at either the 200- or 100-ft. levels. The mine will be in condition to supply 250 tons ore daily by Dec. 1. The concentrator of 250 tons daily capacity is nearing completion and should be ready for operation in December. The electric-light plant for lighting the surface and underground, and the concentrator has been running for some time and is giving satisfaction. Grading on the road which will connect the mine and the mill has been started. Two-ton, side-dump cars are to be used on an 18-in. track. In addition to the 6-drill compressor already in use a 12-drill compressor is being installed.

El Triunfo—This mine in Arizpa district has developed on three levels copper-silver ore of good grade. A 50-ton smeltery, using charcoal for fuel, will be installed. A. C. Charlot is in charge.

El Tigre—Tunnel No. 7, to be used for haulage and draining purposes, has been driven 1500 ft. It is below prior workings and will be 2600 ft. long when completed.

Santa Rosalia—Ore is stored on the dump for shipment, but the intention of the management is to eventually reduce the output. Frederick D. Sandtner is in charge of the mining.

Greene-Cananea—A railroad spur from the company's line to the lower tailings dam is under consideration. A quantity of these impounded slimes are sent to the smeltery each month for converter lining.

New Zealand

Gold production in October is reported at 49,995 oz. bullion, an increase of 18,886 oz. over October, 1908. The bullion this year was equal to $965,381, or 46,705 oz. fine gold. Silver production for the month was 153,167 oz., an increase of 21,824 oz. over last year.

Metal, Mineral, Coal and Stock Markets

Current Prices, Market Conditions and Commercial Statistics of the Metals, Minerals and Mining Stocks

QUOTATIONS FROM IMPORTANT CENTERS

Coal Trade Review

New York, Nov. 24—The coal trade in the West continues to be in generally good condition. A wave of cold weather has started up domestic demand, while steam coal continues to sell well at all the large centers. There is some complaint of car shortage, but it has not yet reached an acute stage, except on the lines carrying coal to the Lake ports for shipments to the Northwest. The Lake trade is in the state of rush and many dealers fear that they will not be able to fill their contracts before the ice comes.

The eastern bituminous trade is in better condition than for a good while past, and a fair business is reported for bituminous coal all along the seaboard. Car shortage is the cause of many complaints on eastern lines.

The anthracite trade is quiet and steady as usual. From now on it will be mainly a weather market.

Cumberland Coal Rates—In the suit brought by the Baltimore & Ohio and other companies to restrain the Interstate Commerce Commission from enforcing its order reducing rates on Cumberland coal to tidewater, the United States Circuit Court has sustained the demurrer filed by the commission, which asked for the dismissal of the temporary injunction. Under this decision the lower rates can be enforced.

Coal Traffic Notes

Coal tonnage of railroads in Ohio Coal Traffic Association, nine months ended Sept. 30, short tons:

	1908.	1909.	Changes.
Hocking Valley.....	2,269,619	2,214,870	D. 54,749
Toledo & Ohio Cent..	1,094,889	948,827	D. 146,062
Baltimore & Ohio ...	1,038,983	1,090,639	I. 51,656
Wheeling & L. Erie..	1,987,683	2,252,717	I. 265,034
Cleve., Lorain & Wh.	1,770,575	1,800,561	I. 29,986
Zanesville & Western	882,790	801,530	D. 81,260
Toledo Div., Pen. Co.	1,130,538	1,319,187	I. 188,649
L. Erie, Alliance & Wh.	734,953	767,810	I. 32,857
Marietta, Col. & Clev.	33,763	56,433	I. 22,670
Wabash-Pitts. Term.	.....	22,888	I. 22,888
Total	10,943,793	11,275,462	I. 331,669

The total increase in tonnage this year was 3 per cent. Only the Ohio lines of the Baltimore & Ohio are included above; the main line is given elsewhere.

Shipments from mines on Norfolk & Western road, four months of fiscal year, July 1 to Oct. 31, were: Commercial coal, 4,577,790; company coal, 657,426; total, 5,235,216 short tons. Of the total shipments 3,615,127 tons were from the Pocahontas field.

Bituminous coal and coke shipments, Pennsylvania and West Virginia, nine months ended Sept. 30, short tons:

	Coal.	Coke.	Total.
Balt. & Ohio.....	16,746,216	3,310,794	20,057,010
Buff., Roch. & Pitts.	4,803,810	344,714	5,148,524
Buff. & Susquch'na	1,075,976	242,575	1,318,551
Penn. lines, N. Y. C.	5,278,843	70,985	5,349,828
Pitts. & L. Erie.....	6,921,267	3,838,404	10,759,671
Pitts., Shawmut & N.	634,308	12,030	646,338
Norfolk & Western.	10,163,422	1,854,689	12,017,111
Ches. & Ohio.....	9,869,725	337,499	10,147,224
Total.....	55,432,567	10,011,690	65,444,257
Total, 1908.....	47,954,169	6,271,137	54,225,306

Total increase this year, 11,218,951 tons, or 20.7 per cent. In addition to the above, the Baltimore & Ohio carried 546,959 tons of anthracite in 1908, and 562,739 in 1909; increase, 15,780 tons.

	Anthracite.	Bitum.	Total.	Per Ct.
New York....	10,399,168	7,803,444	18,202,612	60.7
Philadelphia	1,445,119	3,495,763	4,940,882	16.5
Baltimore....	161,941	2,543,215	2,705,156	9.0
Newp't News	.....	2,636,077	2,636,077	8.7
Norfolk.....	.....	1,550,431	1,550,431	5.1
Total.....	12,006,228	18,028,930	30,035,158	100.0
Total, 1908.	12,754,492	16,902,207	29,656,699	.....

Total increase this year, 378,459 tons, or 1.3 per cent. The gain was in bituminous coal, anthracite showing a decrease.

New York

Anthracite

Nov. 24—The anthracite market has settled down into a weather market and will probably so continue for some time. For the past week the weather has been mild, but yesterday a storm and cold wave struck the seaboard, which will probably send up sales.

Schedule prices for large sizes are unchanged at $4.75 for lump and $5 for egg, stove and chestnut, all f.o.b. New York harbor. For steam sizes quotations are: Pea, $3.10@3.25; buckwheat, $2.25@2.50; No. 2 buckwheat or rice, $1.75@2; barley, $1.35@1.50; all f.o.b. New York harbor.

Bituminous

The soft-coal market is in about the same condition as reported last week. Demand from the West still continues to affect the mines, but it is beginning to slacken, and there is a little less rush to get coal to Lake Erie ports. This will benefit seaboard shippers a little later by giving them more cars. At present car shortage continues to be a feature in the trade, and complaints are numerous from mines which have orders to fill. Coal is not coming forward as fast as it is wanted. Shippers to the shoal-water ports are beginning to get uneasy, as cold weather may come at any time and ice may cause trouble before orders are filled. Transportation continues to be irregular, and it is hard to say when shipments will reach tidewater.

Buying is fair and is pretty well distributed. The Far East is taking coal and the Sound ports are doing better than they have been. New York harbor trade is looking up a little.

Prices are firmer than they were. In some cases advances have been paid by buyers who are in a hurry. It cannot be said that there has been any general advance.

Coastwise trade is good, and rates are firm. For large vessels from Philadelphia charters are taken at 85c. per ton to Boston, Salem and Portland. Small vessels from New York harbor points command 65c. to points around Cape Cod.

Birmingham

Nov. 22—All the coal that is being mined in Alabama is finding a ready demand. The production is heavier now than it has been since the summer of 1907, and the efforts being made to bring in more labor, much of which goes to the mining section of the territory, are being felt in an increasing production. The mining companies expect still better results when the increased wage scale goes into effect Dec. 1. Contracts are said to be in hand that call for a steady delivery of coal through several months to come. The railroads are now consuming more coal than in two years. The coke demand is also steadily improving, but the make holds practically the same.

Chicago

Nov. 22—The demand for both domestic and steam coals continues good, with supplies in general well regulated so that sales at sacrifice prices are few, and prices firm. On the better grades of Illinois and Indiana domestic coals prices are advancing slightly. With continued cold weather—and November so far has been extraordinarily mild—dealers look for a large demand from country territory, for retailers' stocks are in general low.

Illinois and Indiana bring, in car lots: Lump and egg, $2@3; run-of-mine, $1.75@1.85 and screenings, $1@1.15.

Eastern coals in general are strong, with the exception of smokeless run-of-mine, which has been over-plentiful, though in good demand. Smokeless lump is fairly strong, bringing $3.60@3.80, while run-of-mine brings $3.05@3.15. Hocking is in good demand and brings the full circular

price, $3.15, generally. Other Eastern coals remain practically unchanged in prices, with good market conditions. No large surplus, indeed, exists of any coal in this market. Anthracite continues to sell well in city and country.

Cleveland

Nov. 23—Colder weather has stirred up the domestic trade. The Lake trade is still in a rushed condition, and the delay caused by the accident at the Sault is making trouble. Shippers fear that navigation will close before their contracts can be filled. Quotations are about the same.

Prices are firmer. Middle district coal brings $1.40 at mines for 1¾-in., $1.15 for ¾-in., $1.05 for run-of-mine and 70c. for slack; 70c. being added for Cleveland delivery. No. 8 district is $1.35 for 1¼-in., $1.05 for ¾-in., 95c. for run-of-mine and 60c. for slack, all at mine; 90c. being freight to Cleveland. Massillon domestic is $2.95 for lump and washed nut and $1.50 for slack; all f.o.b. Cleveland. Pittsburg coal is $2.40 for 1¼-in., $2.20 for ¾-in., $2.10 for run-of-mine and $1.65 for slack, Cleveland delivery.

Indianapolis

Nov. 22—There is no special change to report in the local market. Business continues good, both for steam and domestic coal, and the mines are generally busy. The coming of cold and stormy weather increases demand and at the same time delays shipments. Car supply is about the same as it was, some complaints of shortage coming in from different quarters.

Pittsburg

Nov. 23—The coal market is firm on contracts for forward delivery while on account of the rush to wind up Lake shipments, and the relative scarcity of cars, some producers are asking premiums on lots for immediate shipment. We quote slack at 60@70c., depending on delivery, mine run and nut at $1.20, ¾ in. at $1.30 and small lots of domestic coal to retail dealers at $1.50, all at mine.

The Pittsburg-Buffalo Company, under date of today, has issued the following list:

	Pittsburg	Dorothy, W. Va.	Brilliant
Slack	$0.60	$0.60	$0.60
Nut, slack	0.90	0.75	1.05
Mine, run	1.20	1.00	1.05
¾ in. lump	1.30	1.15	1.15
1¼ in. lump	1.40	1.10	1.25

[illegible] Coke. The market is [illegible] about 25 per ton on prompt [illegible] other points being [illegible] There is not much demand for [illegible] are expected on [illegible] and deliveries are better on account of the [illegible] Furnace. The Uniontown [illegible] in [illegible] prices should be [illegible] the first of the year as it is pretty generally expected there will be a general wage advance Jan. 1, although official information is withheld. The furnaces, which have not covered for the first half, are showing little interest in the market.

The market stands at $2.85@2.90 for prompt furnace, $2.90 for contract furnace, $3@3.25 for prompt foundry and $3.25@3.50 for contract foundry.

The *Courier* reports production in the Connellsville and lower Connellsville regions in the week ended Nov. 13, at 458,329 tons, and shipments at 4834 cars to Pittsburg, 8203 cars to points west of Pittsburg and 956 cars to points east of Connellsville, a total of 14,053 cars.

St. Louis

Nov. 22—The coal market is now purely a weather market and the demand varies entirely according to the thermometer. At the first part of this week we had several brisk days which livened up things a little. However, it is now quite warm again with the result that the situation is easing up. The demand for high-grade coal from southern Illinois continues to be strong from the Northwest, though even this market does not show the strength that it has been for the past month. This has had no effect as yet on the tone of high-grade coal as the car supply has been so bad in southern Illinois that it more than makes up for any slight falling off in demand.

The car supply has been so short that a number of mines ran only one full day this week. The Illinois Central is so short of cars that the mines on the line are practically out of business. The Iron Mountain and other roads in southern Illinois are also exceedingly short, but seem to be giving better service than the Illinois Central. The Chicago & Eastern Illinois seems to be the only Illinois road in the State which is even doing fairly well in the matter of car supply. The mines in the central Illinois field have also been very short of cars all week and have been able to run only one-half time. The Louisville & Nashville yesterday placed an embargo on all coal moving outside of switching limits of St. Louis. By this means it hopes to husband the car supply and, although it restricts the market very much for their operators, yet they feel that on the whole this is the best way to keep their tonnage up. The warm weather having slowed up the production of lump coal has had the effect of stiffening up the market on the coal and prices in general on the smaller sizes are about 10c. per ton better than have been prevailing for the last month.

Standard 6-in. lump is being offered much at $1.10 mine, or $1.62 St. Louis; 2-in. lump is bringing 95c. mine, or $1.47 St. Louis; 3-in. nut coal is being quoted 80c. at mine, or $1.32 St. Louis; 1¼- to 1½-in. steam nut coal is selling at mine, or $1.02@1.12 St. Louis. Nut and pea are worth 30c. mine, or 82c. St. Louis, while 1½-in. screenings are now 10c. mine, or 62c. St. Louis.

Staunton, Mt. Olive, or Springfield district 6-in. lump is quoted at $1.50 mine, or $2.02 St. Louis; 2-in. lump is $1.20 at mine, or $1.72 St. Louis; 2-in. nut is 85c. mine, or $1.37 St. Louis.

Carterville 6-in. lump or egg is held strong at $1.75 per ton at mine, or $2.42 St. Louis; 3- to 2-in. nut is bringing $1.35 per ton mine, or $2.02 St. Louis.

Franklin county 6-in. lump is strong at $2 per ton mine, or $2.67 St. Louis; 3- to 2-in. nut coal is $1.50 per ton mine, or $2.17 per ton St. Louis. At present nearly all of this coal is going to the Northwest.

The market on anthracite remains unchanged; chestnut is in strong demand while other sizes are slow.

Foreign Coal Trade

British Coal Exports—Exports of fuel from Great Britain, with coal sent abroad for use of steamships in foreign trade, 10 months ended Oct. 31, long tons:

	1908.	1909.	Changes.	
Coal	52,423,508	52,272,368	D.	151,140
Coke	958,102	947,554	D.	10,548
Briquets	1,244,869	1,235,282	D.	9,587
Total exports	54,626,479	54,455,204	D.	171,275
Steamer coal	16,218,324	16,410,514	I.	192,190
Total	70,844,803	70,865,718	I.	20,91

The larger exports this year were 8,650,699 tons to France, 7,988,976 to Germany, 7,000,066 to Italy and 3,203,382 tons to Sweden.

Austrian Coal Production—Coal production of Austria, nine months ended Sept. 30, metric tons:

	1908.	1909.	Changes	
Coal	10,664,558	10,344,934	D.	319,624
Brown coal	20,058,522	19,148,094	D.	910,428
Total mined	30,723,080	29,493,028	D.	1,230,052
Coke made	1,450,463	1,403,612	D.	46,851
Briquets made	249,800	268,941	I.	19,141

Of the briquets reported this year 133,449 tons were made from brown coal, or lignite.

Transvaal Coal—The total coal mined in the Transvaal for the nine months ended Sept. 30 was 3,058,749 tons. The total shipped and sold was 2,600,354 tons. The balance was used at mines, or sorted and screened out as waste. The average value at mines was $1.22 per ton.

Spanish Imports—Imports of coal into Spain, nine months ended Sept. 30, were 1,527,947 metric tons, an increase of 109,300 tons; imports of coke, 223,879 tons, an increase of 7084 tons over last year.

Welsh Coal Market—Messrs. Hull, Blyth & Co., London and Cardiff, Wales, report prices of coal as follows on Nov. 6: Best Welsh steam, $4.08; seconds, $3.84; thirds, $3.60; dry coals, $3.84; best Monmouthshire, $3.48; seconds, $3.36; best small steam, $2.88; seconds, $1.92. All prices are per long ton, f.o.b. shipping port, for cash in 30 days, less 2½ per cent. discount.

Iron Trade Review

New York, Nov. 24—The comparative lull in the iron and steel trades continues and it appears quite probable that quieter times are ahead, at least until buying for the needs of the second and third quarters of 1910 begins. It is not likely that this buying will fairly set in much before the close of the year. This does not mean that business is dead, however, for the mills are generally full of work and there is every prospect that they will continue so for a good while to come.

In pig iron the buying in eastern territory has been chiefly of small lots of foundry. In the central West the steel companies are still picking up outside bessemer and there is quite a demand for basic pig. Some good orders for basic from Virginia furnaces are reported, mostly for eastern delivery.

In finished material there is a fair demand for bars and railroad supplies, and the railroads continue to put in orders for new cars which will absorb a good deal of material. Structural steel is quiet just now, although there is talk of some large contracts which may come forward for spring work.

Lake Superior iron-ore shipments were delayed last week by an accident to the Poe lock at Sault Ste. Marie. This will reduce the November shipments a little and the companies are all rushing work to get off as much ore as possible before navigation closes. No action has yet been taken about ore prices for next season.

Foreign Iron Ore—The receipts of foreign iron ore at Philadelphia this year have been unusually large. For the year to Nov. 20 they reached a total of 1,017,000 tons. Receipts at Baltimore to Oct. 31 were 665,000 tons. It appears that some ore is to come from Africa; a Berlin despatch reporting that the Otavi Mining Company in German Southwest Africa has made a contract to send 100,000 tons to this country, the first cargo to be shipped in December.

Baltimore

Nov. 23—Imports for the week included 1312 tons ferromanganese and 203 tons silicospiegel from Liverpool; 5018 tons cupreous pyrites from Spain; 16,550 tons iron ore from Cuba. Exports included 567,971 lb. tin scrap to Rotterdam; 2296 tons rails and 222,000 lb. splice bars to Brazil; 578,924 lb. galvanized sheets to Liverpool.

Birmingham

Nov. 22—The Southern pig iron market continues strong despite the fact that the lull in buying is still on, and in some quarters a concession is being made on the price. No. 2 foundry is quoted at $15 per ton, delivery during the first half of the coming year, but $1 under that price is said to be made by some of the smaller producers. The strength of the market is encouraging and the manufacturers are not thinking of cutting down the active production. There is more iron being shipped or melted than is being manufactured in this territory. The fact that some of the producers have notified speculators, brokers and others who have a large quantity of iron stacked in the yards here that storage charges will be made has caused the removal of a good block of this iron. The furnace companies are accumulating a little iron of their own, but not to any great extent. The indications are there will be no disturbance in the production during the balance of the month. The pipe people have a strong trade, some new contracts having been secured recently. Cast-iron pipe prices have gone up a little in this section, $25 per ton being a basis.

The operations at the steel plant in this district show no change. While the full capacity of the steel-rail mill is not on, inasmuch as something like 6000 tons of fabricated steel is being produced monthly at the Bessemer rolling mills—also property of the Tennessee company—there is much work being done. Another large consignment of rail is being made on the Argentine railroad order received some time ago; three cargoes are to leave Pensacola, Fla., soon for Buenos Aires. Satisfaction is expressed on the announcement that the American Steel and Wire Company will put up at once a large plant in the Birmingham district. Machine shops and foundries throughout the South are busy these days and are giving employment to more men every week.

Cleveland

Nov. 23—The accident to the Pre lock at the Sault Ste. Marie, one of the gates being rammed by a big freighter, put the lock out of commission for 10 days, materially reducing the capacity of the canals at a critical time, and reducing the arrivals of iron ore.

Pig Iron—The market is quiet just now, but prices remain firm, with no change from last week.

Finished Material—The biggest business for the week has been in railroad supplies and in bars. The bar demand is heavy, and it is difficult to get early deliveries, the mills being full.

Chicago

Nov. 22—The iron market continues quiet, with a steady buying of pig iron in small amounts and no indication of weakening in prices. As there is a slackening of inquiries, it would seem that the melters have about reached their limit of need caused by several months of light buying and will proceed now on an even basis of steady probable needs. Furnaces seem to be well adjusted to this condition and sellers of both Northern and Southern express no apprehension. Northern iron continues to be strong at $19@19.50 for No. 2, and Southern holds to about $15 Birmingham ($19.35 Chicago), with a variation of 50c. above and below this price according to special conditions. Considerable resale iron appears, at low prices.

The demand for iron and steel finished products continues generally heavy, despite some advances in prices. Railroad supplies are in steady demand and structural material shows a wide distribution of sales. Coke is somewhat weaker but holds to $5.50 for both Connellsville and Wise county.

Philadelphia

Nov. 24—The volume of business in pig iron has fallen off. This does not mean that iron could not be sold if it could be delivered to suit buyers. Quite a number of small concerns, especially foundry people who were overcautious or indifferent a month or two ago, would like to place orders at present, though few of them are in urgent need. There are more foundry-iron buyers than any other kind. The bar-mill people are pretty well supplied for the present. Steel-making irons are, of course, scarce and higher. Basic irons are next to impossible to get at any price. There is less anxiety this week to buy iron for mid-winter delivery than there was last week. Some buyers comfort themselves by saying that the danger of a further advance is past. Basic is nominally $19; gray forge $18, and No. 2X foundry $19@19.50 per ton.

Steel Billets—Importations of steel billets have taken place in large lots and further dependence for winter supplies will be had on this source. The price in this market is $29.25.

Bars—Common and refined iron are in excellent request from both large and small consumers. All of the mills are running full time at the higher level of prices for new business. Steel bars have also advanced and the capacity is strained to the utmost.

Scrap—There has been a free movement in some of the lower grades of scrap, such as borings and turnings, while the higher grades such as railroad scrap and heavy melting steel have not been called for.

Pittsburg

Nov. 23—The iron and steel market is relatively quiet all along the line as to new buying, and in some quarters the tone is not regarded as altogether as strong as it was, although there are no evidences of actual weakness at any point. The mills are still congested with specifications in most lines. The quietness in the market is due in part to the conservatism of the mills, which are restricting sales to definite requirements of customers and are avoiding commitments to jobbers for far forward delivery.

Pig Iron—The market continues quiet and as to foundry grades is not over strong. As noted in previous reports, one Valley furnace has been an aggressive seller, at cut prices, but it is now less active. The views of other furnaces have not been greatly influenced by the incident. A local machine interest is in the market for 2250 tons of foundry iron, 250 tons for December and the balance for first half. We note a sale of 100 tons of prompt bessemer at $19.10, Valley. The market is quotable at Valley furnace—90c. higher delivered Pittsburg—as follows: Bessemer, $19@19.10; basic, $17.25@17.50; No. 2 foundry, $17.25@17.50; malleable, $17.50@18; gray forge, $16.25@16.50 per ton.

Steel—No important sales of sheet-bars are reported since it became generally recognized that the price for first quarter would be $30, f.o.b. Pittsburg mill. The Carnegie Steel Company is not selling, nor are the Youngstown Sheet and Tube Company and Republic Iron and Steel Company, while the Jones & Laughlin company seems to have stopped making sheet-bars. The Lackawanna Sttel Company is likely to have a limited tonnage available. Billets are scarce and prices are largely nominal. We quote sheet-bars at $28@30 and billets at $27@28, Pittsburg, depending on delivery.

Ferromanganese—The advancing market continues. Consumers already supposed to be covered are taking additional tonnages. Prompt metal is $45@46 and first half $45.50@46, f.o.b. Baltimore; freight to Pittsburg $1.95 per ton.

Sheets—Demand is fair and mills continue conservative in selling ahead. Last week the independent mills able to make good deliveries on blue annealed sheets advanced their prices $1 a ton to 1.80c. for No. 10 gage, thus placing themselves again $1 above the leading interest, which does not promise deliveries on blue annealed sheets in less than about three months. Prices are: black sheets, 28 gage, 2.40c.; galvanized, 3.50c.; blue annealed, 10 gage, 1.75@1.80c.; painted corrugated roofing, $1.70; galvanized, $3 per square.

St Louis

Nov. 22—The demand for pig iron for the past week has been quiet. Nearly all the larger users seem satisfied for the present and only odds and ends of business are being closed now. Business is held to be quiet from now on until selling for the second quarter commences. Prices on No. 2 foundry iron remain unchanged at $18@18.25 per ton Birmingham, or $18.75@19 St. Louis. The furnaces are stocked up on high-silicon iron which they are offering this week.

Coke—The demand for 80 per cent. Connellsville is at $3.90@4 per ton f.o.b. St. Louis. Car shortage is still and difficulty has been experienced in getting shipments made.

Sault Ste. Marie Canal Traffic

The total freight passing through the Sault Ste. Marie canals in October was 9,127,240 short tons, or about 100,000 tons less than in September. For the season to Nov. 1 the total movement was, in short tons:

	1908.	1909.	Changes.
East-bound	24,734,614	38,606,780	I. 13,872,166
West-bound	9,441,730	9,559,908	I. 118,178
Total	34,076,344	48,166,688	I. 14,090,344

In October, as in September, the Canadian canal carried a larger proportion of the traffic than ever before. The mineral freights included for the season were, in short tons, except salt, which is in barrels, as follows:

	1908.	1909.	Changes.
Coal	8,444,735	8,316,830	D. 127,905
Iron ore	20,953,638	34,395,380	I. 13,441,742
Pig and man. iron	245,607	407,594	I. 171,987
Copper	75,708	94,230	I. 18,522
Building stone	1,019	1,674	I. 655
Salt, bbl	467,777	531,065	I. 63,288

Iron ore was 71.4 per cent. of the total freight this year, and coal 17.3 per cent.

Foreign Iron Trade

German Iron Production—The German Iron and Steel Union reports the production of pig iron in Germany in September at 1,068,345 tons, or 32,326 tons less than in August. For the nine months ended Sept. 30 the output was, in metric tons:

	1908.	1909.	Changes.
Foundry iron	1,668,587	1,804,190	I. 135,603
Forge iron	495,194	504,503	I. 9,309
Steel pig	704,940	810,818	I. 105,878
Bessemer pig	297,039	307,435	I. 10,396
Thomas(basic)pig	5,758,905	6,082,091	I. 323,186
Total	8,924,665	9,509,037	I. 584,372

The total increase this year was 6.5 per cent. Steel pig includes spiegeleisen, ferromanganese, ferrosilicon and all similar alloys.

British Iron Trade—Exports and imports of iron and steel in Great Britain, nine months ended Sept. 30, are valued as below by the Board of Trade returns:

	Exports.	Imports.	Excess.
Iron and steel	£27,826,523	£ 5,860,808	Ex. £21,965,715
Machinery	21,089,186	3,438,275	Ex. 17,650,911
New ships	4,831,561	.....	Ex. 4,831,561
Total	£53,747,270	£ 9,299,083	Ex. £44,448,187
Total, 1908	59,825,166	9,195,087	Ex. 50,629,179

Decrease in exports, £6,077,896, or 10.2 per cent.; this loss was in new ships and machinery. Increase in imports, £103,096, or 1.1 per cent. The quantities of iron and steel were, in long tons:

	1908.	1909.	Changes.
Exports	3,109,120	3,074,202	D. 34,918
Imports	791,049	877,051	I. 86,002

The increase in imports was chiefly in ingots, blooms and other half-finished material.

British Iron Ore Imports—Imports of iron ore into Great Britain, nine months ended Sept. 30, were 5,428,880 long tons in 1908, and 4,572,874 in 1909, decrease, 1,143,078 tons. Of the imports this year 1,127,825 tons were from Spain.

Metal Markets

New York, Nov. 24—The metal markets have shown a good degree of activity, and some tendency to advancing prices, followed by a reaction. The rise in some of the minor metals is noticeable.

Gold, Silver and Platinum

UNITED STATES GOLD AND SILVER MOVEMENT

Metal.	Exports.	Imports.	Excess.
Gold:			
Oct. 1909	$ 9,379,402	$ 7,034,164	Exp. $ 2,245,438
" 1908	1,952,574	3,785,705	Imp. 1,833,131
Year 1909	106,652,236	38,139,557	Exp. 68,512,679
" 1908	70,889,954	42,213,678	" 28,676,276
Silver:			
Oct. 1909	4,053,745	4,017,884	Exp. 35,861
" 1908	4,378,015	3,746,863	" 631,652
Year 1909	47,342,861	37,258,414	" 10,084,447
" 1908	43,159,395	34,539,067	" 8,620,328

Exports from the port of New York, week ended Nov. 20: Gold, $2,220,700, to Argentina and Brazil; silver, $682,190, to London and Paris. Imports: Gold, $78,974; silver, $216,706, from Australia, Japan, South America and Mexico.

Treasury Department estimate of money in the United States on Nov. 1:

	In Treasury.	In Circul'n.
Gold coin (inc. bullion in Treasury)	$ 175,284,087	$ 598,773,175
Gold certificates	79,451,380	795,205,489
Silver dollars	2,271,862	74,383,857
Silver certificates	5,792,111	481,794,889
Subsidiary silver	17,992,453	142,324,038
Treasury notes of 1890	12,465	4,021,535
U. S. notes	4,501,054	342,179,962
Nat. bank notes	17,944,644	685,996,112
Total	$303,210,056	$3,124,679,057

Population of the United States Nov. 1 estimated at 89,404,000; circulation per capita, $34.95. The total amount in circulation shows increases of $3,369,031 over Oct. 31, and of $26,181,036 over Nov. 1 last year.

Foreign trade of the United States, 10 months ended Oct. 31, as valued by the Bureau of Statistics, Department of Commerce and Labor:

Merchandise:	1908.	1909.
Exports	$1,402,751,887	$1,359,535,399
Imports	900,538,278	1,198,505,608
Excess, exports	$ 502,213,609	$ 164,029,791
Add excess of exports, silver		10,084,447
Add excess of exports, gold		68,512,679
Total export balance		$ 242,626,817

The gold and silver movement in detail will be found in the table at the head of this column.

Gold and silver movement in Great Britain, 10 months ended Oct. 31:

	Imports.	Exports.	Excess.
Gold	£43,071,192	£40,346,564	Imp. £2,724,628
Gold, 1908	38,710,965	38,885,321	Exp. 1,174,556
Silver	10,160,161	10,199,750	Exp. 39,589
Silver, 1908	8,798,269	11,178,436	Exp. 2,380,167

Of silver imports this year a total of £8,520,704 is credited to the United States.

Corrected returns from the Transvaal show a total gold production of $12,451,930 for October, and of $125,027,919 for the 10 months ended Oct. 31; showing an increase of $6,204,865 over the corresponding period of last year.

Gold—With a fair demand, chiefly from the Bank of England, the price of gold on the open market in London continued at 77s. 9d. per oz. for bars and 76s. 4d. per oz. for American coin. In New York more gold was taken for shipment to South America.

Platinum—Business continues good, the jewelry trade taking a good deal of metal, as is usual at this season. The price remains unchanged, dealers still asking $29.50 per oz. for refined platinum and $33.25 for hard metal.

Silver—The market has been held by China operations. Exports from that country have been in excess of imports, and apparently this has had much to do with its ability to offer some staying quality to the position of silver.

SILVER AND STERLING EXCHANGE

Nov.	18	19	20	22	23	24
New York....	50⅝	50¾	50¾	50¾	50¾	50¾
London.....	23⅝	23⅝	23⅝	23¾	23¾	23⅝
Sterling Ex..	4.8725	4.8730	4.8740	4.8745	4.8745	4.8750

New York quotations, cents per ounce troy, fine silver; London, pence per ounce sterling silver, 0.925 fine.

Exports of silver from London to the East, Jan. 1 to Nov. 11, as reported by Messrs. Pixley & Abell:

	1908.	1909.	Changes.
India.....	£ 8,250,623	£5,351,000	D. £2,899,623
China	516,400	1,829,300	I. 1,312,900
Straits.....	164,885	82,800	D. 82,085
Total.. ...	£ 8,931,908	£7,263,100	D. £1,668,808

Indian exchange in London for the week, 16.09d. per rupee.

Copper, Tin, Lead and Zinc

Nov.	Copper. Lake, Cts. per lb.	Copper. Electrolytic, Cts. per lb.	Copper. London, £ per ton.	Tin. Cts. per lb.	Lead. New York, Cts. per lb.	Lead. St. Louis, Cts. per lb.	Zinc. St. Louis, Cts. per lb.
18	13½ @13¾	13¼ @13½	60¼	30¾	4.35 @4.37½	4.22½ @4.27½	6.22½ @6.25
19	13¾ @14	13⅝ @13⅞	60¾	31¼	4.35 @4.37½	4.22½ @4.27½	6.22½ @6.25
20	13⅞ @14	13⅝ @13⅞	....	31¼	4.35 @4.37½	4.22½ @4.27½	6.22½ @6.25
22	13⅝ @13⅞	13⅜ @13⅝	60⅝	31½	4.37½ @4.40	4.22½ @4.27½	6.22½ @6.25
23	13⅝ @13⅞	13⅜ @13½	59¾	31⅜	4.37½ @4.40	4.22½ @4.27½	6.22½ @6.25
24	13½ @13¾	13¼ @13⅝	59⅛	31	4.37½ @4.40	4.22½ @4.27½	6.22½ @6.25

London quotations are per long ton (2240 lb.) standard copper. The New York quotations for electrolytic copper are for cakes, ingots and wirebars, and represent the bulk of the transactions made with consumers, basis, New York, cash. The prices of casting copper and of electrolytic cathodes are usually 0.125c. below that of electrolytic. The quotations for lead represent wholesale transactions in the open market. The quotations on spelter are for ordinary Western brands; special brands command a premium.

Copper—Up to Monday of this week activity in the copper market continued unabated, and heavy sales were made for delivery over the next three months, and producers generally are now well sold for these deliveries. Manufacturers of copper also booked a large volume of business, the reports of an impending combination and curtailment of production having aroused the ultimate consumers out of their apathetic attitude. This week, in consequence of the Standard Oil decision, buyers have held aloof, waiting to see in how far this would affect the plans with respect to copper above referred to. The best opinion on this point is that these plans are not in conflict with the law, and they will be carried through. In the meanwhile some sellers have offered both Lake and electrolytic copper at concessions from the prices made last week. At the close the market is nominal at 13½@13¾c. for Lake copper, and 13¼@13½c. for electrolytic copper in cakes, wirebars and ingots. Casting copper is quoted nominally at 13⅛@13⅜ cents.

Copper sheets are 18c. base for large lots. Full extras are charged, and higher prices for small quantities. Copper wire has again been advanced to 13¼c. base, carload lots at mill. Business is excellent.

The doubt which has been raised by the Standard Oil decision with regard to the plans respecting copper found its most pronounced expression in the London standard market. That market had advanced on Friday to £60 15s. for spot, but early this week it was flooded with a large number of selling orders on the part of speculators who desired to realize, and in consequence declined on Wednesday morning to £58 12s. 6d., but closes somewhat higher at £59 2s. 6d. for spot and £60 5s. for three months.

Refined and manufactured sorts we quote: English tough, £63 10s.; best selected, £62 10s.@£63 10s.; strong sheets, £74 10s.@£75 10s. per ton.

Exports of copper for the week from New York and Philadelphia were 6813 long tons. Our special correspondent gives exports from Baltimore at 3093 tons copper.

Tin—The market in the middle of last week showed considerable strength both here and in London. The latter market was influenced by a large demand from this side and advanced almost £2 from Nov. 18 to Nov. 19. The high-water mark was reached on Nov. 22 when the London quotations reached about £142 15s. for spot and £144 17s. 6d for three months, while this market advanced to about 31½c. Since then a reaction has set in brought about by a marked falling off in the demand on this side and by realizing on the part of London speculators, and the close is weak at £140 5s. for spot and £142 5s. for three months, and about 31c in the domestic market.

Lead—The market is somewhat firmer at 4.22½@4.27½c. St. Louis, and 4.37½@4.40c. New York. The nominal price of the American Smelting and Refining Company for desilverized continues to be 4.40c., New York.

The London market is unchanged at £13 2s. 6d. for Spanish, and £13 5s. for English lead.

Spelter—The market is quiet with some demand from day to day, and prices are unchanged at 6.37½@6.40c. New York, and 6.22½@6.25c. St. Louis.

New York quotations for spelter Nov. 18 to 24, inclusive, were 6.37½@6.40 cents.

Base price for zinc sheets is 8c. per lb., f.o.b. La Salle-Peru, Ill., less 8 per cent. discount.

The market abroad is firm, the close being cabled at £23 5s. for good ordinaries, and £23 10s. for specials.

The Western zinc smelters are at present producing at the rate of about 18,000 tons of spelter per month, every plant, with a single exception, being operated at full capacity. Some unfavorable opinion is expressed as to the gas situation in Kansas, wherefore some authorities think it doubtful if the present rate of production, namely, 215,000 tons per annum, can be materially exceeded.

Imports and exports of spelter and zinc products in Germany, nine months ended Sept. 30, metric tons:

	Imports 1908.	Imports 1909.	Exports 1908.	Exports 1909.
Spelter.....	22,681	30,987	49,741	54,92
Scrap....	1,201	1,833	4,207	4,605
Zinc sheets.....	268	66	12,448	13,539
Zinc dust.....	848	574	1,830	2,456
Zinc oxide, etc.....	5,599	5,219	19,680	19,009

Imports of zinc ores 137,873 tons in 1908, and 153,044 in 1909. Exports of ores, 26,045 tons in 1908, and 35,285 tons this year.

Other Metals

Antimony—The market is dull and no change is expected before the end of the year. Prices are unchanged. Cookson's is quoted at 8⅛@8½c. per lb.; Hallett's 8¼@8⅜c.; U. S., 7⅞@8c.; outside brands, 7⅝@7¾c. per pound.

Aluminum—The price of aluminum is unchanged at 20@23c. per lb. for ingots. The higher price is that asked by the American producer.

The Aluminum Company of America has taken a contract for 1,500,000 lb. aluminum wire for an electric installation in Ontario.

Quicksilver — The market continues strong. In New York the quotation is $52.50 per flask of 75 lb for large lots; for small lots 72@75c. per lb. is asked by jobbers. The San Francisco quotation is $50.50@51.50 per flask for domestic orders, and $2 less for export. The London price is £6 15s per flask, with jobbers asking 2s. 6d. more

Nickel—Large lots, contract business, 40@45c per lb Retail spot, from 50c for 2000 lb lots, up to 55c for 500 lb lots The price for electrolytic is 5c. higher

Magnesium—The price of pure metal is $1.50 per lb. for 100 lb. lots f.o.b. New York.

Cadmium—Current quotations are 65@70c. per lb. in 100 lb. lots at Cleveland, Ohio. In Germany 450@475 marks per 100 kg., at factory in Silesia.

Zinc and Lead Ore Markets

Joplin, Mo., Nov. 20—The highest price paid for zinc sulphide ore was $54 per ton, the assay base price ranging from $50 to $52.50 per ton of 60 per cent. zinc, on the general market, though some bins of ore carrying over 4 per cent. of iron sold on a base of $53 per ton. Zinc-silicate ore sold on a base price of $28@30 per ton of 40 per cent. zinc, and sold as high as $36 per ton. The average price, all grades, was $48.06. In the lead-ore market some ore sold on a base price of $53 per ton of 80 per cent. lead, but the general market was straight $50@53. The average price, all grades, was $52.42 per ton.

Outputting conditions improved materially toward the end of the week, the outlook early in the week being gloomy. Still the production was below an average, and many of the shallow mines made little ore, the shipment in some cases being from a reserve stock. The entire shipment was above an average, which means a reduction in the stock in the bins.

SHIPMENTS, WEEK ENDED NOV. 20.

	Zinc, lb.	Lead, lb.	Value.
Webb City-Carterville	4,250,650	641,730	$125,236
Joplin	1,810,510	136,350	50,200
Duenweg	848,330	52,130	21,699
Prosperity	581,440	96,420	17,356
Galena	624,050	53,480	17,004
Miami	446,230	65,990	11,549
Granby	360,190	71,430	10,681
Aurora	476,250	84,320	10,572
Spurgeon	435,360	92,140	10,228
Alba-Neck	335,540	.....	8,724
Cave Springs	322,110	.....	8,052
Saginaw	282,070	11,040	7,137
Badger	231,750	.....	5,909
Granby	369,200	2,800	5,900
Sarcoxie	255,520	.....	5,330
Carthage	201,810	.....	5,247
Zincite	195,270	.....	5,076
Oronogo	227,060	2,310	5,051
Carl Junction	85,330	.....	2,303
Jackson	80,000	.....	2,101
Steel City	63,330	.....	1,583
Totals	12,588,000	1,340,140	$336,938
47 weeks	534,998,070	79,946,070	$12,991,031

Zinc value, the week, $302,593; 47 weeks, $10,809,268
Lead value, the week, 34,345; 47 weeks, 2,181,763

MONTHLY AVERAGE PRICES

Month.	Zinc Ore. Base Price. 1908.	Zinc Ore. Base Price. 1909.	Zinc Ore. All Ores. 1908.	Zinc Ore. All Ores. 1909.	Lead Ore. All Ores. 1908.	Lead Ore. All Ores. 1909.
January	$37 60	$41 25	$35 56	$38 46	$46 88	$52.17
February	36 64	36 94	34 92	34 37	49 72	50 40
March	36 19	37 40	34 19	34 71	49 90	50.82
April	35 40	38 63	34 08	37 01	52.47	55 63
May	34 19	40 06	33 39	37 42	56 05	56.59
June	33 06	44 15	32 07	40 35	60 48	57 52
July	34 55	43 06	31 67	41 11	59 90	53.74
August	36 54	42 25	33 42	44 54	60 34	57 60
September	37 64	43 59	34 41	41 87	54 59	56 11
October	39 95	49 50	34 98	45 73	52 63	55.02
November	40 14	.....	35 00	.....	54 53	..
December	42 75	.....	39 66	.....	49 68	..
Year	$36 62		$34 31		$53 99	.....

Note.—Under each of the heads of "All Ores" are given the prices for 60 per cent. zinc ore and 80 per cent. lead ore, respectively, and then the average for all ores sold. Under "Base Price" are the prices for the ores specified.

Platteville, Wis., Nov. 20—The highest price paid this week for zinc ore was $50 per ton; the base price, 60 per cent. zinc, was $49.50@51. The base price paid for lead ore, 80 per cent., was $53@54 per ton.

SHIPMENTS WEEK ENDED NOV. 20.

Camps.	Zinc ore, lb.	Lead ore, lb.	Sulphur ore, lb.
Platteville	538,780	.....	162,500
Mineral Point	424,000	.....	.....
Benton	250,250	.....	.....
Galena	240,000	.....	.....
Days Siding	160,000	.....	.....
Harker	154,700	.....	.....
Linden	146,990	.....	66,860
Shullsburg	76,000	.....	.....
Dodgeville	75,000	.....	.....
Highland	65,700	.....	.....
Cuba City	65,670	.....	65,000
Total	2,197,090	.....	294,360
Year to Nov. 20	123,840,145	8,139,645	13,860,545

In addition to the above there was shipped to the separating plants, Platteville, Galena and Mineral Point, 1,322,140 lb. zinc ore.

Petroleum

Exports of petroleum and its products from the United States, to months ended Oct. 31, in gallons:

	1908.	1909.
Crude petroleum	82,224,798	118,234,099
Naphthas	31,008,721	51,365,885
Illuminating oil	959,369,736	870,806,530
Lubricating and paraffin	119,145,071	126,499,655
Residuum	63,743,877	80,230,318
Total	1,255,492,203	1,247,136,487

The total decrease this year was 8,355,716 gal., or 0.7 per cent.

Chemicals

New York, Nov. 24—No renewal of activity can be noted in the chemical market generally, and there are few changes in price.

Copper Sulphate—The market is quiet at unchanged prices. Quotations are still $3.05 per 100 lb. for carload lots or over, and $4.20 per 100 lb. for smaller parcels.

Arsenic—Prospects appear good for better trading in the near future; but, at present, prices for white arsenic are unchanged at 2.75c. per lb. for both spot and futures.

Nitrate of Soda—Business in this article continues on a moderate scale only. Spot prices are unchanged at 2.07½c. per lb., but futures are a shade easier, at 2.07½c. per lb., the same as spot.

Sulphur—Shipments of sulphur from Sicily for the nine months ended Sept. 30 were 304,197 metric tons in 1908, and 285,015 in 1909, a decrease of 19,112 tons. Shipments to North America, included in the totals, were 11,124 tons in 1908, and 12,878 in 1909; an increase of 1755 tons. Stocks Sept. 30 were 621,016 tons, an increase of 33,135 tons over Sept. 30 of last year.

Mining Stocks

New York, Nov. 24—The general stock markets have again been irregular and somewhat disturbed, but with no very heavy fluctuations. The principal topic of discussion this week was the decision of the United States Circuit Court in the Standard Oil case. This has seriously disturbed Wall Street, as it is difficult to say how far the effects of the decision will extend and how many other companies may come within its scope. An appeal will be taken, of course, but the general impression is that the decision will stand.

Amalgamated Copper sold off several points from the high level recently reached. Homestake, of South Dakota, sold off from $80 to $74.50 per share on sales of 680 shares; the cause being the strike at the mine and some other unfavorable reports.

On the Curb coppers were not specially active and generally inclined to be weak. The main interest was in Standard Oil, which declined $45 per share. The Cobalt stocks held their price pretty well, but they were rather neglected as were also the Nevada gold stocks. Curb talk is that the Standard decision will prevent the formation of the much talked of copper combination.

Boston, Nov. 23—Copper shares responded nobly to the proposed copper merger. Those shares mentioned as likely to go into the combine were the features early, but the Lake issues also had their innings, particularly Lake Copper, which has advanced $8.25 to $40 per share. The fact that this mine is preparing to send daily shipments of ore for treatment at the Franklin mill will put it among the list of producers at an early date.

The whole copper-share list has been active and strong and record prices have been made frequently during the week. At times the market has been very near the boiling point and commission orders have been greatly increased by the advent of the public into the market. A sharp reaction followed the decision in the case of the Government against the Standard Oil Company, but prices quickly recovered and the outlook is for an active and higher market the balance of the year.

Amalgamated has been persistently accumulated and brokers' offices are almost bare of this issue. The price rose $3.37½ to $90.12½, but reaction to $87.75 followed with a fair speed recovery from this. Calumet & Arizona spurted $7.50 to $110.50, on anticipated increased-dividend action, but reaction to $106 followed on announcement of the regular $1 quarterly rate. Utah Copper did not reach the level attained in New York, but did rise

Curb trading has not brought any particular movements outside of a few. Chino rose $1.50 to $10, but did not all of the advance. Corbin Copper also moved up $2.75 to $8.75. The general trend of prices on the Curb is toward higher levels, however, for the better class of stocks.

STATISTICS OF COPPER.

Month.	United States Product'n.	Deliveries, Domestic.	Deliveries for Export.
I	112,135,200	51,862,624	38,499,797
II	103,700,817	43,578,118	30,968,496
III	117,058,661	48,871,964	59,191,043
IV	113,574,292	47,546,010	65,110,111
V	118,356,146	61,163,325	70,542,753
VI	116,567,493	60,591,116	70,966,457
VII	118,277,603	75,520,083	75,018,974
VIII	120,597,234	59,614,207	48,382,704
IX	118,023,139	52,105,955	50,077,777
X	124,657,709	66,359,617	56,261,238
XI	....	....	....
XII	....	....	....

VISIBLE STOCKS.

	United States.	Europe.	Total.
I	122,357,266	124,716,480	247,073,746
II	144,130,045	118,574,400	262,704,445
III	173,284,248	117,140,800	290,425,048
IV	182,279,902	115,024,000	297,303,902
V	183,198,073	114,050,320	297,248,393
VI	169,848,141	127,352,960	297,201,101
VII	154,858,061	150,928,960	305,787,021
VIII	122,596,607	171,492,160	294,088,767
IX	135,196,930	197,993,600	333,190,530
X	151,472,772	210,224,000	361,696,772
XI	153,509,626	222,566,400	376,076,026
XII	....	....	....

Figures are in pounds of fine copper. U. S. production includes all copper refined in this country, both from domestic and imported material. Visible stocks are those reported on the first day of each month, as brought over from the preceding month.

Monthly Average Prices of Metals

SILVER

Month.	New York. 1908.	New York. 1909.	London. 1908.	London. 1909.
January	55.678	51.750	25.738	23.834
February	56.000	51.472	25.855	23.706
March	55.365	50.468	25.570	23.227
April	55.505	51.428	25.133	23.708
May	52.795	52.905	24.377	24.343
June	53.663	52.538	24.760	24.166
July	53.115	51.043	24.514	23.519
August	51.683	51.125	23.858	23.588
September	51.720	51.449	23.877	23.743
October	51.431	50.923	23.725	23.502
November	49.647	......	22.933	......
December	48.766	......	22.493	...
Total	52.864	......	24.402	

New York, cents per fine ounce; London, pence per standard ounce.

COPPER

	NEW YORK. Electrolytic 1908.	Electrolytic 1909.	Lake. 1908.	Lake. 1909.	LONDON. 1908.	LONDON. 1909.
January	13.726	13.893	13.901	14.280	62.386	57.688
February	12.905	12.949	13.098	13.295	58.786	61.198
March	12.704	12.387	12.875	12.826	58.761	56.231
April	12.743	12.56[illegible]	12.928	12.93	58.331	57.363
May	12.598	12.893	12.788	13.248	57.387	59.338
June	12.675	13.214	12.877	13.548	57.842	59.627
July	12.702	12.880	12.933	13.363	57.989	58.556
August	13.462	13.007	13.639	13.296	60.500	59.393
September	13.388	12.870	13.600	13.210	60.338	59.021
October	13.354	12.700	13.646	13.030	60.139	57.551
November	14.130	......	14.386	......	63.417	......
December	14.111	......	14.411	......	62.943	...
Year	13.208	......	13.424	......	59.902	...

New York, cents per pound. Electrolytic is for cakes, ingots or wirebars. London, pounds sterling, per long ton, standard copper.

TIN AT NEW YORK

Month.	1908.	1909.	Month.	1908.	1909.
January	27.380	28.060	July	29.207	29.125
February	28.978	28.290	August	29.942	29.966
March	30.577	28.727	September	28.815	30.293
April	31.702	29.445	October	29.444	30.475
May	30.015	29.225	November	30.348	.....
June	28.024	29.322	December	29.154	.....
			Av. year	29.465	.....

Prices are in cents per pound.

LEAD

Month.	New York. 1909.	New York. 1909.	St. Louis 1909.	London. 1908.	London. 1909.
January	3.691	4.175	4.025	14.469	13.113
February	3.725	4.018	3.868	14.250	13.313
March	3.838	3.986	3.835	13.975	13.438
April	3.993	4.168	4.051	13.469	13.297
May	4.253	4.287	4.214	12.938	13.225
June	4.466	4.350	4.291	12.600	13.031
July	4.744	4.321	4.188	13.000	12.563
August	4.580	4.363	4.227	13.375	12.475
September	4.515	4.342	4.215	13.125	12.781
October	4.351	4.341	4.215	13.375	13.175
November	4.330	......	......	13.538	...
December	4.213	......	......	13.166	.
Year	4.200	......	......	13.439	...

London, pounds sterling per long ton. New York and St. Louis, cents per pound.

SPELTER

Month.	New York. 1908.	New York. 1909.	St. Louis. 1908.	St. Louis. 1909.	London. 1908.	London. 1909.
January	4.518	5.141	4.363	4.991	20.563	21.225
February	4.788	4.889	4.638	4.739	20.875	21.563
March	4.665	4.757	4.527	4.607	21.075	21.438
April	4.645	4.965	4.495	4.815	21.344	21.531
May	4.608	5.124	4.458	4.974	19.906	21.975
June	4.543	5.402	4.393	5.252	19.000	22.000
July	4.485	5.402	4.338	5.252	19.031	21.969
August	4.702	5.729	4.556	5.579	19.350	22.125
September	4.769	5.796	4.619	5.646	19.563	22.906
October	4.801	6.199	4.651	6.043	19.750	23.200
November	5.059	......	4.909	......	20.875	
December	5.137	......	4.987	......	20.625	
Year	4.726	......	4.578	......	20.163	

New York and St. Louis, cents per pound. London, pounds sterling per long ton.

STOCK QUOTATIONS

NEW YORK Nov. 24

Name of Comp.	Clg.
Alaska Mine	‡.11
Amalgamated	89½
Anaconda	50½
Balaklala	‡2⅞
British Col. Cop.	7
Buffalo Mines	3½
Butte Coalition	30⅞
Colonial Silver	⅛
Cum. Ely Mining	8¾
Davis-Daly	6⅛
Dominion Cop.	7
Douglas Copper	1⅜
El Rayo	2⅛
Florence	2⅞
Foster Cobalt	‡.32
Furnace Creek	‡.05
Giroux	11
Gold Hill	1¼
Goldfield Con.	7⅞
Granby	‡101
Greene Gold	‡½
Greene G. & S.	‡9
Guanajuato	2
Guggen. Exp.	240
Hanapah	‡15
Kerr Lake	8
McKinley-Dar.	.81
Miami Copper	17
Micmac	[illegible]
Mines Co. of Am.	¾
Montezn. of C. R.	11
Mont. Sho. C.	1¼
Nev. Utah M. & S.	1 1/16
Newhouse M. & S.	3¼
Nipissing Mines	10¼
Old Hundred	½
Silver Queen	.29
Stewart	⅞
Tennessee Cop'r.	40
Tri-Bullion	1¼
United Copper	9
Utah Apex	5⅛
Utah Copper	61
Yukon Gold	5

‡Last quotation.

BOSTON Nov. 24

Name of Comp.	Clg.
Adventure	5½
Allouez	57
Am. Zinc	36¾
Arcadian	4½
Arizona Com.	44¾
Atlantic	11½
Boston Con.	19¾
Calumet & Ariz.	104
Calumet & Hecla	680
Centennial	38
Copper Range	93½
Daly-West	9⅜
East Butte	12¼
Franklin	16¾
Greene—Can	12¾
Hancock	16½
Isle Royal	26¼
Keweenaw	3
La Salle	16
Mass	6¼
Michigan	7
Mohawk	63
Nevada	27⅞
North Butte	64¼
Ojibway	8
Old Colony	‡.50
Old Dominion	.54
Osceola	160
Parrot	30¾
Quincy	87
Rhode Island	10¾
Shannon	16¼
Superior	65½
Superior & Bost.	15
Superior & Pitts.	16⅞
Tamarack	67
Trinity	11
U. S. Smg. & Ref	56
U S Sm & Re., pd.	53
Utah Con.	46¼
Victoria	8
Winona	7¼
Wolverine	149
Wyandotte	2

‡Last quotation.

N. Y. INDUSTRIAL

Am. Agri. Chem.	48
Am. Smelt. & Ref.	100¾
Am.Sm. & Ref., pf.	111½
Colo. Fuel & Iron.	49½
Federal M. & S., pf.	90
National Lead	88½
National Lead, pf.	‡110
Pittsburg Coal	26⅞
Republic I. & S.	46¼
Republic I. & S., pf.	105½
Sloss-Sheffield	88½
Standard Oil	674
U. S. Steel	88⅞
U. S. Steel, pf.	125
Va. Car. Chem.	48⅞

BOSTON CURB

	Low.
Ahmeek	215
Chemung	15½
Chino	8⅜
Gila	8¼
Indiana	7¼
Mason Valley	1⅞
Ray Central	2¼
Ray Con	21½
San Antonio	10
Yuma	1¼

Furnished by Hornblower & Weeks, N. Y.

ST. LOUIS Nov. 20

N. of Com.	High.	Low.
Adams	.40	.30
Am. Nettie.	.09	.07
Center Cr'k	1.80	1.60
Cent. C. & C.	85.00	84.00
C. C. & C. pf.	84.00	83.00
Cent. Oil	105.00	100.00
Columbia	9.00	7.00
Con. Coal	18.00	17.00
Doe Run	110.00	105.00
Gra. Bimet.	.30	.25
St. Joe	12.50	11.00

LONDON Nov. 24

Name of Com.	Clg.
Dolores	£1 10s 0d
Stratton's Ind.	0 3 3
Camp Bird	1 7 6
Esperanza	2 15 0
Tomboy	0 18 9
El Oro	1 5 6
Oroville	0 10 3

Cabled through Wm. P. Bonbright & Co., N. Y.

NEVADA STOCKS. Nov. 24.
Furnished by Weir Bros. & Co., New York.

Name of Comp.	Bid.
COMSTOCK STOCKS	
Belcher	.90
Best & Belcher	.55
Caledonia	.39
Chollar	.26
Comstock	‡.33
Con. Cal. & Va.	87
Crown Point	85
Exchequer	‡ 43
Gould & Curry	.25
Hale & Norcross	40
Mexican	1 25
Ophir	1.47
Overman	.54
Potosi	45
Savage	.48
Sierra Nevada	.49
Union	55
Utah	.08
Yellow Jacket	.90
TONOPAH STOCKS	
Belmont	65
Extension	.47
Golden Anchor	...
Jim Butler	.10
MacNamara	.27
Midway	.15
Montana	75
North Star	‡.02
Tono'h Mine of N.	6.50
West End Con.	21
GOLDFI'D STOCKS	
Adams	‡.01
Atlanta	10
Blue Bell	.02
Booth	09
C.O.D. Con	.06
Columbia Mt.	.06
Comb. Frac.	.50
Cracker Jack	‡ 01
Dia'dfield B. B. C.	.01
Florence	2.37½
Goldfield Belmont	.04
Goldfield Daisy	07
Great Bend	.03
Jumbo Extension	.12
Kendall	‡ 02
Lone Star	‡.02
May Queen	.04
Oro	.03
Red Hill	.02
Sandstorm	‡.05

Name of Comp.	Bid.
Silver Pick	08
St. Ives	05
Triangle	‡.01
BULLFROG STOCKS	
Gibraltar	‡ 02
Homestake King.	‡ 01
Mont. Shoshone C.	1 37½
Tramp Cons.	04
MISCELLANEOUS	
Cumberland Ely.	8.50
Giroux	10.62½
Greenwa'r Copper	07
Nevada Con.	27.62½
Nevada Hills	.70
Navada Smelting.	.75
Nevada Wonder	.60
Nevada-Utah	1.12½
Penn-Wyoming	...
Pittsburgh S. Pk.	65
Ray Central	2.37½
Ray Con.	21.00
Round Mt. Sphinx	‡ 05

COLO. SPRINGS Nov. 23

Name of Comp.	Clg.
Acacia	.07½
C. C. Con.	‡.03
Doctor	.08
Elkton	.69½
El Paso	.61⅝
Findlay	.10
Gold Dollar	.13
Gold Sovereign	.04¼
Isabella	.18¼
Jack Pot	‡.08½
Jennie Sample	‡ 08
Jerry Johnson	.08
Lexington	‡.01¾
Mary McKinney	47½
Old Gold	‡.04
Pharmacist	‡.03¼
Portland	.82
U. G. M.	‡.08
Vindicator	‡.70
Work	‡.06

Assessments

Company.	Delinq.	Sale.	Amt.
Alpha, Nev.	Nov. 11	Dec. 7	$0.05
Arcadian Copper, Mich	....	Mar. 1	0.50
Camp Bird Min. Co., Colo	Dec. 13	....	0.002
Chemung Copper, N. M.	Jan. 1	Jan. 2	1.00
Chollar, Nev.	Nov. 8	Dec. 1	0.10
Crown Point, Nev.	Nov. 30	Dec. 20	0.10
Hancock Min., Mich.	.	Feb. 1	1.00
Hypotheek, Ida	Sept. 30	Dec. 1	0.005
King Philip Copper, Mich	Dec. 10		1.00
Marie M. Co., Ida.	Oct. 30	Nov. 30	0.002
Mexican, Nev.	Dec. 6	Dec. 29	0.10
Mineral Flat, Colo.	Dec. 11	Jan. 6	0.01
Missoula Copper, Ida	Oct. 4	Dec. 6	0.01
Potosi, Nev.	Nov. 12	Dec. 6	0.10
San Antonio Copper, Mex.	Dec. 1	.	1.00
Savage, Nev.	Nov. 10	Dec. 1	0.10
Seven Troughs Mon., Utah	Nov. 22	Dec. 11	0.00½
Sheridan M. & M., Ida.	Nov. 20	Dec. 20	0.002
Sonora M. & M., Ida	Nov. 20	Dec. 14	0.002
Winona, Mich.	Dec. 1	Jan. 1	1.00
Yellow Jacket, Nev.	Nov. 18	Dec. 22	0.10

Patents Relating To Mining and Metallurgy

A Selected and Classified List of New Inventions Described during the Past Month in the Publications of the Patent Offices

UNITED STATES AND BRITISH PATENTS

A copy of the specifications of any of these patents issued by the United States Patent Office will be mailed by THE ENGINEERING AND MINING JOURNAL upon the receipt of 25 cents. British patents are supplied at 40 cents. In ordering specifications, correspondents are requested to give the number, name of inventor and date of issue.

ALUMINUM

MANUFACTURE of Alumina. Gilbert McCulloch, East St. Louis, Ill., assignor to Aluminum Company of America, Niagara Falls, N. Y., a Corporation of Pennsylvania. (U. S. No. 938,269; Oct. 26, 1909.)

MANUFACTURE—Recovery of Soda in the Manufacture of Alumina. Harry C. Peffer, East St. Louis, Ill., assignor to Aluminum Company of America, Pittsburg, Penn., a Corporation of Pennsylvania. (U. S. No. 938,270; Oct. 26, 1909.)

METALLURGICAL PROCESS of Making Aluminum. Anson G. Betts, Troy, N. Y. (U. S. No. 938,634; Nov. 2, 1909.)

COAL AND COKE

COKE OVEN—By-Product Retort Coke Oven. Hugh Prentice, Bellevue, Penn. (U. S. No. 939,086; Nov. 2, 1909.)

COKE OVENS—Improvements in Doors for Coke Ovens and Other Furnaces. Herman J. Limberg, Gelsenkirchen, Germany. (Brit. No. 21,499 of 1908.)

COPPER

CEMENT COPPER—Improved Process for Obtaining Cement Copper. O. Frolich, Wilmersdorf, Germany. (Brit. No. 27,025 of 1908.)

EXTRACTION of Copper from Raw Unroasted Ores and Other Products. Georg Schneider, Friedeburg, Germany, assignor to Eugen Viereck, Neustadt on the Hardt, Germany. (U. S. No. 937,965; Oct. 26, 1909.)

MATTE TREATMENT—Method of Separating Copper, Nickel and Other Metals from Copper-Nickel Matte. Horace L. Wells, New Haven, Conn. (U. S. No. 940,292; Nov. 16, 1909.)

MATTE TREATMENT—Recovering Hydrochloric Acid from Nickel-Chloride Solution. Horace L. Wells, New Haven, Conn. (U. S. No. 940,293; Nov. 16, 1909.)

MATTE TREATMENT—Treatment of Copper or Copper-Nickel Mattes. James T. Carrick, Johannesburg, Transvaal, assignor of one-third to Basil Stuart Pattison, Johannesburg, Transvaal. (U. S. No. 939,947; Nov. 9, 1909.)

GOLD AND SILVER

ALLOY Composed of Gold, Silver and Platinum. Edward B. Craft and Jonathan W. Harris, Hackensack, N. J., assignors to Western Electric Company, Chicago, Ill., a Corporation of Illinois. (U. S. No. 937,284; Oct. 19, 1909.)

ASSAYING—Process of Assaying for Silver. Joseph C. Holmes, [illegible]. (U. S. No. [illegible]; Nov. 9, 1909.)

EXTRACTION PROCESS—Improvements in Processes of Extracting Silver from its Ores. [illegible], Trout Mills, North Bay, Ont. (Brit. No. [illegible] of 1908.)

FILTER—Apparatus for Filtering and Washing the Filtered Material. [illegible], Mexico. (U. S. No. [illegible]; Oct. 26, 1909.)

STAMP MORTAR. [illegible], San Francisco, Cal. (U. S. No. [illegible]; Nov. 9, 1909.)

TUBE MILL. [illegible], New York, N. Y. (U. S. No. [illegible]; Nov. 2, 1909.)

TUBE MILL LINING. [illegible]. (U. S. No. [illegible]; Nov. 9, 1909.)

IRON AND STEEL

[illegible] FURNACE. [illegible]

MANGANESE STEEL. Winfield S. Potter, Mahwah, N. J., assignor to Manganese Steel Rail Company, Mahwah, N. J., a Corporation of New Jersey. (U. S. No. 939,084; Nov. 2, 1909.)

MANGANESE STEEL—Treating Manganese Steel. Winfield S. Potter, New York, N. Y., assignor to Manganese Steel Rail Company, Mahwah, N. J., a Corporation of New Jersey. (U. S. No. 939,163; Nov. 2, 1909.)

OPEN-HEARTH FURNACE. Luther L. Knox, Ben Avon, and Montgomery Murray, Wilkinsburg, Penn., assignors to Keystone Furnace Construction Company, Pittsburg, Penn., a Corporation of Pennsylvania. (U. S. No. 938,245; Oct. 26, 1909.)

REFINING—Process of Producing and Refining Steel. Frank C. Perkins, Buffalo, N. Y. (U. S. No. 937,855; Oct. 26, 1909.)

TIN

DETINNING—Process for Detinning Tin Plate Waste and the Like by Means of Chlorine. Hans von Schutz, Philosophenweg, Prussia. (Brit. Nos. 22,337 and 23,594 of 1908.)

DETINNING—Process of Recovering Tin from Waste. Albert Nodon, Bordeaux, France. (U. S. No. 940,471; Nov. 16, 1909.)

ZINC

ZINC OXIDE—Process for the Preparation of Zinc Oxide for Reduction. Herman Pape, Hamburg-Billwarder a Bille, Germany. (Brit. No. 5293 of 1909.)

MINING—GENERAL

SHAFT TUBBING—Improvements in and Relating to Tubbing for Use in Pit Sinking and Like Operations and the Method of Jointing the Same. Charles Walker, Wrexham, North Wales. (Brit. No. 20,727 of 1908.)

ORE DRESSING

CONCENTRATION—Apparatus for Concentrating Solutions. Eudo Monti, Turin, Italy. (U. S. No. 940,644; Nov. 16, 1909.)

CONCENTRATORS—Improvements in and Connected with Concentrators or Apparatus for Separating or Grading Metals, Ores and Other Substances in Wet Recovery Processes. G. E. Whitcombe, Johannesburg, Transvaal, and Agnes K. Cox, London. (Brit. No. 13,336 of 1908.)

DRY CONCENTRATION—Improvements in Apparatus for the Dry Concentration of Crushed Ores. H. G. Christian, Paris, and Thwaites Bros., Ltd., Bradford. (Brit. No. 20,615 of 1908.)

MAGENTIC ORE SEPARATOR. Wayne D. Ludwick, Seattle, Wash., assignor to Northwest Metallurgical Company, Seattle, Wash., a Corporation. (U. S. No. 939,523; Nov. 9, 1909.)

ORE SEPARATOR and Concentrator. Homer J. Orr, Georgetown, Wash. (U. S. No. 937,325; Oct. 19, 1909.)

ORE TREATMENT—Improvements Relating to the Treatment of Ores or the Like. A. A. Lockwood and M. R. A. Samuel, London, E. C. (Brit. No. 12,962 of 1908.)

SEPARATION—Improvements in and Relating to Apparatus for the Separation of Solid Materials from Liquids. Wilfley Mining Machinery Co., and [illegible], London, E. C. (Brit. No. 23,189 of 1908.)

SEPARATION—[illegible] Separating Process. Henry A. Wentworth, Newton, Mass., assignor to Huff Electrostatic Separator Company, Boston, Mass., a Corporation of Maine. (U. S. No. [illegible]; Nov. 2, 1909.)

METALLURGY—GENERAL

BRIQUETTING—An Improved Process for Briquetting Ores. [illegible]. (Brit. No. [illegible] of 1908.)

ELECTRIC SMELTING—Art of Electric Smelting. Edward R. Taylor, Penn Yan, N. Y. (U. S. No. [illegible]; Oct. 26, 1909.)

ORE TREATMENT—Process of Extracting Metals from Their Ores. [illegible]. (U. S. No. [illegible]; Oct. 19, 1909.)

SMELTER SMOKE—Improvements in Apparatus for the Recovery of Metallic [illegible] Fumes Obtained in Roasting or Smelting Ores. A. M. G. Sebillot and Louis Mauclaire, Paris. (Brit. No. 2938 of 1909.)

SULPHIDE ORE TREATMENT—Method of Chloridizing Ores. Charles A. Diehl, Cleveland, Ohio. (U. S. No. 938,044; Oct. 26, 1909.)

SULPHIDE ORE TREATMENT—Method of Treating Poor Sulphide Ores. Alfred Holdsworth, Barnsbury, London, England. (U. S. No. 938,055; Oct. 26, 1909.)

MINING MACHINERY AND APPARATUS

ELECTRIC FUSE—Priming Charge for Mines. Louis Cahüc, Neumarkt, Germany. (U. S. No. 938,553; Nov. 2, 1909.)

LAMP HOLDING ATTACHMENT for Miners' Caps. Cecil R. Anderson, Bellevue, Penn. (U. S. No. 938,942; Nov. 2, 1909.)

MINE CARS—End-Gate for Mine-Cars. Louis F. Brubaker, Cambridge, Ohio, assignor of one-half to Michael J. Conroy, Cambridge, Ohio. (U. S. No. 939,944; Nov. 9, 1909.)

MINE VENTILATOR. Martin T. McDonough, Beckley, W. Va. (U. S. No. 938,781; Nov. 2, 1909.)

MINER'S ELECTRIC LAMP. Hermann Remané, Berlin, Germany, assignor to Deutsche Gasglühlicht Actien Gesellschaft (Auergesellschaft), Berlin, Germany, a Corporation of Germany. (U. S. No. 939,650; Nov. 9, 1909.)

ROCK-DRILLING MACHINE or Engine. Lewis L. Scott, Joplin, Mo. (U. S. No. 937,872; Oct. 26, 1909.)

SIGNALING APPARATUS—Apparatus for Recording Bell or Like Signals, Especially Applicable to Mines. John Russell, Langlaagte, near Johannesburg, Transvaal, assignor of one-half to John Hugh Milligan, Langlaagte, Transvaal. (U. S. No. 938,516; Nov. 2, 1909.)

METALLURGICAL MACHINERY AND APPARATUS

AGITATING DEVICES—Improvements in and Relating to Agitating Devices Particularly Applicable for Use with Gritty Material. J. T. Webb and Percy Tarbutt, London. (Brit. No. 9268 of 1909.)

BLAST-FURNACE CHARGING—Mechanical Charging Apparatus for Blast Furnaces. Leon Geuze, Terth St. Leger, France. (U. S. No. 938,572; Nov. 2, 1909.)

ELECTRIC SMELTING FURNACE. Edward R. Taylor, Penn Yan, N. Y. (U. S. No. 938,351; Oct. 26, 1909.)

FURNACE DOORS—Improvements in or Relating to Bottom Dumping or Discharging Doors for Furnaces or Cupolas. James Hyslop, Harvey, Ill. (Brit. No. 11,818 of 1909.)

FURNACES—Improvements in Furnaces for the Treatment of Metals, Metallic Ores and Alloys. F. T. Fennell, Woolwich, and F. L. Sackett, Charlton, Kent. (Brit. No. 22,412 of 1908.)

ORE ROASTING FURNACES—Rabbles for Ore Roasting Furnaces. Arthur V. Legge, St. Kilda, Victoria, Australia. (U. S. No. 940,[illegible]; Nov. 16, 1909.)

REGENERATIVE REVERSING FURNACE. Luther L. Knox, Ben Avon, Penn., assignor to Keystone Furnace Construction Company, Pittsburg, Penn., a Corporation of Pennsylvania. (U. S. Nos. 938,246 and 938,2[illegible]; Oct. 26, 1909.)

ROASTING AND LIKE FURNACE. Utley Wedge, Ardmore, Penn. (U. S. No. 939,880; Nov. 9, 1909.)

ROASTING FURNACE. Arthur R. [illegible], Denver, Colo., assignor of one-half to [illegible], Penn. (U. S. No. [illegible]; Nov. 9, 1909.)

ROASTING FURNACE. Utley Wedge, Ardmore, Penn. (U. S. No. 939,881; Nov. 9, 1909.)

SMELTING FURNACES—Improvements in and Relating to Smelting Furnaces. Société Anonyme d'Exploitation des Brevets [illegible], Paris, France. (Brit. No. 22,082 of 1908.)

TAPPING FURNACE. George O. Seward, [illegible], N. Y., assignor by mesne assignments to Electro Metallurgical Company, a Corporation of West Virginia. (U. S. No. 940,[illegible]; Nov. 16, 1909.)

Mining and Metallurgical Companies—U. S.

Name of Company	and Location.	Shares. Issued.	Par Val	Dividends. Total to Date.	Latest. Date.	Amt.
Alaska, Mexican, g.	Alas	180,000	$5	$2,400,381	Oct '09	$0.60
Alaska Treadwell, g.	Alas	200,000	25	10,885,000	Oct '09	1.00
Alaska United, g.	Alas	180,200	5	657,680	Oct '09	0.40
Amalgamated, c.	Mont	1,538,879	100	71,557,871	Nov '09	0.50
Am. Sm.&Ref.,com	U. S	500,000	100	17,000,000	Oct. '09	1.00
Am. Sm. & Ref.,pf.	U. S	500,000	100	32,375,000	Oct. '09	1.75
Am. Smelters, pf. A	U. S	170,000	100	4,475,000	Dec '09	1.50
Am. Smelters, pf. B	U. S	300,000	100	6,732,000	Dec '09	1.25
Am. Zinc,Lead&Sm.	Kan	80,000	25	280,000	Nov. '07	0.50
Anaconda, c.	Mont	1,200,000	25	45,300,000	Oct. '09	0.50
Arizona Copper, pf	Ariz	1,266,120	1 20	1,240,933	Nov. '09	0.012
Arizona Copper,com.	Ariz	1,519,896	1 20	11,287,228	July '09	0.30
Atlantic, c	Mich	100,000	25	990,000	Feb. '05	0.02
Bald Butte, g. s.	Mont	250,000	1	1,354,648	Oct '07	0.04
Beck Tunnel, g. s. l.	Utah	1,000,000	0.10	675,000	Oct. '07	0.02
Bent'a M.&D.,pf.,l.z.	Wis	196,607	1	10,949	Nov. '08	0.01½
Boston & Montana.	Mont	150,000	25	54,300,000	Oct '09	3.00
Bull. Beck.&Cham.,g	Utah	100,000	10	2,728,400	July '08	0.10
Bunker Hill& Sull	Ida	300,000	10	11,241,000	Nov '09	0.15
Butte Coalition, c s.	Mont	1,000,000	15	2,700,000	Dec. '09	0.25
Calumet&Arizona, c.	Ariz	200,000	10	10,700,000	Sept. '09	1.00
Calumet & Hecla, c	Mich	100,000	25	109,750,000	Sept. '09	8.00
Camp Gird, g s.	Colo	820,000	5	5,766,650	Oct. '09	0.24
Colorado, l. g. s.	Utah	1,000,000	0.20	1,950,000	Nov '09	0.08
Columbus Con., c.	Utah	285,540	5	226,832	Oct. '07	0.20
Con. Mercur., g	Utah	1,000,000	1	3,385,313	Dec. '06	0.02½
Continental, z. l.	Mo	22,000	25	231,000	Oct. '08	0.25
Copper Range Con.	Mich	384,185	100	8,836,255	Oct. '09	1.00
Creede United, g.	Colo	1,625,000	1	214,053	July '06	0.00½
Daly Judge, g. s. l.	Utah	300,000	1	225,000	April '07	0.37½
Daly West, g. s. l.	Utah	180,000	20	6,039,000	Oct. '09	0.30
De Lamar, g. s.	Ida	80,000	5	835,200	Sept. '06	0.24
Doe Run, l.	Mo	65,749	100	2,053,779	Sept. '09	1.50
Elkton Con., g.	Colo	2,500,000	1	2,429,460	Oct. '09	0.01½
El Paso, g.	Colo	2,450,000	1	1,315,545	Sept. '08	0.01
Fed Sm., com	Idaho	60,000	100	2,708,750	Jan. '09	1.50
Federal M & S., pf.	Idaho	120,000	100	5,171,250	Dec '09	1.75
Findley, g.	Colo	250,000	1	337,500	Sept. '06	0.01
Florence, g	Nev	1,050,000	1	630,000	Oct. '09	0.10
Frances-Mohawk, g.	Nev	912,000	1	546,000	Jan '08	0.05
Gemini-Keystone	Utah	5,000	100	2,000,000	Aug. '07	10.00
Gold King Con.	Colo	3,750,370	1	1,407,504	May '05	0.01
Goldfield Con., g.	Nev	3,558,367	10	3,551,942	Nov '09	0.20
Grand Central,g.	Utah	250,000	1	1,321,250	Dec. '07	0.04
Granite g	Colo	1,650,000	1	230,500	June '09	0.01
Hecla, s. l.	Idaho	1,000,000	0.25	1,900,000	Nov. '09	0.01
Homestake, g	S. D	218,400	100	25,027,640	Nov '09	0.50
Horn Silver, g.s.c.z.l.	Utah	400,000	25	5,642,000	Sept. '07	0.05
Imperial, c	Ariz	500,000	10	300,000	Jpne '07	0.20
Inter'l Nickel, pf.	N. Y	89,126	100	2,139,024	Dec. '09	1.50
Iron Blossom, s.l.	Utah	1,000,000	0.10	399,000	Nov. '09	0.08
Iron Silver	Colo	500,000	20	4,150,000	Sept. '07	0.10
Jamison, g	Cal	390,000	10	354,900	July '09	0.02
Jerry Johnson	Cal	1,500,000	1	86,700	Jan. '08	0.01
Kendall, g	Mont	500,000	5	1,275,000	Oct. '08	0.02
Liberty Bell, g. s.	Colo	130,551	5	228,353	June '09	0.15
Lightner, g	Cal	102,255	1	253,081	Oct. '06	0.05
Lower Mammoth, g.	Utah	190,000	1	57,000	Sept. '07	0.07½
MacNamara, s. g.	Nev	728,341	1	21,850	May '09	0.01
Mammoth, g. s. l.	Utah	400,000	2.50	2,220,000	Mar. '08	0.05
Mary McKinney, g.	Colo	1,309,252	1	867,278	June '09	0.02
May Day, g. s. l.	Utah	800,000	0.25	108,000	Sept. '08	0.01½
Mohawk M. Co	Mich	100,000	25	1,950,000	July '09	1.00
Mont. Ore Purch.	Mont	80,833	25	9,437,274	Jan. '07	15.00
Nevada Hills, s.g.	Nev	746,000	5	373,000	Dec. '07	0.10
New Century, z.l	Mo	300,000	1	216,000	Oct. '09	0.01
Newhouse M. & S. c.	Utah	600,000	10	300,000	Sept. '07	0.50
New Idria, q.	Cal	100,000	5	1,434,000	Oct. '09	0.30
New Jersey Zinc	U. S	100,000	100	12,000,000	May '08	4.00
North Butte	Mont	400,000	15	8,600,000	Dec '09	1.00
North Star, g.	Cal	250,000	10	2,186,988	Sept. '09	0.40
Old Dominion, s	Ariz	293,245	25	1,147,413	Sept. '09	0.50
Old Dominion,M&Sc	Ariz	162,000	25	850,500	Sept. '09	1.00
Ophir, g. s.	Nev	201,600	3	1,816,360	May '08	0.10
Osceola, c	Mich	96,150	25	7,997,150	July '09	4.00
Parrot, c. s	Mont	229,850	10	6,807,649	Sept. '07	0.25
Phelps, Dodge & Co.	U. S	44,934,600	1	3,370,095	Sept '09	0.02½
Portland, g.	Colo	3,000,000	1	8,227,080	Jan. '09	0.40
Quartette, g. s	Nev	110,000	10	375,000	July '07	0.20
Quincy, c.	Mich	110,000	25	18,890,000	Dec '09	1.00
Round Mountain, g	Nev	800,000	1	192,027	Sept '09	0.04
Sacramento, g. q.	Utah	1,000,000	1	225,000	Nov. '06	0.00½
St. Joseph, l.	Mo.	1,000,000	10	6,608,357	Sept '09	0.15
Shannon, c	Ariz	100,000	10	150,000	July '07	0.50
Silver Hill, g. s.	Nev	108,000	1	81,000	June '07	0.05
Silver King Co't'n.†	Utah	1,250,000	5	1,490,850	Oct. '09	0.15
Sioux Con., s. l. g.	Utah	746,389	1	672,002	Nov. '09	0.03
Snow Storm, s. l.	Ida	1,500,000	1	802,500	Nov. '09	0.01½
Standard Con., g s	Cal	178,394	10	5,194,130	Dec. '08	0.10
Stratton's Independ	Colo	1,000,000	5	1,895,865	April '06	0.12½
Swansea, g. s. l.	Utah	100,000	5	329,500	Mar. '07	0.05
Tamarack, c.	Mich	60,000	25	9,420,000	July '07	4.00
Tennessee, c	Tenn	200,000	25	2,056,250	Sept '08	1.25
Tomboy, g. s.	Colo	300,000	5	2,160,000	June '09	0.18
Tonopah of Nev.	Nev	1,000,000	1	4,950,000	Oct '09	0.35
Tonopah Belmont	Nev	1,500,000	1	600,000	April '07	0.10
Tonopah Ext'nsion	Nev	943,433	1	283,030	April '06	0.15
Tonopah Midway.	Nev	1,000,000	1	250,000	Jan. '07	0.05
Uncle Sam, g. s. l.	Utah	500,000	1	330,000	Nov. '09	0.02
United States, com.	Utah	351,010	50	2,499,070	Oct '09	0.50
United States, pf*	Utah	186,042	50	6,156,896	Oct '09	0.87½
United Cop. com.	Mont	450,000	100	5,962,500	Aug. '07	1.75
United, c. pf.	Mont	50,000	100	1,500,000	May '07	3.00
United, z. l., pf.	Mo.-Kan.	19,556	25	312,782	Jan. '08	0.50
United Verde, c.	Ariz	299,927	10	1,385,322	Mar. '09	0.75
U. S. Red & Ref. Pf	Colo	39,458	100	1,005,504	Oct '07	1.50
Utah, g (Fish Sp'gs)	Utah	100,000	10	325,000	Feb. '09	0.02
Utah Con, c	Utah	300,000	5	7,800,000	Oct '09	0.50
Utah Copper	Utah	733,624	10	1,793,587	Sept. '09	0.50
Victoria, Utah	Utah	250,000	1	177,000	Mar. '07	0.04
Vindicator Con., g.	Colo	1,500,000	1	2,047,500	Oct '09	0.03
Wolverine, c.	Mich	60,000	25	5,400,000	April '09	5.00
Work, g	Colo	1,500,000	1	172,500	July '08	0.01
Yankee Con	Utah	1,000,000	1	182,500	Jan '07	0.03
Yellow Aster, g.	Cal	100,000	10	958,789	Aug. '07	0.20
Yukon Gold, g.	U.S.&Can.	3,500,000	5	350,000	Sept '09	0.10

Divided previous to consolidation. *$1,436,250. †$11,187,500

Coal, Iron and Other Industrials—United States

Name of Company	and Location.	Shares. Issued.	Par Val	Dividends. Total to Date.	Latest. Date	Amt.
Allis-Chalmers, pf	U. S	161,500	$100	$3,108,875	Feb. '04	$1.75
Amer. Ag.Chem., pf.	U. S	181,530	100	2,292,210	Oct '09	3.00
American Cement	Penn	200,000	10	1,348,000	July '09	0.30
American Coal	Md	50,000	25	2,572,187	June '09	0.375
Bethlehem Steel, pf	Penn	150,000	100	900,000	Nov. '06	0.75
Cambria Steel	Penn	900,000	50	9,450,000	Feb. '09	0.75
Central C. & C., com	Mo	51,250	100	2,613,750	April '09	1.51
Central C. & C., pf.	Mo	18,750	100	1,456,562	April '09	1.25
Col & Hock.C &I.,pf	Ohio	69,244	100	591,550	Oct. '09	1.50
Consolidated Coal	Ill	50,000	100	350,000	July '04	1.00
Consolidation Coal.	Md	190,247	100	x17,020,770	July '09	1.50
Crucible Steel, pf.	Penn	244,365	100	9,102,596	Sept. '09	1.50
Empire S. & I., pf.	N. J	25,000	100	933,033	Jan. '09	1.50
Fairmont Coal	W. Va	120,000	100	1,980,000	Jan '09	2.00
Gen. Chem., com.	U. S	74,103	100	2,445,399	Dec. '09	1.00
General Chem., pf.	U. S	100,000	100	6,555,000	Oct. '09	1.50
International Salt	Penn	182,280	100	911,400	Dec. '06	1.00
Jeff &Cl'f C &I., cm	Penn	15,000	100	330,000	Aug. '05	5.00
Jeff. & Cl'f C. & I.,pf.	Penn	15,000	100	937,500	Aug. '09	2.50
Kern River Oil	Cal	20,000	100	84,000	July '08	0.18
Lehigh Coal & Nav.	Penn	382,260	50	16,739,860	Nov '09	2.50
Maryland Coal, pf.	Md	18,850	100	2,061,122	June '09	2.50
Monon. R. Coal, pf.	Penn	100,000	100	2,324,000	July '08	3950
Nat. Carbon, com.	U. S	55,000	100	715,000	April '08	1.00
Nat. Carbon, pf.	U. S	45,000	100	3,071,259	Nov. '08	1.75
National Lead, com.	N. Y	149,034	100	3,642,789	Jan '10	1.25
National Lead, pf	N. Y	149,040	100	18,676,708	Dec '09	1.75
Nat'l Steel&Wire,pf.	N. Y	25,778	100	631,561	May '06	1.75
New Central Coal.	Md	50,000	20	390,000	Nov. '08	0.40
New River Coal, pf.	W. Va	37,617	100	451,405	Nov. '08	1.50
Pacific Coast Borax	Cal	19,000	100	2,086,500	Aug. '05	1.00
Peerless Oil	Cal	92,000	10	711,000	June '08	0.06
Penna. Salt	Penn	60,000	50	15,098,000	Oct. '08	3.00
Penna. Steel, pf.	Penn	165,000	100	8,662,500	Nov. '08	3.50
Phila. Gas, com	Penn	664,800	50	*24,264,600	Feb. '09	0.75
Phila. Gas, pf.	Penn	120,000	50	2,850,000	Sept '08	1.25
Pittsburg Cal, pf	Penn	297,010	100	11,434,962	April '09	1.75
PocahontasC.C., pf.†	W. Va	28,000	100	336,000	July '09	3.00
Pocah'tasC.C., cm.†	W. Va	45,000	100	†406,800	Oct. '08	3.00
Republic I. & S., pf.	Ill	204,169	100	8,189,111	Sept. '09	1.75
Sloss-Sheffield, com.	Ala	100,000	100	2,133,000	June '09	1.25
Sloss-Sheffield, pf.	Ala	67,000	100	4,338,000	July '09	1.75
Standard Oil	U. S	970,000	100	668,322,000	Dec. '09	10.00
Tenn. C. & I., com.	Tenn	225,536	100	3,583,060	Nov. '07	1.00
Tenn. C. & I., pf.	Tenn	2,840	100	390,040	Nov. '07	2.00
Texas&Pacific Coal	Texas	23,940	100	1,747,620	April '09	1.50
Uni. Metals Selling.	U. S	50,000	100	5,875,000	Jan. '09	5.00
U.S. Steel Corp., cm.	U. S	5,083,025	100	94,784,862	Dec '09	1.00
U. S. Steel Corp., pf.	U. S	3,602,811	100	250,499,867	Nov. '09	1.75
Va Carolina Ch., pf.	U. S	180,000	100	15,420,869	Oct. '09	2.00
Warwick I. & S	U. S	148,671	10	517,739	Nov. '08	0.30
Westmoreland Coal.	Penn	60,000	50	8,880,000	Oct. '08	2.50

*Since 1894. †Since 1907. ‡Since 1890. xStock div. $6,130,000 Mar. '09.

Canada, Mexico, Central and South America

Name of Company	and Location.	Shares. Issued.	Par Val	Dividends. Total to Date.	Latest. Date.	Amt.
Amistad y Conc'rdia	Mex	9,600	$50	$417,070	April '08	$1.36
Batopilas	Mex	446,486	20	†55,870	Dec. '07	0.12½
British Columbia, c	B. C	503,000	5	201,200	Sept. '07	0.40
Buffalo, s.	Ont	900,000	1	543,000	Nov. '09	0.03
Butters' Salvador, g.	Salv	150,000	5	600,000	April '05	0.25
Cobalt Central, s.	Ont	4,761,500	1	187,460	Aug. '09	0.01
Conagas	Ont	800,000	5	720,000	July '08	0.15
Consolidated M. & S.	B. C	53,552	100	781,885	Nov. '07	1.25
Crow's Nest Pass.	B. C	160,000	25	2,018,648	July '07	0.62½
Crown Reserve, s.	Ont	1,750,000	1	1,536,000	Dec '09	0.10
Dolores, g s	Mex	400,000	5	750,000	Nov '09	0.22½
Dominion Coal, com.	N. S	150,000	100	3,300,000	July '09	1.00
Dominion Coal, pf.	N. S	50,000	100	‡630,000	Feb. '08	3.51
Dos Estrellas, g.s	Mex	300,000	0.50	3,780,000	Jan '09	1.00
El Oro, g.s	Mex	1,147,500	5	4,989,600	June '09	0.36
Esperanza, s g	Mex	455,000	5	9,895,567	Sept. '09	0.37
Foster Cobalt, s.	Ont	1,000,000	1	50,000	Jan. '07	0.05
Granby Con.	B. C	135,000	100	3,508,630	Dec. '08	2.00
Greene Con. Copper	Mex	864,000	10	6,137,800	Mar. '07	0.40
Guanajuato	Mex	540,000	5	74,250	Oct '06	0.07
Guanajuato D., pf.s	Mex	10,000	100	184,356	July '09	3.00
Guggenheim Expl	Mex	105,000	100	5,535,000	July '09	2.50
Hinds Con., g s c.l.	Mex	5,000,000	1	100,000	Feb '08	0.02
Kerr Lake, s.	Ont	600,000	5	1,198,000	Dec '09	0.35
La Rose Con., s	Ont	1,143,368	5	1,085,598	Oct '09	0.20
Le Roi, Ltd., g	B. C	200,000	25	425,000	Dec. '06	0.48
Le Roi No 2, g.	B. C	120,000	25	946,800	Nov '09	0.48
Lucky Tiger Com.,g	Mex	[illegible]	10	[illegible]	Nov '09	0.05
McKinley-Darragh,s	Ont	2,247,692	1	580,000	June '09	0.05
Mex Con M &S Co	Mex	240,000	10	660,000	Mar '08	0.25
Mex Mill &Trans pf	Mex	10,500	100	65,858	July '08	3.00
Mines Co. of Am	Mex	2,000,000	1	[illegible]	Nov '09	0.03
N Y & Hond Ros	C. A	150,000	10	[illegible]	Oct '09	0.10
Nipissing, s	Ont	1,200,000	5	3,390,000	Oct '09	0.37½
N S St &Coal, com	N S	9,876	100	1,087,856	April '08	1.50
N S St & Coal, pf	N S	10,300	100	479,130	April '09	2.00
Penoles*	Mex	2,500	100	8,630,000	Dec '07	20.00
Peregrina M. & M.,pf	Mex	10,000	100	258,656	Sept. '09	3.50
Pinguico, pf s	Mex	20,000	100	[illegible]	Oct '09	3.00
Reco, g s l	B C	985,000	1	527,082	April '06	0.02
Right of Way	Ont	499,518	1.00	294,672	July '09	0.06
Securities Corp., pf	Mex	2,000	100	42,699	July '08	3.50
Silver Queen s	Ont	1,500,000	1	345,000	Nov '08	0.05
Temiskaming, s	Ont	2,500,000	1	525,000	April '09	0.06
Tezlutlan Copper	Mex	10,000	100		Dec '08	1.20
Tilt Cove, c	N F	89,000	2	495,630	May '08	0.55
Tretheway, s	Ont	945,450	1	526,080	Dec '09	0.15
Tyee, c	B C	180,000	5	201,600	Aug '07	0.63

*Mexican Currency. †Since reorganization ‡Since August, 1905

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Industrials

Guy H. Gibbs, formerly with the Westinghouse Electric and Manufacturing Company, is now with the Western Electric Company at Cincinnati, Ohio.

At the Alaska-Yukon-Pacific Exposition at Seattle, Washington, the Hardinge conical mill received the highest award granted any fine grinding device.

The S. Dessau's Sons Company has recently imported one of the largest carbons ever found. The stone weighs 462 carats and is of the same quality all through.

The Decicco Contracting Company, of Ossining, New York, has reported making a record in quarry work with eight 3¼-inch "Wood" rock drills, and has placed a large order with the Wood Drill Works for additional machines.

The Sprague Electric Company, New York City, is sending out a very attractive pamphlet, No. 233, which calls attention to its lines of electric hoists, shovels, winches, etc. A copy will be sent upon request to anyone interested in such apparatus.

Circular No. 55 of the Wood Drill Works, Paterson, New Jersey, can be secured from any of the company's representatives, and is a practical explanation of the company's slogan, "Rock drills that can be cleaned up with a sledge hammer" and "Wiped off with a scoop shovel" and yet "Stay with you."

The Mulconroy Company, Inc., Philadelphia, Pennsylvania, has issued a new catalog, No. 19, which illustrates and describes its "7-League" sewed leather soled rubber boots. This catalogue will be found interesting by any one engaged in excavating, tunnel work, concrete building, surveying, prospecting, mining and wet work.

Frank McHale, 302 Havemeyer Building, New York City, has issued a catalog of books relating to engineering subjects, including chemistry, mining, mechanical, electrical and steam engineering, construction, hydraulics, etc. Books will be furnished at the lowest market prices and forwarded prepaid to any part of the world on receipt of advertised price.

The Jackson hand power rock drill was awarded a gold medal at the Alaska-Yukon-Pacific Exposition, Seattle, Washington, this summer. This award was made after thorough demonstrative tests in the hardest granite, and covers not only the efficiency of the drill, but ease of operation—in fact, all of its various features, and therefore confirms all claims regarding the efficiency of the drill.

At the second annual meeting of the Economic Machinery Company, held recently in its Denver offices, it was decided by the officers and board of directors to enlarge its present plant and erect additional buildings for the manufacture of its line of mining machinery. C. C. Wilson, who is president of this company, after a brief trip to the West, declares in favor of Denver as a manufacturing point for mining equipment. Salt Lake City and a prominent Pacific Coast point will also figure largely in the immediate extension of this company.

The Izard Warren Company, Inc., announces to its friends and customers that owing to the rapid growth of its business it finds its present quarters inadequate for its requirements. On November 1 it opened its new four story building at 136 North [illegible] street, Philadelphia, Pennsylvania, [illegible] its entire manufacturing plant, [illegible] and offices. [illegible]

[illegible]

installation of a mine hoist, either big or little. In addition to showing a regular line of direct and alternating single and double drum hoists of various characteristics the pamphlet includes cuts and descriptions of some very interesting special hoists for various uses recently built by the company. These include the Cornwall Ore Bank hoist, the Doe Run Lead Company hoist, novel skip hoists built for the National Tube Company and the Carnegie Steel Company, and the Virginia Railway Hoist for the Sewell's Point Terminal.

Service is one of the chief characteristics of the Dodge Manufacturing Company, power transmission engineers and manufacturers of the Dodge line of conveying and transmission machinery, Mishawaka, Ind. This is largely based upon the maintenance of large stores and warehouses in many of the principal cities of the country, in connection with expert engineering departments, which makes possible immediate deliveries and the solution of knotty problems without delay. From time to time the Dodge people have enlarged and extended this service until it now takes in nine points—Boston, New York, Brooklyn, Pittsburg, Philadelphia, Cincinnati, Chicago, St. Louis and London, England. Announcement has just been made of the addition of Minneapolis, Minn., and Atlanta, Ga. to the list. These two branches will serve the two-fold purpose of local stores and distributing stations for the Northwest and Southland. The Minneapolis store is located at 202-204 Third street, South, and the warehouse at 312 to 320 First street, North. The agency arrangement with tne Minneapolis Steel and Machinery Company has been discontinued. Burke Richards, former resident salesman at Cleveland, Ohio, has been promoted to manager of the Minneapolis branch. The Atlanta branch and warehouse is located at 54 Marietta street. S. L. Dickey, resident salesman at that place, has been appointed manager. No change has been made with any of the agency connections in the South.

Among the recent contracts made by the Buffalo Forge Company calling for the installation and erection of engines, forge shop equipment and heating and ventilating apparatus are the following. For the W. P. Story building, Los Angeles, California, a 12x13x12 tandem compound engine and a 12x20x14 compound engine for direct connection to generators. For the Atlantic Terminal of the Erie Railroad a 10x10 horizontal engine for a 25-kw. lighting set. For the Allis-Chalmers Company four double vertical engines. For the U. S. navy yard at New Orleans, Louisiana, a 12x12 vertical engine for driving a 50-kw. generator. For Fairbanks, Morse & Co. a 15x14 horizontal engine to be used for driving a 100-kw. generator at the Michigan Sugar Company. For the United States government, for direct connection to generators, two 17x16 horizontal engines for Fort Scott, two 15x14 horizontal engines for Fort Casey, and two 13x12 engines for Fort Stevens. For the Indian Refining Company, Georgetown, Ky., a 14x14 engine, belt drive. For the Great Lakes Engineering Works, of Detroit, Michigan, a 3x6 marine type engine for direct connection to a 15-kw. generator. For the Westinghouse Electric and Manufacturing Company, a 10x10 vertical engine for generator. For the Central High School Manual Training Annex of St. Louis, Missouri, 25 Buffalo down-draft forges with blower and exhauster. For the Soldan High School, St. Louis, Missouri, 21 down-draft forges with blower and exhauster. For the College of Hawaii, Honolulu, three down-draft forges [illegible] [illegible] the Montana [illegible] down-draft forges [illegible]

& Co., New York City, three down-draft forges, two volume blowers and two steel plate exhausters. For the Burgess Sulphite Fibre Company, Berlin, New Hampshire, a large steel plate exhauster and a 12x10 engine. For the Geo. J. Meyer Malting Company, of Buffalo, New York, a large blower, pulley driven for use in the germinating room of their malt house. For the Eastern Tanners Glue Company, Gowanda, N. Y., three large fans with heaters, and a 10-inch centrifugal pump with direct-connected Buffalo engine. For the New York Consolidated Card Company, a steel plate exhauster with return bend heater, and three large disc wheels. For the Hamilton Steel and Iron Company, of Ontario, two fans with direct-connected engines. For the White Oak mine, at Archbold, Pennsylvania, a special multivane steel plate fan, to be used for forced draft. For the Anaconda Copper Mining Company, of Butte, Montana, one large fan wheel. For the Clarkson School of Technology, Potsdam, New York, an exhauster for ventilating laboratory. For the Elk Tanning Company, of New York City, seven small drying outfits, each witn heater and engine-driven fan. With the John G. Sutton Company, apparatus for San Francisco schools, as follows: A large steel plate exhauster for the McKinley School; a large steel plate exhauster and two small motor driven exhausters for the Commercial High School; and a large steel plate exhauster with heater for the Sutro School. For the Binghamton (New York) State Hospital, a large steel plate exhauster and vertical engine, to be used for forced draft. For the Hollingworth & Whitney Company, of Boston, a large steel plate fan with necessary heaters and two 7x12 horizontal engines, for heating the grinder room, screen room, wet machine room, etc., in their new paper mill at Madison, Me. With the J. H. & C. K. Eagle Company, one steel plate fan with heater and a 3x3 horizontal engine, for their dye house at Shamokin, Pennsylvania. For Public School No. 15, Jersey City, New Jersey, two large steel plate fans, with return bend heater, two large steel plate exhausters, two 15x10 vertical engines, and two duplex pumps with receivers. For the Standard Bleachery Company, Carlton Hill, N. J., a large fan and return bend heater, to be used for center drying outfit. For the Wilkes-Barre (Pennsylvania) High School two large steel plate fans, a medium size steel plate fan, return bend heater, two large propeller type disc wheels, two exhausters, a forced draft fan and two 6x5 vertical engines.

Trade Catalogs

Blaisdell Company, Pacific Electric building, Los Angeles, Cal. Bulletin. Vacuum filter leaf. Illustrated, 4 pages, 6x9 inches.

The Bruce-Macbeth Engine Company, Cleveland, Ohio. Catalog. Meriam vertical gas engines. Illustrated, 30 pages, 7x10½ inches, paper.

Wisconsin Engine Company, Corliss, Wis. Bulletin C 4. Heavy duty Corliss engines, belted type. Illustrated, 24 pages, 7½x10 inches.

Partridge Hot Blast Smelter Company, Hotel Orndorff, El Paso, Texas. Booklet. Partridge hot blast smelter. Illustrated, 12 pages, 3½x6 inches.

Thwaites Brothers, Limited, Vulcan Iron Works, Bradford, England. Catalog. Metallurgical plant and accessories. Illustrated, 60 pages, 7x[illegible] inches, paper.

H. W. Caldwell & Son Co., Western avenue, Seventeenth and Eighteenth streets, Chicago, Ill. Catalog No. 31. Elevating, conveying, power transmitting machinery. Illustrated, 848 pages, cloth.

Fairbanks, Morse & Co., Chicago, Ill. Catalog No. [illegible]. Engines. Illustrated, 64 pages, 6x9 inches, paper. Catalog No. 65[illegible]. [illegible] tanks and pumps. Illustrated, 3[illegible] pages, 6x9 inches, paper.

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Notes on Mother Lode Mine in British Columbia

Ore Won by Underhand Stoping; Average Production Eight to Nine Tons per Day per Man Employed; Total Cost below 65 c. per Ton

BY ROY HUTCHINS ALLEN*

The Mother Lode mine of the British Columbia Copper Company is at Deadwood camp, about three miles west of the company's smeltery at Greenwood, with which it is connected by a spur of the Canadian Pacific railway, and seven miles from the mines at Phœnix. With the exception of those of the Granby company this mine is the largest in the Boundary district.

THE MOTHER LODE MINE, PHOENIX, BRITISH COLUMBIA

Geology

The ore occurs as an immense body, or series of bodies, 30 to 200 ft. in width, lying along the contact between a white crystalline limestone on the west and footwall side, and a green fissile epidote material, which may be either altered argillite or greenstone-tuff, on the east. The strike of the orebody is a little east of north, corresponding with the direction of the principal fracture lines of the district, and its dip is to the east at an angle varying from 55 to 70 deg. The ore, according to the members of the Geological Survey of Canada, is a metasomatic replacement of both wall rocks.

The contact with the limestone is sharp, but the line of demarcation from the other wall rock is merely commercial. The ore belongs to the class described by the geologists as the "magnetic" type, and includes the minerals magnetite, chalcopyrite and pyrite, with a very little blende, galena, pyrrhotite, and an occasional trace of arsenopyrite, intermixed with calcite, actinolite, garnet, epidote and quartz. As a whole, there is more magnetite than in the ores of the Phœnix camp.

The most valuable metal is the copper, but the ores will average more than $1 per ton in gold and silver. Tests have shown that the ores with 2 per cent. copper carry the most gold, while those with as high as 30 per cent. copper carry no gold. No limestone is found within the orebody. The ore outcrops for a length of over 2000 ft., and has been proved to a depth of 600 ft. below the highest point of the outcrop. Development work has shown the presence of several nearly horizontal dikes of alkali porphyry running through the orebody, but apparently in no way affecting its continuity.

Plant and Equipment

The mine is opened by a vertical four-compartment shaft, 475 ft. in depth, with drifts at the 60-, 200-, 300- and 400-ft. levels. All ore, from the glory hole as well as from the underground workings, is handled through this shaft. The shaft is well timbered with 10x12-in. timbers, and has two ore-hoisting compartments, each 5x5 ft. in the clear, one cage compartment, 5x5 ft., and one pipe- and ladder-way, 4 ft. 6 in. by 5 ft. in the clear.

The ore is hoisted in four-ton, self-dumping vertical skips from ore pockets at each of the levels, and is dumped into a bin at the headframe. From this bin the

*Mining engineer, Lunenburg, Mass.

ore passes through a finger gate, made of heavy rails bent at right angles and operated by a compressed air lift, to a 30x42-in. Blake crusher having corrugated jaw plates of manganese steel. This crusher is driven by a 100-h.p. Canadian General Electric motor taking current at 550 volts, but it may be also be run by a 14x16-in. Erie City slide-valve engine which is held for cases of emergency. The broken ore is taken by a 36-in. belt conveyer up an incline of about 15 deg. to the railroad bins about 150 ft. distant. The discharge from the belt is sampled automatically by a shovel which, revolving about a horizontal axis, cuts out about one-fifteenth of the ore. This sample drops into a bin and is shipped in carload lots to the smeltery, where the final sampling and assaying is done. The bulk of the ore falls into a three-way chute from which any one of the three ore bins may be filled.

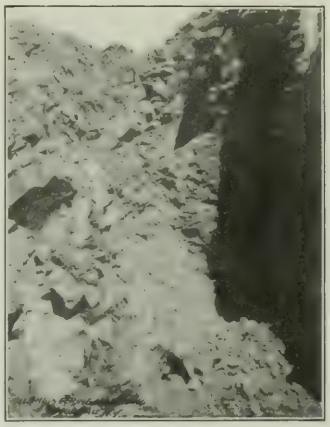
The ore skips, which are hung in balance, are handled by a Jenkes Machine Company first-motion hoist, having cylinders 20x42 in., and drums 6 ft. in diameter with a 30-in. face, taking a 1¼ in. hoisting rope. The hoisting speed is about 1000 ft. per minute, and the complete trip from the 400-ft. level is made in 35 seconds. The normal output of the shaft is 100 tons per hour, but this has more than doubled on occasion. The cage which is used for handling men and supplies is served by a James Cooper duplex geared hoist, having 12x14-in. cylinders, and a drum 4 ft. 6 in. in diameter with a 4-ft. face. Both hoisting engines are operated by compressed air at a pressure of from 90 to 100 lb. per sq.in., the air being taken directly from the 7-in. main leading to the compressor house 600 or 800 ft. distant.

The compressor house is beside a small creek and contains, in addition to the compressors, a vertical, triplex single-acting, motor-driven pump which forces the water to the reservoirs 500 ft. higher. There are two air compressors: one an Ingersoll-Sergeant, 30-drill, Corliss compound steam, two-stage air compressor with piston intake, the other a Canadian Rand 40-drill, duplex, tandem two-stage air compressor. The first machine is now driven by a rope drive from a 500-h.p. Westinghouse alternating-current motor making 247 r.p.m. at full load, and taking current at 2000 volts. The compressor has a rated capacity of 2800 cu.ft. of free air per min., compressing to 100 lb. per sq.in., but is being operated at only two-thirds its capacity.

The Rand compressor has two sets of air cylinders, 16 and 28x36 in., with rotary intake and poppet discharge valves. The machine is provided with an automatic cut-out which acts successively on each of the eight intake valves, a variation of 3 lb. in the air pressure being sufficient to close or open all of the valves. This compressor is driven by a rope drive from a Canadian General Electric low-speed motor receiving alternating current at 2050 volts, and has a rated capacity of 3400 cu.ft. of free air per min., compressing to 100 lb. Power is furnished by the West Kootenay Light and Power Company from its plant at Bonnington falls, and is delivered to the mine at 2050 volts.

Mining Methods

On each level two drifts are run, 7x8 ft. to 10x8 ft. in the clear, one along the footwall, the other 25 to 30 ft. from the hanging-wall and parallel to it. Where the orebody is of sufficient width, as is usually the case, a third drift is run midway between the two. These are connected by diagonal drifts and crosscuts. At intervals varying from 40 to 60 ft. raises are put up on the incline, frequently being driven so as to connect with those



GLORY HOLE, MOTHER LODE MINE

of the parallel drifts on the same level. An 18-hole round is used, the holes being drilled 6 to 7 ft. deep in vertical rows of three each, the resulting raise varying from 8x12 ft. to 10x20 ft. in cross-section. If necessary, other holes are drilled in the roof to obtain the desired hight. A 3¼-in. Sullivan drill is employed, mounted on a 7-ft. column.

When the raise has been advanced about 50 ft., the direction of inclination is often reversed, and as it approaches the level above it is flattened and brought around on the hanging-wall side in the form of a drift or chamber at the top of the raise. The ore on the hanging-wall side is then drilled with machines set on tripods and blasted, after which the ore on the footwall is broken down in benches. In some places the raises are nearly vertical, in others they are of corkscrew shape. In any case, the stoping begins at the top and is carried down by underhand work. Pillars are left throughout the mine, both longitudinally between the drifts, and transversely from wall to wall.

The early method of stoping was to take the ore out in rooms, 30 to 40 ft. square and 20 to 25 ft. in hight, leaving vertical pillars between, but this was awkward and expensive, and was not long practised. In the present method of underhand work drill steel 16 ft. in length is used both in the glory hole and in the stopes, and many holes are drilled before any are blasted. The holes are fired simultaneously and the result is a large tonnage per hole drilled. A blast of 85 holes in the stopes in one case yielded over 8000 tons of broken ore. For blasting, 40 and 50 per cent. dynamite, Hercules brand, is used, while 60 per cent. dynamite is used for bulldozing. Sullivan machines are used for both development work and stoping, and drill from 12 to 40 ft. of holes per shift, according to the nature of the rock. A few 2½-in. Rand "sluggers" are used in raising.

As the glory hole is extended, raises are put up to it from the 60-ft. level at such an angle that the ore will slide readily. The ore here frequently breaks in large blocks and these have to be bulldozed, either on the surface or in the chute. Where the blocks will pass the chute openings, which are 30x48 in., but are too large for the skips, they are removed from the cars near the shaft with a chain tackle and run by an overhead trolley to the adjoining chamber of an old stope, where short holes (5 to 6 in. deep) are put in with a Murphy drill and blasted. By this method a half stick of dynamite will break a rock which would require four or five sticks by bulldozing. The broken rock is thrown into the ore pocket at the shaft.

The ore cars on this level are scoop-shaped, end dumping, and hold 2½ tons. These are drawn in trains of three or four by horses. At the shaft the loaded cars are run by hand on an automatic dumping arrangement, whereby the car is dumped through the shock of the car and weight of the ore and is returned empty to its original position by means of counterweights. Two men are required to handle the cars.

The ore drops into the shaft ore pockets, the gates of which are about 45 ft. below. These gates are of the finger type similar to those in use at the Granby mines, but differ slightly in the method of action. The four double fingers are pivoted on a rod at the front of the chute and are raised by chains attached to the cross-bar of the piston of the air lift. On the inside of the shaft timbers, at the mouth of the chute, is a large sheet-iron gate to catch the fine material which will pass between the fingers when the gate is closed. The sheet iron gate is balanced by a weight and is raised and lowered by hand. This gate binds badly when there is a large amount of fines in the ore, and two men are required in loading the skip, whereas with the Granby type but one man is needed.

On the other working levels, viz., the 200, 300 and 400-ft. levels, the mine cars are side-dumping and have a V-shaped

bottom. These also hold 2½ tons, but are drawn by horses in trains of only two cars each. The loaded cars are drawn on a bridge spanning the ore pockets and there dumped by hand, while the horse returns along a shelf or drift cut at the side of the ore pocket for a passageway. The pockets are provided with gates similar to those on the 60-ft. level.

The ore chutes throughout the mine are strongly made, being built to withstand much hard usage. The posts are stulls, 10 to 20 in. in diameter and up to 20 ft. in hight. Behind these are laid pieces of heavy lagging until the desired hight of the bottom of the chute is reached, usually about 6 ft. above the level of the rails. On top of this lagging is placed a false set which forms the opening of the chute. Dividers are also placed between the front stulls, or posts, at the top and bottom of the chute opening. The planks of the chute are spiked to the lagging and to the lower divider. The chute opening is 48 in. wide and approximately 3 ft. high, and is closed with the ordinary plank gate made in three sections, the second and third being set successively above and behind the first one. In some of the newer chutes are gates made of heavy sheet iron are used.

A GROUP OF COMPANY HOUSES AT THE MOTHER LODE MINE

The mine is well lighted throughout by 16-c.p. incandescent lamps, placed every 35 ft. along the drifts and crosscuts. The mine employs a total of about 185 men, most of whom live near by in houses owned by the company. There are a large number of four-room houses for the married men, while a good boarding house is maintained for those unmarried. The output depends upon the requirements at the smeltery, and varies from 1000 to 1600 tons per day. The output per man employed has averaged from 8½ to 9 tons per day for months at a time, with a total cost stated not to exceed 65c. per ton for the ore delivered in the railroad cars at the mine—surely an enviable record. About 60 tons of ore are broken daily for each drill used in stoping.

Work of the Geological Survey in Alaska

The gold output from Alaska for 1909 is estimated by Alfred H. Brooks, geologist in charge of the Alaska work of the U. S. Geological Survey, at between nineteen and twenty million dollars. The production of the Nome placers has been curtailed by dry weather and other unfavorable conditions, but most of the other camps have either maintained or increased their output. The copper production will exceed 4,000,000 pounds.

The field work of the survey this season in Alaska was carried on by thirteen parties. Districts containing both quartz- and placer-gold deposits, silver, copper and coal were explored and surveyed. An investigation was also made of the water resources of the Territory.

In view of the recognized importance of Alaska's bituminous-coal deposits a detailed survey has been made of the Matanuska coalfield. The resulting map will be used as a base for delineating the coal-bearing strata, and by the time this important field is reached by the Alaska Central railway, of which over 70 miles have already been completed, detailed information regarding the distribution and magnitude of the coal deposits will be available. This railway will also afford access to the Willow creek district, where some quartz veins, rich in gold, were opened up last year.

Railroad construction is also being energetically pushed on the Copper River railway. Trains are running on 75 miles of this road and probably 25 miles more will be completed this autumn. The road will connect the copper deposits of the Chitina with tidewater on Prince William sound. Detailed geologic mapping of the best developed portion of this copper district has been completed.

New Fairbanks District Promising

A preliminary study of the newly discovered lode deposits of gold at Fairbanks was made. Although no large orebodies have been found here, some of the veins are rich and appear to be persistent. Pyrite, arsenopyrite, stibnite, sphalerite, galena and free gold are found in a gangue of quartz. Prospectors report the occurrence of telluride ores, but specimens tested in the survey's laboratory show no evidence of tellurium. The development work is chiefly surface prospecting, but some deposits have been followed to a depth of nearly 100 feet.

Two important pieces of exploratory work were accomplished, one in the region west of Cook inlet and one over an area between the lower Yukon and Seward peninsula. The two largest lakes in Alaska have been surveyed, Lake Iliamna, about 100 miles long, and Lake Clark, a narrow lake about 50 miles in length. Copper- and gold-bearing quartz and a little placer gold have been found in this region, but they have been but little developed. Exploratory surveys in the country lying between the Yukon and Norton bay show that the region extending eastward from longitude 161 deg. holds out but little promise of containing valuable mineral deposits. To the west of this line, however, there are metamorphic rocks which may be auriferous. Geologic work was done by one party in the gold and copper regions of the eastern Kenai peninsula and important information obtained concerning its geology, geography and mineral deposits.

Water Power Investigated

Measurements of stream flow, in order to determine the quantity of water available for placer mining during the open season, were continued this year by the survey engineers in the Fairbanks, Birch Creek, Hot Springs and Rampart districts, and also in the Seward peninsula.

Water powers also play an important part in the mining industry of southeastern Alaska, since their utilization will permit the mining of low-grade ores which cannot be commercially exploited by the use of coal for power. For this reason an engineer of the water resources branch of the survey visited this field in order to familiarize himself with the water problems involved and to obtain a basis on which to plan systematic work.

Another party spent the summer in carrying reconnaissance surveys from the Yukon to the Koyukuk and thence to the Chandalar. The annual gold production of the Koyukuk among the Yukon camps is exceeded only by that of Fairbanks.

In accordance with the practice of making detailed surveys of the important mining districts, the geologic mapping and study of the ore deposits of the Berners bay district was completed this summer. This district, though dormant at present, possesses some valuable lode quartz deposits. These surveys were also carried southward to the Eagle river district.

Ore Dressing in the Coeur d'Alene District—II

Intelligent Ore Sorting a Valuable Aid in Milling; Few Mills Designed by Engineers; Disadvantages of Steep Millsites

BY EDWARD S. WIARD*

Those mines which are some distance away from the mills, as notably the Last Chance and the Standard-Mammoth, have large storage bins at the mines in addition to those at the mills. The ore of the Standard-Mammoth mine at Mace is transported to the mills about six miles below in Canyon creek on the standard-gage tracks of the Oregon Railroad and Navigation Company and Northern Pacific Company. The ore of the Last Chance mine is hauled a distance of five miles from the mines at Wardner to the mill two miles west of the town of Kellogg on the main line of the Tekoa-Wallace branch. The Bunker Hill & Sullivan and the Standard-Mammoth mines are equipped with electric motors to haul the ore from the stopes to the storage bins. The storage bins of the Bunker Hill mine are in the rock house near the portal of the main working tunnel, the rock house being connected with the mill building by an inclined conveyer belt. The cost of transporting ore from the stopes to the mills of the properties mentioned is 2½ to 5c. per ton per mile. At the Hercules the ore is trammed from the portal of the tunnel to a point above the mill, whence there is a gravity tram to the mill bin.

Ore Sorting

The ore of nearly all the mines in the district is so pure and occurs in such large masses that sorting can profitably be resorted to. In the Last Chance mine sorting is employed in the stopes and over the storage bins at the portal of the main haulage tunnel. At the latter place the bins are equipped with inclined grizzlies with wide spacings, and after the ore is sprayed the larger pieces of galena are removed. The average grade of the ore sorted in the stopes and over the bins for a period of about two years was approximately 50 per cent. lead and 22½ oz. silver.

Sorting in the stopes also prevails at the Bunker Hill, Hercules and Standard-Mammoth mines. The rock house of the first company is arranged for sorting, the oversize from four grizzlies with 1¼-in. spacing passing to a flange-sided picking belt. This belt is merely a conveying belt at present, sorting not being attempted owing possibly to the crowded condition of the belt from the heavy tonnages being put through the plant. I am of the opinion that the operation of sorting would not be a success here as no feeder is provided to control rushes of ore, and the need of spraying is not recognized. For the year ending May 31, 1907, the Bunker Hill Company shipped crude ore obtained by sorting which averaged approximately 40 per cent. lead and 17 oz. silver.

All the mill ore which comes from the mines of the district is wet and slime coated so that it is impossible to distinguish galena from waste. Freshly broken in the stopes the larger pieces of galena can be readily seen and removed, but in the dim light of a candle the bulk of the smaller rich pieces must inevitably be overlooked. There is thus a field in the Coeur d'Alene mines for sorting underground and in daylight when the ore is properly spread out. In Mexico and other arid regions where the ground-water level is deep, the milling ore is often bone dry and it does not become coated over in handling. It is possible to sort such ore without spraying, as the small amount of adhering dust does not hide the galena.

Crushing Reduces Galena to Fines.

The ease with which galena reduces to impalpable fines in crushing operations, to say nothing of other operations in the mill which tend to make fines and slime, is perhaps not thoroughly appreciated. I will cite two instances from my own experience. In the first mill the ore, after being crushed by a McCully crusher to pieces of a maximum size of 3 to 4 in., was delivered directly to a conveyer belt.

It was the original intent to sort on this belt, but owing to its being too narrow and no feeder having been provided to take care of the rushes of ore from the crusher, the idea had to be abandoned. It will also be noted that the fines were not eliminated. In the ore on the belt could be seen many pieces of nearly pure galena.

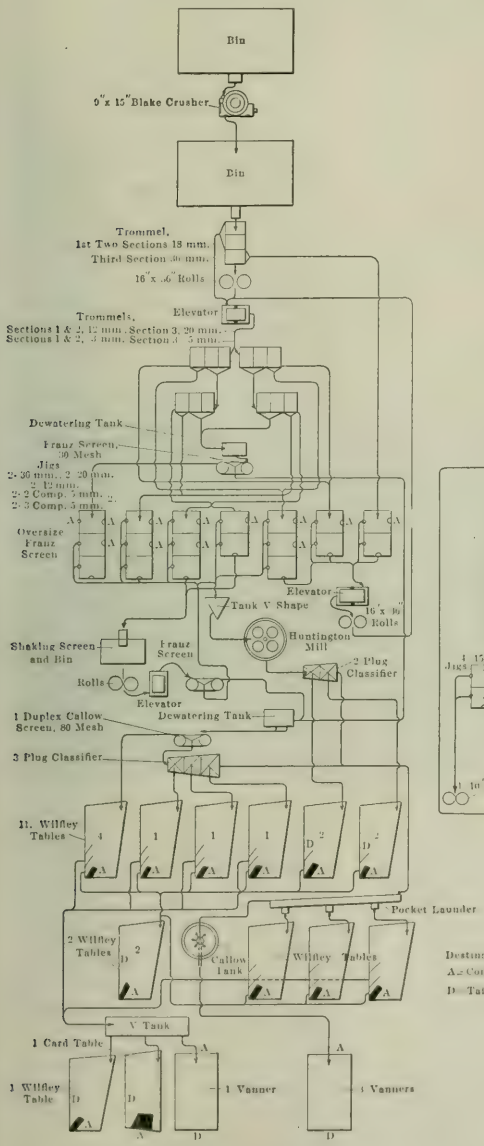
The belt discharged its load into Blake crushers which reduced it to a maximum size of 1¼ in. It then passed to trommels with ¾-in. and 6-mm. round openings. The oversizes of the trommels were fed to rolls. After crushing, the product from the rolls was returned to the trom-

HELENA-FRISCO AND STANDARD MINES—COEUR D'ALENE DISTRICT, IDAHO

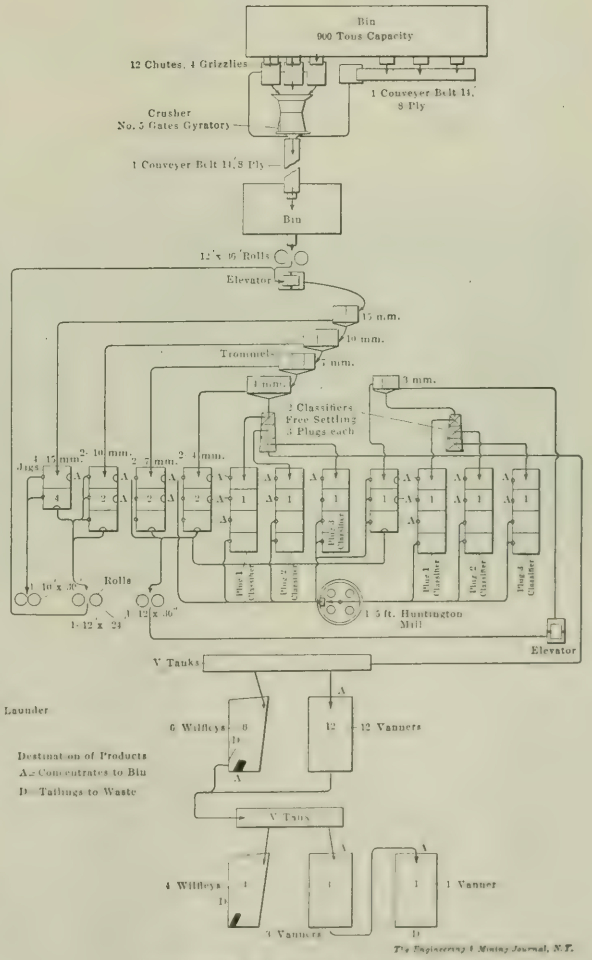
*Mining engineer, Denver, Colo.

mels and the ore thus crushed to a limiting size of 6 mm. A cursory examination of the material from the 6-mm. trommel in the spout over the rolls failed to disclose a single piece of clean galena, but a sizing test showed relatively large amounts of fine galena.

The second instance is the extreme one of a stamp mill crushing gold ore containing galena of a maximum size of 2 in. through a 24-mesh battery screen. The stamped product was found by careful test to contain over 96 per cent. of galena which would pass a 200-mesh screen. The ore as fed to the stamp battery contained 2 per cent. galena which would pass a 200-mesh screen. To successfully sort ore in a surface plant in the Coeur d'Alene district, the following points must be observed: The fines must be eliminated; the ore must be uniformly fed on the sorting belt; the belt must be sufficiently wide to allow of a thorough spreading out of the ore; the ore must be sprayed. That sorting can be highly successful in intelligently designed plants, the following description of the Hecla plant will show.



FLOW SHEET OF HERCULES MILL.



FLOW SHEET OF FEDERAL'S MAMMOTH MILL.

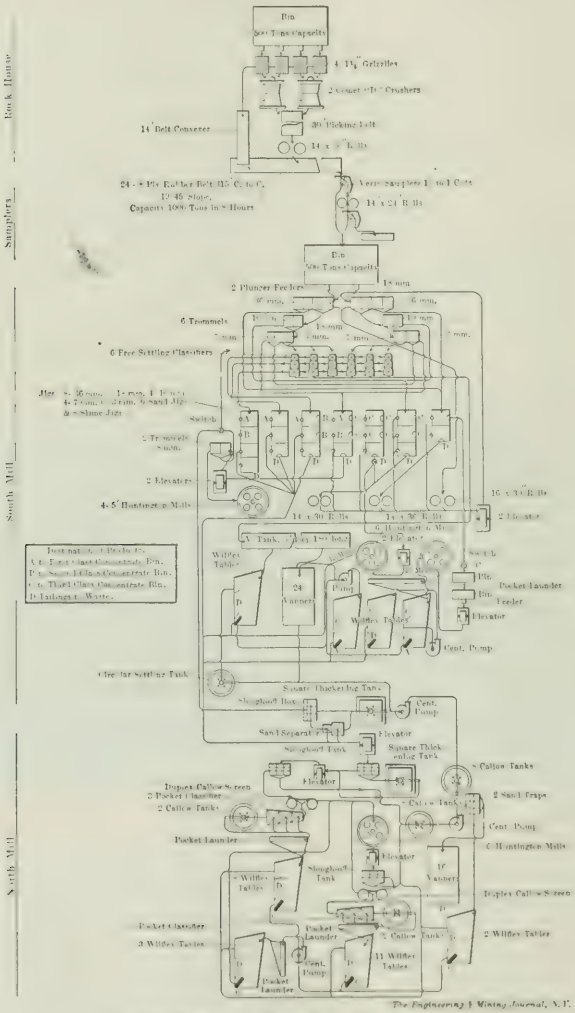
EQUIPMENT FOR SORTING AT HECLA PLANT.

The ore is hoisted 62 ft. above the collar of the vertical shaft and dumped upon grizzly bars with 3-in. spacings and inclined at an angle of 31 deg. The oversize slides to sheet-steel tilting plates

placed flush with the working floor and hinged at the rear, or grizzly, side. The men work over the plate facing the grizzlies. While sorting, the plate is prevented from dumping by supporting lugs which can be depressed by hand levers placed at a convenient distance on each side of the plates. The cars which are now in use are to be replaced by self-dumping skips. For each tilting table there is a sorter who receives three dollars per shift and who sorts out 6¼ tons of waste and 2¾ tons of first-class shipping ore. The crude ore contains approximately 40 oz. of silver and 40 per cent. lead, and the waste 0.3 oz. silver and 0.3 per cent. lead. Two shifts are employed on the tilting plates.

The ore hoisted per 24 hours amounts to 350 tons. When a car of ore is sorted the plates are dropped, the ore falling into a bin underneath. From this point the oversize ore is trammed to a 9x15 Blake crusher and, after being crushed, passes by a conveyer belt to the railroad storage bin, its destination being the mill some distance below in Canyon creek. The undersize from the 3-in. grizzly drops upon a second grizzly with 1-in. spacing. Both undersize and oversize ore from this grizzly pass into bins beneath, equipped with shaking feeders. Plunger feeders were originally provided, but did not work satisfactorily and the present feeder is merely a shaking pan placed under the sheet iron hoppers secured to the bottom of the bins.

The undersize ore is fed to a flat conveyer belt 18 in. wide and with a rate of travel of 150 ft. per minute. This belt discharges upon the conveyer belt below the 9x15-in. crusher mentioned, and thus has the same destination as the rejected material from the tilting tables. The oversize ore from the 1-in. grizzly drops from the feeder upon a flat 30-in. sorting belt with a rate of travel of 15 ft. per minute, and is sprayed near the feeder. Ore and waste are sorted out on this belt, the residue discharging upon the conveyer belt below the 9x15 crusher. Four men are employed on the picking belt per 9-hour shift, and sort out a total amount of 7½ tons of waste and 4½ tons of first-class crude ore. These products carry the same amounts of lead and silver as the similar ones from the tilting table.



BUNKER HILL & SULLIVAN FLOW SHEET

Sorting Cheaper Than Concentration.

Approximately 85 per cent. of the ore hoisted goes to the mill, the remainder being waste or crude ore. Seven men work per shift, six sorters and a shift boss and oiler. The results obtained are summarized in an accompanying table

SORTING COSTS AT HECLA PLANT.

	Tons Ore per Man per Shift.	Total Tons per Man per Shift.	Cost per Ton.	Cost per Ton Shipping Ore.
Tilting table:				
Shipping crude	2¾	9	$0.34	$1.78
Waste	6¼		0.34	
Sorting belt:				
Shipping crude	1.13	2.98	1.06	1.29
Waste	1.85		0.60	

in which the costs given include labor, supplies and repairs, but not depreciation, etc. On the same basis the cost of milling in the district is from 25 to 30c. per ton.

Assuming that the ratio of concentration is 7 to 1, the cost of producing a concentrate of 40 per cent. grade would be from $1.75 to $2.10. In the last column of the table I have figured all the cost against the crude ore produced, and it will be thus seen that in this district a shipping product can be made at a lower cost by hand sorting than by concentration. If the losses in concentration are taken into account, the balance in favor of sorting would be much greater. Also the elimination of 40 tons of waste is bound to effect a saving in the wear and tear of the milling machinery, but to an amount, of course, which cannot be figured.

Sizing and sorting of the ore below 1 in. would probably not be profitable. The conception of the plant is due to James F. McCarthy, the manager of the Hecla mine, and the design to J. M. Callow, of Salt Lake. The plant was built only comparatively recently. In imitation of it a similar plant has been installed at the Standard-Mammoth mine.

The methods employed elsewhere have been already stated.

The Mills

The principal mills in the district are the following: Bunker Hill south mill, class A, daily capacity, 1000 tons, erected 1899 to replace a mill destroyed by dynamite; Morning, class A, 950 tons, replaced a mill destroyed by fire; Standard, class A, 600 tons; Mammoth, class B, 450 tons; Last Chance, class B, 450 tons, erected 1901; Hecla, class B, 300 tons; Hercules, class B, 300 tons, erected 1905; Hunter, class B, 150 tons, remodeled 1904; Success, class B, 150 tons, erected 1906.

Those mills designated as class A are practically double mills up to the tanks of V cross-section for distributing sand and slime to the Wilfley tables and vanners. They have two trommel lines, duplicate equipment of classifiers, two No. 1 elevators, and duplicate sets of rolls for crushing the coarser jig middlings and the ore from the roll bin. The class B mills have single trommel lines, etc.

With the exception of the North mill of the Bunker Hill company and its new mill, none of the strictly lead-silver mills have been erected from carefully drawn detailed plans following exhaustive tests of the ore. On account of the large masses of nearly pure galena which occur in nearly all of the mines, it was early appreciated that the bulk of the galena could be removed by jigging. The earliest mills were jig mills pure and simple. In the old Last Chance mill, for example, the equipment comprised a crusher, rolls, trommels, classifiers, jigs and a large double-deck round table for treating the coarser sorts of sand. Later in this mill an additional settling and classifying tank and some Wilfley tables and vanners were added.

The mills have been built and designed by practical millwrights, those coming earliest to the district bringing their experience from other camps. In building a plant for a new mine, mills already in operation were more or less copied and mistakes in designing were left to the foreman to correct. When a new mill was planned to take the place of an old one, the usual procedure has been for the millwright to call into consultation all the millwise" ones about the mine, and, with the aid of their quotas of information, to make the design. Careful detailed designing was not attempted, the mill being constructed by the aid of a few general drawings supplemented by sketches and verbal directions. The crushing machinery, shafting, etc., were furnished by contract. Until very recently all betterments in the mills have been directed toward obtaining an increased saving in the slime department.

Mill Sites Usually on Hill Sides

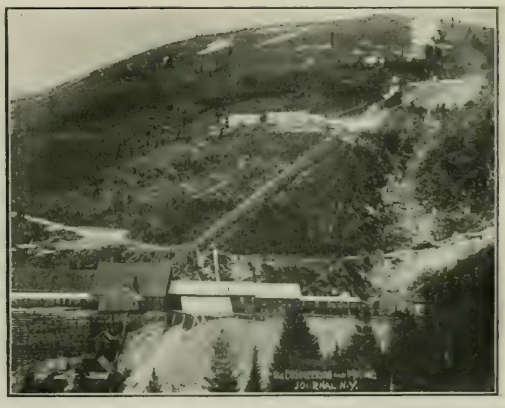
The mills of the district are entirely of timber construction and are situated usually on steeply sloping hill sides. The Bunker Hill mill is on a low, gently sloping bluff of the south fork of the Coeur d'Alene river near the town of Kellogg. The receiving bin is usually at the highest point, the roll bin being in front of it but on a lower terrace. From the roll bin the ore drops into the No. 1 set of rolls, and from this machine drops into the boot of the No. 1 elevator. At the Last Chance mill there is a reserve or storage bin, the ore from which being conveyed to the crusher when needed.

In a number of the mills, as the Mammoth and Morning, one end of the bin is over the crusher, the ore from the chutes at the other end being conveyed to the crusher by a conveyer or cars. As received at the mills the ore has been sufficiently broken to pass into the mouth of 9x15-in. crushers of the Blake pattern, where the first reduction is to 3-in pieces or smaller. At the Hercules mill the ore after being crushed in a 9x15 crusher drops directly into the roll bin beneath, which is of the same capacity as the receiving bin. The ore is thus reduced in one operation from the usual mine size, which has been mentioned, to a 1¼- to 1½-in. size for roll treatment. This is the usual final limit for crushers in the district.

At the Mammoth mill the ore, after being broken to about 3¼-in. size, is conveyed by a nearly horizontal conveyer to the roll bin. At the adjoining Standard mill the ore is crushed to about 3-in. size in a gyratory crusher, then passes to a grizzly by means of a nearly horizontal conveyer. The oversize from the grizzly is crushed in a smaller gyratory crusher, both undersize and oversize dropping into a roll bin beneath. All the mills mentioned employ grizzlies above the first crusher.

In the Bunker Hill rock house the ore is fed directly from the receiving bin to grizzlies with 1¼-in. spacings, the oversize passing to a gyratory crusher and thence to a set of 14x36-in. rolls. Below the rolls it joins the stream of undersize material from the grizzlies. At the Morning mill the ore from the receiving bin is crushed in a 12x15-in. crusher. It is then conveyed to two gyratory crushers, only one of which is in use at a time. The roll bin is placed under these crushers. At the Last Chance mill two 9x15-in. crushers are employed, only one being in commission at a time. The roll bin below the crusher in this mill is much smaller than those to be found in the other plants. As a rule, roll bins are of sufficient capacity to hold from 12 to 24 hours' supply for the No. 1 rolls.

At the Bunker Hill the ore from the rock house is conveyed on an inclined conveyer to the mill bin. Plunger feeders feed the ore directly into the trommel lines. With this exception, the ore after being broken passes by feeders of vari-



HERCULES MILL AND MINE SHOWING TRAM

ous types to the No. 1 rolls. Sizing out of the fines before the No. 1 rolls is practised only at the Hercules mill. From the rolls the ore passes into the boot of the No. 1 elevator.

Arguments Against Steep Mill Sites

It will be seen from the foregoing descriptions that, with the exception of the Bunker Hill south mill, the ore descends by gravity from the mill or roll bin to the bottom of the No. 1 elevator. The boots of these elevators generally rest on the ground at the base of the hill sides or at the base of the more pronounced sloping portion. Some idea of the hight necessary to raise the ore to put it into the trommel lines will be gained from the following figures of the vertical distances between centers of the head and boot pulleys of the No. 1 elevators in some of the mills: Hercules, 38 ft. 10 in.; Morning, 31 ft. 5½ in.; Mammoth 33 ft. 5¾ in.; Last Chance 48 feet.

In the Last Chance mill, to accommodate the deep jig concentrate bins it was necessary to raise the jig floor which stands over them and the trommel line. Some of the comparatively great hight used to raise the ore to the trommels is expended in giving a high slope to the undersize launders from the trommels to the jigs, the rest being absorbed by adhering to the almost universal plan which prevails in the district of dropping the ore from the bin by gravity to the boot of the No. 1 elevator, and of bringing the coarser jig middling back to one or more sets of rolls set in the same general line at the rear of the mill, and which discharge into the boot of the No. 1 elevator.

I think it must be regarded as a vicious fault that any of the jig middlings are returned to the original trommel line. If this be admitted one of the chief arguments in favor of the hill-side site, viz., fewer elevators, falls to the ground. If the middlings are not to be brought back to the original trommel line they can be kept ahead or down the mill in retreatment. Personally, I favor the gently sloping site to the flat site. In arguments in favor of flat sites too much stress is usually laid on the ease with which a mill can expand and not enough on the fagging out which comes to hard-working millmen who have to climb from top to bottom of a hill-side mill many times a day, and their inability to see what is going on without doing this.

Returning now to elevators; the gravity site as employed in the Coeur d'Alenes favors fewer elevators but higher ones. With, say, 4-mm. stuff and inner bucket elevators give but little trouble if properly designed, but the troubles increase with the hight. As the material to be raised increases in size the troubles become more and more manifest. With 1 in. sized stuff or thereabouts it would be a more truthful statement to say that the troubles increase as the square of the hight. Flat or gently sloping mill sites exist at various points along the south fork of the Coeur d'Alene river. In the branch streams, such as Canyon, Nine Mile and Milo creeks, the hill sides are precipitous and the mines are contiguous to these canyons. To reach a favorable mill site a more or less long haul would be necessary for all the mines.

Upper Limit of Screening High

At the trommels the first thing which would attract the observer acquainted with the practice in other camps employing wet concentration would be the high upper limit of screening. At the Bunker Hill mill the largest opening in the punched trommel plates is 36 mm.; at the Hercules mill, 36 mm.; at the Mammoth, 15 mm.; at the Morning mill, 22 mm. The oversize from these screens with holes of the maximum diameter goes to rolls. The high upper limit of screening is made possible by the coarseness and purity of the galena. The bulk of the ore fed to the mills is jigged, the weight of ore fed to the tables and vanners amounting to from 10 to 20 tons per 100 tons of ore fed to the mills. However, two-thirds of this amount represents the reground middlings from the jigs. About 95 per cent. of the ore fed to the mills is thus jigged. The percentage of ore treated on tables and vanners is increasing from year to year.

Extraordinarily large tonnages are put through single trommel lines in the mills of the district. In the single-unit mills with but one trommel line, the tonnage from the bin per 24 hours ranges from 150 to 450, and in the double-unit mills, from 300 to 500 tons. In addition there is a heavy return of middlings. Not infrequently the rate of feed to a single trommel line exceeds 700 tons per 24 hours. I shall treat of this matter further in a later chapter; the point to be noticed now is that with the heavy burdens of undersized materials which pass to the jig a large jig equipment is necessary, and to reach the dead boxes of the jigs the trommel line must be raised and the elevators be made higher.

The jig floor below the trommels is usually on the same general level as the rolls for coarse crushing. Not infrequently the ball jigs and some of the jigs treating larger sizes of material from the trommels are on a raised platform overlooking the Nos. 1, 2 and 3 sets of rolls and the No. 1 elevator. These machines are thus set in a form of well formed by the foundations of the mill at roll bin and the platform. At the Bunker Hill south mill the roll bin, which in this case feeds directly into the trommel line, is raised from a flat piece of ground spreading out from the top of a low bluff. The rolls also rest on this terrace. The whole jig floor is raised up on a platform, the bin end of which looks down upon an equipment of six sets of rolls and two No. 1 elevators. As to the jigmen is delegated the duty of caring for the main complement of rolls, the necessity of having them visible from the jig floor is apparent.

At the Last Chance mill the roll equipment is entirely under the jig floor and access to the rolls is had by stairways at each end of the jig floor. The oversize of the first trommel is returned to the head of the trommel line after being crushed in the No. 2 set of rolls. The middlings from about 8-mm. size and coarser also find their way into the boot of the No. 1 elevator after being crushed in the No. 3 set of rolls, a portion of the sandy hutches of the coarse jigs likewise making the same circuit.

Reference to Flow Sheets

For examples of the practice in these respects, reference should be made to the flow sheets which accompany this section. The final undersize from the trommels flows to one or more classifiers, usually 3-plug, these giving products for jigs. The destination and treatment of the middlings from the fine jigs can also be seen. At the Mammoth and Last Chance mills the rolls and Huntington mills for regrinding the finer middlings are situated on the floor immediately beneath the jig floor. In the south mill of the Bunker Hill the battery of Huntingtons is on the solid ground immediately in front of and below the jig floor. On this floor are likewise the tables and vanners of the south mill. Long V cross-section tanks usually receive the overflow from the classifiers and these not infrequently are placed athwart the mill, the slime and sand from the classifier discharging into the side.

At the Hercules mill these long tanks have been replaced by shorter ones, the overflow of which passes to a long launder provided with classifier pockets, and what is not removed in these pockets is thickened in conical tanks and fed to vanners. At the Mammoth mill the first treatment tables and vanners are on a floor ahead of the jig floor and but little below it. Distribution of sand and slime to the tables and vanners is made by two parallel tanks, the overflows of which pass into others on the same general level. Re-treatment of the middlings from these tables is accomplished on a floor below the jigs and also by the first-treatment tables and vanners. In the rear of this floor are, as has already been mentioned, rolls and Huntington mills. At the front are the tables and vanners and the bins for jig and slime concentrates.

In the Morning mill the overflows from the classifiers pass into the side of a V tank and the overflows from this into two others parallel to it. The coarser sands receive treatment on round tables

and the finer sands and slime on tables and vanners. In the settlement and distribution of the middlings from these machines for retreatment, and for retreatments of the vanner tailings, an enormous system of parallel V tanks is employed.

At the Last Chance mill the overflow from the classifiers flows by a launder to tanks above the upper floor of a separate two-story building, retreatment of table and vanner middlings being accomplished on the lower floor. Classifiers are not employed in the Federal mills for producing table and vanner feed. At the Hunter mill there is an elaborate system of classifiers, both for the jigs and Wilfley tables. The final overflows from the classifiers pass into two wall tanks. Retreatment tables are on a floor immediately below, and on this floor are likewise the direct and retreatment vanners. The concentrate bins are usually placed on the lowest floor of the mill. At the Last Chance mill the slime concentrates are settled in a bin on the lower floor of a building separate from the main one, and the jig concentrate bin is immediately below the jig floor. In expansion for slime treatment the relatively narrow main buildings have frequently been built out in long wings at the bottom.

Flow Sheets Typical of the District

Three flow sheets have been selected as typical of the practice of the district. It will be noticed that there are only solid lines to indicate the flow of various classes of material down the mills. If correct average assays could be obtained of the various classes of material circulating through the mills whose flow sheets are presented, and it would be advisable to print them, some clearness might result by inserting the assays on the flow sheet and accompanying them with different sorts of lines to indicate middlings, different grades of concentrates, etc. The ultimate destination of a finished or rejected product is a bin, the dump or the creek. On the flow sheets such destinations are indicated by letters, the meaning of these letters being explained by the text which accompanies the flow sheet, and the destination of material to be treated is thus all represented by solid lines.

On the Bunker Hill sheet three separate buildings are indicated. Of these the south mill is the old or main building. The north building is a recently erected plant some distance away from the south mill on the jig tailings dump. This plant was erected to treat the immense mass of tailings which has accumulated there. At present it is being used to retreat middlings from fine jigs, Wilfley tables and vanners in a way that an inspection of the flow sheet will show. On the completion of the new west mill, the north mill will be put in commission as a tailings plant. The Bunker Hill mill of 1899 is substantially the south mill as it exists today; there was, however, originally an equipment of round tables which have been replaced by Wilfleys. The round tables had three decks and received the sand from the first plugs of the V tank. The middlings from the two upper decks was treated on the lower deck and two products were made, concentrates and middlings. The middlings from the lower deck were retreated on Wilfley tables.

The Hercules flow sheet may be regarded as that of a mill in an unstable condition. This mill[1] has only recently been completed and constant changes are being made in the treatment of sand and slime. The most noticeable features of the mill are the substitution of screens for the usual deep-pocket classifiers, the use of short classifying tanks and classifying launders and the employment of round filter tanks for collecting the slime concentrates. The Mammoth mill is an example of a mill in equilibrium, no important changes in the flow sheet of this mill having been made in recent years.

In addition to the equipment shown on the sheets, the Bunker Hill has a great spread of settling tanks situated outdoors to settle the drainings from the floors and the overflows of the concentrate bins. The Mammoth also has outdoors settling tanks. The Hercules has a pumping system for returning the overflow of the slime concentrate tank to the water distribution tank in the upper part of the mill, and also tanks and pumps for dewatering the coarse-jig tailings, the water being returned to the storage tanks.

[1]Destroyed by fire, Labor Day, 1909.

Metallurgical Improvements on the Rand

Special Correspondence

In reviewing the events of the last financial year of the Simmer & Jack mine, the chairman referred to the progress that had been made in metallurgical work. Improved results had been obtained by the introduction of a cone classifier between the stamps and the ball mills. The cost of dressing plates had been reduced by allowing much longer intervals between dressings than was hitherto customary, and this has been done without reducing amalgamation efficiency. The introduction of sand filters has also proved successful, and under the new system the time available for sand treatment has been increased by 20 per cent. Improvements have been made in the construction of assay furnaces enabling coal to be burnt instead of the more costly coke. A source of loss has been discovered due to the presence of carbonaceous matter in commercial lime, which causes a precipitation of the gold in solution, and steps have been taken to reduce this loss to a minimum.

During the last year the tonnage treated was in excess of that for the preceding year, having been 831,040 tons as against 785,310, and this increase accounts to some extent for a reduction in costs, although the improvements in metallurgical treatment no doubt account for the greater part of this reduction. The treatment costs of 1908 were 4s. 2d., while those of 1909 were 3s. 9d. per ton milled.

Concentrating Tin Ores

At the Rooiberg tin mine in South Africa, the ores from different parts of the mine vary greatly and the present mill was built with the idea of using the results obtained from its operation as data for its gradual change and improvement. Two features of the plant distinguish it from most tin plants: provision has been made for preliminary sorting, and coarse concentration is employed.

The process is briefly described by R. Recknagel in a report to the Rooiberg Minerals Development Company, Ltd., as follows: The ore as it comes from the shaft is reduced by a rock breaker to 1½-in. size, elevated to the highest point of the mill and passed over grizzlies. The undersize drops into the mill bin and the oversize is washed and then sorted on a sorting belt which delivers the sorted ore into the mill bin. From there this ore is fed by mechanical feeders into a 10-stamp mill of 1050 lb. weight per stamp, crushed and discharged through a 100-mesh screen. The battery pulp is elevated to the highest point of the mill by a bucket-belt elevator, unwatered to a certain degree by a Callow tank, and the pulp passes on the Callow screens where the separation of the pulp above and below 400-mesh fineness takes place. The oversize is treated in a three-compartment Hartz jig, and the undersize passes through a classifier which separates the pulp suitable for treatment on Wilfley tables from the slimes. The latter are thickened in four Callow tanks and then treated on Frue vanners. The middlings from the jigs and from the Wilfley tables are reground by a Holman pan, and the reground material joins the general pulp flowing into the classifiers.

Definite data are as yet not at hand, but it is thought possible to improve the results by even coarser crushing than though the 100-mesh screen, and that the jigs may take finer material than the 400-mesh oversize. Only a small amount of slimes is made in the mill. During the last fiscal year 1100 tons of sorted ore were treated for a yield of 75 tons of concentrates averaging 70 per cent. metallic tin. An output of 60 tons per month is expected.

Reflecting the bad situation of the aluminum industry in Europe in 1908, it is reported that the first year of the Societa Italiana per la fabbricazione dell'Alluminio resulted in a loss of 232,704 lire.

The Guanajuato District, Mexico

SPECIAL CORRESPONDENCE

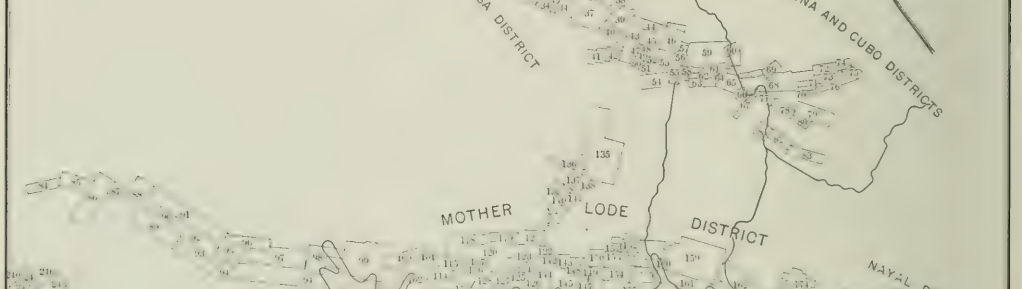
The Guanajuato district in Mexico is one of the best known mining districts in that country. It is particularly well known in the United States on account of the several large mining promotions which have been financed in the United States for this camp. The camp has an interesting history and has a record of enormous production from the earliest time in Mexican mining. The revival commenced with the inauguration of cheap power for the district about 1900 and since that time there has been undertaken in the camp some of the most important mining and milling operations in Mexico. The district, which is quite extensive, comprises the Guanajuato camp proper, and the La Luz district, and several outlying camps. It produced last year over $8,000,000 of gold and silver. The production now is on the basis of nearly $12,000,000 yearly, and it is expected that with the completion of developments and mill installations under way and planned, this annual output will be increased materially.

The camp was extensively exploited by the colonial and early Mexican operators, but with the fall of the price of silver, about 1880, these early operations were nearly at a standstill until the beginning of the new period in the history of the camp. For a time several English companies were interested in the camp, and endeavored to meet the conditions of increasing power costs and decreasing price for silver. These factors, coupled with the unsatisfactory and expensive methods of ore treatment, induced them to leave the field just prior to the American occupancy of the district.

The last revival in the camp was based largely on the assumption of vast reserves of milling ore in the mines and on the dumps, and also with some expectation of finding rich ore which had been left by the Mexican operators. In this last expectation most of the operators were entirely disappointed, but in the matter of ore reserves, the dumps and filling have afforded an enormous tonnage which is today being profitably worked in the mills by cyanidation. The future of the camp depends upon the development of the low-grade orebodies which were not exploited by the early miners, and of the finding at depth of new orebodies of low and high grade. Several companies are sinking deep shafts and driving tunnels to reach the veins in depth and there is a likelihood that the life of the camp will be prolonged for an indefinite period as a result of these explorations.

The camp is supplied with cheap electrical power and now has advantageous railroad connections by a branch line to the Mexican Central. Labor is cheap, and is efficient. The ores are suitable for cyanidation, and the methods largely developed in this camp, in applying this process have so cheapened the costs of treatment that ore which was of no value a few years ago now yields an adequate return on the large investment which is required.

A number of smaller companies are operating on unexplored ground, or in outlying districts, and there is a likelihood that some of these companies will in time become productive and add to the total output of the camp. At the present time



The Engineering & Mining Journal, N.Y.

MAP SHOWING MINING CLAIMS OF THE GUANAJUATO DISTRICT

Index to Mining Claims Shown on Map of the Guanajuato District in the Mexican State of That Name

SANTA ROSA DISTRICT.

1—Nueva Florencia.
2—San Gabriel.
3—Negociacion de Sta. Brigida.
4—San Vincente.
5—La Facilidad.
6—La Dificultad.
7—Purisima de San Antonio.
8—La Soledad.
9—San Antonio.
10—San Miguel.
11—San Miguel de San Tomas.
12—Sta. Isabel.
13—Indiana.
14—San Lorenzo.
15—Espana.
16—La Trinidad.
17—El Oriolo.
18—El Refugio la Asuncion.
19—Sta. Fe de Providencia.
20—San Francisco.
21—San Cayetano.
22—San Cayetano.
23—La Conda.
24—San Bruno.
25—San Miguel.
26—La Trinita.
27—El Refugio.
28—La Gallena.
29—La Fortuna.
30—La Conda.
31—San Nicolas.
32—Nueva Mexico.
33—New York.
34—El Durango.
35—La Porfia.
36—La Libertad.
37—San Ignacio.
38—Morelos.

PEREGRINA AND CUBO DISTRICTS.

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40—Dolores.
41—Solo Estrella.
42—Buena Vista.
43—Milanesa.
44—Santa Fe del Monte.
45—La Asuncion.
46—S. Juan Tagultapa.
47—Lolseta.
48—Dem. de Pasadena.
49—Pasadena.
50—Nellie K.
51—Espiritu Santo.
52—Gold King.
53—Los Alisos.
54—Mecultepec.
55—La Buena Fe.
56—Los Alisos.
57—San Anton de los Viejos.
58—Guadalupe.
59—La Constancia.
60—La Merced.
61—El Desquite.
62—La Barrecani.
63—Jupiter.
64—Purisima de Caballeros.
65—La Virgen.
66—El Dem. Crato.
67—San Rafael.
68—Peregrina Group.
69—La Fortuna.
70—S. Antonio Cata Diana.
71—La Cumbre.
72—Noche Buena.
73—El Golgota.
74—Patrocinia.
75—Todos Santos.
76—La Purisima.
77—1 Amp. Perseguida.
78—Perseguida.
79—San Antonio (A) La Chilmitera.
80—Las Palomas.
81—El Rescate.
82—Santa Teresa.
83—Santa Rita de Casia.

MOTHER LODE DISTRICT, INCLUDING NAYAL, PINGUICO AND CARMEN DISTRICTS.

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85—Jessie.
86—Copenhagen.
87—Carlos.
88—Cayadonga.
89—Nuevo Porvenir.
90—San Juan Nepomuceno.
91—Socavon de Buena Vista.
92—Restauradora.
93—La Red.
94—El Echado.
95—Socavon de la Aventura.
96—El Broche.
97—Maria y Jose (A) La Piedad.
98—La Porfirista.
99—Esperanza.
100—Protectora.
101—San Bernardo.
102—Victoria.
103—Santa Ana.
104—Sta Fe de Jesus.
105—Maridad.
106—Devonian.
107—La Cruz.
108—San Prospero.
109—La Chueca.
110—San Francisco.
111—Nueva Luz.
112—El Progreso.
113—Negociacion Minera de Valenciana.
114—Esperanza.
115—La Concepcion y Annex.
116—James Burno.
117—La Lucita.
118—Ocho Senores.
119—Las Palmas.
120—Argentita.
121—Colorado Springs.
122—Princess.
123—Nueva Ley.
124—Avis Pero.
125—San Lorenzo.
126—Secho.
127—Marivillas.
128—Tepeyac.
129—Union.
130—Nuestra Senora de Guanajuata.
131—Annex.
132—El Obrero.
133—El Nopal.
134—San Mateo.
135—Superiora.
136—Guadalupe.
137—Pipichagu.
138—Superiora.
139—San Carlos
140—1 Ampliacion de San Carlos.
141—Amp. de Servia.
142—Zapote.
143—El Atalaya y San Vicente.
144—Mellado.
145—Rayas.
146—LaSorpresa.
147—El Maguey y Annex.
148—Pomentorio.
149—Annex.
150—La Aparecida.
151—El Sol.
152—Guadalupe.
153—El Sol.
154—Sirena.
155—Independencia.
156—Paris.
157—Anaconda.
158—El Amparo.
159—Mizpah y San Jorge.
160—Alamita.
161—Mexico.
162—La Concepcion.
163—Isabella Victoria.
164—El Centenario.
165—Ampliacion de San Roberto.
166—Oyama.
167—El Salto.
168—San Roberto.
169—Estrella de Oro.
170—Guanajuato.
171—Pinguico Junction.
172—San Jose.
173—Esperanza.
174—La Fe.
175—Escorpion.
176—El Cedro Group.
177—La Confianza.
178—Golden Queen.
179—La Bufa.
180—Ubaldina.
181—Nueva Carmen.
182—El Engenio.
183—Escondida.
184—El Carmencita.
185—Amp. De El Pinguico.
186—El Pinguico.
187—San Jose.
188—Humboldt.
189—Argentina.
190—Canales.
191—Alfa.
192—Gama.
193—Escondida.
194—Escondida.
195—San Vicente.
196—1 Annex. to San Vicente.
197—Beta.
198—Independencia.
199—La Sorpresa Ofelia.
200—N. O. Alcala.
201—Alcala.
202—Iota.
203—New Nayal.
204—Santa Eduwigio (Nayal)
205—1 Ventura.
206—New Nayal.
207—Annex. to San Vicente.
208—Santa Isabel.
209—Cardones.
210—Fe de Constancia.
211—La Cima.
212—El Vaval.
213—El Carmen.
214—Padre Ambrio.
215—Americana.
216—Morelos.
217—Merced.
218—New Pinguico.
219—Constancia.
220—Demasias.
221—El Santo Nino.
222—La Torre Mines.
223—Colorado.
224—Ampliacion del Prestigo.
225—Rosita.
226—El Prestigo.
227—New Pinguico.
228—Monte Cristo.
229—Las Playas.
230—El Pacifico.
231—Roosevelt.
232—Th. Roosevelt.
233—1 Amp. Roosevelt.
234—Gold Bonanza.
235—Los Tusas.
236—Josefina.
237—El Gato Montes.
238—Los Leones.
239—Los Leones.

LA LUZ DISTRICT.

240—San Juan del Jordan.
241—La Constancia.
242—S. Pedro & S. Pablo.
243—Thyself.
244—Tres Marias.
245—Sto. Eduwigis.
246—Morado.
247—Purisima.
248—Sellschop.
249—Cuatro Marias.
250—Cadena de Oro.
251—Susie.
252—Burgos.
253—Sta. Irma.
254—Buena Fe.
255—Keystone.
256—Nueva Purisima.
257—Sevillan.
258—Alianza.
259—E. Sacramento.
260—Feliz Idea.
261—La Chispa.
262—Pennsylvania.
263—San Antonio.
264—Ernestina.
265—Trafalgar.
266—Melladito.
267—San Pedro & San Pablo.
268—La Fe.
269—Sta. Gertrudis.
270—San Fran. de Paula.
271—El Salvador.
272—British Isles.
273—San Fella.
274—La Luz.
275—Thistle.
276—Russel Howland.
277—Cinco Senores.
278—Terreno Libre.
279—Independencia.
280—La Asuncion.
281—San Jorge.
282—Sta. Elena.
283—El Cuervo.
284—Sta. Rita.
285—Peru.
286—La Soledad.
287—San Jose de los Mucnacnos.
288—El Refugio.
289—Doctor.
290—Plnidad.
291—Platernos.
292—San Nicolas Tolentino.
293—S. Benito.
294—Amp. S. Benito.
295—Ampliacion De San Nicolas Tolentina.
296—Benito.
297—Benito.
298—La Paz.
299—La Caridad.
300—V. De Dios.
301—Cata.
302—La Porfia.
303—Golconda.
304—La Esperanza.
305—La Cruz.
306—El Carmen.
307—La Soledad de las Carreras.
308—Bonaparte.
309—La Marsellas.
310—St. Elena.
311—El Tirol.
312—Ampliacion de Matilde.
313—Matilde.
314—Lepanto.
315—Avis Flores de Oro.
316—San Jorge.
317—La Abundancia.
318—Emma.
319—Loreto
320—San Francisco de Pill.
321—Sangre de Frisco.
322—Santo Nino.
323—Americana.
324—Palanca.
325—Anne.
326—Purisima.
327—San Miguel.
328—San Pedro.
329—Rosario.
330—Todos Santos.
331—Republicano.
332—Los Reyes.
333—Bethel.
334—Puertecita.
335—San Juan.
336—La Joya.
337—La Perla.
338—G. Felice de Jesus.
339—La Tourraine.
340—Amp. Tourraine.
341—Sampson.
342—David.
343—Solomon.
344—Dalila.
345—Belem.
346—Rabbit's Foot.
347—Rabbit's Foot Annex.
348—Los Reyes.
349—Aurora.
350—S. Angelo.
351—De Aurora.
352—La Bandera.
353—Pabellon.
354—El Jicote.
355—Socavon de S. Julian.
356—Bella Luz.
357—San Jose de la Era.
358—Tres Coronas.
359—Margaritas.
360—Mejiamora.
361—Diamante.
362—S. Carreyano.
363—San Antonia.
364—La Merced.
365—San Miguel.
366—La Loca.
367—Emma.
368—S. Julian.
369—San Jose.
370—Los Yankees.
371—Noche Buena.
372—1 Ampl Buena Ventura.
373—Buena Ventura.
374—Allie E.
375—Ruby G.
376—Harriet M.
377—Siglo XX.
378—Edwin E.
379—1 Amp. Edwin E.
380—Dolores.
381—El Patrosinio de los Reyes.
382—Am Sta. Teresa.
383—S. Nicholas del Jora'.
384—La Tlaxpana.
385—Independencia.
386—Socavon de la San Cayetano.
387—San Pascual.
388—Buenos Aires.
389—Buenos Aires.
390—Lourdes.
391—Sta. Monica.
392—Refugio.
393—San Jose de Gracia.
394—La Precascion.
395—San Antonio de los Millagros.
396—Ruby Silver Tunnel.
397—Carter.
398—Walter Scott.
399—El Maguey.
400—Irene A.
401—Purisima del Ocotilla.
402—San Pablo.
403—Riverside.
404—San Diego.
405—El Rol.
406—Guadelupe de Cabrera.
407—Los Dos Ninos.
408—Edwardo VII.
409—La Trinidad.
410—Buena Vista.
411—Waterloo.
412—Humboldt.
413—El Roble.
414—Ampl. Del Roble.
415—La Fortuna.
416—Sta. Teresa.
417—El Porvonia.
418—Reyes Annex.
419—Maria.
420—Zaragoza.
421—Grand Oro.
422—Los Reyes Madas.
423—El Rubi.
424—La Aldana.
425—El Topacio.
426—El Metero
427—Rubi Ext.
428—Anna E.
429—Eliza
430—Esperanza M.
431—Margarita.
432—Sta. Maria De Colon.
433—El Peru.
434—Amp. de Sta. Mariale Colon.
435—Santarder.
436—San Gonzalo.

most of the operations and output are confined to the several large companies which have extensive milling facilities that are operated with great economy and on a large scale.

Practically all of the mining operations now being conducted in the Guanajuato camp are in charge of Americans and are by American companies. The large Mexican holdings have in most cases been transferred, either by purchase, or under contract to these American operators and to all intents and purposes the camp is an American camp. Nearly all of the skilled help is American, but the labor generally is Mexican. There is an increasing tendency to use Mexicans more generally in positions of responsibility in connection with the mines and mills. However, the management and direction of the great enterprises of Guanajuato will probably continue to remain in the hands of Americans.

New Cement Plant in Maryland

Work has been started upon the large cement plant which the Tidewater Portland Cement Company is building at Union Bridge. A spur has been run from the main line of the Western Maryland railroad up to and through the property of the cement company. The first unit of the plant, which will consist of five modern lime kilns, together with a fully equipped hydrating plant, having a capacity of 200,000 bbl. of lime annually, will be ready for operation Feb. 1, 1910. A novel feature of the Tidewater company's operations will be the manufacture of a white portland cement. This will be done from the limestone, which contains barely a trace of iron, and white clay.

The deposits of raw material at this point consist of white limestone, containing between 98 and 99 per cent. of calcium carbonate. The shale deposits lie directly adjacent to the limestone deposits. In fact, the two could be worked in one quarry if necessary. Both materials have been thoroughly tested and pronounced suitable for the manufacture of the highest grade of portland cement. The limestone will also make good burned lime.

The plant is being designed and built by the Fuller Engineering Company, of Allentown, Penn. The kilns will be 8 ft. in diameter and 123 ft. long. The raw material will be dried by the waste heat of the kilns. There will also be an extensive clinker storage, thereby insuring a sound and uniform product. White Portland cement will be manufactured in a separate unit, immediately adjacent to the main unit. The fixed charges and operating expenses of the manufacture of the latter will thereby be reduced to a minimum.

The officers of the company are: Pres[illegible] John K. Ponce, vice president, [illegible] treasurer, Edgar D. [illegible] secretary, Owen B. Murphy. It is expected that by the spring of 1911 the cement plant will be in operation.

Early Iron Making in Brazil*

By Orville A. Derby†

The colonial records of Brazil register the fact that about 1590 an exploring party that set out from the town of São Paulo, founded about 40 years before, reported the finding of iron ore in a mountain situated about 100 km. to the southward. Gold and silver were also reported from the same region, and acting on this information the Portuguese government took measures to promote the mining industry in the colony by sending out, in 1597, officials especially charged with this mission. The inclusion of an iron founder in the party indicates a special interest in the discovery of the iron ore, and one or two small forges were set up, which commenced to produce iron probably about the year 1600 and continued in activity to about 1629. The place subsequently took the name of Ipanema, which has ever since been inseparably connected with the long, though not brilliant, history of the iron industry in Brazil. There is a reasonable probability that the iron produced here was the first to be manufactured on the American continent.

Later Iron Making

About 100 years later the rich goldfields of the district of Ouro Preto, the former capital of the state of Minas Geraes, were discovered, and by the year 1700 the rush that ensued was fully established. This opened up to exploration and permanent settlement the most extensive and important of the Brazilian ironfields, that of the Sierra do Espinhoço, or Backbone range, forming the eastern rim of the basin of the São Francisco river. A large part of the gold mines of this and the neighboring district are actually in iron ore which, from the difficulties it presented to the miners, must have necessarily attracted their attention to a marked degree.

There is, however, a reasonable presumption that long before the definite establishment of the iron industry in this region some metal may have been produced by the primitive African methods with which many of the slaves imported in immense numbers for the working of the gold mines must have been familiar. Eschwege states that in 1811 when he arrived in the district most of the smithies then existing produced their own iron, either directly by the spongiful in an ordinary blacksmith's forge, or in a primitive furnace constructed especially for the purpose. Two men who were still living at that time disputed the honor of being the first to introduce the process, which was thus presumed to have been a recent event.

Under the direction of Eschwege a company was formed to erect a direct-process plant in the neighborhood of Ouro Preto, which commenced to produce metal at the end of 1812 at the rate of about 100 lb. per day. The improvements here introduced were eagerly copied, and in a short time the whole mining district of Minas Geraes was dotted with little furnaces. The number of these was estimated in 1864 as 120, many of which are still in operation.

Introduction of Blast Furnaces

In 1765 the production of iron was resumed at Ipanema in São Paulo, but again abandoned after a few years. An attempt made in 1800 to revive the industry, this time by means of a blast furnace, was unsuccessful, and in 1810 a Swedish metallurgist under contract with the government constructed four direct-process furnaces which continued in operation until 1818, when two blast furnaces constructed by the German engineer officer, Frederic von Vernhagen, then in the service of the Portuguese government, were put into operation. These continued in blast under government administration until 1895 with a daily production of three or four tons.

Between 1809 and 1814 an attempt was made to establish a blast furnace at the Morro de Pilar in the neighborhood of Serro do Minas, but the enterprise was abandoned before reaching the productive stage, and until 1888 all the iron produced in Brazil, outside of Ipanema, was made by the direct process. In that year a blast furnace with a daily capacity of four tons, afterward raised to six, was put into blast at Esperança near Itabira do Campo in the state of Minas Geraes, and this has continued to operate successfully until the present, being now the only establishment of its kind in the whole country.

Brazilian Iron Ores

Iron ores of good appearance are known in every state of the Brazilian Union and specimens of them figure in every national exposition, but for the most part definite information regarding the deposits is lacking. The greater part of the specimens exhibited in expositions and museums are magnetites, and of these the majority of those that have been examined have proved to be quite highly titaniferous. A good number of specimens of hematites of excellent aspect, representing numerous widely separated localities, have also appeared.

Limiting ourselves to the districts regarding which definite information is at hand, it may be said that these belong to the states of Minas Geraes, São Paulo, Bahia, Goyaz, Paraná, Santa Catharina, Rio Grande do Sul, and Matto Grosso. The ores known in the first three and the last of these states are predominantly hematites; in others predominantly magnetites.

*Abstract of memorandum prepared for the International Geological Congress, 1910.

†Chief of the Geological Survey of Brazil.

Electric Smelting with the Girod Furnace

These Furnaces in Successful Operation on a Commercial Scale in a Number of European Steel Works. New Plant for Making Special Steels

BY W. BORCHERS*

In all special branches of the chemical and metallurgical industries in which large electric furnaces became necessary for carrying out new processes or for the improvement of old ones, the development of electric furnaces took place along much the same lines. The endeavors to make a success of a new idea originated many ingenious designs which, almost without exception, proved that the safest and shortest way to practical success is in the utmost simplicity of construction of the necessary apparatus.

Our knowledge of the qualities of materials for building electric furnaces and of the constituents of the furnace charges, especially as to their conductivities at high temperatures, as well as in regard to their chemical affinity toward one another in high degrees of heat is, in spite of all scientific progress, far from being complete: and from that we must deduce that the smaller the number of elements of construction of a furnace the smaller the number of unreliable factors in the construction and running of such furnace.

This natural deduction deserves special attention when an electric furnace for steel making has to be chosen from the constantly growing number of inventions; for the chief constituent of steel, the element iron, is a substance which in its liquid phase has so great an affinity to those elements which are to be removed from the charge, that it is very difficult to comply with the following conditions: (1) To heat the refining slag to the highest point of its chemical activity; (2) to prevent the iron from partaking in these reactions, or, where this cannot be prevented, to make it partake in them in such manner that it finally appears in the end product without material losses; (3) to choose and arrange the materials from which the furnace is to be built so that wherever their contact with the furnace charge cannot be avoided they shall not react upon constituents of the latter in an injurious way.

POURING THE CHARGE FROM 12-TON GIROD FURNACE AT UGINE

The Girod Furnace

When reviewing[1] the electrode furnaces about six years ago, I could say that a furnace simpler than that of Héroult could not be found; today, I have to correct this judgment. For now the Girod furnace must be recognized to be at the head of the list of electrode furnaces in simplicity and safety in construction and running. Though I am far from changing my good opinion of Doctor Héroult's work in electrometallurgy, yet I consider it my duty as professor of electrometallurgy and as an author of electrometallurgical books and other scientific publications, to correct publicly opinions formed during earlier stages of scientific progress which have been superseded by a better knowledge.

After having perceived the advantages of the Girod electric heating system for my laboratory research work, I was accordingly happy to receive and accept several invitations of Director Paul Girod to

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[1] Elektro-Metallurgie. III. Borchers. Ed. 1903. p. 536

see a few years ago his old works, owned by the Société Anonyme Electrométallurgique Procédés Paul Girod, and later the new steel works owned by the Compagnie des Forges et Aciéries Electriques Paul Girod, both at Ugine, Savoie, France, with permission to make unrestricted use of my observations at Ugine for my lectures and all other publications.

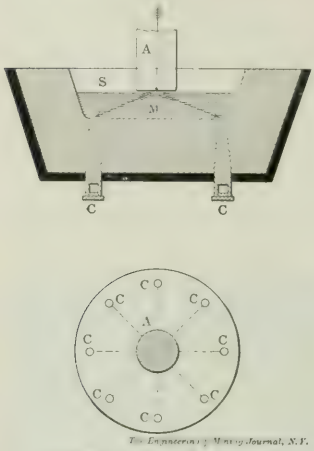
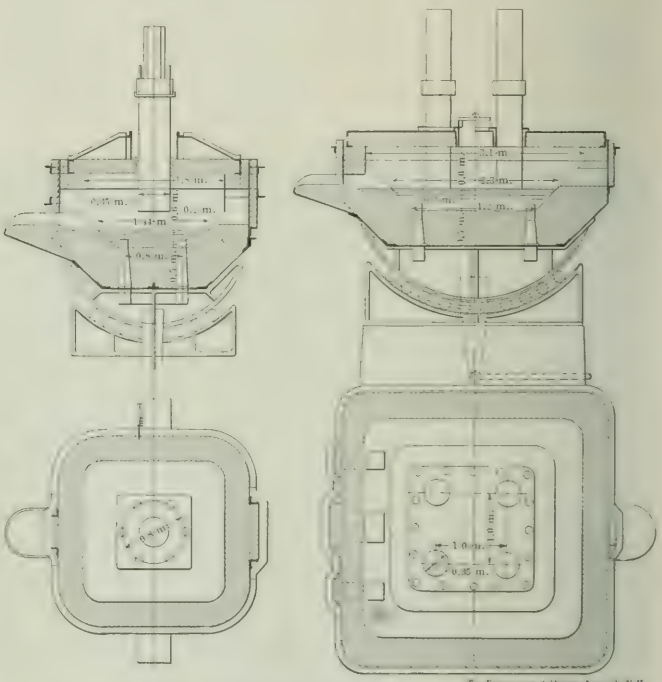


DIAGRAM OF GIROD FURNACE

A Combination of Resistance and Arc Heating

The Girod furnace is, as I mentioned above, the simplest of our modern electric steel furnaces, useful as an experimental furnace, or as a smelting furnace on the largest possible scale. I am using it in my laboratory with currents of 30 to 36 kw., and for steel smelting it is being used with currents of 300 and 1200 kw. It is a combination of resistance and arc heating furnace. The metal to be smelted serves as one of the electrodes; it is covered by the refining slag as an electrolytic conductor while a carbon block (or several carbon blocks), entering from above through the cover of the furnace, forms the opposite electrode above the center of the bath. The arcs play between the carbon blocks and the slag, and no doubt here the largest amount of heat is produced. A second heat-producing place is the layer of slag through which the current passes to and from the metal. Finally the metal itself becomes an important heat producer on account of the effective manner in which the electric current is made to pass through the molten metallic body, and this is the most important feature of the Girod process.

The distribution of the electric current through the molten metal is clearly shown in the accompanying diagram in which the letters indicate: *A*, carbon electrode; *S*, slag; *M*, molten metal; *C*, contact pieces to connect the metal with the current conductors. These contact pieces are of such cross-section and length that every one of them will take up only a certain part of the whole current without being exceedingly heated and, therefore, exceedingly increasing its resistance. An additional regulation of the temperature and resistance of each contact piece is effected by cooling the ends of these bodies, which contain small chambers, by means of circulating water. These bodies, made of pure iron to avoid any deterioration of the furnace charge, are thus not only the connecting rods between the furnace charge and the current generators, but they serve also as regulating current distributers, making the electric charges pass uniformly from and to the centrally hanging carbon rod or rods in radial direction to and from the periphery of the bath. This is important, not only for uniformly heating the bath, but also for keeping every part of the liquid metal in constant motion.



DETAILS OF 2½-TON AND 12-TON GIROD FURNACES

Running a furnace with as high a current density as is found necessary to smelt iron and steel, one can easily observe that the passage and the transformation of the electric current into heat is accompanied by a violent mechanical motion of all particles of the liquid. This movement, however, accelerates the contact between the impurities of the iron and the refining slag swimming on top of the bath. The Girod system of arranging the electrodes and contacts is a safeguard against any stagnation of parts of the liquid furnace charge, and for this reason the advantages of both the induction or transformer furnaces and the electrode furnaces are combined in the Girod furnace, while their imperfections have been overcome.

Cold Scrap or Molten Metal May Be Charged

The peculiar arrangement of electrodes and contacts gives the Girod furnace a special advantage over other electrode furnaces when cold scrap is to be smelted. Soon after charging the hearth of the furnace the upper electrode is lowered until it rests upon the heap of scrap; then the current finds no other way from the center of the heap than by means of numerous small arcs through the whole mass of scrap to the periphery of the heap on the hearth bottom. The heap is breaking down simultaneously in all parts in a very short time. There is no sticking of cold pieces to the bottom of the furnace and no necessity for stirring up and loosening such lumps from the hearth, thereby avoiding danger of breakage.

It will easily be understood, that if during a smelting operation pieces of the ends of the contact bodies melt and dissolve in the steel, no harm will be done to the latter as the contacts consist of pure iron; the quantity of iron which in such a case combines with the liquid

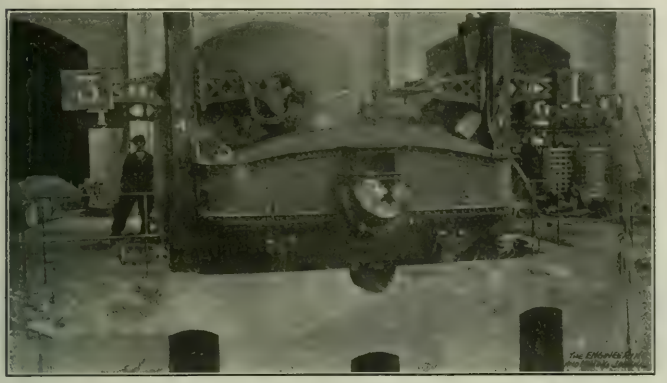
charge of the furnace is proportionally so small that the qualities of the charge will not be influenced to any perceptible degree.

The applicability of the Girod furnaces is not at all restricted by the nature of the raw materials. They may be fed with cold scrap or with molten metal. When feeding cold scrap one does not put in the whole charge at once. After the larger part of the charge has been shoveled or otherwise thrown upon the hearth, the current is sent through the heap in the manner already described; the rest of the charge is put into the furnace together with the first batch of the refining ingredients. Taking the run of a 2-ton furnace as an example, the charge consists of 2000 to 2500 kg. of iron scrap, and the first batch of refining slag usually consists of about 80 kg. of lime (CaO) and 220 to 250 kg. of iron oxide ore. Together with the iron ore oxide that covers the scrap the iron ore serves as an oxidizing agent.

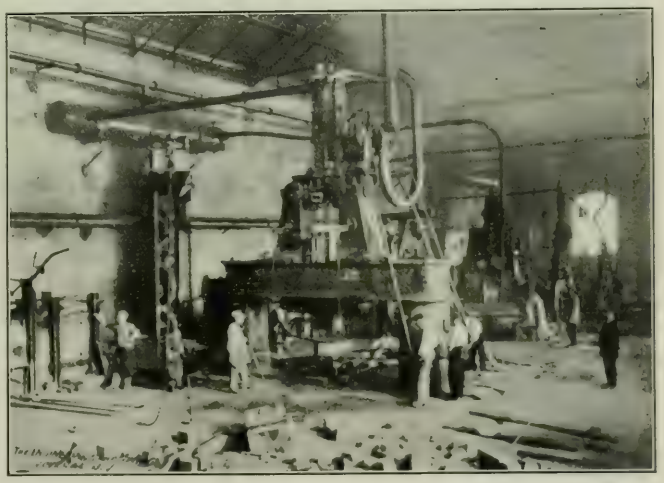
The smelting of the iron charge and the first batch of refining slag requires 4½ to 5 hours. This slag becoming exhausted of iron oxide and therefore of its oxidizing power, samples are taken and tested to ascertain the degree of refining of the molten metal. According to the degree of purification, the furnace now receives (after the first slag has been skimmed off) a second, and if necessary a third batch of lime-iron-oxide slag. After the removal of the last slag the surface of the metal bath is thoroughly cleansed by throwing in about 30 to 40 kg. of lime and skimming this off after a while. The further treatment of the iron bath depends upon the absence or presence of impurities which could not be removed by the lime-iron-oxide refining, and upon the quality of steel to be produced.

Depending upon these considerations, deoxidizing or other refining agents are employed; for instance, ferromangano silicon, ferroaluminium silicon, ferromangano-aluminium silicon and other alloys. For producing carbon steels Swedish charcoal iron or a kind of iron very rich in carbon produced in an electric furnace of the steel works is added.

The final step in the production of special steels is the addition of iron alloys with metals like nickel, tungsten, chromium and others after these refining operations. It is not the purpose of this paper to give a report on researches on the reactions during the refining process; I shall have to leave this to the special sidero-metallurgists; I wish today to deal only with the practical working of this useful electrometallurgical apparatus.



12-TON GIROD FURNACE DURING SMELTING



FORGING HALL AT UGINE

Calcined Dolomite Linings

The total duration of one smelting operation from the starting of the current to the casting of the product into ingots or molds covers about eight hours when the raw material is not pure. Pure raw material, of course, will require less time and power. The smaller of the two types of furnaces used in steel works is run with alternating currents of about 300 kw. at about 60 to 65 volts. The larger furnaces require 1000 to 1200 kw. at 70 to 75 volts. Taking in account a loss of 10 to 11 per cent. of the charge by oxidation and evaporation, the power required to make one ton of steel in a small furnace is 900 to 1000 kilowatt-hours; in a large furnace 800 to 900 kilowatt-hours.

The consumption of carbon electrodes amounts to 12 to 15 kg. per ton of steel, including the short pieces which remain in the holders when the latter have reached the lowest point at which they can withstand the radiating heat of the bath. The lining of the furnaces, mostly consisting of calcined dolomite, will withstand at least 80 charges, excepting the sidewalls into which cavities have been eaten by the slag around the level of the molten bath. These repairs are now required at short intervals of time, but the bottom of the furnace will stand 120 to 160 charges without repair. The thickness of the bottom will have lost at this time about 100 mm. Furnace linings will stand a considerably longer time if liquid charges are used. One of these furnaces was run during 200 charges without any repair. The linings of the furnace covers require more frequent renewing, in the small furnaces after 25 to 30 charges, in the larger ones after 20 to 25 charges. The other pieces of the furnace outfit are not worn out as fast as the linings and electrodes; the furnaces which so far have been put into operation still have their original outfit.

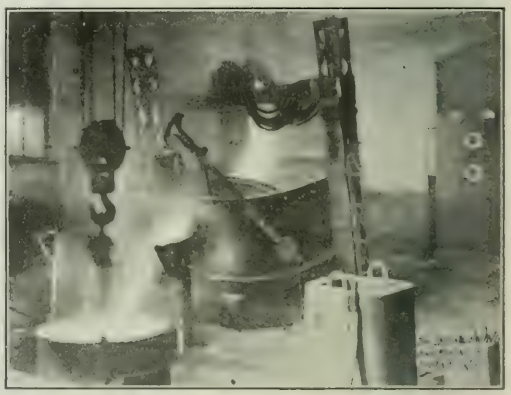
At the works at Ugine only scrap iron is used as raw material for steel making, as well as for the manufacture of iron alloys. The larger part of the scrap is

s it iron and steel, the smaller part pig and cast iron. The average percentage of impurities in the raw material used during a long period of operations was as follows: C, 0.4 to 0.5 per cent.; Si, 0.15 to 0.25; Mn, 0.5 to 0.7; S, 0.06 to 0.09; P, 0.08 to 0.1. What degree of refining can be reached in the Girod furnace will be seen from the accompanying list of analyses of the various steels produced.

The cost of the different types of Girod furnaces and the cost of complete plants are the following: A small 2½-ton furnace, including regulators for the electrodes, measuring instruments, tilting-device mechanism and the conductors from the furnace to a dynamo or transformer near the furnace room, costs about 15,000 fr. A large 12½-ton furnace with a like equipment will cost about 30,000 fr. The manufacturing cost of the electrodes amounts to 3 to 4 fr. per ton of carbon body. A complete plant with one 2½-ton furnace for regular running, one furnace for reserve, and with all appliances and smeltery building, but without dynamo or transformer, will cost approximately 200,000 to 300,000 fr.; a plant working with a large 12½-ton furnace, 300,000 to 400,000 francs.

ANALYSES OF STEELS MADE IN THE GIROD FURNACE.

Properties.	C. Per Cent.	Si. Per Cent.	Mn. Per Cent.	S. Per Cent.	P. Per Cent.	Other Constituents. Per Cent.
Very soft	0.079	0.106	0.205	0.015	0.012	....
Soft	0.236	0.180	0.431	0.012	0.010	....
Middle soft	0.283	0.208	0.430	0.014	0.010	....
Middle hard	0.388	0.155	0.342	0.011	0.009	....
Middle hard	0.463	0.204	0.463	0.010	0.016	....
Hard	0.596	0.198	0.302	0.017	0.005	....
2 per cent. nickel	0.076	0.099	0.101	0.014	0.010	2.12 Ni
3 per cent. nickel soft	0.06	0.123	0.209	0.013	0.007	3.47 Ni
3 per cent. nickel hard	0.364	0.144	0.435	0.012	0.015	3.41 Ni
5 per cent. nickel soft	0.134	0.148	0.375	0.016	0.013	5.25 Ni
5 per cent. nickel middle soft	0.250	0.157	0.414	0.010	0.015	5.08 Ni
Nickel-chrome	0.420	0.199	0.500	0.010	0.009	2.53 Ni 0.77 Cr.
Tool steel	1.223	0.168	0.224	0.011	0.010	....
Tool steel	1.474	0.119	0.264	0.015	0.007	....
Tool steel	1.010	0.219	0.306	0.008	0.009	0.32 Cr.
Tool steel	1.277	0.230	0.130	0.009	0.006	0.24 Cr.
Tool steel	1.251	0.176	0.258	0.010	0.008	1.21 Cr. 0.49 Ni
Tool steel	0.689	0.029	0.096	0.012	0.009	6.07 Cr. 0.46 Mo 25.82 W.



2½-TON GIROD FURNACES IN OPERATION IN FRANCE AND BELGIUM

The Old Plant at Ugine

To carry out the Girod processes for the purpose of making alloys and steel, a company under the name Société Anonyme Electrométallurgique Procédés Paul Girod, Ugine, Savoie, France, was created several years ago. This company owns the Girod alloy works where the first experimental two-ton steel furnace was tried. The fact that today 10 furnaces with 400 to 600 electrical h.p. are kept running, and that 12 new furnaces of 1200 electrical h.p. each are being put up, shows to what extent the manufacture has been developed. In the future these old works will do only the alloy business and the old steel furnace will be transferred to the new steel works.

This company also owns an electrode factory with the most perfect and modern equipment for turning out daily 10 to 12 tons of electrode sections in diameters up to 350 mm. and in lengths up to 1600 mm. of round or square cross-section. At present only 7 tons are made, for which only one furnace is required; a second furnace will be built as soon as the demand for electrodes increases. The raw materials for the electrodes are retort graphite, petroleum coke, anthracite coal and anhydrous tar. The solid materials are ground in ball mills, kneaded with tar in double-screw mixers and upon chilean mills. The scarcely plastic mixture is then stamped into big blocks which finally are pressed into blocks of the dimensions given above. The burning of these blocks is done in gas-fired ring furnaces, in the chambers of which large fire-clay tubes take up the pressed blocks under a covering of ground coal.

The company owns several water powers. The dam which was built for the old works is situated about 3 km. above Ugine on the Arly river. There a strong dam with gates sends the water into a tunnel which leads it to a pipe line directly above the power house at Ugine. Nineteen Pelton wheels drive as many dynamos direct coupled to the wheels, furnishing a total of 8500 to 9000 electrical h.p. The second power station, furnishing an additional 12,000 electrical h.p., is situated above Le Fayet. The tunnel and pipe lines are large enough for carrying the water for 20,000 h.p., but the machine house is fitted with turbines and dynamos for only 12,000 h.p. It will soon be enlarged. The three-phase current is sent under 45,000 volts to Ugine. It is transformed here into currents of 2500 volts for the large machines, and 60 to 75 volts for the furnaces. The 2500-volt current is transformed into a current of 500 volts, and this into a 110-volt current for lighting and small motors and a 500-volt direct current for locomotives, cranes and the like.

Besides this power the works of Ugine are leasing from a power station at Bionnay, on the Bonnant river near St. Gervais, 6000 electrical h.p., and from the Société d'Electrometallurgie Sud-Est, at Veuthon near Albertville, during the winter months (Oct. 1 to April 1) 8500 to 10,000 electrical h.p. From both stations the

current is furnished under an e.m.f. of 45,000 volts. The current from St. Gervais is conducted to Le Fayet and there enters the Le Fayet-Ugine line.

New Steel Works

For the production, and for the first mechanical and thermal treatment of the special steels, a new company also under the management of Paul Girod has been formed (the Compagnie des Forges et Aciéries Electriques Paul Girod) whose works have been built about 1 km. below the old works. The electric current for these works is bought from the old company, the Société Anonyme Electrométallurgique Paul Girod.

The installations which have been provided for the new steel works, most of which are now in running order, are the following: Three electric furnaces of 2 tons capacity each, one of which works only for small steel castings; two large electric furnaces of 10 to 12 tons capacity each. The steel produced in all of these furnaces, except the one mentioned, is cast by means of large ladles, worked by electric cranes, into ingots which go to the rolling mills. Working with several furnaces for steel castings, pieces (dynamo frames) up to 20,000 kg. have been made. For the mechanical and thermal treatment of the steel ingots the most effective modern machinery has been erected.

The rolling mill has two 3-tier rolls, one of which is able to take ingots up to 525 mm. diameter and 400 kg. weight and roll them down to rods of 125 mm. diameter, while the other will roll ingots of 325 mm. diameter to smaller round, square and otherwise-profilated rods. The other equipment of this mill consists of two furnaces for heating the ingots before they go to the rolls, and of the necessary cutting and sawing machinery for the rolled blocks.

A large forging hall contains 9 hammers operated by compressed air. The largest of these hammers weighs 5000 kg.; the weights of the other 8 hammers are from 1000 to 100 kg. Here specially tough forgings are made for automobile machinery, shaftings, gears, tool-steel rods, projectiles, etc. Besides several annealing furnaces already in operation, a large hall is being built for tempering, annealing and hardening large forged or cast-steel pieces. A second forging hall is being erected which is to be fitted with one 1000-ton forging press, one forging hammer of 10 tons hammerweight, and three stamps with falling hammers of 3000, 2000 and 1000 kg. respectively.

The steel foundry contains a carpenter shop for making the models, a sand separating plant, a number of molding machines, the necessary molding frames, drying and heating furnaces and an air-sand-jet plant for cleaning the castings.

The foundry with its present equipment will be able to turn out about 10 tons of steel castings daily, but, as mentioned above, pieces up to 20,000 kg. may be cast. A mechanical workshop is now being built and will soon be completed.

The analytical laboratory at the old works is doing the analytical investigation for both companies; 15 chemists and assistants are employed. A laboratory for mechanical and physical tests of the products is connected with the new works. It is fitted with all appliances to determine the mechanical strength and to investigate the microstructure and changes of the latter on mechanical and heat treatment. The two companies are erecting sanitary quarters and comfortable dwelling houses for their workingmen and other employees.

I have been informed that, besides the two Girod companies mentioned above, the following firms have ordered Girod furnaces, some of which have been running for some time: Oehler & Cie., steel foundry in Aarau, Switzerland; Société John Cockerill, iron and steel works in Seraing, Belgium; Stotz & Co., steel foundry in Kornwestheim near Stuttgart, Germany; Stahlwerk Becker, Krefeld, Germany; Gutehoffnungshütte (one of the largest and oldest coal-mining, iron and steel-smelting works in Germany) in Oberhausen; Ternitzer Stahlwerk, Schoeller, in Ternitz, Austria; Danner & Co., steel works in Judenburg, Austria; Ungarisches Staats-Stahlwerk in Diosgyor, Hungary. From this, it is apparent that at last the Girod furnace is earning well deserved attention and success.

Asbestos in Canada

Asbestos is mined in Canada in the Eastern townships of Quebec, at Black Lake, Thetford, East Broughton and Danville. Several other occurrences of the mineral have been reported from various parts of the Dominion, but mining is only being conducted in the above district at the present time. The mining of asbestos in this region dates from about 1878, and the value of the annual output has grown from less than $25,000 in 1880 to over $2,573,000 in 1908. At the present time asbestos stands next to coal in the list of nonmetallic minerals produced in Canada. According to the report of the Department of Mines the total shipments in 1908 aggregated 90,773 tons, valued at $2,573,335, which is slightly better than the record of the previous year.

A portion of the Canadian asbestos is of sufficiently high grade to be shipped crude, the greater part, however, is crushed and has the fiber extracted by special machinery. As yet a uniform system of classification has not been adopted by the operating companies but for statistical purposes the crude is divided into two classes, the mill fiber into three grades, and short fibered, asbestic, and sand separately classified.

Oriental Consolidated Mining Company

The annual report of the Oriental Consolidated Mining Company, operating 7 mines in the Wunsan district, Korea, states that during the fiscal year ended June 30, 1909, 293,828 tons of ore of an average grade of $5.77 per ton were mined by the company. In addition to this 2589 tons of an average grade of $7.60 per ton were produced by tribute mines. The cost of mining in the company's operations was $1.59 per ton. The net receipts were $556,370, an increase over a year ago due to an increased grade of ore mined.

Development work as follows was done: Shafts, 313 ft.; main drifts or tunnels, 11,223; side drifts, 1629; crosscuts, 3585; raises or winzes, 6539; total, 23,289. Most of this work was done on the Tabowie and Taracol mines. The ore reserves at present amount to 733,882 tons worth $3,243,866.

The seven mills of the company crushed 296,417 tons of ore worth $1,716,104. Of this, 89.3 per cent. was saved in bullion and concentrates. The Tabowie and Maibong mills have been improved and a capacity of 325,000 tons is expected during the present year. Milling costs were 58c. per ton.

The Chorrie dam to furnish power has been completed. This dam is 86 ft. high and has a 6-ft. spillway 160 ft. long in the center. The company also owns its own cord-wood railways, schooners, etc., and maintains a free hospital where 15,652 cases were treated during the last year.

Dolores Mines Company, Mexico

The quarterly report of the Dolores Mines Company, Chihuahua, Mexico, states that conditions at this mine are most satisfactory. For the months of July, August and September the revenue was $298,610; expenses, $167,169; profits, $131,441. The dividend rate is 18 per cent. and the earnings have been at the rate of 26 per cent. per year. During October the mill crushed 3500 tons.

From the main tunnel a raise has been driven over 50 ft. in ore averaging $35 to $40 per ton and 5 to 6 ft. wide. Above No. 3 level the No. 2 orebody was again encountered. The ore is of good grade. The faces of the north and south drives on the bottom level are now about 360 ft. apart; both are in $40 ore. About 30 ft. above this level in the south drive some high grade ore averaging over $100 has been encountered.

According to the *Aust Min Stand.*, Sept. 8, 1909, a deposit of telluride of gold and silver was recently discovered in the Maratoto district, New Zealand.

Gold and Silver Production of the United States

The United States Geological Survey and the Bureau of the Mint, acting in cooperation in the examination and analysis of reports from private refineries and records of Federal mints and assay offices, have determined the finished product from domestic mines in 1908. The unusual delay in furnishing these figures this year has been caused by wholly unlooked for difficulties in adjusting the data furnished.

The completed statement for 1908, as compared with 1907, is as follows:

	1907	1908		Changes.
Gold, fine oz	4,374,827	4,374,340	I.	199,513
Value	$90,435,700	$94,560,000	I.	$4,124,300
Silver, fine oz	56,514,700	52,440,800	D	4,073,900
Coinage value	$37,299,600	$28,050,000	D.	$9,249,600

The decrease in value of silver is much greater than in quantities, owing to the lower average prices. As compared with the preliminary estimates, published last January, the revised figures are $1,753,256 less for gold, and 642,053 oz. greater for silver. The differences are largely due to the difficulty of separating foreign from domestic material in the earlier reports.

Gold Production by States

The gold production by States for two years is given in the accompanying table, the figures given being the values:

GOLD PRODUCTION OF THE UNITED STATES.

	1907.	1908.		Changes.
Ala.....	$27,400	$41,200	I.	$13,800
Alas	18,489,100	19,858,800	I.	1,369,400
Ariz	2,664,000	2,500,000	D.	164,000
Cal.....	16,853,500	19,329,700	I.	2,476,200
Colo.....	20,897,600	22,871,000	I.	1,973,400
Ga	64,800	56,200	D.	8,600
Idaho....	1,255,900	1,443,500	I.	187,600
Mont	3,472,900	3,160,000	D.	312,900
Nev.....	15,411,000	11,689,400	D.	3,721,600
N. H		3,700	I	3,700
N. M	330,000	306,300	D.	23,700
N. C	78,700	97,500	I.	18,800
Ore.....	1,222,200	905,900	D.	316,300
S. C	58,100	58,700	D	1,100
S. D.....	4,138,200	7,742,200	I.	3,604,000
Tenn	3,800	3,700	D.	100
Tex	1,000	500	D	500
Utah	5,121,600	3,946,700	D	1,174,900
Va	8,300	3,600	D.	4,700
Wash....	262,300	253,700	D.	8,600
Wyom.	9,400	7,600	D	1,800
Total States	$90,369,800	$91,274,900	I	$3,905,100
Philippines	64,700	284,500	I	219,800
Porto Rico	1,200	600	D	600
Total	$90,435,700	$91,560,000	I	$4,124,300

The larger increases were in South Dakota, California, Colorado and Alaska; the larger decreases in Nevada and Utah. Colorado continues to be the leading State in 1908, with Alaska second and California third, though the comparatively large gain in California put it very close to Alaska. Nevada remained fourth and South Dakota took the fifth place, passing Utah, which stood fifth in 1907. The total gain last year over 1907 was 4.6 per cent.

Silver Production by States

The production of silver in the various States is shown in the accompanying table for 1907 and 1908; the figures being in fine ounces:

SILVER PRODUCTION OF THE UNITED STATES.

	1907.	1908.		Changes.
Ala	600	400	D.	200
Alas.....	179,300	204,600	I.	25,300
Ariz.....	2,903,100	2,900,000	D.	3,100
Cal.....	1,590,000	1,703,700	I.	113,700
Colo	11,495,100	10,150,200	D.	1,345,200
Ga	700	200	D.	500
Idaho	7,888,400	7,558,300	D.	330,100
Ill	2,900	2,000	D.	900
Mich.....	331,300	294,100	D.	37,200
Mo	25,300	49,400	I.	24,100
Mont	11,129,600	10,356,200	D.	773,400
Nev.	8,280,500	9,508,500	I.	1,228,000
N. H.....	.....	6,300	I.	6,300
N. M..	596,500	400,900	D.	198,600
N. C	25,200	1,300	D.	23,900
Ore	96,000	56,100	D	39,900
S. C	100	200	I.	100
S. D	106,600	197,300	I.	90,700
Tenn	58,300	60,900	I.	2,600
Tex	305,300	417,000	I.	111,700
Utah	11,406,900	8,451,300	D.	2,955,600
Ver	3,800		D.	3,800
Va	200	300	I.	100
Wash	84,000	86,800	I.	2,800
Wyom	1,600	3,500	I.	1,900
Total States	56,514,600	52,439,500	D.	4,075,100
Philippines	100	1,300	I.	1,200
Total...	56,514,700	52,440,800	D.	4,073,900

The total decrease was 7.2 per cent. The only important increase in 1908 was in Nevada; the larger decreases were in Utah, Colorado and Montana. As a producer Montana took the first place in 1908, Colorado dropping from the first place in 1907 to the second in 1908 and Utah from second to fourth. Nevada held the third place last year and Idaho the fifth.

The Potash Salts Situation

Special Correspondence

Advices lately received in Washington are to the effect that the German government is still contemplating the presentation of legislation designed to improve the position of the potash producers in that country. The information now at hand appears to point conclusively to a decline in the favor with which the notion of export taxes or other discriminating legislation was at first regarded, and this is ascribed to the attitude which has been adopted by our officials who have given positive expression to the belief that the passage of any such legislation, under existing circumstances, would be construed from our side as an "undue" discrimination by virtue of the terms of the Payne-Aldrich tariff.

The German government is now inclined rather to favor a plan whereby the formation of a new and close organization controlling the potash mines would be effected. This would still leave open the difficult question of the long term contracts already closed with the American interests, and it is not believed that such an organization could be brought about unless some feasible plan for abrogating or disposing of the American contracts could be developed. The chief interest felt in the situation from the administrative standpoint is found in the apparent abandonment of the proposed export-tax scheme. It seems evident, from this side, that the Kali-Syndikat cannot be revived, at least in its old form.

Decision in Elmore Flotation Patents

Special Correspondence

The litigation on the subject of ore flotation patents, which has been going on for some time, has now advanced a step by the publication of the judgment of the House of Lords on the action brought by the Minerals Separation, Ltd., versus the British Ore Concentration Syndicate, Ltd., and Alexander Stanley Elmore. The court of appeal, over which Lord Justice Fletcher Moulton presided, reversed the decision of the court below and decided that the Minerals Separation process was an infringement of the Elmore patent of 1901. This judgment has now been reversed by the higher appeal court of the House of Lords.

In giving judgment the Lord Chancellor said: "I greatly regret to differ from the court of appeal in this case, but it seems to me that when this very skilfully drawn specification (Elmore's 1901 patent) is closely read, the only claim is for acidulation; the only discovery alleged is the merit of acidulation, and the process to which acid is to be applied is described in terms so wide that it covers any process, certainly any known process, of separating mineral substances by the selective action of oil in a mixture of ore, water and oil. I cannot agree with Lord Justice Moulton that the claim in this specification is the use of a small amount of added acid in the process described, that is, in a process where the ore is pulverized and suspended in water so as to make a freely flowing pulp, and is mingled with oil, so as to cause a selective flotation. The specification expressly says it is not confined to any definite proportion of acid. And, what is more important, the making of a freely flowing pulp is only stated to be what is generally done. It is not claimed as an essential feature of the mixture to which acid is to be added. It is this definition of the 1901 claim, erroneous as I respectfully think, which was at the root of the judgment of the court of appeal."

The defendants have to pay the costs of this appeal, as well as that heard in the courts below. It may be noted in this connection that the German Patent Office refused a patent to the Minerals Separation, Ltd., as an infringement on the Elmore process used by the licensees of the Ore Concentration Company, Ltd. The vacuum process used by the licensees of the Ore Concentrating Company is not involved in this litigation.

The Story of the St. Paul Mine Fire

Details of Worst Disaster That Ever Occurred in Illinois, and the Lessons to Be Learned. Miraculous Escape of 20 Men after 7 Days Imprisonment

BY FLOYD W. PARSONS

It is always possible to show afterward how a mine accident could have been prevented. However, the dangers incurred in mining coal are so great that even the most careful engineers hesitate at the task of criticizing. No one who is familiar with present conditions will deny that the coal-mining industry in America is traveling the road to greater safety at a more rapid pace than ever before. There are those who would lift us up and land the industry at the end of the journey immediately. Such a course, however, is unwise and might cause the retracing of many steps.

and operated by this latter company. The output is used almost entirely by the railroad company in its locomotives. The surface plant was most complete and cost something like $250,000. The tipple is a three-track steel structure with shaker screens, weigh hoppers, cross-over dumps, steam pushers, steam transfers and tandem cages. Such tipples are common in northern Illinois, where the coal lies 300 ft. or more below the surface, and the seams are thin. Some of the coal passing over the screen is loaded into cars by a box-car loader.

The ventilation at the mine is furnished

lower, or No. 3 bed, was worked on the longwall plan.

The No. 2 seam at the Cherry mine, is practically the only bed that is worked room-and-pillar in this northern district of Illinois. The No. 2 bed is 380 ft. below the surface, while the No. 3 seam is about 500 ft. down.

The Longwall System

The method of longwall development carried on in the No. 3 seam, and typical throughout northern Illinois, is to undercut the face of the coal, and then to snub and sprag it before going home at night.

AFTER 7 DAYS WAITING, AND WITH HOPE ABANDONED, NEWS WAS SHOUTED UP THE SHAFT THAT MEN HAD BEEN FOUND ALIVE. THIS VIEW CAUGHT THE MAN AT THE SHAFT REPEATING THE GLAD NEWS

Following every serious disaster, there is much talk and some action on the part of those interested in eliminating the dangers. This flurry soon dies out and the laborious journey is resumed at the normal pace. One thing results, however, and that is that each accident furnishes lessons that never can be forgotten.

The catastrophe at the St. Paul mine at Cherry, Ill., is the worst accident which has ever occurred in the mines of that State. The mine in question is located on a branch of the Chicago, Milwaukee & St. Paul railroad and is owned

by a modern, high-speed Clifford-Capell fan. This machine is a double inlet, direct-blowing, reversible fan, 16 ft. in diameter and 6 ft. wide, and is connected direct to a high-speed engine. The fan foundations are of concrete, and the housings of steel, concrete and brick.

The shafts penetrate three separate beds of coal. The No. 1 seam being topmost, the No. 2 below that and the No. 3 seam at the bottom. Work has been progressing only in the No. 2 and No. 3 seams. The No. 2 seam was worked on the room-and-pillar system, while the

In the morning when the miners return, the sprags are knocked out, and the weight of the overlying strata brings down the coal. The undercut is sometimes made in the coal, but more frequently in the clay underlying the coal bed. In this system of longwall, a high percentage of good coal is obtained, and no powder at all is used. I desire at this time to correct a statement made by myself in an article published in The Engineering and Mining Journal, October 23. On page 810 of the issue just mentioned, I stated that the system of longwall as practiced in Illinois was not long-

wall in the true sense, as shooting from the solid was universally practised. Mr. Bement, of Chicago, called my attention to this error, and I propose in a later issue of the JOURNAL to describe the Illinois longwall system in detail, and to state that the general method of development along these lines is admirably adapted for the local conditions that prevail.

How the Mine Fire Started

When the time arrives that coroners' inquests will disclose true facts concerning mine accidents, we will all then be content to wait and publish only the story as told before such a tribunal. At present, however, the inquests are of small importance and of even less value from an educational point of view. No one is ever found guilty (unless he is dead) and the company is most always shown to be blameless.

The St. Paul mine is located in a district where gas is almost unknown, as a consequence naked lights are used in this and other mines of the district. I may say at the beginning that I do not believe that there was any explosion of any kind in the underground workings, except perhaps a can or so of powder that had been taken into the No. 2 seam by the miners. It is my opinion that the explosion of a can of powder in a mine is sufficient to raise and ignite dust, causing the mine to be literally torn to pieces. The gases pervading every crevice of the workings and coming from the mine after such an explosion are not easily mistaken for the black-damp that follows a mine fire. There are a score of reasons tending to prove that there was no explosion of gas or dust at the St. Paul mine; however, it is improbable that anyone will claim an explosion occurred, so at present it is unnecessary to defend the statement that none occurred.

The truth concerning the cause of the fire is as follows: The mules used in the No. 2 seam were kept in a stable near the main shaft; this made it necessary for the stablemen to lower hay to serve as feed for the animals. Shortly after 1 o'clock on Saturday, November 13, a load of hay came down to the No. 2 seam and was pushed off the cage toward the mine stable. The entry leading to the stable and the stable itself were ordinarily lighted by electricity; several days previous to the fire one of the main cables had become buried out, and in the meantime open or naked lights were used to illuminate the stable. Several of the torches were hung, or rather stuck along the side of the entry. One of these lights ignited one of the bales of hay, and the flames spread with such rapidity that the efforts of the men nearby to extinguish the flames were unsuccessful. A large number of the men scenting danger made a dash for the shaft, while others stood their ground and fought the fire. It seems that at this point some of the men became panic stricken, and one car of the blazing hay was pushed along the entry to the shaft that connects the No. 2 and No. 3 seams. Engineer Raisbeck was in charge of hoisting in this latter shaft, and he states that he was directed to raise the cage to about 4 ft. above the landing in the No. 2 seam; this was done so that the men could push the burning hay underneath the cage and have it drop down to the bottom of the pit in the No. 3 seam where there was water. Engineer Raisbeck said he lowered his cage twice after this, bringing men up both times. On the second trip up, the cager who was supposed to give signals to the No. 2 seam came up. Raisbeck also says that after the cager (Bill Smith) came up from the No. 2 seam, no more signals were received, and he let his cage remain at the bottom.

One of the most important points that should be brought out at the coroner's inquest is the time of day that the fire started. Practically all of the reliable information which can be obtained points to about 1:30 p.m. Engineer Raisbeck says he first discovered smoke coming from the main shaft at 1:30, and that he

THE RAILROAD STATION AT CHERRY, ILLINOIS

VIEW SHOWING MAIN STREET IN TOWN OF CHERRY

A ROW OF MINERS' HOUSES

CROWD SURROUNDING TIPPLE SOON AFTER THE ACCIDENT

immediately helped two of the machinists reverse the mine fan. Engineer Cowley, who had charge of hoisting the men from the No. 2 seam to the surface in the main shaft, says that it was about 1:30 when he first saw smoke arising from around the fan house. Charles McDonald, one of the men who was rescued, was working in the No. 2 seam near the stable. His statement is as follows:

"All of a sudden there was a yell from one of the men, and I saw smoke coming from the hay. I immediately started for the hay with a number of other men. Before we got there it was all on fire and there was no chance of putting it out. Then there was a rush for the main shaft. Everybody was scared almost to death and men ran over each other in getting to the cage landing. I fought my way to the opening and fought back the men who were trying to crowd me out. We waited and it began to get hotter. Then the cage came down and got me, and I don't remember anything else."

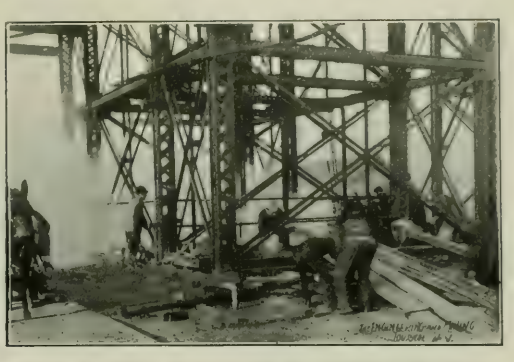
Perhaps the most serious charges against the company are those made by miners who claim that more than an hour elapsed before any alarm signal was given. It was also charged that the company continued to hoist coal for some time after the fire had started and that the mine bosses ordered some of the men back to work after they had discovered that the mine was afire and tried to leave the workings. I believe such stories are exaggerated, and I know from actual facts that the mine officials in every instance acted with great bravery and interest in the welfare of the men.

If no alarm was given, it was because the mine bosses believed to the last moment that they would be able to extinguish the flames, and although it is easy to say afterward just what should have been done, it is practically certain that those in charge acted in accordance with their best understanding.

For some reason or other many witnesses modify their statements when questioned at the inquest. It will, however, be interesting if one miner, who was rescued, repeats the following story under oath:

"It was long past 3 o'clock on Saturday afternoon that a little French boy—one of the trappers whose name I did not know—rushed up to his father and said: 'Pop, the mine's afire.' We were down in the No. 3 seam. The cry soon spread that the mine was afire, and all of us, about 175 men, who were in the No. 3 seam rushed toward the cage. John Brown, the cager, was surprised. He said 'what are you fellows getting excited about? Ain't you got any nerve? Stick.' Brown was game. Finally I said: 'This is serious. For God's sake Brown take us up.' Brown rang, and after repeating the signal many times he got no reply. Then he said that the Polish fellow in the No. 2 seam was not watching his job. Brown said: 'The Polish guy refuses the signal. He must have run.' My cousin and I and a number of other men who were down in the No. 3 seam scaled the interior of the shaft. There was general confusion, and when I reached near the top I was shocked to have other human bodies fall down on my head. The poor devils had climbed the interior, but were overcome. When I reached the No. 2 seam, I fought my way 200 ft. northeast to the main shaft, climbed over dead mules, the carcasses of human beings, stumbled and fell among the torches, picks, shovels, dinner buckets and other things that the sufferers discarded in their flight. Only one man—John Lundy the mine superintendent—I recognized. I saw his light. Finally, after what seemed to me like eternity, I reached the shaft. Lundy, who was in the rescuing party, grabbed me and put me on the cage that brought us to the surface. He went down again and perished. Brown, the cager at the No. 3 seam, died also."

ROPES WERE STRETCHED AND THE MILITIA KEPT BACK THE CROWD



IT WAS FOUND NECESSARY TO SEAL THE MAIN SHAFT

THE FAN WAS BURNED OUT IN LESS THAN TWO HOURS AFTER THE FIRE STARTED

FIREMEN FROM CHICAGO WERE BROUGHT TO THE SCENE

The fan before described was acting as a blower, but as soon as the fire was discovered, this ventilator was reversed so that air would be drawn down the main shaft instead of being forced out that way. At 3 o'clock Saturday afternoon, about one hour and a half after the fire started, the fan was burned out. The mine officials immediately ordered another fan from the Spring Valley Coal Company, several miles distant.

Rescuers Perish

Shortly after 2 o'clock on Saturday afternoon a rescue party consisting of 11 men was lowered into the mine. The first trip was unsuccessful and no miners were brought to the surface. On the five succeeding trips a large number of men were brought up. When several of the rescuers went down on the seventh trip no more men were found and all of the rescuers themselves perished. It was with difficulty to the loss of the lives of these men that much discussion occurred. Engineer Cowley was severely censured and for a time it seems that he was in danger of personal violence. I believe the truth of this matter is stated as follows: On the seventh trip Engineer Cowley was instructed by men who had just reached the surface to lower the cage and bring up the men who had just reached the surface. After waiting a little longer for signals Cowley hoisted the cage, and when it reached the surface all of the men on it had been suffocated and burned. Probably the true solution for this confusion of signals to the engine room is about as follows: When the cage started up on its last trip, some miner who had just reached the foot of the shaft saw the cage disappearing and immediately signaled the engine room to stop and then lower. After he got on and the cage started again another miner rushed up and signaled for the cage to stop and lower again. All of the men on the cage during this interval were completely at the mercy of the men at the bottom who were giving the signals. After the second man piled on the cage, the entire party were overcome by the gas and were unable to signal. Engineer Cowley was accustomed to obeying the signals and in a way is hardly to blame for not having hoisted sooner.

The Mine is Sealed Up

The last man was saved at 4:30 p.m. The cage was hoisted the last time with the dead rescuers at 4:30. Previous to this the fan had been burned out and ventilation had practically stopped. When the fire started there were 527 men in the mine. Before the last hoist was made Saturday afternoon, 124 men had escaped and been rescued.

Shortly after this last hoist was made, it was decided to seal the mine, the officials believing that if the flames were permitted to burn, the shaft would soon be completely destroyed and probably cave-in. It is probable that no mine officials at any time, in any country, have ever been compelled to decide a more serious problem on such short notice. Here was a case where several hundred men were confined underground and to seal the shafts seemed almost like murder, but on the other hand, to leave the shafts open would have caused even more certain destruction and probably would have closed all exits of escape. The mine officials were severely censured, not only this first time, but several succeeding times when they sealed the shafts. I do not think such censure is merited, and I believe all experienced miners will agree that no other course was left open. Had adequate facilities for fighting fire been present, a different course might have been successfully pursued.

After the mine was closed Saturday

ONE OF THE SURFACE BUILDINGS WAS TURNED INTO A TEMPORARY MORGUE

A LARGE TENT WAS USED AS A PLACE FOR IDENTIFICATION

THE GOOD NEWS OF HER HUSBAND'S RESCUE WAS TOO MUCH FOR ONE WOMAN

THE WIFE OF A RESCUED MINER RUNNING TO THE HOSPITAL CAR

afternoon, nothing further was done until midnight Saturday, when a large bucket was lowered in the shaft several times. Each time this bucket came back empty. The mine was opened again Monday morning, but no men were rescued and nothing of importance was accomplished, and as the flames seemed to be fanned by the fresh air, the shafts were closed again Monday afternoon. By this time a new fan had been brought over and installed, and 30 minutes after the air had started to circulate the flames were again intense, so that the officials were obliged to stop ventilation. By Monday afternoon, practically every official had made a statement, declaring that no men could possibly be alive and all hope was abandoned.

lowered into the mine. On Thursday, Nov. 18, the air shaft was opened, and the first of the entombed miners were brought to the surface. On Saturday, the 20th, 21 miners who had retreated from the shaft and barricaded themselves in a long chamber, were resurrected and 20 of these men brought to the surface alive. The remarkable photograph accompanying this article shows the situation on the surface when this first glad news was shouted from the shaft. When the news came up that men were found alive in the mine, hope was then revived that perhaps a majority of the entombed miners were still living. The story of the rescue of these men is best told by one of them himself: "I was in the No. 2 seam when I learned

A number of the boys, however, kept their heads and came with me. We got out of the fiery entry as soon as possible and got into a chamber several hundred feet long, and free from smoke. Every one of us had his dinner pail. Some of the men picked up the pails of those who had dropped them in their mad flight for safety. In these were only scraps of bread and meat. We realized that we must save this food as long as possible. Many of us had been in mine accidents before, where little pieces of bread and a scrap of meat meant life.

"After we got in the chamber, we decided that the best thing to do was to wall up the entrance in order to prevent the gases from coming in. In a little time we had the chamber completely blocked.

WOMEN HUDDLED TOGETHER AND WAITED FOR NEWS

NEITHER WEATHER NOR DARKNESS COULD DISPERSE THE WIVES AND MOTHERS

AT LAST THE FIRST BODY WAS BROUGHT OUT

OTHER BODIES WERE BROUGHT UP AND COVERED WITH CANVAS

Grave charges flew back and forth; representatives of the Miners Union claimed that the shaft should not have been sealed. They said that there had been no regard for the lives of the miners, but only a desire to save company property. Matters grew worse and State troops were asked for. On Monday, mine superintendent Steele said no men could live longer than two hours after the shafts were sealed. On Tuesday, the 16th, fire chief Horan, of Chicago, arrived with his men. On Wednesday, the 17th, the troops reported at 1 a.m. Feeling was running so high that the coroner's inquests were postponed. Engineers Cowley and Raisbeck were spirited away. On Wednesday rescuers were again

that the mine was on fire. My first action was to try to reach the main shaft. I found this blocked by the fire and already the bodies of many men were on the ground. All of them evidently had been suffocated. I did not try to go farther, something told me that if I attempted to pass the fiery barrier my death was certain. Turning I made my way back to the entrance of the No. 3 seam. I realized the danger of getting mixed up with the smoke. I shouted to the men to warn them of their danger, I even sprang in front of some of them and tried to hold them back. Many of them were crazed with fright and they pushed past me, only to fall when they reached the heavy smoke.

There was nothing further to do so we seated ourselves on lumps of coal to await our rescue or death. A day and night passed, and suddenly we discovered we had no water. This fact almost unnerved the entire crowd, but we set to digging and at last the moisture began to come. It seeped through slowly, but nothing ever gladdened the heart of a man as did that little black ooze that came from the gravel. At times we shouted, vainly hoping that someone would enter the tunnel and give us relief. Finally, we almost lost count of the days and nights, and we had given ourselves up for lost when we heard a sound from far off. Then our courage returned, for we knew that rescue was

near at hand. We shouted and yelled again, but we did not know whether we were heard. Then came the unsealing, and I lost consciousness. All of the days and nights fell back, and I dropped into a sleep."

The suffering of these miners, as is evidenced from the foregoing statement of one of the survivors, was beyond description. Some of the men ate their leather gloves and hat bands, others the grease from their lamps. Toward the last the bark from the mine props was considered a delicacy. These imprisoned miners burned but one light at a time. The last light gave out at 3 p.m. Tuesday, and this was the last time they looked at their watches. It was about seven days to the hour from the time they were imprisoned in the mine until their rescue was effected.

No More Men Saved

After the discovery of these 20 men, the rescuers worked like fiends in the hope of saving other lives. Extra shifts were put on and the work was continued night and day. The rescuers penetrated further into the workings, but only dead bodies were recovered. At last the No. 3 seam was entered, and it was soon evident that all of the miners in this level had perished. The men were piled in heaps near the foot of the shaft. Rude fans had been constructed in a desperate effort to furnish air. These men on the third level were not discovered until Wednesday, Nov. 24, eleven days after the fire started.

The best evidence at hand showed that these miners lived about 48 hours. Messages were written on the slate, showing that after the fire started, practically all of the men in the No. 3 seam had gathered at the foot of the shaft. The rescuers counted only 68 bodies, showing that the men had split up into parties and had gone to different parts of the seam in search of air and to escape the black-damp. It is probable that all of these men were suffocated by this latter gas.

The figures showing the extent of this latest mine horror are about as follows: Men in mine when fire started, Nov. 13, 527; rescuers burned in cage, 10; dead bodies recovered, 101; bodies in sight in No. 3 seam, 68; escaped and rescued Nov. 13, 124; rescued alive, Nov. 20, 20. This makes the totals as follows: Known dead 179; escaped, 144; total accounted for, 323; unaccounted for, 204, estimated total death list, 393.

It is probable that the foregoing figures will not be changed materially, as the flames became so bad that rescue work was finally abandoned and the mine sealed on Nov. 22. The town of Cherry has now been practically deserted and work temporarily abandoned. The mine may be left closed for weeks, or several months, according to the officials' decision. No other course was left open to them, and under the circumstances their action seems [illegible]

Lessons to be Learned

It is to be hoped that the mining industry in America will consider the men sacrificed in the St. Paul mine disaster as martyrs to a cause, and that cause the safeguarding of our mines and the men they contain. The St. Paul mine, as is claimed by many, was a well designed and constructed plant on the surface. Conditions underground, however, could certainly have been improved. When a mine is equipped to get out the maximum tonnage of coal, it is often widely advertised as a modern property, and the idea is conveyed that no accident should have occurred in such a mine. A big steel tipple and a fine power plant on the surface do not necessarily mean superior protection for the men working underground. After an accident of the kind that has occurred

RESCUERS WERE EQUIPPED WITH BREATHING APPARATUS

at the St. Paul mine, it is absurd to claim that the operation was safe, and the safety precautions were adequate. There were two hoses in the stable, but they were certainly not effective. The hay was brought down each day and none was kept underground; however, there was sufficient of this material there to make a furnace of the entry in a very short time. All shots in the mine were supposed to be fired at 11.30 each morning, so it is probable that whatever dust had been raised was quite settled by the time the fire started.

The main criticisms are that fire drills were absent and that the shaft and the bottom near the shaft and about the stable, was far from being fireproof. The accident should impress mining men with the importance of fireproof shafts and landings. It is to be hoped that the St. Paul officials will satisfactorily explain the delay in giving an alarm. The accident has also drawn attention to the rapidity with which mine timbers covered with dry dust will flame and burn.

Many mistakes have been made in this and other mines, and it is certain that in the future many operators who now believe their mines are safe will also have cause for sad disappointment. In coal mining, most of us live in glass houses, so it is dangerous to throw stones. Mine operators must pull together; mine laws must be adequate and then must be strictly observed; the miners' union must learn to pull with, rather than against the operators, and the miners themselves will have to be educated until they are careful of their own and their comrades' lives. Lastly, the public will have to pay a better price for coal so that coal operators can live and make interest on their investment, and at the same time safeguard their men and property.

Coke and Briquets in Great Britian

The quantity of coke produced in Great Britain for the year 1908, now ascertained for the first time, was 18,537,468 long tons; of which 11,213,651 tons were made in coke ovens and 7,323,817 tons at gas works. No comparative figures for 1907 are available. The coal used in making coke was 35,233,523 tons, showing an average consumption of 1.901 tons to the ton of coke. The total number of coke ovens in Great Britain is reported at 26,214, of which 19,478 are beehive ovens. The number of by-product ovens is 6736, of various types; the more important as to number being the Coppee, the Simon-Carves the Otto-Hilgenstock and the Semet-Solvay, in the order named.

The production of briquets in Great Britain in the year 1908 was 1,604,649 long tons. The coal used in making briquets was 1,471,448 tons, showing a consumption of 0.917 ton of coal to the ton of briquets.

Output of Canadian Mines

According to a report from Consul Harry A. Conant, of Windsor, Ontario, the value of the output of mines of Ontario during the first six months of 1909, as given by the Bureau of Mines, amounted to $10,049,023, an increase over the first six months of 1908 of $2,617,050. The shipments from the Cobalt silver mines amounted to 15,360 tons of ore and concentrates, against 9209 tons during the first half of 1908. The increase in the silver contents of the shipments was about 45 per cent. The output of nickel increased about 25 per cent and that of pig iron about 41 per cent. There was little change in the output of iron ore and a slight decrease in the output of copper.

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Publicity by Mining Companies

A contemporary, *The African World*, from the other side of the globe voices its approval of a remark that we recently made, viz., that the stockholders of a mining company should have such a frank and honest statement of conditions and prospects as one partner in charge of the operation of a property would make to another who was absent.

We feel that we have already accomplished a good deal in awakening the managers of American mining companies to the recognition that it is only the square thing to their stockholders to communicate promptly to them data about their property. One of the largest and most important of our mining companies, viz., the Goldfield Consolidated, wrote us a few days ago as follows: "Thus far we have avoided the publication of monthly data, but we are happy to say that the view entertained by our board of directors, at their meeting on Nov. 18, was in favor of such a publication."

There is now a rather large list of American mining companies that are publishing monthly reports of progress. These differ in degrees. Some give only the figures of production, others report the result of prospecting and development. The conditions among mining companies are different. All cannot make the same kind of report. The important thing is that stockholders are now being put in the way of obtaining prompt official information as to their interests. In all probability every important public mining company will soon adopt this policy. Of course, there are many close corporations, to all intents and purposes private affairs, that are not to be expected to make public reports, which in their cases are unnecessary.

The Sacrifice of Life in Industry

This is a broad subject, but we here confine ouselves to our specialty—mining. Both in metalliferous and in coal mining the loss of life in the United States is far higher than it should be, far higher than it is in the more enlightened of foreign countries, and that this is so is shameful.

It is not in the spectacular catastrophes that the greatest loss is suffered, but in the little accidents that happen every day and extinguish the lives of one or two men each time. It is, though, the terrible disasters like Monongah, Marianna and Cherry that fix public attention for a while and will eventually correct the injustice to our laboring men.

Anyone can see that if the Cherry mine had had proper escape outlets most of its men would have been saved. The operators of mines must be made by law to provide such means for safety and others that experience has shown to be wise; and there must be adequate inspection to insure enforcement of the law.

This is the first thing to be done. We have passed the time when our operators can consider their responsibility to have ceased in giving the less fortunate who must work with their hands only the right to be killed, and dismissing the widows and orphans with costless sympathy, or a petty donation to pay the funeral expenses.

No one will accuse us of any leaning toward labor unionism. We have practised what we have preached and in this have been no theorist. But we say solemnly that in their propaganda that the sacrifice of life in any industry is an economic charge against that industry Mr. Gompers and Mr. Mitchell are right.

It is cheaper to prevent the loss of life than to pay the bills for disasters however it be done. Almost every great reform has been compulsory. After the victory has been won the very persons regulated have acclaimed the benefits resulting. The interests that now squirm at the idea of effectual legislation and mine inspection will admit the increased economy in their operations after they have been forced to endure it.

The Corporation Tax Law

A pamphlet on the "Corporation Tax Law of 1909" has been extensively circulated. It contains copies of a correspondence between a number of firms representing the American Association of Public Accountants on the one hand, and the Attorney-General of the United States on the other. The original object of the correspondence was to secure, if possible, some modification in the requirements of the law in order that the computation of

earnings subject to tax might be made more easily and in accordance with the usual methods of accounting, adopted by railroad, mining and manufacturing corporations at the present time. In this object the correspondence failed and the provisions of the law remained on its passage practically the same as when the bill was first introduced.

For the most part the objections raised by the accountants seem to be reasonable and well founded. The law requires in effect that the earnings of a corporation shall be ascertained by deducting from its actual cash receipts during the year the actual cash disbursements for expenses, interest, etc.; losses actually incurred and a reasonable allowance for depreciation of a plant and property. Now, as the accountants well point out, in the case of a large business the actual cash transactions will not always represent the condition of the business for the specified period. In the long run, of course, and over an extended time, the difference between cash receipts and disbursements will represent the net earnings of a company; but there may be a wide divergency between the cash and the real earnings in any one year. The conditions of a company's business will certainly be better shown by the method outlined in the accountants' letter, which is practically that adopted by all large companies at the present day. That is, the earnings should be the amount accruing during the year whether actually collected in cash or not; the charges the expenses actually incurred and the interest accruing during the year whether actually paid in cash within the year or not. These credits and charges represent the real condition of the business, whether the payment has been deferred—as many must necessarily be—beyond the actual time. It may well be that cash receipts and cash payments may fall due in such a way as to show large discrepancies from the actual state of the business, and very considerable differences between two years when there was really but little divergence.

It would be comparatively easy to bring up examples to illustrate this. We might suppose, for instance, that a large copper mining and smelting company for some reason or other closed down its mines and works on the last day of the year. Its accounts would properly cause and determine from that date for its cash book for the year, yet would show properties of a considerable amount of money received and disbursed. The receipts might be in excess, but they could not possibly under any just rule be considered as representing net earnings.

To take another instance; we know of only one case where the report of an important company is made on the cash received and paid basis. That company's annual statement consists of a full account of the cash actually paid and received during its fiscal year. Accepting the figures as correctly given, it is impossible for a stockholder to figure out the actual condition or earnings of the company, except by very careful analysis and comparison, and even then he will not be sure that he is right.

One point which the accountants urge rather strongly is not, we think, well taken, and that is their objection to the requirement that reports must cover the calendar year. It is true that many companies have fiscal years which do not correspond with the calendar year for some reason or other. The railroad companies which report to the Interstate Commerce Commission are required to end their fiscal years on June 30, possibly for the reason that the United States treasury ends its fiscal year on that date, but more likely because reports of that date allow the commission to have its report ready for the meeting of Congress in December. The calendar year is the natural period and the large majority of business men and corporations make their accounts correspond with that period. At any rate, no large concern is going to let its accounts run for a whole year without taking a balance or ascertaining its condition. The statement of earnings and expenses by months is common practice, and where that is adopted there can surely be no difficulty in making reports for a period which shall meet the Government's requirements.

Gold Production in Australasia

The returns of gold production in the States of Australia and the Dominion of New Zealand for the third quarter of the current year show little improvement over those for the first half of the year, and it is apparent that Australasia will show for 1909 a continuation of the decrease which has been going on for three years past. The following table shows the totals for the nine months ended Sept. 30, the small returns from Tasmania and South Australia being estimated. The figures are in fine ounces:

	1908.	1909.	Changes.
West'n Australia	1,235,467	1,196,713	D. 38,654
Victoria.....	483,426	453,660	D. 29,766
Queensland.....	338,053	327,029	D. 11,024
New South Wales	170,296	150,922	D. 19,374
Tasmania.... ...	46,500	44,250	D. 2,250
South Australia..	10,850	9,900	D. 950
Commonwealth	2,284,492	2,182,474	D. 102,018
New Zealand....	363,533	348,724	D. 14,809
Total, oz.....	2,648,025	2,531,198	D. 116,827
Total value....	$54,744,677	$52,319,863	D.$2,414,814

The total decrease this year was 4.4 per cent., a slight improvement over the first half, when a decrease of 5.7 per cent. was reported. The larger proportional losses were in New South Wales and Victoria. In New South Wales gold mining seems to be a declining industry in the older districts, while no new ones are brought in to supply deficencies. Something of the loss also may be due to the diversion of interest and labor to copper mining, which is in much better condition.

In Victoria a general falling off in production from the older districts has been apparent, without any special cause which can be assigned in the case of any one of them. Queensland came near holding its own, the decrease coming chiefly from Mount Morgan. Western Australia did well in the third quarter, reducing the loss shown in the first half of the year by 6294 oz. This was for the most part the result of the working of new districts; the large Kalgoorlie mines showing but little change. In New Zealand the decrease was small and was nearly all in the returns from the dredging industry.

In all the Commonwealth—outside of Western Australia—there seems to be a lack of prospecting. There are no new districts and new enterprises are few. The present apathy may pass over soon, but until it does there will be no revival in the gold-mining industry.

The question of what is "scrap," referred to in the JOURNAL of Nov. 6, seems to be giving rise to some complications in the official mind, as was expected. The Treasury Department, apparently, is not disposed to classify wrought scrap as "junk" and thus let it come in free, which seemed the obvious conclusion. Reluctant to allow anything to go on the free list, if it can possibly be avoided, the department seems to be meditating some legislation on its own account, as in the zinc-ore case. Meantime the importation of scrap is held up, as no one knows what it will cost to bring it in from abroad.

November Dividends

In the accompanying table are shown the amount per share and total amount of the dividends paid during November, 1909, by a number of mining and industrial companies in the United States, Canada, South and Central America.

U. S. Min. and Indust. Cos.	Location.	Amt. per Share	Amt. Paid.
Amal. Copper, c	Mont.	$0.50	$769,139
Arizona Copper, c.	Ariz.	0.042	53,839
Boston-Sunshine, g	Utah	0.02	3,000
Bunker Hill & Sullivan, s.l	Ida.	0.15	45,000
Combination Fraction, g	Nev.	0.10	92,000
Colorado Gold Dredging, g	Colo	0.25	25,000
Colorado, l.g.s	Utah	0.08	80,000
Gold Dollar, g	Colo.	0.00½	12,500
Goldfield Con., g	Nev.	0.20	711,673
Hecla, sl.	Ida.	0.01	10,000
Homestake, g	S.D.	0.30	109,200
Iron Blossom, s.l.	Utah	0.08	80,000
Sioux Con., s.l.g.	Utah	0.03	22,391
Snow Storm, s.l.	Ida.	0.01½	22,500
Uncle Sam, g.s.l	Utah	0.02	10,000
Yuba, g	Cal.	0.12½	300,000
Internat'l Nickel, pf.	N. Y.	1.50	44,563
Lehigh Coal & Nav.	Penn.	2.50	955,650
U. S. Steel, pf	U. S.	1.75	6,304,919

Foreign Mining Companies.	Location.	Amt. per Share.	Amt. Paid.
Buffalo Mines, s	Ont.	$0.03	$27,000
Dolores, g.s.	Mex.	0.22½	90,000
Le Roi, No. 2, g	B. C.	0.18	57,600
Lucky Tiger-Com., g	Mex.	0.05	35,750
Mines Co. of Am.	Mex.	0.03	60,000
Panuco	Mex.	2.50	25,000
Temiskaming & H. B., s	Ont.	3.00	75,000

Chronology of Mining for November, 1909

Nov. 1—Last spike is driven in Western Pacific railway.—Plant of North Ontario Reduction and Refining Company at Sturgeon Falls, Ont., burned.—Twelve men killed in an explosion in the Cambria coal mine at Johnstown, Penn.

Nov. 2—The Saddle Mountain properties and a large interest in the London-Arizona Copper Company in Arizona sold to the Development Company of America.

Nov. 3—Announcement that A. Goerz & Co., of London and South Africa, have purchased control of La Fe property at Zacatecas, Mexico.

Nov. 6—W. A. Clark wins in prolonged suit against the United Verde Company alleging mismanagement, brought by George A. Treadwell.

Nov. 10—A fire at the Great Boulder mines, Perth, West Australia, did damage of over $1,000,000—Nine men killed in mine fire at Auchingloss coal mine, Wilkes-Barre, Penn.—Tipple and power house of Neffs Coal Company at Neffs, Ohio, burned; loss, $125,000.

Nov. 13—Fire in the St. Paul mine at Cherry, Ill., resulting in loss of life of between 200 and 300. After a week 26 men were taken alive from the mine.

Nov. 20—Decision declaring the Standard Oil Company, of New Jersey, a violation of the Sherman law.—The new mining law for Mexico approved by the senate without material change from that passed by the lower house. It will become effective Jan. 1, 1910.

The Goldfield Consolidated Mines Company

In his report to the president, the manager of the Goldfield Consolidated Mines Company, of Nevada, reviews the operations of the mines during the month of October as follows:

During the month of October the total production was 20,137 tons containing $794,421, or an average of $39.45 per ton, of which the whole was milled with an average extraction of $37.28 per ton, or 94.49 per cent. The total net profit was $554,781, or $27.55 per ton. Although the monthly tonnage was less than that of the previous month on account of the loss of the Combination mill, the average grade of the ore and the total profits showed a substantial increase on account of the production of rich ore from development work at the Clermont.

Development—On company account 3743 ft. of development work were done, and 158 ft. by lessees. Developments during the month were unusually successful, especially on the Mohawk 600 and Clermont 750 and 900 levels, and in order to prepare for the increased milling capacity the amount of development work has been greatly increased over that of the previous months.

Operating Costs—The total cost of mining, development, transportation, milling, office and general expense was $6.985 per ton, distributed as shown in the accompanying table. All ore was treated in the new mill. The total cost of operation per ton was raised by a charge for development work of $2.41 per ton, which is greatly in excess of the cost for the previous month on account of an increase of 1303 ft. in the footage driven. A portion of this work for the purpose of recovering the bodies of two miners lost in the cave of the Hampton stope was very expensive; and in addition, all work at the Clermont, including construction in preparation for regular production has been charged to operation. The total cost of production, exclusive of the development work, is only 35c. higher than for the previous month, in spite of a smaller tonnage and a larger amount of filling in stopes.

OPERATING COSTS.

Stoping (including a portion of general expense)	$2.56
Transportation	.10
Milling	1.915
Total cost of production	$4.575
Development (including all work at Clermont and a portion of general expense)	2.41
Total cost of operation	$6.985

Combination Mine—The caved Hampton stope is being successfully reopened from both the 230 and 280 levels, and on the latter level medium-grade ore has been followed some distance further south. A portion of the richer ore is also accessible from this level. Conditions in other portions of the mine remain unchanged. The crosscut on the 600 level from the Combination Fraction, which is now out 335 ft., has not yet exposed ore.

Mohawk Mine—The old Kalfus lease workings are being reopened above the 350 level, and good ore is being produced by development work. On the 600-ft. level ore is now exposed in three crosscuts in the footwall of the main oreshoot. All these places have shown irregular seams of free gold and the average production has been of good grade. All the stopes have continued a good production.

Red Top Mine—On the 165-ft. level good ore has been encountered in the south drift, beyond a break, and has been followed 60 ft. farther south. Raises from the north drift have continued in low-grade ore. The north and south drifts on the 260 level have reached the limits of continuous ore so far as known at present. On the 330 level the south drift has alternated between ore and waste, and the north drift has been continued in waste. A large tonnage of good ore was broken in the stopes during the month.

Jumbo Mine—On the 600 level the drift north on the Red Top vein has not encountered commercial ore, although the rock is well mineralized and scattered assays up to $10 per ton have been obtained. On the 750-ft. level the south drift which was on high-grade ore has become poor. Ore averaging $170 per ton is exposed continuously for 220 ft., and the probable length of the oreshoot between the limits exposed is 300 ft. In addition, a drift southeasterly on a cross vein has exposed good ore for a length of 80 ft. The main south heading has reached a point below the main Mohawk oreshoot on its dip, and a raise and crosscut are being started in search of ore. On the 900 level the north and south drifts have exposed good ore for a length of 320 ft. Both faces are now poor. The main heading on the 1000 level is progressing more rapidly, but has not yet neared the expected ore on this level as indicated by the workings above. During the month of October the Clermont produced 2301 tons of ore from development work containing $225,000, an average of $98 per ton.

Mill Construction—Preparations for the installation of additional machinery at the Consolidated mill are progressing favorably. Foundations are in place for all new equipment except the concentrators and delivery of machinery has commenced. The Combination mill is being dismantled.

The production of mercury in the Almaden mines, Spain, was 1,007,923 kg., or 20,472 flasks in 1908. At Mieres it was 500,785 kilograms.

Properties of the American Smelters Securities Company

In connection with the application of the American Smelters Securities Company to list its shares on the New York Stock Exchange, the company has submitted to the listing committee of the exchange a report enumerating the various properties which it holds in fee or controls by stock interest. The company began the conduct of its business on May 1, 1905, and now controls the following properties:

Properties Held in Fee

Dolores, Trinidad and Azul Mining Properties—Situated at Matehuala, Mex., consisting of 151.95 acres. Worked through four mine shafts completely equipped. This property has been worked for a considerable time, and has been and is a large producer and shipper of silicious copper-sulphide ores. The production for the period June 1, 1905, to May 31, 1907, amounted to 116,000 metric tons.

Zaragoza Mine—Situated at Monterey, Mex., consisting of 60 acres. Worked principally through a tunnel 1000 ft. in length. Its production consists of plumbiferous iron ore, zinc sulphide, zinc carbonate and basic copper ores. The production for the period June 1, 1905, to May 31, 1907, amounted to 11,357 metric tons.

Veta Grande Mine—Situated at Parral, Chihuahua, consisting of 57.9 acres. Worked through principal shaft 984 ft. deep, with full equipment. Product consists of silicious silver ores. Production for the period June 1, 1905, to May 31, 1907, amounted to 38,723 metric tons.

Jibosa Mine—Situated at Jiminez, Mex., consisting of 87.103 acres. Three shafts, fully equipped, are used in working the property. Product consists of basic copper sulphide ores. Production for the period June 1, 1905, to May 31, 1907, amounted to 22,436 metric tons.

Bonanza Mining Properties—Situated at Zacatecas, Mex., consisting of 335.27 acres of mining property and 13,000 acres of ranch property. Seven shafts are used in the working and development of the property. Product consists of plumbiferous iron and zinc carbonate ores and of plumbiferous iron slags carrying gold and silver. Production for the period June 1, 1905, to May 31, 1907, amounted to 1918 metric tons of iron and zinc carbonate ores and 7717 metric tons of iron slags.

Escalotes Mine—Situated at Santa Barbara, Chihuahua, Mex., consisting of 160.25 acres of mining rights and 40 acres of surface right. The properties are fully equipped and have reached a high state of development. The production of the property includes sulphide smelting ores, carbonate smelting ores and sulphide concentrating ores, all carrying gold, silver, lead and copper. Production for the period June 1, 1905, to May 31, 1907, amounted to 33,414 tons. A concentrator, with a capacity of 5500 metric tons per day, has been constructed to handle the concentrating ores of this property. The cost of this construction was about $150,000.

La Luz and El Angel Mines—Situated at Matehuala, Mex. Are undeveloped properties being prospected with a view to later development.

Everett Plant—Situated at Everett, Wash., consisting of 45 acres, 27.5 acres constituting the smelting works property. This has a water frontage of 180 ft., and the tracks of the Great Northern railway pass alongside the premises.

Subsidiary Companies

The American Smelters Securities Company owns the entire capital stock of the following corporations:

Selby Smelting and Lead Company—Organized under the laws of the State of California, with a capital stock of $600,000, par value $100 per share. This company's smelting plant occupies 185 acres with deep-water facilities at Selby, Contra Costa county, Cal., near Vallejo Junction, on the Southern Pacific railway, about 30 miles from San Francisco. In connection with the smelting plant the company owns 110 acres in the town of Tormez, adjacent to its plant. In addition to refining gold, silver and lead, the Selby company owns and operates a lead-manufacturing plant, producing lead pipe, sheet lead, shot, solder and babbitt metals.

Tacoma Smelting Company—Organized under the laws of the State of Washington, with a capital stock of $500,000, par value $100 per share. Its lead- and copper-smelting plants occupy 52 acres, on deep water, at Tacoma, Wash., and on the tracks of the Northern Pacific Railroad Company. It operates also a copper refinery with a capacity of 1200 tons of copper monthly.

Federal Lead Company—Organized under the laws of the State of Delaware, with a capital stock of $2,000,000, par value $10 per share. The lead-smelting and refining plant is situated at Federal, Ill., near Alton, and comprises 302.5 acres. The plant is a custom smeltery, handling ore from neighboring territory, especially from the Missouri field, and also smelting the ore produced by the company mines. The mining properties consist of about 13,427 acres in the Flat River district in southeastern Missouri. The smelting plant is modern and the mining properties are in a high state of development, fully equipped and producing. The product consists of magnesium limestone ores carrying lead only. Production for the period June 1, 1905, to May 31, 1907, amounted to 389,972 tons. During the period in question the installation of a 2500 h.p. steam plant and a 2100-ton concentrator have been constructed and are now in operation. It is estimated that the property can produce from 2500 to 3000 tons per diem.

Central Lead Company—Organized under the laws of the State of Missouri, with a capital stock of $1,000,000, par value $100 per share. Situated at Flat River, Mo., consisting of 1603 acres of mining property in the Flat River district. Its ore is of the same character as that of the Federal Lead Company. The production for the period June 1, 1905, to May 31, 1907, amounted to 161,449 tons.

Velardeña Mining and Smelting Company—Organized under the laws of the State of Colorado, with a capital stock of $3,000,000, par value $25 per share. Situated at Velardeña, Durango, Mex., consisting of 2627.7 acres. The ores of this property are various in character. The property has produced at the maximum during the last year as follows: Santa Maria, sulphide shipping ores, 75 tons per diem; Santa Maria sulphide concentrating ores, 150; Terneras, silicious smelting ores, 100; Copper Queen, silicious smelting ores, 400; total, 725. A lead and copper smeltery of a daily capacity of 1000 tons has been completed at a cost of approximately $1,500,000, and is in operation.

Garfield Smelting Company (formerly Silver Lake Mines Company)—Organized under the laws of the State of New Jersey, with a capital stock of $1,000,000, par value $100 per share. Consists of 1506 acres of mining and milling property in the Animas district, San Juan county, Colo. The product consists of silicious concentrating ores carrying gold, silver, lead and copper. Production for the period June 1, 1905, to May 31, 1907, amounted to 70,200 tons. Owing to the destruction of the milling plant at this property by fire early in 1906 the total production of the mines ceased for a considerable portion of the period in question. The 250-ton concentrator now completed cost approximately $100,000.

In addition to the foregoing this company owns about 10,000 acres of land at Garfield, near Salt Lake City, Utah, on which a large copper-smelting plant has been constructed, with a capacity of 2250 tons per day, at a cost approximating $6,000,000 paid for out of cash resources of the company.

Stock Interest in These Companies

The American Smelters Securities Company also owns shares of the capital stock of the following corporations:

Western Mining Company—Organized under the laws of the State of New Jersey, with a capital stock of $1,500,000, par value $100 per share. The total amount of stock issued, par value, is $1,047,875, of which amount the Securities company owns $541,575 par value, being a majority of the capital stock. The property of the company is at Leadville and Lake City, Colo., and consists of 150 acres in fee and 186

acres of leasehold. There are three concentrating mills of 100 tons daily capacity, each, on this property. Its product consists of silver, lead and zinc ores of both shipping and concentrating grades; also iron-oxide ores. Production for the period June 1, 1905, to May 31, 1907, amounted to 432,000 tons.

Dairy Farm Mining Company—Organized under the laws of the State of California, with a capital stock of $200,000, par value $1 per share, of which 142,500 shares have been issued, of which the Securities company owns 96,927 shares. The property consists of 150 acres near Van Trent, Cal. The equipment of the property has cost approximately $75,000. The mine has been developed and shows ore in sight amounting to about 350,000 tons of copper sulphide ores, carrying gold and silver, and about 50,000 tons oxidized cyaniding ores, carrying gold and silver.

First National Copper Company—Organized under the laws of the State of Maine; authorized capital stock, $7,000,000, divided into 1,400,000 shares of the par value of $5 per share; 1,300,000 shares have been issued upon the payment of $2.50 per share, and are assessable at the rate of $2.50 per share. The American Smelting and Refining Company owns 80,000 shares. The 100,000 shares unissued remain in the treasury of the company, exchangeable at $10 per share for $1,000,000 bonds issued against the property of the Balaklala Consolidated Copper Company. The First National Copper Company owns the entire capital stock of the Balaklala Consolidated Copper Company, organized under the laws of the State of Nevada with a capital of $10,000,000, divided into 400,000 shares of the par value of $25 per share, all issued and outstanding.

The property consists of 1149.7 acres in the mineral zone of Shasta county, Cal., and includes tramway right of way, smeltery site and the town of Coram, Cal. A smeltery has been constructed at Coram, 16,000 ft. by aërial tramway from the mine, cost of tramway line being $125,000. The capacity of the smeltery is about 1000 tons per day. The smeltery consists of three blast furnaces and one reverberatory furnace, and has cost approximately $1,000,000. Developments show 700,000 tons actual ore, running 2.6 per cent. copper, and about 400,000 tons of probable ore carrying the same percentage of copper.

Garfield Improvement Company—In connection with the construction of the Garfield plant, heretofore mentioned, and the construction on contiguous property of the plants of the Utah Copper Company and the Boston Consolidated Copper Company, the Garfield Improvement Company was organized for the construction, ownership and management of the town of Garfield, Utah. The Garfield Improvement Company is owned jointly by the Garfield Smelting Company, the Utah Copper Company and the Boston Consolidated Copper Company, the Garfield Smelting Company owning 60 per cent. of the stock. The Improvement company was organized with a capital stock of $200,000, divided into 2000 shares, par value $100 per share, of which the American Smelters Securities Company owns 1200 shares. The company has expended in the purchase of real estate, the construction of hotels, boarding houses, stores, residences, warehouses, etc., approximately $350,000.

Garfield Water Company—In connection with the organization and building of the town of Garfield, the Garfield Water Company was organized to supply water for the township and also for the three concentrating plants of the Garfield Smelting Company, the Utah Copper Company and the Boston Consolidated Copper Company. The capital stock of the Garfield Water Company is $300,000, all issued and outstanding, in 3000 shares of $100 par value per share. The American Smelters Securities Company owns 1000 shares of the stock of the Garfield Water Company. There has been expended in the purchase of springs, real estate and construction something in excess of $500,000.

San Bruno Plant—The Securities company has purchased about 65 acres of land together with water frontage on San Francisco bay at San Bruno point, San Mateo county, Cal., on the Southern Pacific railway, about 18 miles south of San Francisco. The construction of a copper smeltery was begun about two years ago. When completed this smeltery, including the construction of a long pier to navigable water in the bay, will cost about $2,000,000.

Baltimore Copper Smelting and Rolling Company—Organized under the laws of the State of Maryland, capital stock $500,000, divided into 5000 shares of the par value of $100, all issued and outstanding. It owns a valuable and profitable copper-smelting and refining plant and also a copper-rolling plant at Baltimore, Md., free of all liens or encumbrances. The refining plant has a capacity of approximately 200,000,000 pounds of copper per annum.

The New Mining Law for Mexico

SPECIAL CORRESPONDENCE

The new mining law of Mexico was approved by the senate, on Nov. 20, practically as it came from the chamber of deputies and now has the sanction of both branches of congress; the bill, upon the signature of the President, will become a law.

Since the elimination of the proposed Art. No. 144, which prohibited foreigners or foreign companies from denouncing or acquiring mining property in the republic, the law contains no radical changes from the old law of 1892. Its object is mainly to perfect the present actual system and conserve formally and in a clear manner the provisions that practice has found advisable, and which until now have been confined to official circulars.

The reforms of special import are:

1. A complete centralization of the mineral law with the federal authority. With the exception of the fundamental principle wherein mineral property reverts to the nation in case of neglect to pay taxes, and apart from a few dispositions relating to right of way given to mining enterprises in general, the other judicial rights applicable to the industry were consigned, by the old law, to the local code of each state. This has resulted in a diversity of rights to the mine owners according to the state in which the property was situated. With the object to at once unify and federalize the entire industry the new law provides that all mineral questions, not expressed in the mineral code, be subjected to the civil code of the Federal District. Also in the same manner are penal questions relating to the industry subject to the penal code of the Federal District, as supplemental to the mineral law.

2. Holders of registered options on mineral property will be protected. Under the old regulation the promise of sale or option was merely a personal obligation, and not an actual right to dispose of it, i.e., a option could be given on a property, and the property under option could be legally transferred to a third party by the person that gave the option. According to the new law, the mere registration of an option gives the holder actual rights to the property and protects him against interference from all sources, and not solely against the party that signs the option.

3. There is a tendency in the new law to increase the judicial powers of the minister of fomento. The new law concedes to the department to decide in matters of opposition occurring between third parties and the original denouncer, in matters of right of way, in expropriations, of inspection of mines, and suspension of mine work in certain cases of infraction of mineral legislation.

4. The exploration zone is limited in the new law to a circle of 500 m radius from a point specified in the petition, and the time for exploration is limited to 60 days instead of 90, as in the old law. Exploration rights will not be granted on ground that has been previously worked, and must not be within 200 m. of other mining property.

5. The old law provides that a foreigner who desires to obtain rights on mineral ground within a zone limited to 80 km or 20 leagues from the frontier, shall secure special permission from the executive of the nation. The new law does not alter this, but also provides that foreigners are prohibited from denouncing or acquiring by any title whatever mineral properties or actual rights over mines within the 80 km zone. The article does not concede to the executive power to alter its provisions in any case.

Details of Practical Mining

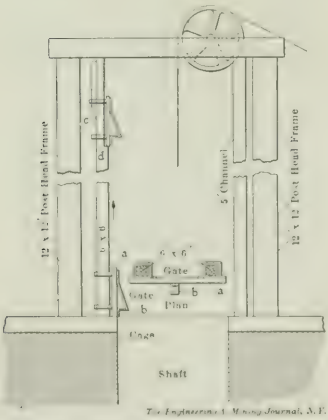
Notes of Interest to Prospectors and Operators of Small as Well as Large Mines. Things That Have to Be Done in Everyday Mining

REPORTS FROM EXPERIENCE

Readers of the JOURNAL are invited to contribute to this department. Articles should be brief, thoroughly practical, and preferably illustrated by drawings or sketches. Our draftsmen will prepare properly any kind of a pencil sketch that is intelligible. Something that is an old story in one district may be quite unknown in another. Articles accepted and published are suitably paid for.

Shaft Gates

The gates or bars seen at the mouth of many shafts are cumbersome and often quite unsatisfactory. The type shown in the accompanying drawing gives satisfactory results and is of simple and inexpensive design. The gate *a* is built with iron guides as shown in the plan,



OPERATION OF SHAFT GATES

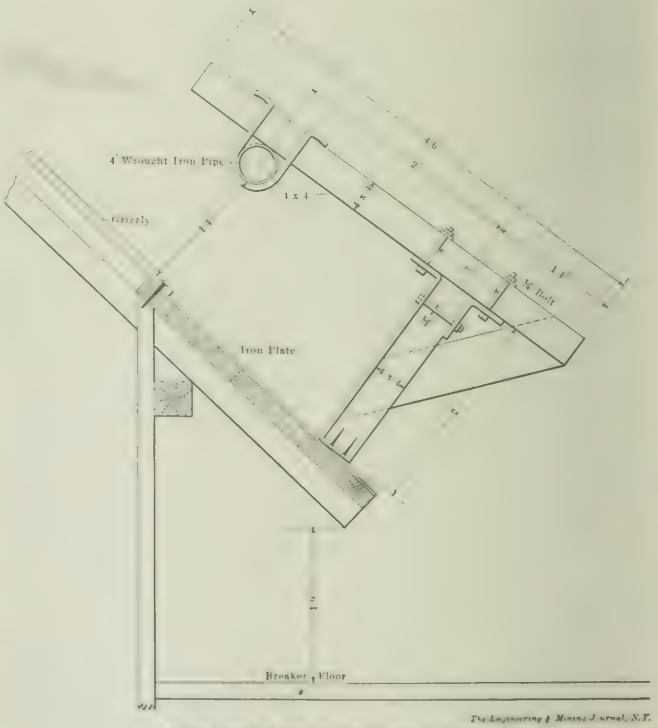
which allow it to travel up and down the guide posts. When the cage comes out of the shaft mouth, it strikes the iron *b* on the back of the gate, lifting it out of the way until the cage is again dropped. In case of overwinding, the gate is diverted by the guide at the point *c*, and swings clear of the cage into the position marked *d* on the drawing.

This same arrangement may be used on both sides of the shaft so that as the loaded car is run off the empty may be run directly upon the cage and lowered, thus saving considerable time. The advantage of these gates rated by the engineer is the fact that the necessity for a top man to watch the shaft is eliminated, and an additional guard is afforded against danger from persons falling down the shaft, as it is difficult to lift the gates without raising the cage. Where there is little danger of overwinding, the guides for the gates may be made of channel irons or straight posts without the notching shown at *d*. The gate itself may be made of any desired dimensions or construction.

A Finger Chute

By A. LIVINGSTOKE OKE.*

The accompanying illustration and drawing show an adaptation of the well-known finger chute employed by me, while manager of a mine in Chihuahua, Mexico.



FINGER CHUTE FOR FILLING WHEELBARROWS

At the Polk county mine of the Tennessee Copper Company, the present headframe is to be replaced by a new and larger one practically without interrupting the operation of the mine. The new headframe will be larger in all dimensions than the old one about which it will be built. In the new arrangement the skips will be automatically dumped directly into an ore bin in front of the headframe. During the erection of this bin and the changing of the cables to the new sheaves is expected to be the only time when hoisting will be interrupted.

The ore coming into the breaker floor from an aërial tramway was being dumped direct on a grizzly, the fines going into the battery bin and the oversize accumulating on the floor above, whence it was shoveled into wheelbarrows and taken to the breaker. To avoid the shoveling, the finger chute was put

*Manager of the Argentine and General Exploration Company, Rodeo, San Juan, Argentina.

in and two out of three peons were displaced. The fingers receive very hard usage and should be built very strongly. Their weight keeps the ore back, as, from the position of the fulcrum, they may be considered to have their center of gravity just where it is most effective, i.e., in front of the sliding ore. They are very easily controlled and saved all the hard work of shoveling. Other types of chute were tried, but failed to be of service.

METHOD OF OPERATING FINGER CHUTE

Treating Concentrates at Lluvia de Oro

Concentrate worth $1000 per ton is reduced to a value of $300 per ton before being packed to the railway from the Lluvia de Oro mine in Chihuahua, Mex., by simply grinding in pans with cyanide and mercury. This is done to remove as much of the free gold from the concentrate as possible, but also to remove a part of the incentive for stealing. Besides the free gold which is caught in the amalgam, most of the gold and silver which dissolves during this grinding in pans is precipitated by, and amalgamates with the mercury, part of the latter going into solution. After the charge is ground fine, the rich solution is decanted and washed from the concentrates as thoroughly as possible and conducted to the zinc boxes where its valuable content is precipitated in the usual way. The ground pulp is conducted over a slime concentrator, reserved for this special material, and thus the concentrate is materially reduced both in bulk and value before shipment on its long journey to the smeltery. The amalgam is reduced to bullion by ordinary methods.

Notes on the Construction and Operation of Stamp Mills*

By G. H. Fison†

Although the power consumption is most economical when the weight of stamp is as great and the drop as low as practice will allow, the duty per stamp controls the operation of a mill, this being adjusted to the capacity of the mill to reduce the ore to the required fineness and expel the pulp through the screen. To maintain a high stamp duty, the speed and hight of drop of stamps must be arranged to give the largest capacity of screen discharge.

At various times efforts have been made to increase the screen discharge by increasing the screen area. Mortar boxes with double discharge have been tried, but usually have not found favor with mill men. One cause for this is that the rear screen is more liable to damage and the consequent loss of time in renewal counterbalances the extra discharge gained. The tables also have to be lowered into a less convenient position in relation to the discharge of the mortar in order to receive the flow from the back of the box. However, if these matters are considered in the original designing of the mill, such difficulties should be easily overcome. In using a back screen a high discharge, 6 in., would be necessary to avoid banking against the bottom edge of the screen under the feed chute.

Vibration Reduces Life of Mills

The life of all stamp mills is materially affected by the vibrations to which they are subjected. These may be minimized by framing timbers carefully and using cushions of gasket rubber under mortar boxes, king-posts and countershaft boxes. The use of concrete mortar-box foundations is another important factor in reducing vibrations in the mill. It is also advisable to carry countershaft bearings on separate concrete blocks and to have the ore-bin foundations built independently of the mill framing. Maintaining the king-post bolts in good order with the nuts tight is also of prime importance. It is therefore evident that these bolts should be placed so as to be accessible and in plain view so that they can be watched continually. It is well to use a heavy yoke with the bolts so as to give a clear hight above the feeder platform and thus make the nuts accessible for heavy spanners. The bolts holding down the mortar box are also important factors in the life of a stamp mill. They should never be placed so as to be masked by mill-water mains or other avoidable obstructions so that they cannot be conveniently reached with heavy wrenches. It is well to have these bolts made in two lengths and joined in the middle with hooked ends. This enables a defective screwed end to be replaced by unhooking the upper half of the bolt without having to dig into the foundation, as is the case when a solid bolt must be removed. Self-locking nuts are reported to be successfully used in a number of mills.

Narrow Mortar Boxes in Favor

The present tendency seems to be to use boxes as narrow as possible with corners rounded in order to avoid waste spaces. With the narrow boxes the inside depth varies from 4 to 9 in., measuring down from the screen opening. The advantage of using a shallow box is that it allows the hight of the discharge to be regulated by chuck blocks, while in deep boxes wear has to be compensated by packing up the dies. Mortar-box liners are made of hard cast iron, mild cast steel or chrome or manganese steel; they should be interlocking and self supporting. They then require but one hardwood wedge to be driven down in either end of the box to hold them tight. A set of interlocking liners can be renewed within 10 min. after the time the dies are removed from the box. Liners should not extend below the level of the false bottom.

Except where inside amalgamation is used the hight of the discharge should be just as short as is consistent with avoiding the banking of sand against the lower edge of the screen, say from 1½ to 2½ in. above the top of the dies, according to the depth of feed employed. The dies should be turned about once in two weeks in order to equalize wear, the highest edge being placed at the back of the box. They

*Abstract of an article in *Min. Journ.*, Sept. 4, 1909.

†Bulawayo, Rhodesia.

should also be proportioned so as to wear out simultaneously. A 7-in. die will usually last as long as a 12-in. shoe. This may in some cases be regulated by using different materials for the die and shoe.

Operation of Stamps

The best results are usually obtained with speeds varying from 95 to 105 drops per min., with corresponding falls of from 8½ to 6 in., varying of course with the type of mill and quality of the ore crushed. In this connection it should be remembered that the effective drop of a stamp is from ½ to 1½ in. less than the hight raised by the cam.

Hardwood guides are reliable and when used with proper care will last for years. In some sections, notably Rhodesia, a grooved cast-iron guide made in halves is coming into favor. The bore is provided with annular grooves to form receptacles for a lubricant consisting of four parts of soft soap to one of graphite. Work is facilitated, when taking up the wear in the guide blocks, by having permanent marks on the king-posts and guide beams to show the exact stem centers. It is very important that these be maintained especially with narrow mortar boxes.

Copper Plates Most Satisfactory

Plain copper plates are preferable to silver-plated ones in that when once set with gold amalgam they will hold a thicker layer of mercury than will the silver-plated ones. It is, however, more difficult to start the amalgamation with the copper plates. When using silver-plated amalgam plates, great care must be exercised in steaming and in scraping or the silver plating will be removed with the amalgam. Hard scraping at any time is liable to injure the plated surface. With acid mill water lime should be fed to neutralize the scouring effect. Silver amalgam is sometimes used with success as a first dressing on the bare copper plates, thus enabling a good gold saving to be made from the start and producing a surface more absorbent and sensitive than is that of the silver-plated copper.

Cyanide solutions should not be used in dressing plates unless the greatest care is exercised. Although the plates will be kept bright, gold losses will result and the plates will not be kept in that solid and sticky condition induced by proper scouring and rubbing. Increased absorption of mercury by the gold is caused by raising the temperature of the feed water, when it can be maintained without ebullition at about 80 deg. F., good results are obtained.

Uniform Water Feed

The water to be supplied a mill is governed more by the flow over the plates than by the conditions in the mortar box. The harder the rock is crushed the more water will be required to keep the plates free from sediment; an excess of water will tend to carry black sand and fine gold away. The best way of introducing water into the mortar is to direct the stream so that it strikes low down the back of the box, and washes over the die with sufficient force to carry fine particles through the screen, but with insufficient force to carry the uncrushed ore from the die. Water with a constant head should be supplied in all cases, and the branch leading to each battery should be fitted with two cocks or valves, one to be used as a regulator and to remain set to pass the required amount of water; the other to be used, whenever the mill is stopped or started, for opening and closing the total supply to the box. A dial may be used with advantage on the first cock so that the exact opening can be observed and maintained.

Use of Mercury Traps and Blankets

No generalization can be made regarding the loss of mercury in amalgamation. Under ordinary conditions, however, with a 7-dwt. plate recovery, the loss, including the process of retorting, should not exceed 1 dwt. of mercury (per ton of ore crushed). Where inside amalgamation is practised the losses in many cases are increased. The use of good traps in the tailings launders aids materially in reducing the quicksilver losses.

In special cases the use of blankets is of undoubted advantage and economy. It is a good scheme to have a blanket mounted on rollers as an endless belt revolving slowly against the stream of pulp; the under side of the blanket passing through a trough of water and being washed automatically, thus saving the dirty and disagreeable work of constant hand washing.

Taking the Wrinkles out of Blueprints

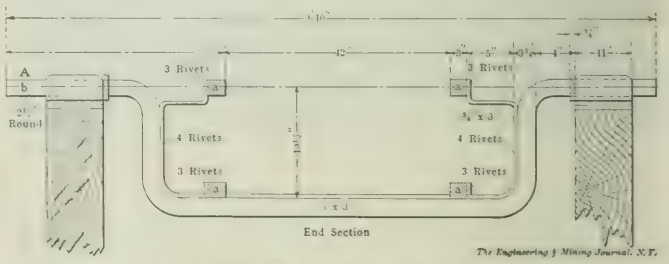
Everyone knows how annoying it is to have blue or other prints roll or curl up when we are referring to them. They are particularly bothersome after being folded or rolled for mailing, especially if not entirely dry when done up.

To save patience, and bad language, J. C. Austin in *Amer. Mach.* Oct. 28, 1909, recommends soaking the prints for a minute or two in a tank of clear, cool water. Then hang by one edge on a line or bar, out of the direct rays of the sun, to dry. If carefully handled they will not be injured a particle by this treatment and will be as flat and smooth when dry as when first made.

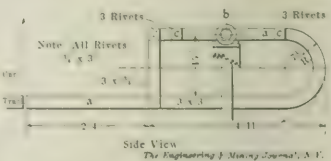
Self Acting Tipple

In the accompanying sketch are shown the details of a satisfactory self-acting tipple which was developed in the Birmingham district and is used by the Sulphur Mining and Railroad Company at its mine near Mineral, Louisa county, Virginia.

The loaded ore car is run by gravity on the tipple where the curved 3x3-in. irons *a* engage the wheels. The tipple is so designed that the weight of the loaded car is sufficient to cause it to rotate about the axis *b*, and hence dump the car. It is also heavy enough to swing back into position after dumping with sufficient force to run the car off the tipple and back on the track. A wheel and band brake may be used on axis *b* at *A*, but this is not necessary. This form of tipple is simple in operation, easily constructed and gives good service. At a number of iron mines in Michigan a similar device is used in connection with a tail-rope haulage for returning the empty car, and one attendant takes care of as many as four or five tipples, depending upon the number of bins used.



AUTOMATIC TIPPLE WITH SUPPORT



ARRANGEMENT OF TRACK FOR TIPPLE

Personal

Mining and metallurgical engineers are invited to keep THE ENGINEERING AND MINING JOURNAL informed of their movements and appointments.

Charles M. Schwab has been elected a trustee of Lehigh University.

H. Kilburn Scott has left London for Spain on professional business.

J. C. Maben, president of the Sloss-Sheffield Steel and Iron Company, has returned to Birmingham from New York.

Robert B. Brinsmade will spend the next few weeks in Philadelphia, where he is engaged in a metallurgical investigation.

C. Colcock Jones, after several months' absence in Alaska, has reopened his office at 323 Henne building, Los Angeles, California.

Charles H. Bunsen, superintendent of mines for the Inde Gold Mining Company, of Mexico, has gone to San Antonio for his health.

J. P. Hutchins, who has been engaged during the last year in professional work in Siberia, has reached St. Petersburg on his way home.

E. Dwight Kendall and Leo Van Rosenberg, of New York, have recently examined and reported on the Union copper mines in North Carolina.

Charles A. Stillman, for years Birmingham, Ala., representative of Rogers, Brown & Co., has been transferred to Chicago. Mr. Stillman was very popular in the Birmingham district.

C. O. Ellingwood and a party of Eastern men are visiting the properties of the National Development Company in Beaver county, Utah, with Grant Snyder, of Salt Lake City, president of the company.

Mason T. Adams has resigned his position as general manager of the Britannia Mining and Smelting Company, of Britannia Beach, B. C., and has opened an office as mining engineer at 412 McPhee building, Denver, Colorado.

J. Cuthbert Welch, late general superintendent for the Alaska Copper Company and manager for the Cymru Copper Company, Alaska, has been appointed smelter manager for the East Butte Copper Mining Company, Butte, Montana.

J. Earlston Throop, Jr., has been appointed superintendent of the Thomas Iron Company's plant of four blast furnaces at Hokendauqua, Penn. He succeeds Horace Boyd, who has been promoted to the position of general superintendent.

G. W. Metcalfe, formerly acting superintendent at the United States Smelting Company plant at Bingham Junction, Utah, has been appointed manager of the Mammoth Copper Mining Company's smeltery at Kennett, Cal., in place of A. S. Haskell, resigned.

Robert Vaughan, for some time past superintendent of the cyanide plant of the Standard Consolidated Mining Company at Bodie, Cal., resigned Dec. 1 and will go to the Guanajuato Consolidated Company at Guanajuato, Mexico, with which he was formerly connected.

H. E. Urban, of Birmingham, Ala., who has been construction engineer for the steel-plant division of the Tennessee Coal, Iron and Railroad Company, has been appointed chief civil engineer for the company. He will have charge of the construction of the new water works and railroad extensions around Ensley.

The Cambria Steel Company, Johnstown, Penn., has made the following promotions in its official staff: H. C. Walle, formerly assistant to the general manager, to be general superintendent; Daniel M. Stackhouse, superintendent of the open-hearth department, to be assistant general superintendent; C. R. Stuart to be superintendent of the open-hearth department.

Prof. George J. Young, of the Mackay School of Mines, University of Nevada, Reno, Nev., is leaving for a nine months' trip in this country and abroad, during which he will visit many mining districts. Upon completion of his trip he will return to his professorial duties at Reno, where he has been remarkably successful in developing the Mackay School of Mines.

Obituary

Joseph E. Sands died Nov. 19 at Fairmont, W. Va., aged 74 years. He was one of the organizers of the Monongah Coal Company and of the Monongahela River railroad.

Francis L. Stephenson died in Pittsburg, Penn., Nov. 20, aged 64 years. He was a banker and largely interested in coal properties. He was instrumental in the formation of the Monongahela River Consolidated Coal and Coke Company, the Hostetter Connellsville Coke Company and other large companies.

Societies and Technical Schools

Mine Makers' Association—This association, consisting of prominent mineowners in the Cœur d'Alene mining district, will soon cease to exist. The association accomplished much in the way of advertising the district, but since the organization of the Wallace Board of Trade, it has been felt that the Mine-Makers' Association will be unnecessary, since the Board of Trade will promote the same interests.

American Society of Mechanical Engineers—The thirtieth annual meeting of the society will be held in the Engineering Societies Building, New York, Dec. 7-10. The entire social entertainment will be in charge of the members resident in and about New York, under the immediate direction of a local committee appointed by them, of which William D. Hoxio is chairman. For Wednesday afternoon, Dec. 8, an excursion is planned which members and guests will be asked to attend in a body, and during the balance of the time there will be opportunities for smaller parties to visit places of interest. In the evening, there will be a lecture for members and guests upon the subject of Agricultural Machinery. The professional papers assigned to the meeting include studies on gas producers, boiler construction and management, engine efficiency and other interesting topics.

Conference of Indiana Coal Mine Operators—The first step by State Mine Inspector James Epperson to lessen the hazards of mining in Indiana, after his return from Cherry, Ill., was to hold a conference in the Clinton field. Mr. Epperson emphasized the importance of complying more rigidly with the safety laws and especially the provision against "drilling ahead," which is commonly done in Indiana. It was pointed out that disregard of mining laws by both operators and miners has long been the custom in Indiana to such an extent that both agree that the wage contract is a higher law and that working conditions must be incorporated in the wage contract to make it effective. A law was advocated requiring each mine to have two or more distinct openings, so constructed that it would not be necessary that one opening should depend on the other for ventilation. It was also contended that a point of great importance to the industry is to place the responsibility on the mine owner and to make him responsible for the employee under the law.

Coal Mining Institute of America—The winter meeting will be held at Pittsburg, Dec. 16 and 17. Two sessions will be held each day in the School of Mines building of the University of Pittsburg. The first meeting, on Dec. 16, will be the annual business meeting. The following papers are promised:

1. Rescue Station and Safety Measures of the H. C. Frick Coke Company; by C. B. Franks.
2. Mining Laws for the Prevention of Accidents; by John H. Jones.
3. Results of Using Safety Explosives; by J. J. Rutledge.
4. The School of Mines of the University of Pittsburg; by Dr. M. E. Wadsworth.
5. Diamond Mining; by Dr. W. R. Crane.
6. Some Economic Problems Confronting the Coal Mining Industry; by Samuel A. Talyor.
7. The Coal in the First Bituminous Basin in Center and Clearfield counties, Pennsylvania; by R. N. Hosler.
8. Dry Processes of Cleaning Coal; by J. B. McDermott.

There will also be a general discussion on Diminution of Accidents in Coal Mining; led by James Blick.

Special Correspondence from Mining Centers

News of the Industry Reported by Special Representatives at Butte, Denver, Salt Lake City, Goldfield, Cobalt and Toronto

REVIEWS OF IMPORTANT EVENTS

San Francisco

Nov. 27—The Anti-Débris Association has adopted a resolution asking the co-operation of the California Débris Commission in the matter of the control of dredge mining, and has also given instructions to its attorneys to commence suits against certain dredge owners as soon as additional data can be obtained. It is probable that the dredge operators will welcome the control of the California Débris Commission and subordinate particular methods of operation to a uniform plan embracing all companies. A ruling will have to be obtained from the War Department as to the jurisdiction of the Débris commission, which was organized in connection with hydraulic mining only, and before dredging operations were thought of.

Operations will commence on the new copper mines in San Benito county, across from Soledad, in Monterey county. A leaching plant has been provided. The owners of copper properties in the Spenceville district, Nevada county, are encouraged over the announcement that John Martin will build an electric road through that section during the coming year.

The value of the mineral products of California for the year 1908 is figured by the State Mining Bureau as $66,363,198. The gold output falls several million below that of petroleum for the year. Kern county with its oil has an output valued at over $10,000,000, Shasta with its copper nearly $7,000,000, and Butte with its gold over $3,000,000. According to the U. S. Geological Survey figures the gold output of the State for the year was $18,761,559, which is about $2,000,000 more than in the preceding year.

Denver

Nov. 27—In the Leadville district, much interest is attached to a strike in the old Ella Becker tunnel, in Iowa gulch. The pay streak is over a foot wide, and the ore runs, it is stated, about $30 per ton. The property is being worked under lease.

In the Cripple Creek district, estimates of the production of the camp from Nov. 1 to Nov. 22, indicated an output of about 47,000 tons of a value of $115,000, or an increase over that of the first 22 days of October. The [illegible] of shipments for several months [illegible] [illegible] Company, the Portland Company, the Golden Cycle Company, the Cripple Creek District Power and Light Company, and the Lake Bennett Mining Company, made by the United States Reduction and Refining Company at Colorado City, the smelting plant [illegible] [illegible] chief factors in bringing about the satisfactory showing.

Some of the non-producing companies of the Cripple Creek district won a legal victory over the Teller county officials a few days ago when a temporary injunction was allowed, restraining the county treasurer from selling for taxes the properties of the seven or eight plaintiff companies. The case will come to trial the latter part of December, and if the injunction is made permanent, other non-producing companies will then petition to be made co-plaintiffs in the Gould case, as it is known, and thus save themselves from loss of their properties through what is claimed by them to be an unfair and exorbitant rate of taxation.

Considerable activity is reported in the Ten Mile district, near Leadville, most of the work now under way being in the nature of development.

It is reported that shipments of ore to the Salida smeltery have been so heavy during the past two weeks as to necessitate a material increase in the working force.

Salt Lake City

Nov. 27—It is authoritatively, though unofficially announced that arrangements have been completed whereby the control of the Boston Consolidated is to pass to the Utah Copper Company on a basis of 2½ shares of the former for 1 of the latter. Just previous to this announcement it became known that Lafayette Hanchett, general manager of the Boston Consolidated, would leave in a few weeks for a year abroad. It is rumored that the Utah Copper has secured an option on the control of the Ohio Copper, and while this is admitted by insiders to be a probable eventuality the rumor cannot be confirmed officially.

The Ohio Copper Company has started up the first 750-ton unit of its 3000-ton mill and is breaking in the machinery ready for the actual treatment of ore, which will begin this week. As soon as this unit is at work on ore the other unit will be started. The mine run of ore will average about 1.75 per cent. copper with some gold and copper, and each unit on a basis of 750 tons per day will yield 7,500,000 pounds of copper per annum.

F. Augustus Heinze has been in Salt Lake City inspecting the Ohio mine and mill and in the Dry Creek section looking over the Western Gold mine, in which he is a [illegible] [illegible] smelting. The [illegible] has not yet been signed. The American Smelting and Refining Company and the International Smelting and Refining Company are the bidders.

Stock in the South Utah Mines and Smelters is being exchanged for the temporary receipts held by the stockholders of the reorganized Newhouse Mines and Smelters. Samuel Newhouse has declined the presidency of the new company on the ground that he expects to spend the coming year in Europe. He will be represented on the board and his interests conserved by F. A. Schirmer and L. N. Kramer.

The slump of Colorado Mining stock has occasioned wide interest in the local market. The stock which once sold for $8 is now quoted at 74c. The company has been a large dividend payer, but had not kept up its ore reserves, and now admittedly finds its mine nearly depleted, although it still has about 600 ft. of virgin ground in the direction of the Sioux Consolidated. This is one of the Jesse Knight properties. Mr. Knight is quoted as saying: "The experience at the Beck tunnel influenced Colorado. In the Beck tunnel the ore cut off short and the dividends ceased. Some doubtless look for the Colorado to do the same. If the Colorado should be compelled to suspend dividends for awhile I should not lose faith in the property. I still hold my stock which takes in the control of the property, and I do not intend to sell it."

The Homber graphite deposits are being actively developed, at present showing a width of 20 ft. which runs about 90 per cent. Machinery and mining equipment are to be installed and an extensive campaign carried on. The mine is four miles south of Brigham City.

The United States Court is hearing two damage suits against the Boston Consolidated for the death of Seth Taft, a former member of the legislature, and of Clint B. Leigh, a reporter on a Salt Lake paper. The accident occurred in February, 1907, when some runaway cars collided with a visitors' inspection train while they were backing down the grade.

Prof. W. H. Burr, of Columbia University, has taken an option on the control of the Utah Gold and Copper Mines Company from F. E. Richards & Co., of New York. The option runs for 30 days, and engineers are now examining the property. If the control passes a mill of large capacity will be built and a spur 30 miles long will be constructed to connect the mine with the railroad at Modena.

The Silver King Coalition Mines Company is being sued in the United States Court by the Lucky Treasure Hill Min-

ing Company for the alleged illegal extraction of ore from the plaintiff's property by the means of secret workings. The bill filed also asks for an equitable partition of the property held jointly by the two companies.

The Creo Mining and Milling Company has filed papers of incorporation. Capital, $50,000. The company will take over 10 claims in the Clifton mining district, Tooele county. Pleasant Grove is the place of business. A. L. Mecham is president.

Butte

Nov. 27—While no definite information is obtainable it is reported that both the North Butte and Tuolumne companies are making surveys and explorations for the purpose of determining the ownership of the Jessie vein. It is possible that there may be litigation between the companies, but it is not expected.

John Junilla and others have started suit against the Washoe Copper Company to recover $370,000 damages alleged to have been sustained by them by reason of the issuance of an injunction in a case which the latter company brought against them to restrain them from working a claim known as the "Summit Valley District" in Butte.

At the Amalgamated company's Pennsylvania mine the new pump station on the 1800-ft. level has been finished and everything is in readiness for the installation of machinery for the new electric pump. It is understood that a long crosscut will be driven north from the 1800-ft. station to intersect a drift run east from the same company's Mountain View mine. The water from the Pennsylvania will be pumped through this crosscut to the Mountain View and from there through the long drift to the Leonard mine where it will be used in the precipitating tanks. The fire at the East Colusa mine is once more under control, and the stopes which caved a short time ago are being caught up again. This fire was started in some unaccountable manner nearly three years ago, but was soon put under control and remained so until about three months ago when the caving of certain stopes caused it to break out with renewed vigor.

At the Coalition's Rarus mine sinking has been discontinued. The shaft is down 2360 ft., but the station now being cut, and which is 10 ft. above the bottom of the shaft, is known as the 2200-ft. station. At the same company's Tramway mine the shaft is now down 1965 ft., and sinking continues. A station set is being put in for the station which will be known as the 2000-ft. station.

In the case of Gassert vs. Strong *et al.*, the supreme court of the United States has recently dismissed the defendant's appeal taken from the Montana supreme court upon the ground that the Federal supreme court has no jurisdiction of the appeal.

Goldfield

Nov. 25—At the quarterly meeting of the directors of the Goldfield Consolidated Mining Company at Goldfield, Nov. 18, the regular quarterly dividend of 30c. per share was declared payable Jan. 31, 1910, to stockholders of record on Dec. 31, 1909. For the fiscal year ended Oct. 31, it was found the earnings were far in excess of the dividend requirements and it was decided to declare an extra dividend of 20c. per share payable the same as regular dividend. After the payment of these dividends, amounting to $1,780,000, there will still be in the treasury of the company more than $1,000,000.

John H. MacKenzie, who is responsible for the present excellent condition of the mine and mill, resigned the office of general manager of the company, owing to large personal holdings in other sections of the western country, which require his attention. One of the last improvements ordered by Mr. MacKenzie is the increasing of the capacity of the mill, from 650 to about 900 tons per day, by the addition of chilean mills which will materially reduce the work required of the stamps. J. R. Finlay, who has been selected to succeed Mr. MacKenzie, enters upon his duties Jan. 1, 1910. Mr. MacKenzie retains his seat as one of the board of directors, and will also act as the consulting engineer of the company.

H. J. Bryant has returned to Goldfield, after arguing in opposition to the attorneys of the local assayers accused of buying stolen ores. His argument was to support the application recently made for a permanent injunction against the purchasing of ore in any of its many forms without notifying the applicants, the Consolidated, the Florence, and the Combination Fraction. The testimony given before Judge Ferrington was to the effect that practically there could be only one source of high-grade ore in the camp and that was from the hands of persons who came into possession of it in an unlawful manner, by stealing it from the properties of the applicants. One week was given the attorneys for the alleged "high grade" assayers in which to prepare and file a brief, and another week was given the applicants in which to prepare and file an answer to the assayers' brief.

Cobalt

Nov. 27—In view of the slump in the stock of the Crown Reserve and the many rumors circulated that this property was not in as good physical condition as was supposed, it is interesting to note that this property sent out the largest shipment for the week. Regarding this slump, a letter was recently published stating that the manager of the mine had sold out his stock, that work had been stopped on the main vein, and the ore stoped out above the 100-ft. level, and that the ore in the Carson vein was inferior, that the workings on the main vein had been flooded, and that insiders in the company only held 800,000 shares, and did not control. In answer to this Colonel Carson has made reply, stating that these assertions are not true, and referring to the statement that none of the veins from the Kerr Lake property had been cut, states "that we have cut No. 15 vein assaying 4031 oz.; No. 16 assaying 4396 oz.; No. 17 assaying 4336 oz.; No. 18 assaying 8528 oz.; No. 21 assaying 2225 oz.; No. 24 assaying 6480 oz." From statements made by the officials of the mine, it would seem that the mine is in excellent condition, and that shipments on the present showings can be maintained for some time.

The Beaver mine again figures in the shipping list. During the week it shipped a 30-ton car of high-grade ore from the 200-ft. level.

It is believed that the Jacobs vein of the Kerr Lake has been cut on the Hargraves, in a crosscut run from the shaft on the 380-ft. level. Up to date this property has done 500 ft. of drifting and crosscutting. Interest in the Porcupine Lake goldfields is rapidly on the increase, and as soon as the winter trails are in good condition a considerable rush into that section will take place. An area of 150 square miles has been staked. Many claims have been sold, and the new owners are losing no time in sending men to do the assessment. The gold-bearing dike extends from the northwest to the southeast, starting in Mountjoy township, passing through Tisdale, Whitney, and into Shaw township.

Interest is again reviving in the districts outside the Cobalt camp. Mosco Vici, associated with Dr. Milton Hersey, has reported favorably on the Rawhide property, Miller Lake district. A shaft will be sunk.

South Lorrain is attracting attention at the present time in view of the excellent results obtained from the summer's work. The Wetlauffer mine during the week shipped a car of 29 tons of high-grade ore. To date this mine has shipped a total of 108,000 lb. of high-grade ore.

The Nivens interest has been ousted from the control of the Cobalt Central, and control has been acquired by outsiders. No change has been effected in the management at the mine, although it is considered probable. The Cobalt Central has been criticized on account of the vague reports regarding the mine that have been issued. It now develops that the money to build the concentrator was supplied by Nivens & Son, and that the indebtedness amounted at one time to $160,000.

Toronto

Nov. 28—Notwithstanding the increase of the import duties on mica entering the United States, the American demand for Canadian mica has for some time been steadily increasing. There has in consequence been a marked revival in the mica mining industry of eastern Ontario, which

was previously in a languishing condition, and the mica-trimming works at Ottawa are active and increasing their staffs. Many properties in the Gatineau district have changed hands. The demand for mica for insulating purposes in connection with electrical apparatus is bringing into the market much of the small material formerly regarded as of little or no value, which is now compressed into micanite.

H. D. Anderson, managing director of the Associated Portland Cement Manufacturers of London, England, is in Canada studying the cement situation here, with a view to entering the field in opposition to the Canadian cement merger. Mr. Anderson's observations led to the conclusion that Canada presented very favorable opportunities for the English manufacturers, though to compete successfully it might be necessary to establish branch factories in the country. The price of cement has already advanced 15c. per barrel on account of the merger and a further increase is anticipated. The matter is causing considerable agitation among consumers, and has been the subject of comment in the Dominion Parliament when Finance Minister Fielding, in reply to an interrogation, stated that during the session an ammendment to the act respecting combinations to enhance prices would be introduced rendering it more effective. The movement for a merger of the smaller marl-using cement plants of western Ontario is still in progress, but details have not yet been arranged.

Mexico City

Nov. 26—The Pachuca, Zimapan & Hidalgo railway reports the construction of the line as far as Actopan, head of the district of that name, and the first large town on the road from Pachuca to the interior. Construction work is being pushed through to the Zimapan mining district as fast as possible. Thomas Solomon is the engineer in charge.

The Mexican Pacific Company, a plantation company, of Seattle, Wash., has started construction on a railway from Acapulco to Zihuatanejo, two ports along the Pacific coast in Guerrero. Construction was begun from the Acapulco end, and the line, which will be 100 miles long, is to be completed in two years. The grading will be along the coast plain and no difficult engineering problems will be encountered. The material for a part of the road is already in Acapulco, as it was purchased from the Mitchell Mining Company, its project to build from Acapulco to the mines at La Dicha having been abandoned two years ago.

The Virginia & Mexico corporation has made its initial clean-up from a run of 1,800 tons of ore netting $7000 in concentrates and $7000 in bullion. The mill has 100 tons capacity, and cost, together with other buildings, $150,000. The property is one of the typical Hostotipaquillo silver deposits with low gold content. It was purchased from a Mexican in 1907 under the name of the Cabrera-America group. These properties have a famous past, some 50,000,000 pesos being claimed to their credit in production. This is only the beginning of milling operations in the Hostotipaquillo district of Jalisco and within a few months several other mills will start operating. The result from the Virginia & Mexico plant is particularly encouraging as between 85 and 90 per cent. saving was made in this, the first run, and there has been considerable interest on the part of engineers to see just what could be saved on these Hostotipaquillo ores. The ores of the Cabrera are not so difficult as most others of the district which are accompanied by high percentages of manganese oxide; nevertheless, a saving of even 85 per cent. on the initial run was a surprise to those who are familiar with the camp.

At Los Ocotes mine, near Ejutla, Oaxaca, a 30-m. shaft has been sunk near the north bank of the Lachigocha river toward the south end of the Teziutlan company's property. Crosscuts at the bottom showed the vein to be in the hanging-wall, the eastern crosscut having cut the vein 1 m. in width. The ore in place runs from 8 to 10 per cent. copper and about 4 kg. silver. Sorted ore of 18 per cent. copper was obtained showing heavy bands of ruby silver. This discovery proves the continuation of the vein for a distance of about 500 m. south of the San Juan shaft. Developments to the north of Dolores shaft extend nearly to the Coapam river, so that roughly 800 m. of the vein are under development. The average width of the vein at 30 m. depth in the San Juan shaft was no more than 1 m., so the vein conditions seem fairly constant, and very little work at the point of recent discovery should add from 25,000 to 30,000 tons to the estimated ore reserves. The effect which this discovery has made on the future possibilities of the Ocotes mine is realized by the local management, who have denounced additional claims in the southern extension.

Paris

Nov. 25—The national federation of miners, wishing to increase its membership will in a short time constitute itself a federation of underground workmen. A plan of this new organization will be drafted in connection with delegates of the federation of slaters, who as underground workers are qualified to form part of this new federation. This will take place after the joint assembly to be held at Albi, at the beginning of 1910. At this meeting will be discussed all questions interesting to both unions.

The Turkish agricultural, mining and forest department will grant on Dec. 27, 1909, at Constantinople, concessions for working phosphate deposits in Cape de Salt. The contractor is bound to build a harbor at Haifa and to construct a railroad of 40 km. to connect the city of Salt to the main road of Hadjaz.

The Kilo mines, property of the Congo Belgium Colony, has increased its monthly production and the returns of the last months show an increase up to 80 kg. The management foresees a monthly production of 60 to 75 kg. The estimates of the Colony's budget call for a production of 70 km. per month and the income thereof to 2,520,000f. against 1,224,000f. the preceding year.

The Société Calédonienne des Mines is putting up a copper-smelting plant at Dilah Point, near Pam, New Caledonia. The installation includes a water-jacket furnace, 36x120 in. The ore of the Pilow mine will be smelted, after hand sorting. The sulphide ores average 7 per cent. copper, giving after sorting 10 per cent. The equipment was obtained from Fraser & Chalmers, of London and Paris. The company is to begin smelting in May, 1910.

At the department of public works in Paris an international commission for the regulation of mining interests in Morocco held a meeting on Nov. 3, the examination of the rules and regulations reported by a French engineer, Mr. Porché. The results will be submitted to the approval of the diplomatic corps at Tangier. The Algeciras act stipulates that no mining concessions will be granted in Morocco before the enactment of the above mentioned regulations.

London

Nov. 23—In addition to the reversal of the decision of the court of appeal regarding the Elmore patent of 1901, noted elsewhere in the JOURNAL, another case of interest to the mining industry has recently been decided in the courts. It is one in which a legal decision was required as to whether sandstone is a mineral. It was somewhat similar to a recent case where china clay was the doubtful mineral. In the present case, that of the North British Railway Company vs. Budhill Coal and Sandstone Company and others, the plaintiffs claimed that the owners of the land, who had sold it to the railway company reserving "any mines of coal, ironstone, slate, or other minerals," had no right to include sandstone under "other minerals." The present case was an appeal from the judgment of a lower court which held that sandstone was a mineral under the act by which the railway obtained its land. This decision has now been reversed, it being held that the words "or other minerals" meant exceptional substances and not the ordinary rock of the district. In giving judgment the Lord Chancellor said that the court had to determine what the words "other minerals" meant in the vernacular of the mining world, the commercial world and land owners at the time when the purchase was effected, and whether the particular substance was so regarded as a mineral.

Mining News from All Parts of the World

New Enterprises, Installations of New Machinery, Development of Mines and Transfers of Property Reported by Special Correspondents

THE CURRENT HISTORY OF MINING

Alaska

The Copper River & Northwestern railway, from Cordova to its terminus at the Kennicott mines, will be completed one year hence, according to E. C. Hawkins, vice-president. The mines are 200 miles above Cordova, and at present the road is completed 96 miles.

At the Moonshine Chomley, Ltd., Ketchikan, a vein of silver-lead galena ore was struck at 140 feet.

Operations have been renewed on the Cuprite property, Prince of Wales island, under the management of J. T. Jones.

The Kupreanof Copper Mining and Smelting Company is making plans for a shipment of ore in February, 1910, from Kupreanof island. This company is making preparation for extensive operations. John T. Towers is manager.

Arizona

COCHISE COUNTY

Tombstone Consolidated—The first instalment of the new pumps has been received and they are being lowered to the new station, east of the pump shaft on the 800-ft. level. These pumps are duplicates of those on the 1000-ft. level now under water. They will throw direct to the surface. Owing to the great heat resulting from the sinkers in the pump shaft, and the consequent discomfort and danger to the men in the shaft in charge of the sinkers, Manager W. F. Staunton has made arrangements for lowering the water from the 800- to the 1000-ft. level by compressed air, and a large compressor plant for this purpose has been purchased. When the 1000-ft. level is unwatered, and this will probably not be before some time in January, the large compressor plant referred to will be used in running the drills on the 1000-ft. level. While waiting for the installation of the new pumps to unwater the 1000-ft. level, the company has developed an orebody on the 700-ft. level west of the pump shaft on an anticlinal which parallels the Westside anticlinal, from which formerly was taken $1,000,000 of ore. This orebody is 4 ft. thick, from 8 to 12 ft. wide and averages $45 per ton. The objective point of operations has been the lower workings and in this section as yet no development work has been done.

GRAHAM COUNTY

Gold Belt and Missabe-Morenci—The companies have continued operations under the new management. The Gold Belt mill is nearly completed.

Arizona Copper—An addition to concentrator No. 6 at Morenci is being built.

YUMA COUNTY

Tank Pass Consolidated—This new company, A. T. Pryor, president, will develop copper properties near Salome.

Inland Mining Company—This company is sinking an exploration shaft near the Planet mine, Parker district.

California

AMADOR COUNTY

Amador Queen No. 1—This mine in Hunts gulch near Jackson, has been leased to F. W. Ruhser who will reopen the shaft and prospect on the footwall. The mine has been idle for 12 years and has a 1000-ft. shaft.

CALAVERAS COUNTY

Mountain King—T. G. Lockhart, of Goldfield, Nev., has secured control of this mine at Hodson and will operate it on a large scale.

Utica—The repairs on the Cross shaft have been completed and a full force will be put on at the Stickle, the Stickle mill, the Cross, the Gold Cliff and the Madison mill. Fred J. Martin is superintendent.

EL DORADO COUNTY

Noble Metals—This company has leased from H. A. Redruch the Golden Cup mine at Greenwood and will use the Jory process.

Blue Bird—At this mine, Georgetown, W. H. Newkirk, manager, the mill is ready and work resumed.

Channel—This company is working, at Josephine, the Alaurena and the Tiederman mines.

Lucero—At this mine, Georgetown, a rich body of ore has been struck on the 400 level.

INYO COUNTY

At Burgess, east of Lone Pine, rich ore has been found in the Wells claim by H. C. Parrett, a leaser.

Four Metals—At this property, Cerro Gordo, E. McGrath, superintendent, a spur track will be built to the smeltery and a sampler installed. The power line will be extended to the mine.

KERN COUNTY

In the Soledad district near Mohave, the Desert, Hobson, Camp Bird and Fraction mines have been bonded by J. R. Goldsworthy to the Gilchrist Investment Company of Los Angeles for $70,000.

NEVADA COUNTY

Central Consolidated—At this mine, Banner Mountain, east of Grass Valley, the shaft is down 600 ft.

Blue Lead—This gravel mine at Relief hill has been bonded to J. O. Jones, of Nevada City and a bedrock tunnel will be run.

Brunswick—The electric hoist has been started and a three-compartment shaft is being sunk.

Yuba—At the mine, above Washington, the oreshoot continues to improve and men are at work on the 500-level drifting.

Grover-Murphy—This company at Nevada City will install a compressor and resume work. Harry Gray is manager.

TRINITY COUNTY

About 30 men are at work on the Brown Bear at Deadwood and electric power has been bought to the Lappin mine, owned by the California-Michigan company. At Eastman gulch, near Deadwood, several mines are shipping ore.

YUBA COUNTY

California Mother Lode—The power line for this mine at Indiana ranch has been completed and the centrifugal pumps have been put in place.

Red Cross Gold Mining Company—This company has been organized at Dobbins to work the Red Cross mine. R. E. Brannan, John Cusick and C. E. Swezy are directors.

Colorado

LEADVILLE DISTRICT

The Big Four, on Breece hill, and the Kimberly-Wilfley, on Elk mountain, both formerly heavy producers, are to be reopened. Another old-time producer which is now resuming operations is the Iron Mask. Considerable activity is manifested in the Elk Mountain section, Kokomo, where the Breene property has men cleaning the lower tunnel, and the workings of the Connors-Bonanza group, recently purchased by Colorado Springs men, are being cleaned out and retimbered, under the management of Terrence Connors. Five hundred feet of the Connors tunnel has been put in shape. This tunnel is projected to develop at depth the orebodies of the Kimberly-Wilfley, Silver Chain and other properties in that section.

Kimberly Wilfley—A receivership action has been commenced in the Wisconsin courts preliminary to a reorganization of the company. A mill costing $200,000 is on the property at Kokomo.

OURAY COUNTY

Mono-Baltic—This company, which

bought the Saratoga mines, near Ironton, is installing a smeltery. E. W. Averill, of Boston, is in charge.

El Mahdi—This property at Ouray, under lease to F. H. Herzinger, has resumed.

Bachelor—Leasers are taking out good ore from this mine.

San Juan District

Smuggler Union—The ground above the Bullion tunnel is being worked by lessees, while the ground below is being operated by the company, which is pushing development work. A fine body of ore is ready for stoping. The assays of this orebody prove that the phenomenally long oreshoot of the Smuggler Union vein continues below the Bullion tunnel. The Gold Pioneer company is making preparations to operate on ore from the lease on the Seventy-six claim, when the weather causes them to curtail work on the Smuggler dumps.

Contention—This mine is being operated under lease by Nivala & Kaanta.

Black Bear and Calumet-Telluride—These properties are being worked on a small scale by companies controlled by Finlanders.

Camp Bird—The October crushing was 6894 tons yielding 11,163 oz. of bullion and 670 tons of concentrates. The month's sales were $231,773 and the expenses $56,308 leaving net $175,465. Development work, 753 feet.

Teller County—Cripple Creek

Trilby—The mine is shipping a car a day of 1-oz. ore to the reduction works, and the mill is running successfully on low-grade ore.

Anchoria-Leland—This property is regaining its former prestige from the results of the lessees. Daily shipments are made of $60 ore.

Idaho

Coeur d' Alene District

About 3500 men are employed in the Cœur d' Alene district and the monthly payroll amounts to nearly one-half million dollars.

E. W. Hand, of Spokane recently purchased the Mt Rose, Maryland, Cœur d' Alene Beauty, Offa, Summit, Snow Line and Cliff claims for $4300 at a sheriff's sale. The claims are 3 miles from Wallace. A company will be organized.

Butte & Coeur d' Alene—A strike is reported on the 200 ft level of the properties near Mullan. The ore is silver-lead but the vein has not been thoroughly explored.

Colson—The tunnel is now go 175 ft and a good showing has been made. The property is near Wallace.

Alice—Large bodies of silver-lead ore have been blocked out. Shipments will begin soon.

Monarch—At the mill 200 tons of ore will be treated daily. The raise from the 900-ft. level has been run 480 ft. disclosing 8 ft. of shipping ore and a large quantity of milling ore.

Hecla—This property, at Burke, has been shipping since June 1, 1909. During the present year there has been distributed $190,000 in dividends.

Rainbow—The lower tunnel at Osbourn, is in 700 ft. and a contract for an additional 100 ft. has been let.

Snowstorm—From the No. 4 tunnel a crosscut is being run to determine the width of the vein recently discovered. The tunnel is in 3296 ft. One hundred and fifty men are employed and shipments are 500 tons daily.

Silver Cliff—The property consists of 20 claims near Lookout and is traversed by four veins. James D. Young, Wallace, is manager.

National—A 4500-ft. tunnel which will give a depth on the orebody of 1600 ft. has been started on the property, east of Mullan.

Illinois

Vermilion County

The mines and coal lands belonging to the estate of the late Michael Kelly have been transferred to the Bunsen Coal Company, which is controlled by the United States Steel Corporation. The consideration is said to have been over $1,000,000. There are six mines on the tract, but little has been done since Mr. Kelly's death. It is said that work will be resumed at once.

Indiana

Daviess County

A series of meetings is being held in this district by the miners to discuss legislation. The bill that seems to be the bone of contention is the law in regard to shot-firing, and the miners will ask that they be allowed to use dampened slack or mud in preparing the shot. They allege the law is now disregarded in many instances from necessity.

Gibson County

A 7 ft. vein of coal of excellent quality at a depth of 632 ft. has been discovered on the Watson farm, northwest of Owensville. The find is due to the drilling of a well for oil. Every test well drilled in this section of Gibson county has revealed the existence of coal.

Pike County

Hinsdale—These mines, five miles southwest of Oakland City, which were abandoned several years ago when the diggers suddenly encountered a limestone ledge, will be reopened. A force of men are at work preparing the mine.

Kansas

Phoenix Pung—This mine north of Galena is being developed and the erection of the mills is being done under the charge of A. O. Ihlseng, of Joplin.

Clermont—The mill at this mine on the Falenbach land south of Galena is nearing completion.

Michigan

Copper

Hancock—No. 2 vertical shaft has encountered No. 3 lode at 2040 ft., and found it containing the same richness shown at other points. This lode was discovered in a crosscut from the 13th level of No. 1 shaft to connect with No. 2. The lode is 15 ft. wide. As the property was originally opened to work the Pewabic-Quincy and the Hancock lodes, the discovery of this additional lode materially aids the prospects. No. 2 shaft will be put down until the Pewabic lode is reached at about 3600 feet.

Allouez—No. 2 shaft is down three levels in the lode and is opening an average grade. In a short time this shaft will be in shape to help out in producing.

Quincy—No. 2 and No. 7 shafts have resumed normal production.

Ojibway—The drift from the 500-ft. level of No. 1 shaft is exposing encouraging ground. The drift from the 800-ft. level of this shaft toward No. 2 has not yet reëntered the copper-bearing ground, although the same level drift from No. 2 shaft is in a good grade of stamp rock. Both shafts are at the 1250-ft. level and sinking has been temporarily suspended.

Keweenaw—The new shaft on the Kearsarge lode has reached 75 ft., and results are encouraging. Operations on the Medora lode have been suspended.

New Arcadian—A second drill has been started 2000 ft. from Portage lake. The first drill continues in operation but has not cut the extension of Baltic formation.

Isle Royale—The Baltic shaft is down 600 ft. and is coming into a change. Production from the old mine continues from the copper-bearing portions of the lode entirely with the result that a smaller tonnage is handled with the same mineral.

North Lake—No. 5 drill hole has finally been established in the lode after difficulty owing to boulders. This drill is being put down to cut the formation exposed in the drill core of No. 4 hole.

Indiana—The drill at the first hole has been moved to No. 3 hole after encountering the eastern sandstone. No. 3 hole is 5300 ft. southwest of No. 1. No. 2 hole at a depth of about 550 ft. encountered an amygdaloid formation, which it has passed through and found it to be 30 ft. wide with a copper-bearing portion of 10 ft. near the footwall. A third drill will soon be in commission.

Lake—Preparations have been about completed for the second shipment of about 100 tons to the Tamarack mill, the rock coming from different openings.

Daily shipments of 100 tons will soon be made.

IRON

Catherine—This local company has begun exploration for iron in the Michigamme district between the Portland and Stewart mines.

Minnesota

Kennedy—The Rogers-Brown Ore Company will install four 150-h.p. boilers and equipment for the second shaft at Cuyuna.

Section 30—It is expected that this famous property near Ely will start shipping next season.

Missouri

JOPLIN ZINC-LEAD DISTRICT

A company of Webb City men have struck a rich prospect in a drill hole on the Richardson land, at Neck City, finding 16 ft. of jack.

The West Joplin district which a year ago had only one or two mills now has 6, all in operation and six more will be built soon. This ore is from 18 to 24 ft. in thickness running from 2½ to 3½ per cent. and making concentrates of 60 per cent. zinc.

Samson—This company has thoroughly drilled the west 40 acres of the tract in the West Joplin sheetground district and found ore in nearly every one of the 12 drill holes. A mill will be built. William Briggle, of Joplin, is superintendent.

Bendalari & Cook—This company has purchased 80 acres of the Luke land on which are the Gibson mine and the Nowata, the richest sheet ground mine in the district at the present time.

Granby—Kenyon brothers, of Nowata, have nearly completed the tailing mill on the old Mascot pile. Foust jigs are being installed.

Montana

BUTTE DISTRICT

Raven—The shaft has been unwatered and drifting on the vein on the lowest level started and sinking will be begun.

Amalgamated—The shaft of the Anaconda company's Right Bower mine is down 600 ft. A connection is being made with the Mountain Chief mine.

North Butte—The shaft is down 2300 ft., the lowest level being the 2200, and the sump extending down 100 ft. below. About 1500 tons of ore is being hoisted daily, and is taken from levels below 1000 feet.

British-Butte—The dredge was shut down several days ago. Whether the shutdown is permanent or not is not known. A drill hole is being driven for exploration purposes, and the work on this continues.

Butte-Balaklava—P. H. Nelson, of Duluth, has succeeded R. B. Dear as president of the company. Regular shipments are being made. The raising of the third compartment in the shaft will be completed within a month.

East Butte—The management plans to put a second furnace in commission at the Pittsmont smelter for the treatment of custom ore.

Tuolumne—The east drift has been run to within 50 ft. of the property's end line and is all in ore.

BROADWATER COUNTY

Keating—Preparations are being made for the installation of a power line from Boulder to the mine near Radersburg. Shipments are being made at the rate of two cars per day.

Black Friday—A recent shipment of 32 tons of ore returned the company $5677.

JEFFERSON COUNTY

Boston & Alta—George Haldron, of New York, has been investigating the title to the Alta mine, near Corbin, in the interest of E. R. Dick, of New York. The title was found to be good and it is likely Mr. Dick will buy a controlling interest in the company and erect a 600-ton concentrator next spring.

Lion Gulch—Operations at the property near Homestake have been discontinued. The shaft has been sunk 400 ft., but no crosscutting done. The reason for the suspension is not known.

FERGUS COUNTY

Cumberland—The boiler has been put in place and the compressor is on the ground. The mill will be completed in January, as planned. A. S. Wright, Maiden, Mont., is manager.

LINCOLN COUNTY

Snowshoe—Operations will be resumed at the property in the Libby district. The mine has been idle for three years, having been closed by a receivership. The shaft is 400 ft. deep and has been kept pumped out.

MADISON COUNTY

Goodrich Gulch—H. Schmidt has discovered a deposit of wolframite on his property. The ore is in streaks of from 12 to 18 in. wide.

Nevada

ESMERALDA COUNTY

Mountain King Group—The U. S. Smelting, Refining and Mining company is negotiating for the purchase of this property, known as the Lucky Boy, from Adams & Miller.

Silver Moon—The shaft on this lease is down 225 ft. and sinking is continued. This adjoins the Hubbare lease. J. R. Woodbridge is president and J. J. McCarthy, manager.

LINCOLN COUNTY

Chief—Hodges, Cook, Floyd and H. W. Rand have secured control of this mine near Panaca and expect to build a mill and cyanide plant immediately.

Little Buck—E. E. Fuller and John Bryden have secured a year's lease on the mine a mile east of Fay. A strong vein is exposed in the mine.

Horseshoe—This mill at Fay, after a short preliminary run is about to be started again to treat principally custom ore. E. E. Fuller is manager.

Ninety-Nine—The shaft at Goodsprings is below 200 ft. in heavy iron formation under which is the copper orebody. Shipments of ore have been made from the 200-ft. level. J. B. Jensen is manager.

Hoosier—Work has been resumed on the lead-zinc ores. J. B. Jensen is manager.

NYE COUNTY—TONOPAH

The value of the production for the week ended Nov. 20 is estimated at $109,625, the tonnage being divided among the various mines as follows: Tonopah, 3100; Montana-Tonopah, 685; McNamara, 350; West End Consolidated, 50; Midway, 200; total, 4385 tons.

McNamara—Shipments will be curtailed from this property in order to carry out a more extensive development in the unexplored territory.

Midway—Owing to the temporary closing of the Belmont mill this company is now shipping to the Western Ore Purchasing Company at Hazen.

Tonopah-Belmont—The surface improvements started recently are completed, and the property will soon be in full running order.

Nevada-Bay State Oil—At 1805 ft., the drill has entered asphaltum and black sulphur, and the manager, J. H. Miller, is confident oil will be struck within a very short distance. The operations are at Blair.

Kendall-Goldfield—The general office of this company has been removed from Tonopah to Goldfield and A. H. Howe has been elected secretary. A statement has been issued showing the company to be $35,494 in debt, and 196,500 shares of stock in the treasury.

Oklahoma

Mission—The mill at this mine will be in operation Jan. 1.

Omaha-Petersburg—The mine at Quapaw is making a good record and running steadily.

Eastmont—This company working the White Eagle mine is making the steadiest run in the Quapaw camp and is being worked in a manner similar to that of the mines of southeast Missouri.

Pennsylvania

ANTHRACITE COAL

Philadelphia & Reading Coal and Iron Company—This company's statement for September and the three months of its fiscal year from July 1 to Sept. 30 is as follows:

	September	Three Mos.
Earnings	$2,037,891	$5,415,153
Expenses	2,108,815	5,642,240
Deficit	$ 70,921	$ 227,087

As compared with 1908, the three

months show decreases of $1,175,402 in earnings and $764,840 in expenses; the deficit of $227,087 above comparing with net earnings of $183,475 last year.

South Dakota

Homestake—Owing to trouble with the Western Federation of Miners the mine has closed. Superintendent T. J. Grier recently posted a notice as follows: "Notice is hereby given that the Homestake Mining Company will employ only non-union men after Jan. 1, 1910. The present scale of wages and the eight-hour shift will be maintained. All employees who desire to remain in the company's service must register at the general offices of the company on or before December 15, 1909." Anticipating a strike the management decided to close for an indefinite period. The wage scale was $3.50 per day for eight hours. The union has been recognized at the mine for 30 years although some nonunion men have been employed. About 2500 men were on the roll.

Tennessee

A cave-in and fire is reported at Copperhill in one of the properties of the Tennessee Copper Company. Eight men are imprisoned. Expert relief has been sent from Knoxville and Washington.

Utah

JUAB COUNTY—TINTIC DISTRICT

Lower Mammoth—By drifting east from the shaft on the 1500-ft. level for 225 ft. to the Black Jack line it has been demonstrated that the east fissure of the Lower Mammoth does not turn into the Black Jack ground as has been supposed. The east fissure was encountered at 85 ft. from the shaft and while it is well mineralized it is not commercial ore. This fissure will be prospected from the 1700-, 1800- and 2000-ft. levels. E. C. Coffin is superintendent.

Mammoth—Forty men are employed and two carloads of ore per week are being shipped. Since the new ore was found on the 2100-ft. level enough has been opened up to justify increasing the shipments providing the mine can secure a more favorable smelting contract. Samuel McIntire is manager.

Tintic Combination—After several months' idleness work is to be resumed. The working shaft is down 210 ft. A station will be cut at the 250 ft. level and a drift run out under the mountain which will give a vertical depth of 500 ft. A hoist and compressor will be installed. B. H. Bullock is superintendent.

Opohonga—Copper ore of good grade has been encountered in the drift from the 300-ft. level of the Black Jack ground through which ground the Opohonga has been driving to open up its property at a depth of 700 ft. from surface. As a result of this new strike a tunnel will be started to give still greater depth and after the ore is reached mining will begin. A hoisting plant will be required. W. H. Hatfield is manager.

Grand Central—The raise from the 2000-ft. level is in ore for 85 ft. and conditions indicate a large orebody. It is expected that the company will be one of the biggest Tintic producers for 1910.

Eagle & Blue Bell—The machinery is now being installed and when completed the shaft will be sunk to the 1100-ft. level.

Tintic Central—A new pump has been installed and sinking operations have been resumed. Two shifts are employed. A. N. Holdaway is superintendent.

Tintic Standard—The shaft has reached 684 ft. At 700 ft. a station will be cut and drifting will be started for the quartz fissure encountered in the shaft above.

Uncle Sam Consolidated—Work has been resumed in old workings closed a year ago on account of lack of power and a streak of high-grade ore 12 in. thick has been encountered.

SALT LAKE COUNTY—BINGHAM DISTRICT

Boston Consolidated—During October the copper production amounted to 1,768,088 lb. and the total average cost of production was a fraction under 10c. The copper from the porphyry ores was derived at a cost of 9.91c. and from the sulphide ores at a cost of 10.34c. per pound. It is expected that the directors will take early action on increasing the capacity of the mill from 3000 tons to 6000 tons per day.

Ohio Copper—The new 2200-ton concentrator will be put in commission soon. The ore will be brought from the Ohio mine through the Mascotte tunnel 14,000 ft. and then to the mill about 3000 ft. from the tunnel. The transportation problem is thus reduced to the handling of the mill product to the smelter.

Utah Metals—Plans for financing this company, the consolidation of the Bingham Metals and the Bingham Central Standard companies, have been completed and operations will be resumed. The 3000-ft. tunnel from the Tooele side of the range will be driven 8000 ft. more to tap the orebodies in Bingham at 2300-ft. depth which will be the deepest workings in Bingham cañon. The portal of the tunnel will be within easy reach of the International smeltery. The company owns 3000 acres in the Bingham district. W. E. Hubbard is manager.

SALT LAKE COUNTY—COTTONWOOD DISTRICT

Big Mutt—G. S. Holmes has taken an option on the property at the mouth of Little Cottonwood cañon. Present developments consist of a tunnel and a winze 100 ft. deep. A hoist and other machinery will be installed and development started.

Rainbow—A new fissure with a northeasterly strike has been encountered in the tunnel at 270 ft. from the portal. The fissure is 3 ft. wide. The tunnel has attained a vertical depth of 175 ft. When the contact is reached, about 42 ft. ahead, if present promising conditions continue a new tunnel lower down will be driven 1400 ft. to attain a depth of 600 feet.

Columbus Consolidated—The tramway from the mine to Tanner's flat will be placed in commission and the output of the mine increased from 50 to 100 tons per day. A winze from the tunnel level shows 10 ft. of sulphide ore, averaging about 10 per cent. copper. The ore above the tunnel is carbonate.

TOOELE COUNTY

Silver Island Coalition—The first carload shipment of ore from the new strike has been sent to the smeltery. The shipment consists of 900 sacks which will assay about $100 per ton. The shipping point is Wendover on the Western Pacific.

West Virginia

Elkins Coal and Coke Company—This company through its Morgantown office, has placed an order for three 10-ton electric locomotives of the Jeffrey type.

Davis Colliery Company—A block of 100 coke ovens is about to be built at Junior.

Wisconsin

Little Bennie—Robert Young has released this property south of the Fox mine, at Benton.

Hoosier—A 50-ton mill is under construction. J. H. Billingsley, Galena, is manager.

Gribbel—A vein of sheet jack has been developed on the property, adjoining the Stevens and Rose properties at Linden.

Dark Horse—This mine is reported sold to the Optimo Mining Company for $25,000.

Wyoming

ALBANY COUNTY

Rambler—The mine near Centennial is increasing its shipments.

FREMONT COUNTY

Carissa—This gold mine near South Pass has been reopened and mill tests of the ore are being made. C. D. Clark, of Evanston, Wyo., is owner.

LARAMIE COUNTY

Chicago—The first carload of iron ore from this mine at Ironton has been shipped to Pueblo, Colo. A shipment of from 15 to 16 carloads daily is planned for the next year.

PARK COUNTY

Hiawatha—The company is preparing to do extensive work. The tunnel will be enlarged and machinery installed. The property is near Cody.

Canada

BRITISH COLUMBIA

Howe Sound—The Britannia Mining and Smelting Company is exploring the orebodies in its Britannia group, and con-

tinuing experiments in concentrating the highly silicious copper ores. Zinc has been encountered in one of the orebodies, so a roaster, cooler and Wetherill separator are being installed for experimental purposes. In the crusher mill rigid rolls have been substituted for chilean mills and jigging is in Hancock, Hartz and Richards' jigs, the pulp passing to concentrating tables and vanners. R. H. Leach, Britannia Beach, is general manager.

Slocan—Damage done to the Canadian Pacific railway to Sandow, Slocan, having been repaired, shipment of ore over it is again practicable. The Consolidated company's Richmond-Eureka mine, near Sandon, during 17 days to Nov. 13 shipped 14 cars of galena. The Summit, in the same locality, shipped 3 cars of similar ore.

Consolidated—This company recently shipped about 200,000 oz. of refined silver to Ottawa. This brings the total of silver from Trail to the mint up to about 500,000 oz. The company is rebuilding its two 100-ton lead blast furnaces and installing enlarged mechanical charging appliances.

Pioneer Placer Mining Company—This company has been organized by Revelstoke and Cleveland, Ohio, men to work a placer gold lease on French creek, north of Revelstoke. Preparatory operations are to be carried on. Forty years ago French Creek had a mining population of about 7000, and much gold was recovered there—coarse gold with nuggets up to 25 oz. in weight. E. A. Bradley, Revelstoke, is in charge.

Ontario

Reeves-Dobie—About four miles of trenching have been done on this property at Gowganda and three shafts put down, the deepest being down 90 ft. Drifting was started at the 60-ft. level. The company has 35 tons of high-grade ore and a large amount of lower-grade and milling ore all taken out in the course of development.

Otisse—The suit brought by S. Kenyon Stowe, claiming $400,000 from the Otisse Mining Company, of Elk Lake, and its promoters for fraud and breach of contract in failing to carry out an option to transfer the property to him has been dismissed by the court on the ground that Stowe was not ready to pay $10,000 on the option when it was due.

American Eagle—At this mine, three miles west of Elk City, a vein 10 in. wide has been found at 20 ft. Ore is being sacked.

Wettlaufer—A block of silver ore 400 lb. in weight, with a vein width of over 12 in. and carrying silver content exceeding 5000 oz. to the ton, taken from the 140-ft. level of this mine, South Lorain, is on exhibition in Toronto.

Ontario—Cobalt District

Shipments for the week ended Nov. 19 consisted of 552.26 tons from 11 mines, and were as follows: Crown Reserve, 185,605; La Rose, 180,641; Kerr Lake, 120,160; Nipissing, 132,595; McKinley-Darragh, 106,926; Right of Way, 61,503; King Edward, 49,282; Coniagas, 84,905; Buffalo, 52,913; Temiskaming, 60,000; Drummond, 70,000; total, 1,109,530 pounds.

Gillies Limit—A force has been started to work on Lot A54, purchased at the recent sale by Mr. Glidden.

Waldman—This property continues to show up well under development, and it is the intention of the management to put on six drills.

Wyandoh—This property, adjoining the Waldman, has encountered good ore at 9 ft. The vein consists of smaltite rich in silver.

Crown Reserve—The Ross vein, or vein 18, has been encountered at the 200-ft. level, giving the mine another 100 ft. of high-grade ore. While hardly as wide or as rich as on the 100-ft. level, it is about 6 in. in width.

Rochester—The vein recently discovered has been stripped for 125 ft. and found very uniform. A shaft is being put down.

Mexico

Chihuahua

Rio Tinto—The 200-ton smeltery at Tersozas, owned by the Corrigan-McKinney interests, of Cleveland, O., will be doubled in capacity.

Durango

Lustre—This property at Indé is closed pending a reorganization plan of the company, the offices of which is at Pittsburg, Penn.

San Andres de la Sierra—This mine is not being worked at present.

Guerrero

At Taxco, the Peña y Cazadores and the Espiritu Santo properties, A. J. Hunter, in charge, will install concentrating plants. The proposed sale of the former property to an English company was not made.

San Mateo—An option on this mine at Poder de Dios has been given. A large amount of ore is developed and the plan is to erect a concentrating plant.

Jalisco

Amparo—The New Jersey court of chancery has handed down a decision allowing the company its claim to 550,000 shares of its stock, claimed also by the Paxson estate, of Philadelphia. Dividends to the amount of $70,000 have accrued on the stock.

Carrizo Copper—The company has made the final payments on the property near Ayutla. A smelting and concentrating plant is installed and development work is under way. The first month's operation of the smeltery gave 300 tons of matte containing 261,000 lb. of copper. Kent E. Keller, St. Louis, Mo., is manager.

Morelia

Santa Rosa—This quicksilver property near Cuernavaca is installing a 10 t. Scott furnace. Philo Burkholder is manager.

Oaxaca

San Juan—A reorganization has been effected of the San Juan company in the Taviche district, and the new company, of which L. R. Wilfley, George I. Ham and C. A. Hamilton comprise the board, has instituted proceedings for the recovery of the property. The case was reopened by means of an amparo for the immediate possession of the mine and an accounting. The property has been one of the largest producers in the district.

Sinaloa

Guadalupe de los Reyes—The new stamp mill and Butters slime plant is nearly completed.

Sonora

Pacific Smelting and Mining Company—The company is developing the Hechal, Rosamond and Aurora properties in the concession limit on the Yaqui river. The Infanito, a contact deposit in the same region on the Yaqui River railroad, it is expected will supply base ore for the Fundicion smeltery.

Cobre Grande—Final payment has been made on the property to Robert Hilburn. Pumping and hoisting equipment have been ordered.

Yaqui River Mining and Smelting Company—The railroad will be completed to Toledo by Jan. 1, and arrangements are in hand to blow in the smeltery at that time. Custom ores will receive primary attention.

Greene-Cananea—The Elisa tunnel has been driven 1470 ft., nearly half the distance it is to go.

Sante Fé—The inclined shaft will be continued to the 300-ft. level and drifts driven at 200 and 300 ft. to cut cross-fissures. The shaft is now 230 ft., and the drifts at 200-ft. level are about 25 ft. each way in the hanging wall. Greenidge & Lee are the engineers.

Los Pintos—This property has been purchased by Los Angeles men, represented by C. H. Thompson. It consists of 35 pertenencias of ground, a 25-ton mill on the gulf of California, and 16 miles of railway connecting mine and mill.

San Juan—This mine has shipped a car of gold-silver ore to El Paso to find what treatment is required. It is under bond to James Randall.

Moctezuma-Arizpe—A special meeting of stockholders has been called to consider the advisability of increasing the capital from 600,000 shares to 750,000 at $5 per share. The mines are idle on account of funds.

Tepic

Purisima—The mine, in the Tepic district being developed by Arthur F. Flynt is obtaining good results.

Metal, Mineral, Coal and Stock Markets

Current Prices, Market Conditions and Commercial Statistics of the Metals, Minerals and Mining Stocks

QUOTATIONS FROM IMPORTANT CENTERS

Coal Trade Review

New York, Dec. 1—In the East the bituminous coal trade makes a very fair showing, the chief drawback being the short supply of cars which is referred to elsewhere.

Anthracite is a weather market and business has been good. At a number of the collieries there is still trouble about a short water supply.

In the West reports continue good. Car shortage is being felt to some extent, but the supply is much better than in the East. There is a little improvement in prices at most of the consuming centers, but the gain is comparatively small.

Anthracite Dividends—The Lehigh & Wilkes-Barre Coal Company has declared a dividend of 6½ per cent. for the last fiscal year. This is the first dividend, though the company has been in existence over 30 years. Nearly all the payment goes to the Central Railroad Company of New Jersey, which owns most of the stock.

Coal Traffic Notes

Coal carried over New England railroads, year 1908, long tons:

	Received		
	At Ports.	Connecting RRs.	Total.
Anthracite	1,307,440	3,512,059	4,819,499
Bituminous	3,650,053	2,482,294	6,132,347
Total commercial	4,957,493	5,994,353	10,951,846
Railroad supply	2,325,000	2,065,000	4,390,000
Total	7,282,493	8,059,353	15,341,846

The railroad supply coal is practically all bituminous coal. The figures are from reports collected by a committee of the Boston Chamber of Commerce.

New York

Anthracite

Dec. 1—The anthracite market shows a fair business, cold weather having started the local dealers into more activity, as their orders come in. Business is steady, supplies being abundant except in the case of pea coal, for which there seems to be a special demand just now.

Schedule prices for large sizes are $4.75 per long and $5 for egg, stove and chestnut f.o.b. New York harbor. For steam sizes quotations are nominally unchanged at $1.60@2.25 for pea, $2.50@2.50 for buckwheat, $1.75@2 for buckwheat No. 2 or rice, $1.50@1.50 for barley, all f.o.b. New York harbor. In some cases, however, 10 or 15c. per ton more has been paid for pea coal.

Bituminous

The soft-coal market is in fair condition, with some improvement over the last report. The shipment of coal to Lake ports is about over for the season, leaving more coal free to come to the seaboard. This has not improved the car shortage as yet, and probably will not for two or three weeks to come. Mines are still making a good deal of complaint about failure to receive cars as they need them. Transportation is a little better, coal coming through nearer to schedule time, but there is still room for improvement.

Buying continues good and quite well distributed. There is something of a rush on to the shoalwater ports and this will probably be continued until they are closed by ice. The Sound ports are doing pretty well and New York harbor is buying better than it has for some time.

Prices are firm with a tendency to advance. At least 10c. more will probably have to be paid soon for good steam coal, and perhaps a little more for the higher grades. Prices are a little uncertain yet, however, and depend a good deal upon the buyer and terms of sale. Demand for vessels is better, especially for small boats which can reach the shoalwater ports. Nominal rates continue at 85c. from Philadelphia to Boston, Salem and Portland, and 65c. from New York to points around the Cape; but there is a tendency to ask more. Stormy weather is beginning to be a factor and the loss of several coal-laden barges is reported this week.

Birmingham

Nov. 30—The Alabama coal production continues to improve and more labor is being received in the district and put to work. The Coal and Iron Employment Company is a new concern just organized in the Birmingham district, the object of which is to conduct a general employment bureau for miners, arranging for the labor supply of a number of mining and manufacturing corporations as well as for individuals; and also with labor organizations and employment bureaus of the country to procure employment for laborers in North Alabama and especially in Jefferson county, Alabama.

The coke situation is unchanged, the output not being altogether sufficient to meet demand.

The miners and mine laborers in the Birmingham district will receive an advance of 2½c. per ton on Dec. 1.

Chicago

Nov. 29—The coal market shows no decided change, weather conditions not yet being such as to bring heavy buying of domestic coals. General purchases of steam coals continue heavy and the market is in good condition.

Illinois and Indiana, in car lots, bring $2@3 for lump and egg, $1.75@1.85 for run-of-mine and 95c.@$1.15 for screenings. Fine coals remain relatively weak.

Of the coals from east of Indiana, Hocking shows most strength, with no surplus in this territory and selling at $3.15. Smokeless holds to $3.60@3.80 on lump and $3.05@3.15 on run-of-mine. Gas coals have a light, steady market. Anthracite sales are somewhat light but are well distributed.

Cleveland

Nov. 30—The Lake trade is fast approaching its close. Quite a number of contracts will remain unfilled, as it will be impossible to get the coal shipped. Steam trade continues steady, and domestic business has been started up again by a cold spell.

Middle District coals are quoted at $1.40 for 1¼-in.; $1.15 for ¾-in.; $1.05 for run-of-mine; 70c. for slack; freight to Cleveland, 70c.; No. 8 district, $1.35 for 1¼-in.; $1.05 for ¾-in.; 95c. for run-of-mine; 65c. for slack; freight to Cleveland, 90c. Massillon domestic is $2.95, Cleveland, for lump and washed nut. Pittsburg coal is $2.40 for 1¼-in.; $2.20 for ¾-in.; $2.10 for run-of-mine; $1.65 for slack; all f.o.b. Cleveland.

Indianapolis

Nov. 29—Wage scales affecting approximately 100,000 coal miners in this country are to be fixed at the convention of the Mine Workers of America, which meets in this city in January. It is understood that a general increase in wages will not be asked by the miners, but a readjustment of contracts now in existence will be made.

Coal-trade conditions are unchanged except that the cold spell has started up domestic buying again.

Pittsburg

Nov. 30—Following the steady conditions reported a week ago the local coal market became very irregular and prices this week are off about 10c. from last week on mine-run and lump. The drop is probably due to the release of so much coal on account of the virtual closing of

the Lake season. Slack is unchanged at 60@70c., depending on delivery, while mine-run and nut can be quoted at $1.10; ¾-in. at $1.20 and small lots of domestic coal to retail dealers at $1.40, all at mine.

Connellsville Coke—The deadlock on furnace coke on contract for next year continues. The furnaces appear wholly indifferent, being committed to a policy of waiting and their position is slightly improved, since this week there are some definite quotations of $2.85 on contract for first half, or 5c. lower than a week ago. Prompt furnace coke has been offered at $2.85 without finding takers, and is also quotable 5c. lower than a week ago. Foundry coke is dull and unchanged. The market is quotable at $2.80@2.85 for prompt furnace coke, $2.85@3 for furnace coke on contract; $5@3.25 for prompt foundry coke and $3.25@3.50 for foundry coke for next year.

The *Courier* reports the production of coke in the Connellsville and lower Connellsville region in the week ended Nov. 20, at 412,156 tons, and shipments at 4837 cars to Pittsburg, 8412 cars to points west of Pittsburg and 930 cars to points east of Connellsville, a total of 14,179 cars.

The reports of the *Courier* and of George B. Irvin, secretary of the Coke Producers' Association, for the week ended Nov. 20, show a much wider difference than usual, Mr. Irvin's report showing a production of 448,262 tons, a slight increase over the preceding week. Operators in touch with the situation regard Mr. Irvin's report as clearly the more representative of conditions in this particular instance.

St. Louis

Nov. 29—With all of the early coal stored away and demand from manufacturing interests not as heavy as it should be, the coal man is now left entirely to the mercy of the weather. Outside of a little cold snap the first part of October we have had practically nothing but summer weather up to date. All the yards report that they are at a standstill and the retail demand from the city and the country is unusually light. Another thing which has depressed the local market is that railroads have so restricted their equipment that the coal cannot be shipped to the northern markets. This, of course, throws an extra tonnage on the St. Louis market with disastrous effects. The market for nut coal and screenings is improving considerably and prices are a little better than heretofore. This is due to the falling off in the movement of lump coal.

The car supply has improved a little and the efforts of the railroads to prevent the equipment from being too widely distributed is having a material effect on the situation. However, this comes too late to be of any real benefit on the roads who have put these restrictions into effect. The mines in southern Illinois, with the exception of those on the Chicago & Eastern Illinois, have been very short all week. Those in the central district have had all the cars they could load.

Carterville 6-in. lump or egg is $1.75 per ton mine, or $2.42 St. Louis; No. 1 nut is $1.40 mine or $2.07 St. Louis. On coal that has to be sold locally on account of railroad restrictions, these prices are being shaded at least 25c. per ton. Screenings are now held at 30c. mine, or 97c. per ton St. Louis.

Franklin County 6-in. lump or egg is still being quoted at $2 per ton mine or $2.67 St. Louis; 3-in. nut is bringing $1.50 mine or $2.17 St. Louis.

Mt. Olive, Staunton or Springfield district 6-in. lump is still being held for $1.50 per ton mine or $2.02 St. Louis; 3-in. lump is now $1.25 mine or $1.77 St. Louis. However, the market seems to be weakening as 3-in. nut is being quoted at $1 per ton mine or $1.62 St. Louis.

Standard 6-in. lump is $1.10 per ton mine or $1.62 St. Louis; 2-in. lump is bringing 90@95c. mine or $1.42@1.47 St. Louis. Screenings are 15c. per ton mine or 67c. St. Louis; while 1 to 2-in. nut coal is strong at 50c. mine or $1.02 St. Louis.

The market for washed No. 1 is exceedingly strong while No. 2 is weak; No. 5 is also hard to move and is being practically given away.

The market on anthracite remains unchanged; chestnut is in great demand with none forthcoming, while grate and egg are up to demurrage.

Foreign Coal Trade

French Coal Trade—Imports and exports of fuel in France, nine months ended Sept. 30, metric tons:

	Imports.	Exports.	Excess.
Coal	10,976,620	818,810	Imp. 10,157,810
Coke	1,383,660	98,800	Imp. 1,284,860
Briquets	745,540	97,740	Imp. 647,800
Total	13,105,820	1,015,350	Imp. 12,090,470
Total, 1908	13,770,072	1,035,351	Imp. 12,734,721

Exports this year included 82,680 tons of coal and 45,600 tons of briquets furnished to steamships in foreign trade.

Russian Coal Production—Coal production in European Russia for the half-year ended June 30 is reported as follows, by districts: Donetz, 8,965,855; Dombrowa, 2,740,349; Ural, 403,957; Moscow, 121,284; Caucasus, 19,811; total, 12,251,261 metric tons. The total for the first half of 1908 was 12,146,310 tons; showing an increase this year of 104,951 tons, or 0.9 per cent.

Welsh Coal Market—Messrs. Hull, Blyth & Co., London and Cardiff, Wales, report prices of coal as follows on Nov. 20: Best Welsh steam, $4.08; seconds, $3.84; thirds, $3.66; dry coals, $3.84; best Monmouthshire, $3.48; seconds, $3.36; best small steam, $2.28; seconds, $1.92. All prices are per long ton, f.o.b. shipping port, for cash in 30 days, less 2½ per cent. discount.

Iron Trade Review

New York, Dec. 1—The iron trade shows little change from our recent reports. So far as naw buying is concerned quiet seems to have settled down on the market and is rather expected to continue until the end of the year. At the same time the receipt of specifications on contracts continues on a large scale and there is no lack of work at mills.

In pig iron there has been little buying, except of basic and foundry in moderate lots to fill up gaps. Buyers think that prices have gone too high; moreover most of them are inclined to hold back until after the turn of the year. Possibly the same view as to prices has been taken by furnaces, as some of them are said to be ready to make concessions for future orders. Southern iron has been quite freely sold at 50c. below the quoted price of $15, Birmingham, for No. 2 foundry.

In finished material the market is also quiet. The demand for bars seems to be fairly well satisfied for the present, and in structural steel there is no large business doing. Plate makers are still taking orders for some good lots. There is rather a scarcity of steel billets, and it is reported that further sales of German basic steel have been made for delivery in the East.

International Rail Syndicate—A London cablegram says: "Dissatisfaction over allotment of orders felt by important British members indicates the possibility of a breakup of the British Rail Association and also of the International Rail Syndicate. The existence of both rail associations is further imperiled by the fact that there is likelihood of important additions to the number of outside makers, especially since open-hearth steel makes less costly the plant investment in rail manufacture. The International Syndicate was established in 1904. The arrangements provide for delimitation of territory and fixing of prices. The combine was renewed for five years in 1907. Serious difficulties that have cropped up from time to time have so far been smoothed over, one of them last year being adjusted by the admission of a Russian works. In the past year British makers have lost orders for 300,000 tons because unable to enter into free competition."

Baltimore

Nov. 30—Imports for the week include 4000 tons spiegeleisen, 2414 tons ferromanganese and 80 tons silicospiegel from Great Britain and Germany; 670 tons manganese ore from Rotterdam and 6700 tons from Bombay, India; 20,050 tons of iron ore from Cuba; 5000 tons cupreous pyrites from Huelva, Spain.

Birmingham

Nov. 29—Some small lot sales are being made by pig iron manufacturers in the

South, delivery mostly in the next two months. While $15 per ton, No. 2 foundry, is given out as the quotation, concessions even as large as $1 per ton are heard of. Resale iron is being openly quoted at $14.50 per ton. The make in this section is being kept up at the high mark. Some of the larger consumers throughout the country have been sounding the iron market again recently, but makers do not expect any big buying until after the holidays. The shipments of pig iron are about equal to the make. The brokers who were requested to remove their iron bought several months ago, or stand for storage charges, have moved out a large quantity of iron. Southern furnace companies have quite a bit of iron sold ahead for delivery during the first quarter of 1910.

The machine shops and foundries here are in better shape now than they have been in more than two years with a good line of orders in hand.

Chicago

Nov. 29—The iron market continues quiet, with sales light and prices remaining $19@19.50 for Northern No. 2 and $14.50@15 Birmingham ($18.85@19.35 Chicago) for Southern No. 2. Distribution of the iron being bought is very wide, showing a tendency to buying for the needs of the next three to six months in small quantities. A steady but light market is looked for up to the first of the year. Few buyers are venturing into the third quarter.

In finished materials the iron and steel market is strong. The demand for railroad supplies, structural material and commercial shapes is good. Coke is quiet, inclining to weakness at $5.50 for the best Connellsville.

Cleveland

Nov. 30—The time is approaching for action on ore prices, and some will be taken soon. November shipments hardly came up to 5,000,000 tons, chiefly on account of the accident at the Sault.

Pig Iron—Nothing is doing just now. The market is quiet, but there is no sign of weakness. In the absence of business quotations are nominally unchanged.

Finished Material—Some lines are quiet, but there have been heavy sales of both iron and steel bars. There has also been active demand for spikes and other track material.

Philadelphia

Dec. 1—In pig iron a pre-holiday quiet has settled over this entire territory. Very little buying is reported for the past week and settled feeling prevails among consumers. Some negotiations started some two weeks ago for basic iron have been suspended. It is understood here that efforts to boost prices through speculative offers will not be tolerated. The market is not weak but it is quiet. No. 2 X foundry is quoted at $19.50 for the best brands; basic at $19; forge at $18. Southern irons are offered at practically the same figures.

Steel Billets—Billets remain strong and a number of orders are now in the hands of makers awaiting acceptance. Prices have not been advanced.

Bars—The bar-iron mills are working to their limit to complete shipments promised before the holidays. Prices remain at the recent high level established. The iron stores of this territory have done a better business this fall than for years.

Sheets—Every kind of sheet is held at the highest prices, and while the past week has not brought in many new orders, office-men report an excellent outlook. Sheet manufacturers are inclined to yield a trifle in favor of large consumers.

Pipes and Tubes—All lines of pipes and tubes are strong in price, with an extraordinary consumption of material.

Plates—The alarm over the probabilities of a further advance in plates is over. It is understood that the raw material will not be permitted to become a football of speculators.

Structural Material—No large orders have been reported. Local requirements are of moderate proportions.

Steel Rails—A small Cuban order will go to an eastern mill. Several orders for export will be taken care of in the next two weeks.

Scrap—Small sales of machinery scrap have been made and offers for railroad scrap are received, although no sales have taken place.

Pittsburg

Nov. 30—The week in the iron and steel trade has shown little in the way of new developments. New business in finished-steel products is light, relative to the previous activity, except that sheets and tinplates have been even more active than formerly since the advances of Nov. 12. Specifications on old contracts continue very good, with customers anxious for deliveries.

Steel-car building operations are about to be increased. The Pressed Steel Car Company and the Standard Steel Car Company will soon be using between 2500 and 3000 tons of plates and shapes daily, all from the Carnegie Steel Company.

The Jones & Laughlin Steel Company will tomorrow, Dec. 1, blow in the first of its new blast furnaces at Aliquippa, and two others will follow at intervals of a month or so. These are 500-ton furnaces, expected to produce 150,000 tons each a year. Ground was broken in 1908, but very little work was done during 1908.

Pig Iron—The Republic Iron and Steel Company has bought 10,000 tons of bessemer from the Bessemer Pig Iron Association at $19, Valley furnace, for first quarter delivery. Its total purchases on this movement amounts to 75,000 tons, the first purchase having beee about May 20. Sales of 5000 tons at $19, 1000 and 1500 tons at $19 and $19.10 were made, the market being quotable at this range. The event in basic pig iron has been the offering of two speculative lots, one of 15,000 and the other of 3000 to 5000 tons, on the basis of $17, Valley, 25c. below the previous minimum of the market, which had been quotable since early in October. Foundry iron is available at $17, Valley, for early delivery, and at $17.25 for equal deliveries over the first half, both prices being 25c. below the previously quotable market. There is very little demand for pig iron and the market is expected to be more or less uneven all month, as consumers do not care to make commitments just prior to the inventory period. It is recognized that pig iron has already scored a large advance, and has been aided in its upward movement chiefly by the spectacular advance in asking prices for coke and the prospect of an advance in ore. Malleable is quotable at $17.50, and forge at $16@16.50 per ton.

Steel—A few small lots of sheet-bars have been sold for first-quarter delivery at $29.50, f.o.b. Youngstown mill, and it is reported that some odd lots have been sold for the same delivery at $30, f.o.b. Pittsburg mill. Limited tonnages are said to be available at $28.50, f.o.b. maker's mill, Pittsburg district, so that the market is not very clearly defined. Billets are quotable nominally at about $27.50, Pittsburg.

Ferromanganese—The market is strong but not quotably changed, at $45@46 for prompt and $45.50@46 for first quarter, f.o.b. Baltimore, freight to Pittsburg being $1.05 per ton.

Sheets—Demand continues good and mills have no trouble booking all the tonnage they care to acept. A slight weakness in galvanized corrugated sheets has disappeared and the market is absolutely firm. Prices are: Blue annealed sheets, 10 gage, 1.75@1.80c., depending on delivery; black sheets, 28 gage, 2.40c.; galvanized, 3.50c; corrugated roofing, painted, $1.70, and galvanized, $3 per square.

St. Louis

Nov. 29—The amount of business closed this week has been light and split up into small lots. The prevailing price is $15@15.25 per ton Birmingham, or $18.75@19 f.o.b. St. Louis for No. 2 foundry iron. While an advance for the second quarter is probable, it is thought that these prices will be good for some time yet.

Iron Ore—Missouri ore is in strong demand at $1.75 per ton f.o.b. St. Louis for 50 per cent ore. A new washer has just been completed at Greenville, Mo. This is in the Williamville, Greenville and Wayne county district.

Metal Markets

New York, Dec. 1—The metal markets on the whole are improving, though copper has been unsettled and inclined to be irregular. Consumption generally appears to be on a large scale.

Gold, Silver and Platinum

UNITED STATES GOLD AND SILVER MOVEMENT

Metal.	Exports.	Imports.	Excess.
Gold:			
Oct. 1909..	$ 9,379,402	$ 7,034,164	Exp. $ 2,245,438
" 1908..	1,952,574	3,785,705	Imp. 1,833,131
Year 1909..	106,652,236	38,139,557	Exp. 68,512,679
" 1908..	70,889,954	42,213,678	" 28,676,276
Silver:			
Oct. 1909..	4,053,745	4,017,884	Exp. 35,861
" 1908..	4,378,015	3,746,863	" 631,652
Year 1909..	47,342,861	37,258,414	" 10,084,447
" 1908..	43,159,395	34,539,067	" 8,620,328

Exports from the port of New York, week ended Nov. 27: Gold, $4,839,200, chiefly to Brazil; silver, $607,375, chiefly to London. Imports: Gold, $128,987; silver, $287,384, from Mexico and South America.

Gold—The price of gold on the open market in London continues at 77s. 9d. per oz. for bars, but 76s. 5½d. per oz. was paid for coin. The Bank of England took most of the gold arriving. In New York a total of $3,000,000 gold was taken for export to South America and $500,000 for Canada.

Platinum—Business continues good. The price remains unchanged, dealers asking $29.50 per oz. for refined platinum and $33.25 for hard metal.

Silver—Silver has shown a slight improvement in price, owing to China operations in a large measure. It is considered that by the time of the Chinese New Year, India will be in possession of the proceeds of an unusually bountiful harvest, and no doubt a fair proportion will be invested in silver. The daily offtake in India for the up-country demand has recently been over 100 bars, which is regarded as an active distribution.

SILVER AND STERLING EXCHANGE

Nov.-Dec.	25	26	27	29	30	1
New York....	....	50⅞	50⅞	51	51¼	51½
London....	23⅞	23⅞	23 7/16	23½	23 9/16	23 9/16
Sterling Ex..	....	4.8750	4.8755	4.8760	4.8765	4.8775

New York quotations, cents per ounce troy, fine silver; London, pence per ounce sterling silver, 0.925 fine.

Exports of silver from London to the East, Jan. 1 to Nov. 18, as reported by Messrs. Pixley & Abell:

	1908.	1909.	Changes.
India.....	£ 8,350,623	£5,838,600	D. £2,512,023
China.....	516,400	1,829,300	I. 1,312,900
Straits.....	164,885	82,800	D. 82,085
Total.....	£ 9,031,908	£7,750,700	D. £1,281,208

Indian exchange in London, average 16.11d. per rupee.

Copper, Tin, Lead and Zinc

Nov.	Copper. Lake, Cts. per lb.	Copper. Electrolytic, Cts. per lb.	Copper. London, £ per ton.	Tin. Cts. per lb.	Lead. New York, Cts. per lb.	Lead. St. Louis, Cts. per lb.	Zinc. St. Louis, Cts. per lb.
25	.....	.....	58⅜	....	.....	.....	.....
26	13⅜ @13⅝	13⅛ @13⅜	59⅜	31½	4.37½ @4.40	4.25 @4.27½	6.22½ @6.25
27	13⅜ @13⅝	13⅛ @13⅜	...	31½	4.37½ @4.40	4.25 @4.27½	6.20 @6.25
29	13¾ @13⅞	13½ @13¾	58¾	31¼	4.37½ @4.40	4.25 @4.27½	6.17½ @6.22½
30	13⅜ @13½	13 @13¼	58¾	31⅜	4.37½ @4.40	4.25 @4.27½	6.17½ @6.22½
1	13⅜ @13½	13 @13¼	58¼	31¾	4.37½ @4.40	4.25 @4.27½	6.17½ @6.22½

London quotations are per long ton (2240 lb.) standard copper. The New York quotations for electrolytic copper are for cakes, ingots and wirebars, and represent the bulk of the transactions made with consumers, basis, New York, cash. The prices of casting copper and of electrolytic cathodes are usually 0.125c. below that of electrolytic. The quotations for lead represent wholesale transactions in the open market. The quotations on spelter are for ordinary Western brands; special brands command a premium.

Copper—The market continues quiet and nominal. Manufacturers are busy filling the large orders that were placed last month, but are not buying pending further developments in the much talked of copper combination. On the other hand, producers are not pressing sales, having sold heavily for delivery during the next few months. There has been some pressure to sell on the part of speculators, and in consequence prices have suffered. Some of the producers are holding aloof, quoting nominally at prices materially above what anyone is now willing to pay, while others are meeting the market but making only small sales in the absence of any important demand. Transactions in Lake have been quite insignificant. At the close the market is 13@13¼c. for electrolytic cakes, wirebars and ingots, and for Lake is nominal at 13⅜@13½c. Casting copper is quoted nominally at 13@13¼ cents.

Copper sheets are 18@19c. base for large lots. Full extras are charged, and higher prices for small quantities. Copper wire is 15¼c. base, carload lots at mill. Business is active.

The standard market has remained under pressure of sales for account of speculators who wanted to realize, and has fluctuated within comparatively narrow limits. At the close, the market is somewhat firmer, with spot at £58 5s., and three months at £59 2s. 6d.

Refined and manufactured sorts we quote: English tough, £62 10s.; best selected, £62 10s@£63 10s.; strong sheets, £73 10s@£74 10s

The copper market opened in November on the basis of 12¾@12⅞c. for electrolytic. The project of a copper consolidation was already in the air and this inspired a speculative movement at the very beginning of the month. In the second week this movement gained force and had the natural effect of drawing in manufacturers who were frightened into covering their requirements for a long time ahead, thus transferring a good deal of the accumulated surplus from the refineries to the factory yards. From Nov. 4 to 20 the volume of sales was huge, the market rising to 13⅝c. Then came the Standard Oil decision which caused buyers to hold aloof, waiting to see how far this would affect the plans for the consolidation, and subsequently there was a sagging of the market under speculative offerings upon which there was a desire to realize; while moreover the New York market had of necessity to get again in tune with London. Although the sales for November were almost unparalleled, it will be found that they were to a large extent of speculative character and will result simply in a transferral of stocks. The weakness of the market at the end of the month, when electrolytic closed at 13@13¼c., is merely a reassertion of the still unfavorable statistical position.

Brass Prices—The following figures are announced by leading manufacturers, taking effect Nov. 22: High-sheet brass, 15¼c.; high-brass wire, 15¼c.; high-brass rods, 15¼c.; all per lb., net base. Brazed brass tubes remain at 20⅜c. per lb. net base.

Tin—After the Banka sale had taken place last week, the London market again became very strong. Reports from this side of a very large consumption for the month of November, accompanied by buying orders, helped the advance, and the close is strong at £143 15s. for spot, and £145 10s. for three months, in London, while the New York market for spot tin is quoted at about 31¾ cents.

Lead—There has been a better demand, particularly for Missouri lead, and the market is firmer at 4.25@4.27½c. St. Louis, and 4.37½@4.40c. New York. The nominal price of the American Smelting and Refining Company for desilverized continues to be 4.40c. New York. Southwest Missouri brands of lead have sold at 4.32½c. St. Louis. The London market is lower at £13 for Spanish lead.

Spelter—There is a lull in the demand, and prices have eased off somewhat, St. Louis being quoted at 6.17½@6.22½c., and New York at 6.32½@6.37½ cents.

New York quotations for spelter, Nov. 26, were 6.37½@6.40c.; Nov. 27, 6.35@6.40c.; Nov. 29 to Dec. 1, inclusive, 6.32½@6.37½ cents.

The market abroad is slightly lower, good ordinaries being quoted at £23, and specials at £23 5s.

Other Metals

Antimony—The market continues dull, and is not expected to improve this month. Cookson's is quoted at 8⅛@8½c. per lb.; Hallett's, 8@8⅛c.; U. S., 7⅞@8c; with 7⅞@7¾c named for outside brands.

Aluminum—The price of aluminum is

unchanged at 20@23c. per lb. for ingots. The higher price is that asked by the American producer.

Quicksilver—Business is slightly less active, but the market continues strong. In New York the quotation is $52.50 per flask of 75 lb. for large lots; for small lots 72@75c. per lb. is asked by jobbers. The San Francisco quotation is $50.50@51.50 per flask for domestic orders, and $2 less for export. The London price is £9 15s. per flask, with £9 16s. 3d. asked by jobbers.

Nickel—Large lots, contract business, 40@45c. per lb. Retail spot, from 50c. for 2000-lb. lots, up to 55c. for 500-lb. lots. The price for electrolytic is 5c. higher.

Magnesium—The price of pure metal is $1.50 per lb. for 100-lb. lots f.o.b. New York.

Cadmium—Current quotations are 65@70c. per lb. in 100-lb. lots at Cleveland, Ohio. In Germany 450@475 marks per 100 kg., at factory in Silesia.

British Metal Imports and Exports

Imports and exports of metals in Great Britain, 10 months ended Oct. 31, figures in long tons, except quicksilver, which is in pounds:

Metals:	Imports.	Exports.	Excess.
Copper, long tons	141,985	52,103	Imp. 89,882
Copper, 1908....	143,576	57,150	Imp. 86,426
Tin, long tons....	35,250	35,046	Imp. 204
Tin, 1908.....	39,211	33,764	Imp. 5,447
Lead, long tons..	170,730	38,630	Imp. 132,100
Lead, 1908	198,884	42,733	Imp. 156,151
Spelter, 12 tons..	94,213	6,615	Imp. 87,598
Spelter, 1908....	88,226	6,922	Imp. 81,304
Quicksilver, lb...	3,108,571	1,178,137	Imp. 1,930,434
Quicksilver, '08	3,168,186	1,542,250	Imp. 1,625,936
ores:			
Tin ore and con.	19,547	.....	Imp. 19,547
Tin ore, 1908...	21,724	.....	Imp. 21,744
Pyrites	651,272	.....	Imp. 651,222
Pyrites, 1908...	652,241	.....	Imp. 652,217

Copper totals include metallic contents of ore and matte. Exports include re-exports of foreign material. Of the imports in 1909 the United States furnished in all 209 tons copper matte, 56,807 tons fine copper and 27,685 tons lead. This lead was chiefly Mexican, refined in this country.

Zinc and Lead Ore Markets

Platteville, Wis., Nov. 27—The base price paid this week for zinc ore was $50@51 per ton. The base price of lead ore was $[illegible] per ton.

SHIPMENTS, WEEK ENDED NOV. 27.

Camps	Zinc ore, lb.	Lead ore, lb.	Sulphur ore, lb.
Highland	425,000	.....	.....
Platteville	407,160	.....	125,100
Mineral Point	376,000	.....	.....
Benton	107,250	109,680	
Galena	58,800		
Cuba City	129,150	141,410	142,750
Dodgeville	8,200		.....
Mineral Ridge	64,000	58,000	
Platteville	60,000	66,300	..
Hazel Green		117,000	
Lancaster			50,850
Totals	[illegible]	[illegible]	318,600
Year to Nov. 27	[illegible]	[illegible]	14,179,415

In addition to the Cuba City shipment [illegible] to the assaying plants: Platteville, [illegible]; Mineral Point, [illegible]; Hazel Green, [illegible].

Joplin, Mo., Nov. 27—The highest price of the week for zinc sulphide ore was $55 the base ranging from $50 to $52.50 per ton of 60 per cent. zinc, for standard grade ores, and a premnum for ores carrying over 4 per cent. of iron. Zinc silicate ore sold from $24 to $34, on a base of $28@30 per ton of 40 per cent. zinc. The average price, all grades, was $48.50. All buyers paid $53 per ton for lead ore. The average price, all grades, was $52.96 per ton.

Failure of the transportation companies to supply cars curtailed the shipment, but enough cars were supplied to ship the week's production, leaving the stock on hand practically unchanged at 6500 tons. Weather conditions are favorable to a large output, but producers find it hard to increase the number of shovelers.

SHIPMENTS, WEEK ENDED NOV. 27.

	Zinc, lb.	Lead, lb.	Value.
Webb City-Carterville	3,332,210	693,5[illegible]0	$103,349
Joplin.....	2,029,290	148,910	57,610
Duenweg.....	588,270	175,740	19,155
Oronogo.....	436,340	113,510	14,269
Aurora.....	622,950	.....	13,884
Alba-Neck.....	492,410	.....	12,802
Granby	820,600	4,400	12,800
Galena.....	371,640	64,090	10,989
Prosperity.....	409,890	5,940	10,656
Spurgeon.....	400,900	60,230	9,685
Carthage.....	285,540	.....	7,423
Quapaw.....	306,220	.....	7,253
Zincite.....	158,420	.....	4,119
Sarcoxie.....	180,430	.....	3,983
Jackson.....	123,310	.....	3,083
Saginaw.....	106,610	11,820	2,660
Senecca.....	.....	51,100	1,353
Peoria.....	60,520	.....	909
Wentworth.....	43,840	.....	658
Totals	10,769,390	1,329,260	$296,390
48 weeks.....	545,767,450	81,275,930	$13,287,421

Zinc value, the week, $261,190; 48 weeks, $11,070,458
Lead value, the week, 35,200; 48 weeks, 2,216,963

MONTHLY AVERAGE PRICES

Month.	Zinc Ore. Base Price. 1908.	1909.	Zinc Ore. All Ores. 1908.	1909.	Lead Ore. All Ores. 1908.	1909.
January.....	$37.60	$41.25	$35.56	$38.46	$46.88	$52.17
February....	36.63	36.94	34.92	34.37	49.72	50.50
March.....	36.19	37.40	34.19	34.71	49.90	50.82
April.....	35.40	38.63	34.08	37.01	52.47	55.63
May	34.19	40.06	33.39	37.42	56.05	56.59
June.....	33.06	44.15	32.07	40.38	60.48	57.52
July	34.55	43.06	31.67	41.11	59.90	53.74
August.....	36.53	48.25	33.42	44.54	60.34	57.60
September ..	37.63	47.70	34.44	44.87	54.59	56.11
October.....	35.95	49.50	33.28	45.75	52.63	55.02
November...	39.13	51.31	35.02	48.29	54.53	53.94
December...	42.75	.....	39.63	.....	49.68	.....
Year.....	$36.63	.....	$34.31	.....	$53.93	.....

NOTE—Under zinc ore the first two columns give base prices for 60 per cent. zinc ore, the second two the average for all ores sold. Lead ore prices are the average for all ores sold.

Chemicals

New York, Dec. 1—The general market is more active, and prices are a little unsettled.

Carbon Sulphide—The tone of the market is rather firmer and prices have been advanced by producers and are now being $[illegible] per lb. for carloads, $[illegible] per lb. for [illegible] and $[illegible] per lb. for [illegible].

Arsenic—More interest is being shown by buyers, but prices are irregular. Some makers are selling white arsenic as low as 2⅝c. per lb., while up to 2⅞c. per lb. is asked by others.

Nitrate of Soda—The market is firmer than a week ago. Spot nitrate is still sold at 2.07½c. per lb., but futures have recovered and are now held at 2.10c. per lb. for all positions next year.

Mining Stocks

New York, Dec. 1—The general stock markets continue to be disturbed and are as a rule irregular and inclined to weakness. Trading has been on rather a large scale and money has been easier, but these factors do not seem to have had much effect on the situation. Foreign buying has fallen off considerably. The excitement in the copper stocks seems to have passed over for the present, and nearly all of them show declines from the recent high levels.

An unusual business was done during the week in Homestake of South Dakota. The price went off from $76.50 to $73.25 per share on sales of 1065 shares. This is due to the reports of the strike of miners and the closing down of the mine.

On the Curb copper stocks were weak and nearly all the issues traded in show declining quotations. This was the result of unfavorable reports as to the proposed merger. The volume of business was quite large, but this did not support the market, and the close shows general weakness. The Nevada gold stocks were rather neglected. Cobalt shares are weak and heavy, and buyers seem reluctant to step in even at a lower range of prices.

Boston, Nov. 30—Plenty of excitement has been furnished in the local copper-share market the past week. The reported hitches in the proposed copper merger brought severe declines in the stocks mentioned as likely to go into the combine, while some of the Lake Superior issues have indulged in a runaway market. Boston Consolidated rose $4.37½ to $22.25 on the reports that a consolidation would be effected with the Utah Copper on a basis of 2½ shares of Boston for one of Utah Copper. Stock of the latter company rose to $63.37½, but subsequently broke to $57.25, while Boston fell to $18 from its high.

Lake Copper has been sensational in its flights. On Monday it had an extreme rise from $52 to $63 per share. The following day it broke to $55.50 from which it recovered to $62.75 in a few hours. For the week the stock has risen a total of $7. An extended short interest has been responsible for this sharp advance.

Hancock Mining and St. Mary's Mineral Land [illegible] also had marked advances.

Dividend announcements during the week [illegible] $8 quarterly by Calumet &

Hecla; $1 quarterly by Copper Range Consolidated; $1 quarterly by Old Dominion of New Jersey; $1.25 by Tennessee Copper; 50c. quarterly by Utah Copper; and 2 per cent. quarterly by Yukon Gold.

Curb trading has been influenced by the big market. Calaveras Copper was put on the Curb list Saturday at $5, but the price slipped off to $4 per share.

STATISTICS OF COPPER.

Month.	United States Product'n.	Deliveries, Domestic.	Deliveries for Export.
I	112,135,200	51,862,624	38,499,797
II	103,700,817	43,578,118	30,968,496
III	117,058,661	48,871,964	59,191,043
IV	113,574,292	47,546,010	65,110,111
V	118,356,146	61,163,325	70,542,753
VI	116,567,493	60,591,116	70,966,457
VII	118,277,603	75,520,083	75,018,974
VIII	120,597,234	59,614,207	48,382,704
IX	118,023,139	52,105,955	50,077,777
X	124,657,709	66,359,617	56,261,238
XI	....	....	....
XII	....	....	....

VISIBLE STOCKS.

	United States.	Europe.	Total.
I	122,357,266	124,716,480	247,073,746
II	144,130,045	118,574,400	262,704,445
III	173,284,248	117,140,800	290,425,048
IV	182,279,902	115,024,000	297,303,902
V	183,198,073	114,050,320	297,248,393
VI	169,848,141	127,352,960	297,201,101
VII	154,858,061	150,928,960	305,787,021
VIII	122,596,607	171,492,160	294,088,767
IX	135,196,930	197,993,600	333,190,530
X	151,472,772	210,224,000	361,696,772
XI	153,509,626	222,566,400	376,076,026
XII	....	236,857,600	....

Figures are in pounds of fine copper. U. S. production includes all copper refined in this country, both from domestic and imported material. Visible stocks are those reported on the first day of each month, as brought over from the preceding month.

Monthly Average Prices of Metals

SILVER

Month.	New York. 1908.	New York. 1909.	London. 1908.	London. 1909.
January	55.678	51.750	25.738	23.834
February	56.000	51.472	25.855	23.706
March	55.365	50.468	25.570	23.227
April	55.505	51.428	25.133	23.708
May	52.795	52.905	24.377	24.343
June	53.663	52.538	24.760	24.166
July	53.115	51.043	24.514	23.519
August	51.683	51.125	23.858	23.588
September	51.720	51.449	23.877	23.743
October	51.431	50.923	23.725	23.502
November	49.647	50.703	22.933	23.351
December	48.766	......	22.493	....
Total	52.864	......	24.402	...

New York, cents per fine ounce; London, pence per standard ounce.

COPPER

	NEW YORK. Electrolytic 1908.	Electrolytic 1909.	Lake. 1908.	Lake. 1909.	LONDON. 1908.	LONDON. 1909.
January	13.726	13.893	13.901	14.280	62.386	57.688
February	12.905	12.949	13.098	13.295	58.786	61.198
March	12.704	12.387	12.875	12.826	58.761	56.231
April	12.743	12.56	12.928	12.93	58.331	57.363
May	12.598	12.893	12.788	13.238	57.387	59.338
June	12.675	13.214	12.877	13.548	57.842	59.627
July	12.702	12.880	12.933	13.363	57.989	58.556
August	13.462	13.007	13.639	13.296	60.500	59.393
September	13.388	12.870	13.600	13.210	60.338	59.021
October	13.354	12.700	13.646	13.030	60.139	57.551
November	14.130	13.125	14.386	13.354	63.417	58.917
December	14.111	......	14.411	......	62.943	.....
Year	13.208	......	13.424	......	59.902	....

New York, cents per pound. Electrolytic is for cakes, ingots or wirebars. London pounds sterling, per long ton, standard copper.

TIN AT NEW YORK

Month.	1908.	1909.	Month.	1908.	1909.
January	27.380	28.060	July	29.207	29.125
February	28.978	28.290	August	29.942	29.966
March	30.577	28.727	September	28.815	30.293
April	31.702	29.445	October	29.444	30.475
May	30.015	29.225	November	30.348	30.859
June	28.024	29.322	December	29.154	....
			Av. year	29.465	.....

Prices are in cents per pound.

LEAD

Month.	New York. 1908	New York. 1909.	St. Louis 1909.	London. 1908.	London. 1909.
January	3.691	4.175	4.025	14.469	13.113
February	3.725	4.018	3.868	14.250	13.313
March	3.838	3.986	3.835	13.975	13.438
April	3.993	4.168	4.051	13.469	13.297
May	4.253	4.287	4.214	12.938	13.225
June	4.466	4.350	4.291	12.600	13.031
July	4.744	4.321	4.188	13.000	12.563
August	4.580	4.363	4.227	13.375	12.475
September	4.515	4.342	4.215	13.125	12.781
October	4.351	4.341	4.215	13.375	13.175
November	4.330	4.370	4.252	13.538	13.047
December	4.213	......	......	13.166	......
Year	4.200	......	......	13.439	......

New York and St. Louis, cents per pound. London, pounds sterling per long ton.

SPELTER

Month.	New York. 1908.	New York. 1909.	St. Louis. 1908.	St. Louis. 1909.	London. 1908.	London. 1909.
January	4.518	5.141	4.363	4.991	20.563	21.225
February	4.788	4.889	4.638	4.739	20.875	21.563
March	4.665	4.757	4.527	4.607	21.075	21.438
April	4.645	4.965	4.495	4.815	21.344	21.531
May	4.608	5.124	4.458	4.974	19.906	21.975
June	4.543	5.402	4.393	5.252	19.000	22.000
July	4.485	5.402	4.338	5.252	19.031	21.969
August	4.702	5.729	4.556	5.579	19.350	22.125
September	4.769	5.796	4.619	5.646	19.563	22.906
October	4.801	6.199	4.651	6.043	19.750	23.200
November	5.059	6.381	4.909	6.231	20.875	23.188
December	5.137	......	4.987	......	20.625	......
Year	4.726	......	4.578	......	20.163	......

New York and St. Louis, cents per pound. London, pounds sterling per long ton.

STOCK QUOTATIONS

NEW YORK Dec. 1

Name of Comp.	Clg.
Amalgamated	85¼
Anaconda	47½
Balaklala	‡2 1/16
Braden	4⅝
British Col. Cop.	7
Buffalo Mines	3½
Butte Coalition	28
Colonial Silver	½
Combination Fra.	.51
Con. Ariz. Sm.	1⅝
Cum. Ely Mining.	8¼
Davis-Daly	5½
Dominion Cop.	7
El Rayo	2⅛
Florence	2⅞
Foster Cobalt	‡.32
Furnace Creek	‡.06
Giroux	10½
Gold Hill	2
Goldfield Con.	8
Granby	‡101
Guanajuato	2
Guggen. Exp.	238
Hanapah	‡15
Kerr Lake	8
McKinley-Dar.	.81
Miami Copper.	17½
Mines Co. of Am.	⅞
Montezu. of C. R.	9½
Mont. Sho. C.	1½
Nev. Utah M. & S.	1 1/16
Newhouse M. & S.	3¼
Nipissing Mines	10⅞
Old Hundred.	½
Pacific Sm. & M	1¼
Silver Queen	.25
Stewart	⅞
Tennessee Cop'r	37¼
Tri-Bullion	1 1/16
United Copper	8¼
Utah Apex	5⅛
Utah Copper	58
Yukon Gold	5

‡Last quotation.

BOSTON Dec. 1

Name of Comp.	Clg.
Adventure	6
Allouez	57
Am. Zinc	35
Arcadian	5
Arizona Com.	44
Atlantic	11
Boston Con.	18¾
Calumet & Ariz.	103
Calumet & Hecla.	‡680
Centennial	37½
Copper Range	82
Daly-West	8¾
East Butte	11⅞
Franklin	16¼
Greene—Can	11⅛
Hancock	21¾
Isle Royal	25
Keweenaw	3¾
La Salle	16
Mass	6
Michigan	6½
Mohawk	61½
Nevada	27
North Butte	62¼
Ohio Copper	5 1/16
Ojibway	10
Old Dominion	.53
Osceola	157½
Parrot	28¾
Quincy	86
Rhode Island	10½
Shannon	15¾
Superior	61½
Superior & Bost.	14
Superior & Pitts.	15⅞
Tamarack	65
Trinity	11
U. S. Smg. & Ref.	53
U S Sm. & Re., pd	52½
Utah Con	44½
Victoria	3½
Winona	8¼
Wolverine	145
Wyandotte	2½

‡Last quotation

N. Y. INDUSTRIAL

Am. Agri. Chem.	47
Am. Smelt. & Ref.	96¼
Am. Sm. & Ref., pf.	110
Colo. Fuel & Iron.	48¼
Federal M. & S., pf.	88
National Lead	87
National Lead, pf.	110¾
Pittsburg Coal	26⅛
Republic I. & S.	45
Republic I. & S., pf.	105½
Sloss-Sheffield	86½
Standard Oil	‡674
U. S. Steel	86½
U. S. Steel, pf.	123
Va. Car. Chem.	46¾

BOSTON CURB

	Low.
Ahmeek	215
Chemung	15
Chino	8⅛
Gila	8¾
Indiana	8⅜
Mason Valley	1⅞
Ray Central	2½
Ray Con	20½
San Antonio	9
Yuma	1¼

Furnished by Hornblower & Weeks, N. Y.

ST. LOUIS Nov. 27

N. of Com.	High.	Low.
Adams	.40	30
Am. Nettie.	.09	07
Center Cr'k	2.00	1 80
Cent. C. & C.	86 00	85 00
C. C. & C. pf.	85.00	84.00
Cent. Oil	110.00	100 00
Columbia	9.00	7 00
Con. Coal	18.00	17 00
Doe Run	110.00	100 00
Gra. Bimet.	.30	.25
St. Joe.	12 50	11 00

LONDON Dec. 1

Name of Com.	Clg.
Dolores	£1 10s 0d
Stratton'sInd.	0 3 3
Camp Bird	1 7 3
Esperanza	2 15 6
Tomboy	0 18 9
El Oro	1 5 9
Oroville	0 9 9

Cabled through Wm. P. Bonbright & Co., N. Y.

NEVADA STOCKS. Dec. 1.

Furnished by Weir Bros. & Co., New York.

Name of Comp.	Bid.
COMSTOCK STOCKS	
Belcher	1.00
Best & Belcher	.58
Caledonia	.36
Chollar	27
Comstock	‡.33
Con. Cal. & Va.	.89
Crown Point	95
Exchequer	‡ 43
Gould & Curry	.25
Hale & Norcross	.48
Mexican	1.35
Ophir	1.55
Overman	55
Potosi	.56
Savage	.47
Sierra Nevada	51
Union	57
Utah	09
Yellow Jacket	1 00
TONOPAH STOCKS	
Belmont	.62
Extension	.47
Golden Anchor	...
Jim Butler	.10
MacNamara	.27
Midway	.15
Montana	.80
North Star	.02
Tono'h Mine of N.	6.50
West End Con.	24
GOLDFI'D STOCKS	
Adams	.01
Atlanta	11
Blue Bell	.02
Booth	09
C.O.D. Con	.06
Columbia Mt.	.06
Comb. Frac.	.49
Cracker Jack	.01
Dia'dfield B. B. C.	.01
Florence	2.62½
Goldfield Belmont	.04
Goldfield Daisy	.08½
Great Bend	03
Jumbo Extension	12
Kendall	02
Lone Star	.02
May Queen	.04
Oro	.03
Red Hill	.03
Sandstorm	.05

Name of Comp.	Bid.
Silver Pick	.08
St. Ives	.05
Triangle	.01
BULLFROG STOCKS	
Gibraltar	.02
Homestake King	.01
Mont. Shoshone C.	1.37½
Tramp Cons.	.04
MISCELLANEOUS	
Cumberland Ely.	8.18¾
Giroux	10.50
Greenwa'r Copper	.07
Nevada Con.	26.87½
Nevada Hills	.70
Nevada Smelting.	.87½
Nevada Wonder	.70
Nevada-Utah	1.12½
Penn-Wyoming	...
Pittsburgh S. Pk.	.64
Ray Central	2.25
Ray Con	20.50
Round Mt. Sphinx	05

COLO. SPRINGS Nov. 30

Name of Comp.	Clg.
Acacia	.07¾
C. C. Con.	.02⅞
Doctor	.08
Elkton	.71½
El Paso	.63
Findlay	.10
Gold Dollar	‡.13
Gold Sovereign	‡.04¼
Isabella	19½
Jack Pot	‡.08
Jennie Sample	.07¾
Jerry Johnson	.08½
Lexington	‡.01¾
Mary McKinney	.49
Old Gold	‡.04
Pharmacist	.03½
Portland	.83
U. G. M.	.07⅞
Vindicator	.70
Work	‡.06

Assessments

Company.	Delinq.	Sale.	Amt.
Alpha, Nev.	Nov. 11	Dec. 7	$0.05
Arcadian Copper, Mich.	......	Mar 1	0.50
Camp Bird Min. Co., Colo	Dec. 13	...	0.002
Chemung Copper, N. M.	Jan 1	Jan. 2	1.00
Con. Virginia, Nev.	Dec 20	Jan 10	0 25
Crown Point, Nev.	Nov. 30	Dec 20	0.10
Exchequer, Nev.	Dec 15	Jan 5	0.05
Hancock Min. Mich.	...	Feb. 8	1.00
Mexican, Nev.	Dec 6	Dec 29	0.10
Mineral Flat, Colo	Dec. 11	Jan. 6	0.01
Missoula Copper, Ida	Oct. 4	Dec 6	0.01
Mountain Deb. Con., Utah	Dec 21	Jan 10	0 01
Potosi, Nev	Nov. 12	Dec 6	0.10
Seven Troughs Mon., Utah.	Nov 22	Dec 11	0.00½
Sheridan, M. & M., Ida.	Nov 20	Dec 20	0.002
Silver Hill, Nev	Dec 23	Jan 14	0.05
Selnh, M. & M. Ida.	Nov 20	Dec 14	0.002
Union Con., Nev.	Dec 22	Jan 13	0 10
Utah Head, Utah	Feb 1	Feb 20	0 00
Winona, Mich	Dec 1	Jan 1	1 00
Yellow Jacket, Nev	Nov. 18	Dec 22	0 10

CHEMICALS, MINERALS, RARE EARTHS, ETC.—CURRENT WHOLESALE PRICES.

ABRASIVES—
Carbons, good drill quality, carat $50.00@75.00
Carborundum, f.o.b. Niagara Falls, powd. lb. .08
Grains " .10@.17
Corundum " .07@.10
Crushed Steel, f.o.b. Pittsburg " .05¾@.06
Emery, in kegs, Turkish flour " .01¾@.02
Grains " .03¼@.04
Naxos flour " .01¾@.02
Grains " .03¼@.04
Chester flour " .01½@.02
Grains " .03½@.04
Peekskill flour, f.o.b. Easton, Pa. " .01¼@.01¾
Grains, in kegs " .02¾@.03
Garnet, per quality . sh. ton. 25.00@35.00
Pumice Stone, Am. Powd., 100 lb. 1.60@2.00
Italian, powdered . per lb. .01¾@.01¾
Lump, per quality " .05@.30
Rottenstone, ground " .02@.04
Lump, per quality " .05@.30
Rogue, per quality " .05@.30
Steel Emery, f.o.b. Pittsburg " .07½@.07¾

ACIDS—
Acetic 28% lb. .02½
Boric " .07
Hydrofluoric, 30% " .02¾@.03¼
" 48% " .06
" 52% " .06½
" 60% " .10
Hydrochloric acid, 20° per 100 lb. 1.15@1.50
Nitric acid, 38° per lb. .04½@.04½
Sulphuric acid, 50°, bulk per ton. $12 up
60°, 100 lb. in carboys. .85@1.12½
60°, bulk, ton 16.00@18.00
66°, 100 lb. in carboys. 1.00@1.10
66°, bulk, ton 18.00
Oxalic per lb. .07½@.08

ALCOHOL—Grain 95% gal. 2.61
Denatured " .42@.44
Refined wood, 95@97% " .52@.57

ALUM—Lump 100 lb. $1.75
Ground " 1.85
Chrome Alum " .03¾@.04½

ALUMINUM—Sulphate, com'l. lb. 1.50@1.75

AMMONIA—24 deg. lb. .04½@.05½
" 26 deg. lb. .04½@.05¾

AMMONIUM—
Bromide lb. .28
Carbonate " .07¾@.09¼
Muriate gram " .05¾@.06¼
Lump " .09¼@.09½
Sulphate, 100 lb. " 2.60@2.65
Sulpho-cyanide com. .30
" " chem. pure .40

ANTIMONY—needle, lump . lb. .04@.04½

ARSENIC—white " .02¾
Red, Outside brands " .06@.07
Saxony " .07½@.08

ASPHALTUM—
Barbadoes per ton. 50.00@80.00
West Indies " 20.00@60.00
Egyptian lb. .11@.16
Gilsonite, Utah ordinary per ton. 32.00@40.00
Trinidad " 20.00@25.00
California per ton. 25.00@30.00

BARIUM—
Carb. Lump, 80@90% lg. ton. 30.00@35.00
Precipitated, 96@98% " 34.00@36.00
Powdered, 80@90% lb. .02@.02½
Chloride com'l sh. ton. 35.00@38.00
Nitrate powdered, in casks lb. .05@.06½
Blanc Fixe, dry, bbl per lb. .02¾@.03½

BARYTES—
Am. Ground sh. ton. 12.00@15.00
Floated " 17.00@19.00
Foreign floated " 20.00@23.00

BLEACHING POWDER—35% 100 lb. 1.40@2.00

BLUE VITRIOL—(copper sulphate) carload, per 100 lb 4.00@4.20

BONE ASH lb. .02½@.04

BORAX, sacks " .04½@.05

CALCIUM—Acetate gray, 100 lb. 1.85@1.92½
Carbide, ton lots f.o.b. Niagara Falls, N. Y., for Jersey City, N. J. sh. ton. 65.00
Chloride, f.o.b. N. Y. " 11.00@14.10

CEMENT—
Portland, Am. 500 lb bbl 1.50@1.60
Foreign " 2.25@2.90
" Rosendale, 300 lb " .85
Lime specks " .65
Slag cement " .75@1.25

CHROME ORE—
New Caledonia 50° ex. ship N. Y. per lg. ton. 14.00@16.00
Brooks, f.o.b. Pittsburg, per M. 175.00

CLAY, CHINA—Am. common ex dock, N. Y. ton 7.00@10.00
Foreign " 10.00@20.00

COBALT—Oxide lb 1.10@1.75

COPPERAS—Bulk 100 lb. $0.55
In bbls " .65@.80
In bags " .60@.75

CRYOLITE (carload) lb. .06@.07

FELDSPAR—Ground . sh. ton. 12.50@14.00

FIRE BRICK—
American per M. 30.00@40.00
Imported " 30.00@45.00
St. Louis " 16.00
Extra " 20.00@23.00
Special extra " 30.00@35.00

FIRE CLAY—F.o.b. St. Louis.
St. Louis, extra quality per ton. 5.00
" ordinary " 2.50

FLUORSPAR—
Domestic f.o.b. shipping port:
Lump lg. ton. 8.00@10.00
Ground " 12.00@14.00
Foreign crude ex. dock " 8.50

FULLER'S EARTH—Lump, 100 lb. .80@.85
Powdered " .80@.85

GRAPHITE—Ceylon.
Flying dust, finest to best lb. .02@.04
Dust " .02½@.05
Chip " .04@.08
Lump " .05½@.12
Large lump " .08¼@.10½

GYPSUM—
Fertilizer sh. ton. 5.00
Ground " 4.00@7.00

INFUSORIAL EARTH—
Ground Am. Best lb. .01½@.02½
German " .02¼@.02¾

LEAD—Acetate (sugar of) brown, lb. .07¾@.08
Nitrate, com'l " .07¼@.08½

MAGNESITE—Greece.
Crude (95%) lg. ton. 7.50@8.50
Calcined, powdered sh. ton. 26.00@37.00
Brick, domes, per qual. f.o.b. Pittsburg M. 160@200

MAGNESIUM—
Chloride, com'l 100 lb. .90@1.25
Sulphate (Epsom salt) 100 lb. .90@1.00

MANGANESE—
Foreign, crude, powdered:
70@75% binoxide lb. .01@.01½
75@85% binoxide " .01½@.01¾
85@90% binoxide " .01¾@.04
90@95% binoxide " .06½
Ore, 80%-85% sh. ton. 16.00@32.50

MARBLE—Flour sh. ton. 8.50@9.00

MINERAL WOOL—
Slag, ordinary sh. ton. 19.00
Selected " 25.00
Rock, ordinary " 32.00

MONAZITE SAND—
Guar. 97%, with 5% Thorium oxide, normal lb. .08 and up

NICKEL—
Oxide, crude, lb. (77%) for fine metal contained .47
Sulphate, single lb. .09@.11
Sulphate, double " .06½@.08

NITRATE OF SODA—
100 lb. 95% 2.07½
95°, for 1910 2.07½
96°, is 2½@7½c. higher per 100 lb.

OZOKERITE—best lb. .14@.17

PAINTS AND COLORS—
Litharge, Am. powdered lb. .05½@.06½
English glassmakers' " .08½@.09½
Lithopone " .05½@.07
Metallic, brown sh. ton 16.50@22.00
Red " 14.00@18.00
Ocher, Am. common " 8.50@9.00
Best " 16.00
Dutch, washed lb .02½@.03
French, washed " .01½@.02
Paris green, pure, bulk " 17½@.20½
Red lead, American " .06@.06½
Foreign " .08½@.09½
Turpentine, spirits bbl, per gal .88@.90
White lead, Am., dry lb .05¾@.05¾
American, in oil " .06½@.07
Foreign, in oil " .07½@.09¾
Zinc white, Am. extra dry " .05½@.05¾
French, process, sealed, dry " .06¾@.07½
French, process, green seal, dry " .07½@.10½

PHOSPHATES—Acid .55@.60c per unit
*Fla., hard rock 77 6.50@9.00
land pebble 68 3.75@4.00
†Tenn., 78@80% 5.00@5.50
75% 4.75@5.00
68@72% 4.25@4.50
‡So. Car. land rock 60% 3.50@4.00

*F.o.b. Florida or Georgia ports †F.o.b. Mt. Pleasant. ‡On vessel Ashley River, S. C.

POTASSIUM—
Bicarbonate crystal lb. $.07½
Powdered or granulated " .08
Bichromate, Am. " .07½@.08
Scotch " .10¾
Bromide " .20
Carbonate (80@85%) " .03¾@.04
Caustic, ordinary " .06½@.06¾
Elect. (90% KOH) " .06
Chlorate (muriate), 100 lb. 1.90
Chlorate, powdered " .09¼@.09¾
Crystals " .09@.09½
Cyanide (98@99%)
Carloads (30,000 lb.) " 18c.
5-ton lots " 18½c.
Less than 5 tons " .20@.22½
Kainite, long ton, bulk, 8.50; bags, 9.50
Permanganate lb. .09½@.10½
Prussiate, yellow " .13@.13½
Red " .30@.33
Sulphate (basis 90%) 100 lb. 2.18@2.21

PYRITE—
Domestic, non-arsenical, furnace size, f.o.b. mines per unit. 11@11½c.
Domestic, non-arsenical, fines, per unit, f.o.b. mines 10@10½c.
Imported, non-arsenical, furnace size, ex-ship, per unit .12@.12½
Imported, arsenical, furnace size, ex-ship, per unit .11½@.12
Imported fines, arsenical, ex-ship, per unit .09
Imported fines, non-arsenical, ex-ship, per unit 10½@11c.
Pyrite prices are per unit of sulphur. A deduction of 25c. per ton is made when ore for furnace is delivered in large lumps.

SALT—N. Y. com. fine 280 lb. bbl. .72@1.13
N. Y. agricultural sh. ton. 3.80@4.50

SALTPETER—Crude 100 lb. 4.00@4.50
Refined, crystals " 5.50@7.00

SILICA—
Ground quartz, ord'ry lg. ton. 10.00@15.00
Silex, ground " 13.00@15.00
Silex, floated " 35.00@40.00
Lump quartz " 5.00@5.50
Glass sand " 2.75

SILVER—Nitrate, crystals oz. .33½@.36¾

SODIUM—Acetate lb .04½@.05
"Alkali," per 100 lb., 58/48 .80@.87½
Bicarb. soda, per 100 lb 1.00@1.30
Soda, caustic, per 100 lb., 78/60 1.80@2.00
Soda, caustic, powdered .02½@.03
Salt cake, per 100 lb., bulk .40 up
Salt cake, bbl .65@.85
Soda, monohydrate, per lb. 1.40@1.75
Bichromate lb. .05½@.06½
Bromide " .20
Chlorate, com'l " .08½@.09½
Cyanide, 120-130% KCN, per 100%
Carloads (30,000 lb.) lb. 18c.
5-ton lots " 18½c.
Less than 5 tons " 19c.
Hyposulphite, Am. 1.30@1.50
Phosphate 100 lb. 2.20@2.50
Prussiate " .08½@.09
Sal soda, f.o.b., N. Y. .65@.75
Foreign, f.o.b., N. Y. " .80@1.00
Silicate, com'l " .65@1.00
Sulphate, com'l (Glauber's salt) 100 lb. .60@.80
Sulphate, com'l, calcined .65@.85

STRONTIUM—Nitrate lb. .07½@.08

SULPHUR—Louisiana (prime) to New York lg. ton. 22.00 up
To Boston, Philadelphia or Baltimore " 22.50 up
Roll 100 lb. 1.85@2.15
Flour " 2.00@2.40
Flowers, sublimed " 2.20@2.60
Sicilian, extra qual., unmixed seconds, crude brimstone to New York lg. ton. $22.00
Other ports " 22.50

TERRA ALBA—Fr. & Eng. 100 lb. .80@1.00

TALC—Domestic sh. ton 15.00@20.00
French " 18.00@25.00
Italian, best " 30.00@40.00

TIN—Bi-chloride, 50% lb. .09½
Crystals " .21½@.22½
Oxide, lb. " .35@.40

URANIUM—Oxide " 3.50@4.25

ZINC—Chloride sol., com. 20° " .02½
Chloride, granular " .04½
Dust " .06½
Sulphate " .02½@.02½

Note These quotations are for ordinary wholesale lots in New York unless otherwise specified, and are generally subject to the usual trade discounts. In the cases of some of the important minerals, such as phosphate rock, pyrites and sulphur, in which there are well established markets, the quotations fully represent the latter. But in the cases of some of the minor mineral products, the quotations represent what dealers ask of consumers and not what producers can realize in selling their output as matters of private contract.

THE MINING INDEX

The editors of this paper read all the important publications of the world that relate to mining and the treatment of minerals. This index is published as a reference for all interested and to make it impossible for readers of the ENGINEERING AND MINING JOURNAL to miss any important article published anywhere.

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No accounts can be opened for these small amounts, but remittance must be sent with order. For the convenience of those making small but frequent remittances, coupons are furnished at the following prices: 20 cents each, six for $1.00, thirty-three for $5.00 and one hundred for $15.00. This arrangement will be especially appreciated by foreign readers and men in distant mining camps. Where remittances are made in even dollars we will return the excess over an order in coupons upon request.

ALUMINUM.

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AMMONIA AND AMMONIUM SULPHATE.

11032—AMMONIA — The Development of the Ammonia Industry in Gas Works During the Last Fifty Years. H. W. Hilgenstock. (Chem. Engr., Sept., 1909; 7 pp., illustrated.) 40c.

11033—AMMONIA RECOVERY at Gas Works. J. S. Unger. (Gas Engrs.' Mag., Sept. 15, 1909; 2 pp.) 40c.

11034—SULPHATE OF AMMONIA—Experiences with a Small Sulphate of Soda Plant. H. W. Saville. (Gas Engrs.' Mag., Sept. 15, 1909; 1½ pp., illustrated.) 20c.

ASBESTOS.

11035—CANADA—The Production of Asbestos in Canada, Calendar Years 1907-8. John McLeish. (Canada Dept. of Mines, 1909; 5 pp.)

11036—QUEBEC—The Asbestos Industry of Quebec, Canada. Alexander Gray. (Min. Journ., Nov. 6, 1909; 1¾ pp.) 40c.

11037—WYOMING ASBESTOS DEPOSITS and Mills. Arthur Lakes. (Min. Sci., Oct. 28, 1909; 2⅓ pp., illustrated.) 20c.

ASPHALTUM.

11038—CHEMICAL EXAMINATION of Asphaltic Material. S. W. Parr, B. Mears and D. L. Weatherhead. (Journ. Ind. and Eng. Chem., Nov., 1909; 3¾ pp.) 60c.

BORAX.

11039—CHILE—The Borate Fields of Chile. (Chem. Trade Journ., Oct. 23, 1909; 2 pp., illustrated.) 40c.

CEMENT.

11041—HISTORY—A Brief History of Cements, Including Portland Cement. I. C. Johnson. (Cement Rec. Co., 1909; 27 pp., illustrated.) 60c.

11042—SLAG CEMENT—The Manufacture of Portland Cement from Blast Furnace Slag at the Coltness Iron Company's Works. (Iron and Coal Tr. Rev., Oct. 29, 1909; 2 pp., illustrated.) 40c.

CHROMIUM.

11043—CANADA—The Production of Chromite in Canada, Calendar Years 1907-8. John McLeish. (Canada Dept. Mines, 1909; 4 pp.)

COAL AND COKE.

11044—BRIQUETTED COAL — Comparative Tests of Run-of-Mine and Briquetted Coal on the Torpedo Boat Biddle. Walter T. Ray and Henry Kreisinger. (U. S. Geol. Surv., Bull. 403, 1909; 44 pp., illustrated.)

11045 — ALABAMA — The Coosa Coalfield of Alabama. W. F. Prouty. (Eng. and Min. Journ., Nov. 6, 1909; 2 1/3 pp., illustrated.) 20c.

11046—COAL DUST—The Barometric and Temperature Conditions at the Time of Dust Explosions in the Appalachian Coal Mines. (Trans. A. I. M. E., Sept., 1909; 12 pp.)

11047—COAL LOADING ELEVATORS —Bekohlanlage mit Becherwerk. C. Guillery. (Zeit. d. Vereines deutscher Ingenieure, Oct. 16, 1909; 2½ pp., illustrated.)

11048—COAL SHIPMENT and the Laying out of Staithe Heads, with Special Reference to Anti-breakage Appliances. John Kirsopp. (Trans. No. of Eng. Inst. Min. and Mech. Engrs., July, 1909; 116 pp., illustrated.)

11049—COAL SHIPMENT—A Short Description of the Various Types of Coal Cargo Steamers and of Doxford's New Self-Discharging Steamer. John Kirsopp. (Trans. No. of Eng. Inst. Min. and Mech. Engrs., Aug., 1909; 29 pp., illustrated.)

11050—COAL WASHING—Bituminous Coal Washing. Lee Fraser. (Mex. Min. Journ., Nov., 1909; 2 pp.) 20c.

11051—COKE—Making Smokeless Fuel from Western Coal. R. S. Moss. (Min. Wld., Nov. 13, 1909; 2¼ pp.) 20c.

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11053—COKE OVEN—The Mitchell Patent Coke Oven. John Fulton. (Mines and Minerals, Nov., 1909; 5½ pp., illustrated.) 20c.

11054—COKE OVEN BY-PRODUCTS—Die direkte Gewinnung des Ammoniaks aus koksofengas. G. Hilgenstock. (Stahl u. Eisen, Oct. 20, 1909; 4½ pp., illustrated.) 40c.

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11056—COLORADO—Mining Coal in Southern Colorado. K. S. Guiterman. (Eng. and Min. Journ., Nov. 20, 1909; 7 pp., illustrated.) 20c.

11057—CONSERVATION OF COAL in the United States. E. W. Parker. (Trans. A. I. M. E., Sept., 1909; 7½ pp.)

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11059—ELECTRICITY in the Collieries of Messrs. Arch. Russell, Limited. (Iron and Coal Tr. Rev., Nov. 5, 1909; 1 2/3 pp., illustrated.) 40c.

11060—ELECTRICITY—The Safe Use of Electricity in Coal Mining. Sydney F. Walker. (Eng. and Min. Journ., Oct. 30, 1909; 1 1/3 pp.) 20c.

11061—FIRE DAMP—The Detection of Firedamp. (Min. Eng., Nov., 1909; 2 pp., illustrated.) A proposed method adaptable to ordinary miners' lamps. 20c.

11062—FUEL IN LOCOMOTIVES—The Utilization of Fuel in Locomotive Practice. W. F. M. Goss. (U. S. Geol. Surv., Bull. 402, 1909, 23½ pp., illustrated.)

11063—ILLINOIS COAL — Fuel Tests with Illinois Coal. L. P. Breckenridge and Paul Diserens. (Bull., Univ. of Ill., Dec. 22, 1908, 52½ pp., illustrated.) Compilation from tests made by the Technologic Branch of the U. S. Geological Survey at the St. Louis Fuel Testing Plant.

11064—PEAT—A Résumé of Some Recent Developments in Peat and the Fuel Question. (Elec. Rev., Oct. 30, 1909; 2 1/3 pp., illustrated.) 20c.

11065—PERU—The Coal Deposits of Peru. (Eng. and Min. Journ., Nov. 13, 1909; ⅔ p.) 20c.

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11078—UNITED STATES—Les Mines de Houille aux Etats-Unis. Victor Watteyne. (Rev. Univ. des Mines, Sept., 1909; 36 pp., illustrated.)

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COPPER.

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11240—STAMP MILLING—The Development of Heavy Gravitation Stamps. W. A. Caldecott. (Bull. I. M. M., Nov. 11, 1909; 10½ pp.) Discussion of paper previously indexed.

11241—TAILINGS DISPOSAL—Handling Stamp Mill Tailings by Belt Conveyers. (Eng. News, Oct. 28, 1909; 1½ pp., illustrated.) Deals with the practice in the Lake Superior copper district. 20c.

11242—UNITED STATES AND MEXICO—Ore Dressing in the United States and Mexico. H. A. Guess. (Eng. and Min. Journ., Oct. 30 and Nov. 13, 1909; 15½ pp., illustrated.) Paper read before Colo. Sc. Soc. 20c.

METALLURGY—GENERAL.

11243—CHLORINATION. Dry Chlorination in Metallurgy. J. Weisz and W. A. Wasey. (Min. Sci., Oct. 28 and Nov. 4, 1909; [illegible] pp.) [illegible]

11244—ELECTROMETALLURGY. Fortschritte in der Elektrometallurgie des Jahres [illegible]. Franz Peters. (Gluckauf, Oct. 30, 1909; 7½ pp., illustrated.) [illegible]

11246—FLUE GASES—The Dilution of Flue Gases. Walford Yorke. (Power, Sept. [illegible]; 1¼ pp., illustrated.) 20c.

11247—INDUSTRIAL PLANTS—The [illegible] and Building of Industrial Plants. [illegible] (Eng. Mag., Nov., [illegible])

11248—QUEENSLAND SMELTING WORKS—Report on the Establishment of State Smelting Works in Queensland [illegible] Mines, [illegible]

11249—[illegible]

11250—[illegible]

MINING AND METALLURGICAL MACHINERY

11251—AIR COMPRESSOR INSTALLATIONS in Mines. P. A. Babb. (Informes y Memorias del Instituto Mexicano de Minas y Metalurgia, No. 2, Oct., 1909; 7 pp.)

11252—AIR COMPRESSORS—Der Kolbenkompressor und der Turbokompressor. J. Ravicek. (Zeit. d. Vereines deutscher Ingenieure, Oct. 30, 1909; 8 pp., illustrated.)

11253—AIR COMPRESSORS — Neure Ausführungen von Kompressoren. E. W. Koster. (Zeit. des Vereines deutscher Ingenieure, Oct. 16 and 23, 1909; 8 pp., illustrated.) Continuation of article previously indexed.

11254—BOILER FIRING — Analytic Control of Boiler Firing by Means of Automatic Gas Analyzers. (West. Chem. and Met., Oct., 1909; 16½ pp., illustrated.) 80c.

11255—BOILER ROOM ECONOMY. William Kavanagh. (Elec. Wld., Nov. 4, 1909; 1 p., illustrated.) 20c.

11256—BOILER SCALE. The Prevention and Removal of Boiler Scale—VI. W. H. Wakeman. (Elec. Wld., Nov. 4, 1909; 1 p., illustrated.) 20c.

11257—COMPRESSOR VALVES—Improvements in Compressor Valves. (Eng. and Min. Journ., Nov. 6, 1909; ⅔ p., illustrated.) 20c.

11258—COOLING TOWERS for Steam and Gas Power Plants with Particular Reference to the Possibilities of the Natural Draft and Auxiliary Draft Type. J. R. Bibbins. (Journ. A. S. M. E., Mid-Nov., 1909; 33½ pp., illustrated.)

11259—CRUCIBLE FURNACES—Notes on the Care of Crucible Furnaces and Character of Fire-Brick to be Used in Them. (Brass Wld., Sept., 1909; 3½ pp., illustrated.) 20c.

11260—ELECTRIC FURNACES—Le Développement du grand Four Électrique. (Journ. du Four Électrique, Oct. 15, 1909; 3 pp., illustrated.) 40c.

11261—GAS ENGINES. M. R. Lamb. (Min. and Sci. Press, Oct. 2, 1909; 2½ pp., illustrated.) 20c.

11263—GAS PRODUCER—The Hill Bituminous Gas Producer. (Iron Age, Nov. 11, 1909; 2¼ pp., illustrated.) 20c.

11264—GAS PRODUCER TESTS—Incidental Problems in Gas Producer Tests. R. H. Fernald, C. D. Smith, J. K. Clement and H. A. Grine. (U. S. Geol. Surv., Bull. 393, 1909; 23 pp., illustrated.)

11265—GRINDING—The Mechanical Preparation of Solids for Chemical Treatment. (Chem. Engr., Sept. and Oct., 1909; 9 pp., illustrated.) 60c.

11266—INTERNAL COMBUSTION ENGINES—Commercial Deductions from Comparisons of Gasoline and Alcohol Tests on Internal Combustion Engines. (U. S. Geol. Surv., Bull. 392, 1909; 33½ pp.)

11267—LOCOMOTIVES—German and American Mining Locomotives. F. C. Perkins. (Can. Min. Journ., Nov. 1, 1909; 1 p., illustrated.) 20c.

11268—LOSS OF HEAT from Uncovered Steam Pipes. W. L. Cathcart. (Cassier's Mag., Nov., 1909; 12 pp., illustrated.) 40c.

11269—LOSS OF HEAT IN PIPES—Der Wärmedurchgang in Rohrleitungen. Wilhelm Nusselt. (Zeit. d. Vereines deutscher Ingenieure, Oct. 23 and 30, 1909; 7½ pp., illustrated.)

11270—LUBRICATING OILS—Efficiency Tests of Lubricating Oils. F. H. Sibley. (Journ. A. S. M. E., Nov., 1909; 9½ pp., illustrated.)

11271—MELTING FURNACES—The Development of Melting Furnaces. L. [illegible] Krom. (Met. Ind., Nov., 1909; 1½ pp., illustrated.)

11272—POWER PLANT WASTE. F. E. Moses. ([illegible] Mag., Oct., 1909; [illegible] pp.) [illegible]

11273—POWER PLANT WASTES. F. E. Moses. [illegible] in fuel, water and maintenance. [illegible]

11274—QUARRY EQUIPMENT. [illegible] Electrically-equipped Quarry and Plant [illegible] at [illegible] (Eng. News, Oct. 14, 1909; [illegible] pp., illustrated.)

11275—STEAM BOILERS. The Care of Small Steam Boilers. W. O. R[illegible] [illegible]

11276—STEAM TURBINES. Exhaust Steam Turbines. [illegible] (Electrician, [illegible] 1909; [illegible] pp., illustrated.) [illegible]

11277—STEAM TURBINES—Exhaust Steam Turbines in Collieries and Rolling Mills. A. P. Chalkley. (Electrician, Oct. 29, 1909; 2½ pp., illustrated.) 40c.

11278—TRANSPORTATION by Electrical Suspended Railway at Copenhagen. A. Gradenwitz. (Eng. and Min. Journ., Nov. 6, 1909; 3 pp., illustrated.) 20c.

11279—TURBINE COMPRESSORS—Betriebsergebnisse von Turbokompressoren. O. Banner. (Stahl u. Eisen, Oct. 27, 1909; 3 pp., illustrated.) 40c.

11280—TURBINE COMPRESSORS—Turbokompressoranlage auf Zeche Sterkrade der Gutehoffnungshütte. Banner. (Glückauf, Oct. 23, 1909; 2¼ pp., illustrated.) 40c.

11281—UNLOADING MACHINERY—Unloading Railroad Cars by Machinery. S. B. Redfield. (Eng. and Min. Journ., Sept. 25, 1909; 3⅓ pp., illustrated.) Describes the McMyler car dumper which is in use at the Hoboken docks of the Delaware, Lackawanna and Western R. R. Co. 20c.

11282—WATER POWER—To Determine the Value of a Water Power. W. T. Ryan. (Power, Oct. 12, 1909; 1⅔ pp., illustrated.) 20c.

ANALYTICAL CHEMISTRY.

11283—ASSAYING—A New Device in Equipment for Electrolytic Assays. F. O. Bacon. (West. Chem. and Met., Sept., 1909; 4 pp., illustrated.) 80c.

11284—ASSAYING—Preparing and Recording Samples for Use in Technical Assay Laboratories. L. D. Huntoon. (Trans. A. I. M. E., Sept., 1909; 9 pp.)

11285—ASSAYING BROKEN HILL ORE—Chemical Notes on Lode Material from Broken Hill Containing Copper, Nickel, Platinum and Platinoid Metals. J. C. H. Mingaye. (Rec., Geol. Surv. of N. S. W., May, 1909; 6 pp.)

11286—CHEMICAL LABORATORIES—Suggestions for the Construction of Chemical Laboratories. A. H. Gill. (Science, Oct. 22, 1909; 4¼ pp.) 20c.

11287—GRAVIMETRIC FACTORS and Their Logarithms. Lester M. Hawk. (Chem. Engr., Aug., 1909; 3 pp.) A table compiled from the atomic weights as reported by the International Committee for 1909. 40c.

11288—METAL ANALYSIS—Fortschritte auf dem Gebiete der Metallanalyse im Jahre 1909. III. T. Döring. (Chem. Zeit., Aug. 3, 1909; 2 pp.) 20c.

11289—ORE ANALYSIS—An Application of Graded Potentials to Ore Analysis. D. F. Calhane and J. C. Woodbury. (Journ. Am. Chem. Soc., Sept., 1909; 2½ pp.) 60c.

11290—STANDARD SOLUTIONS—A System of Standard Solutions. Walter J. Rose. (Aust. Min. and Eng. Rev., Aug. 5, 1909; 2 pp.) Paper before Sci. Soc. of Broken Hill. 40c.

INDUSTRIAL CHEMISTRY.

11292—ATMOSPHERIC NITROGEN—Cyanamid Industry in Canada. W. H. H. Webster. (Am. Fertilizer, Sept., 1909; 2 pp.) 20c.

11293—ATMOSPHERIC NITROGEN—Hydro-Electric Nitrogen Works at Notodden, Norway. (Engineering, Nov. 5, 1909; 2½ pp., illustrated.) 40c.

11294—ATMOSPHERIC NITROGEN—The Innsbruck Plant for Nitric Acid from Air. (Electrochem. and Met. Ind., Oct., 1909; 2¼ pp., illustrated.) 40c.

11295—ATMOSPHERIC NITROGEN—The Manufacture of Air-Saltpeter by the Process of the Badische Anilin and Soda Fabrik. Dr. Schönherr. (Paper before Am. Electrochem. Soc., Oct. 28-30, 1909; 33 pp., illustrated.)

11296—BOILER WATER. Dampfkesselspeisewasser. E. E. Basch. (Zeit. f. angew. Chem., Oct. 1, 1909; 1½ pp.) 40c.

11297—CALCIUM CARBIDE. C. A. [illegible] (Electrochem. and Met. Ind., Oct., 1909; [illegible] pp., illustrated.) A paper before Internat. Congress of Applied Chem., London, 1909. 40c.

11298—CYANAMIDE. État Actuel de la Fabrication de la Cyanamide. (Genie Civil, Aug. 21, 1909; 1½ pp., illustrated.) 40c.

11299—SULPHURIC ACID—Lead Chamber Construction. Frederick J. Falding. (Eng. and Min. Journ., Sept. 4, 1909; 4 pp., illustrated.) 20c.

Mining and Metallurgical Companies—U. S.

Name of Company and Location.		Shares. Issued.	Shares. Par Val.	Dividends. Total to Date.	Dividends. Latest. Date.	Dividends. Latest. Amt.
Alaska, Mexican, g.	Alas	180,000	$ 5	$ 2,400,381	Oct. '09	$0.60
Alaska Treadwell, g.	Alas	200,000	25	10,885,000	Oct. '09	1.00
Alaska United, g.	Alas	180,200	5	657,680	Oct. '09	0.40
Amalgamated, c.	Mont	1,538,879	100	71,557,871	Nov. '09	0.50
Am. Sm.&Ref.,com	U. S	500,000	100	17,000,000	Oct. '09	1.00
Am. Sm. & Ref.,pf.	U. S	500,000	100	32,375,000	Oct. '09	1.75
Am. Smelters, pf. B.	U. S	170,000	100	4,475,000	Dec. '09	1.50
Am. Smelters, pf. B.	U. S	300,000	100	6,732,000	Dec. '09	1.25
Am. Zinc,Lead&Sm.	Kan	80,000	25	280,000	Nov. '07	0.50
Anaconda, c.	Mont	1,200,000	25	45,300,000	Oct. '09	0.50
Arizona Copper, pf.	Ariz	1,266,120	1.20	1,240,933	Nov. '09	0.042
Arizona Copper,com	Ariz	1,519,896	1.20	11,287,228	July '09	0.30
Atlantic, c.	Mich	100,000	25	990,000	Feb. '05	0.02
Bald Butte, g. s.	Mont	250,000	1	1,354,648	Oct. '07	0.04
Beck Tunnel, g. s. l.	Utah	1,000,000	0.10	675,000	Oct. '07	0.02
Bent'a M.&D.,pf.,l.z.	Wis	196,607	1	10,949	Nov. '08	0.01½
Boston & Montana.	Mont	150,000	25	54,300,000	Oct. '09	3.00
Bull. Beck.&Cham.,g	Utah	100,000	10	2,728,400	July '08	0.10
Bunker Hill& Sull.	Ida	300,000	10	11,241,000	Nov. '09	0.15
Butte Coalition, c.s.	Mont	1,000,000	15	2,700,000	Dec. '09	0.25
Calumet&Arizona, c.	Ariz	200,000	10	10,900,000	Dec. '09	1.00
Calumet & Hecla, c.	Mich	100,000	25	110,550,000	Dec. '09	8.00
Camp Gird, g s.	Colo	820,000	5	5,766,650	Oct. '09	0.24
Colorado, l. g. s.	Utah	1,000,000	0.20	1,950,000	Nov. '09	0.08
Columbus Con., c.	Utah	285,540	5	226,832	Oct. '07	0.20
Con. Mercur., g.	Utah	1,000,000	1	3,385,313	Dec. '06	0.02½
Continental, z. l.	Mo	22,000	25	231,000	Oct. '08	0.25
Copper Range Con.	Mich	384,185	100	8,836,255	Oct. '09	1.00
Creede United, g.	Idaho	1,623,000	1	214,053	July '09	0.00½
Daly Judge, g. s. l.	Utah	300,000	1	225,000	April '07	0.37½
Daly West, g. s. l.	Utah	180,000	20	6,039,000	Oct. '09	0.30
De Lamar, g. s.	Ida	80,000	5	835,200	Sept. '06	0.24
Doe Run, l.	Mo	65,749	100	2,053,779	Sept. '09	1.50
Elkton Con., g.	Colo	2,500,000	1	2,429,460	Oct. '09	0.01½
El Paso, g.	Colo	2,450,000	1	1,315,545	Sept. '08	0.01
Fed. Min., com	Idaho	60,000	100	2,708,734	July '09	1.50
Federal M & S., pf.	Idaho	120,000	100	5,171,250	Dec. '09	1.75
Findley, g.	Colo	250,000	1	337,500	Sept. '06	0.01
Florence, g.	Nev	1,050,000	1	630,000	Oct. '09	0.10
Frances-Mohawk, g.	Nev	912,000	1	546,000	Jan. '08	0.05
Gemini-Keystone.	Utah	5,000	100	2,000,000	Aug. '07	10.00
Gold King Con.	Colo	3,750,370	1	1,407,504	May '05	0.01
Goldfield Con., g.	Nev	3,555,967	10	3,551,942	Nov. '09	0.20
Grand Central,g.	Utah	250,000	1	1,321,250	Dec. '07	0.04
Granite g.	Colo	1,650,000	1	230,500	June '09	0.01
Hecla, s. l.	Idaho	1,000,000	0.25	1,900,000	Nov. '09	0.01
Homestake, g.	S. D	218,400	100	25,027,640	Nov. '09	0.50
Horn Silver, g.s.c.z.l.	Utah	400,000	25	5,642,000	Sept. '07	0.05
Imperial, c.	Ariz	500,000	10	300,000	Jpne '07	0.20
Inter'l Nickel, pf.	N Y	89,266	100	2,139,024	Nov. '09	1.50
Iron Blossom, s.l.	Utah	1,000,000	0.10	399,000	Nov. '09	0.08
Iron Silver	Colo	500,000	20	4,150,000	Sept. '07	0.10
Jamison, g	Cal	390,000	10	354,900	July '09	0.02
Jerry Johnson	Cal	1,500,000	1	86,700	Jan. '08	0.01
Kendall, g.	Mont	500,000	5	1,275,000	Oct. '08	0.02
Liberty Bell, g. s.	Colo	130,551	5	228,353	June '09	0.15
Lightner, g.	Cal	102,255	1	253,081	Oct. '06	0.05
Lower Mammoth, g	Utah	190,000	1	57,000	Sept. '07	0.02½
MacNamara, s. g.	Nev	728,341	1	21,850	May '09	0.01
Mammoth, g. s. l.	Utah	400,000	2.50	2,220,000	Mar. '08	0.05
Mary McKinney, g.	Colo	1,309,252	1	867,278	June '09	0.02
May Day, g. s. l.	Utah	800,000	0.25	108,000	Sept. '08	0.01½
Mohawk M. Co.	Mich	100,000	25	1,950,000	July '09	1.00
Mont. Ore Purch.	Mont	80,833	25	9,437,274	Jan. '09	15.00
Nevada Hills, s.g.	Nev	746,000	5	373,000	Dec. '07	0.10
New Century, z.l.	Mo	300,000	1	216,000	Oct. '09	0.01
Newhouse M. & S. c.	Utah	600,000	10	300,000	Sept. '07	0.50
New Idria, q.	Cal	100,000	5	1,434,000	Oct. '09	0.30
New Jersey Zinc	U. S	100,000	100	12,000,000	May '08	4.00
North Butte	Mont	400,000	15	8,600,000	Dec. '09	1.00
North Star, g.	Cal	250,000	10	2,186,080	Sept. '09	4.00
Old Dominion, s.	Ariz	293,215	25	1,147,413	Sept. '09	0.50
Old Dominion,M&Sc	Ariz	162,000	25	850,500	Sept. '09	1.00
Ophir, g. s.	Nev	201,600	3	1,816,360	May '08	0.10
Osceola, c.	Mich	96,150	25	7,997,150	July '09	4.00
Parrot, c. s	Mont	229,850	10	6,807,619	Sept. '07	0.25
Phelps, Dodge & Co.	U. S	44,984,600	1	3,370,095	Sept. '09	0.02½
Portland, g.	Colo	3,000,000	1	8,227,085	Jan. '09	0.01
Quartette, g. s.	Nev	110,000	10	375,000	July '07	0.20
Quincy, c.	Mich	110,000	25	18,890,000	Dec. '09	1.00
Round Mountain, g.	Nev	800,000	1	192,027	Sept '09	0.01
Sacramento, g. q.	Utah	1,000,000	1	225,000	Nov. '06	0.00½
St. Joseph, l.	Mo	1,000,000	10	6,608,357	Sept. '09	0.15
Shannon, c.	Ariz	100,000	10	450,000	July '07	0.50
Silver Hill, g. s.	Nev	108,000	1	81,000	June '07	0.05
Silver King Co't'n,†.	Utah	1,250,000	5	1,490,850	Oct. '09	0.15
Sioux Con., s. l. g.	Utah	746,389	1	672,002	Nov. '09	0.03
Snow Storm, s. l.	Ida	1,500,000	1	802,500	Nov. '09	0.01½
Standard Con., g.s.	Cal	178,394	10	5,191,130	Dec. '08	0.10
Stratton's Independ.	Colo	1,000,000	5	4,895,865	April '06	0.12½
Swansea, g. s. l.	Utah	100,000	5	329,500	Mar. '07	0.05
Tamarack, c.	Mich	60,000	25	9,420,000	July '07	4.00
Tennessee, c.	Tenn	200,000	25	2,306,250	Dec. '08	1.25
Tomboy, g. s.	Colo	300,000	5	2,160,000	June '09	0.48
Tonopah of Nev.	Nev	1,000,000	1	4,950,000	Oct. '09	0.35
Tonopah Belmont.	Nev	1,500,000	1	600,000	April '07	0.10
Tonopah Extension	Nev	943,433	1	283,030	April '06	0.15
Tonopah Midway.	Nev	1,000,000	1	250,000	Jan. '07	0.05
Uncle Sam, g. s. l.	Utah	300,000	1	330,000	Nov. '09	0.02
United States, com.	Utah	351,010	50	2,499,070	Oct. '09	0.50
United States, pf*.	Utah	486,042	50	6,156,896	Oct. '09	1.50
United Cop. com.	Mont	450,000	100	5,962,500	Aug. '07	1.75
United, c. pf.	Mont	50,000	100	1,500,000	May '07	3.00
United, z. l., pf.	Mo.-Kan.	19,550	25	312,782	Jan. '08	0.50
United Verde, c.	Ariz	299,927	10	1,385,322	Mar. '09	0.75
U. S. Red. & Ref.	Colo	39,458	100	1,005,501	Oct. '07	1.50
Utah, g. (Fish Sp'gs)	Utah	100,000	10	323,000	Feb. '09	0.02
Utah Con , c.	Utah	300,000	5	7,800,000	Oct. '09	0.50
Utah Copper	Utah	733,624	10	1,793,587	Sept. '09	0.50
Victoria, l.	Utah	250,000	1	177,000	Mar. '07	0.01
Vindicator Con., g.	Colo	1,500,000	1	2,017,500	Oct. '09	0.03
Wolverine, c.	Mich	60,000	25	5,400,000	April '09	5.00
Work, g.	Colo	1,500,000	1	172,500	July '08	0.01
Yankee Con	Utah	1,000,000	1	182,500	Jan. '07	0.03
Yellow Aster, g.	Cal	100,000	10	958,789	Aug. '07	0.20
Yukon Gold, g.	U S.&Can.	3,500,000	5	350,000	Sept '09	0.10

Divided previous to consolidation. *$1,436,250. †$11,187,500.

Coal, Iron and Other Industrials—United States

Name of Company and Location.		Shares. Issued.	Shares. Par Val.	Dividends. Total to Date.	Dividends. Latest. Date	Dividends. Latest. Amt.
Allis-Chalmers, pf.	U S	161,500	$100	$3,108,875	Feb. '04	$1 75
Amer. Ag.Chem., pf.	U. S	181,530	100	2,292,210	Oct. '09	3.00
American Cement	Penn	200,000	10	1,348,000	July '09	0.30
American Coal	Md	50,000	25	2,572,187	June '09	0.375
Bethlehem Steel, pf.	Penn	150,000	100	900,000	Nov. '09	0.75
Cambria Steel	Penn	900,000	50	9,450,000	Feb. '09	0.75
Central C. & C., com	Mo	51,250	100	2,613,750	April '09	1.51
Central C. & C., pf.	Mo	18,750	100	1,456,562	April '09	1.25
Col.&Hock.C.&I.,pf	Ohio	69,244	100	591,550	Oct. '09	1.50
Consolidated Coal.	Ill	50,000	100	350,000	July '04	1.00
Consolidation Coal.	Md	190,247	100	z17,020,770	July '09	1.50
Crucible Steel, pf.	Penn	244,365	100	9,102,596	Sept. '09	1.50
Empire S. & I., pf.	Penn	25,000	50	933,033	Jan. '09	1.50
Fairmont Coal	W. Va	120,000	100	1,980,000	Jan. '09	2.00
Gen. Chem., com.	U. S	74,103	100	2,445,399	Dec. '09	1.00
General Chem., pf.	U. S	100,000	100	6,555,000	Oct. '09	1.50
International Salt	Penn	182,280	100	911,400	Dec. '06	1.00
Jeff.&Cl'f C.&I., cm	Penn	15,000	100	330,000	Aug. '05	5.00
Jeff. & Cl'f C. & I.,pf.	Penn	15,000	100	937,500	Aug. '09	2 50
Kern River Oil	Cal	60,000	10	84,000	July '08	0.18
Lehigh Coal & Nav.	Penn	382,260	50	16,739,800	Nov. '09	2.50
Maryland Coal, pf.	Md	18,850	100	2,061,122	June '09	2 50
Monon. R. Coal, pf.	Penn	100,000	100	2,324,000	July '08	3950
Nat. Carbon, com.	U. S	55,000	100	715,000	April '08	1.00
Nat. Carbon, pf.	U. S	45,000	100	3,071,259	Nov. '08	1 75
National Lead, com.	N. Y	149,034	100	3,642,789	Jan. '10	1.25
National Lead, pf.	N. Y	119,040	100	18,676,708	Dec. '09	1.75
Nat'l Steel&Wire,pf.	N. Y	25,778	100	631,561	May '06	1.75
New Central Coal	Md	50,000	20	390,000	Nov. '08	0.40
New River Coal, pf.	W. Va	37,617	100	451,405	Nov. '08	1 50
Pacific Coast Borax	Cal	19,000	100	2,086,500	Aug. '05	1.00
Peerless Oil	Cal	92,000	10	711,000	June '08	0.06
Penna. Salt	Penn	60,000	50	1,098,000	Oct. '08	3.00
Penna. Steel, pf.	Penn	165,000	50	8,662,500	Nov. '09	3 50
Phila. Gas, com.	Penn	664,900	50	*24,264,600	Feb. '09	0 75
Phila. Gas, pf.	Penn	120,000	50	2,850,000	Sept. '08	1 25
Pittsburg Cal, pf.	Penn	297,010	100	11,434,962	April '09	1 75
PocahontasC.C.,pf.†	W. Va	28,000	100	336,000	July '09	3 00
Pocah'tasC.C., cm.†	W. Va	45,000	100	†406,800	Oct. '08	3.00
Republic I. & S., pf.	Ill	204,169	100	8,546,400	Jan. '10	1.75
Sloss-Sheffield, com.	Ala	100,000	100	2,153,000	June '09	1.25
Sloss-Sheffield, pf.	Ala	67,000	100	4,338,000	July '09	1.75
Standard Oil	U. S	970,000	100	668,322,000	Dec. '09	10.00
Tenn. C. & I., com.	Tenn	225,536	100	3,583,060	Nov. '07	1.00
Tenn. C. & I., pf.	Tenn	2,840	100	390,040	Nov. '07	2.00
Texas&Pacific Coal	Texas	23,940	100	1,747,620	April '09	1.50
Uni. Metals Selling.	U. S	50,000	100	5,875,000	Jan. '09	5.00
U.S. Steel Corp., cm.	U. S	5,083,025	100	91,785,862	Dec. '09	1.00
U. S. Steel Corp., pf.	U. S	3,602,811	100	250,499,867	Nov. '09	1.75
Va Carolina Ch., pf.	U. S	180,000	100	15,420,869	Oct. '09	2.00
Warwick I. & S.	U. S	148,671	10	517,739	Nov. '08	0.30
Westmoreland Coal	Penn	60,000	50	8,880,000	Oct. '08	2 50

*Since 1894. †Since 1907. ‡Since 1890. z Stock div. $6,130,000 Mar. '09.

Canada, Mexico, Central and South America

Name of Company and Location.		Shares. Issued.	Shares. Par Val.	Dividends. Total to Date.	Dividends. Latest. Date.	Dividends. Latest. Amt.
Amistad y Conc'rdia	Mex	9,600	$ 50	$417,070	April '08	$1.36
Batopilas	Mex	446,486	20	†55,870	Dec. '07	0.12½
British Columbia, c.	B. C	503,000	5	201,200	Sept. '07	0.40
Buffalo, s	Ont	900,000	1	543,000	Nov. '09	0.03
Butters' Salvador, g.	Salv	150,000	5	600,000	April '05	0.25
Cobalt Central, s	Ont	4,761,500	1	187,460	Aug. '09	0.01
Coniagas	Ont	800,000	5	720,000	July '08	0.15
Consolidated M. & S.	B. C	53,552	100	781,880	Oct. '07	1 25
Crow's Nest Pass	B. C	160,000	25	2,018,648	July '07	0 62½
Crown Reserve, s	Ont	1,750,000	1	1,336,000	Dec. '09	0.10
Dolores, g.	Mex	400,000	5	750,000	Nov '09	0.22½
Dominion Coal, com.	N. S	150,000	100	3,300,000	July '09	1 00
Dominion Coal, pf.	N. S	50,000	100	‡630,000	Feb. '08	3.51
Dos Estrellas, g.s.	Mex	300,000	50	3,750,000	Jan. '09	1 00
El Oro, g. s	Mex	1,147,500	5	4,985,000	Nov. '09	0.36
Esperanza, s.g.	Mex	455,000	5	9,895,567	Sept. '09	0.37
Foster Cobalt, s	Ont	1,000,000	1	50,000	Jan. '07	0.05
Granby Con	B. C	135,000	100	3,508,630	Dec. '08	2 00
Greene Con. Copper	Mex	864,000	10	6,137,800	Mar. '07	0.40
Guanajuato	Mex	540,000	5	74,250	Oct. '06	0.07
Guanajuato D., pf.s	Mex	10,000	100	184,456	July '09	3.00
Guggenheim Expl.	Mex	105,000	10	5,535,000	July '09	2 50
Hinco Con., g.s.c.l.	Mex	5,000,000	1	100,000	Feb. '08	0.02
Kerr Lake, s	Ont	600,000	5	1,498,000	Dec. '09	0.35
La Rose Con., s	Ont	1,143,368	5	1,085,598	Oct. '09	0.20
Le Rol, Ltd., g.	B. C	200,000	25	425,000	Dec. '06	0.48
Le Roi No. 2, g	B. C	120,000	25	946,800	Nov. '09	0 48
Lucky Tiger-Com.,g.	Mex	715,000	10	175,250	Nov. '09	0 05
McKinley-Darragh,s	Ont	2,247,692	1	580,000	June '09	0.05
Mex. Con. M. Co.	Mex	240,000	10	660,000	Mar. '08	0.25
Mex. Mill &Trans.pf	Mex	10,500	100	65,888	July '08	3 00
Mines Co. of Am	Mex	2,000,000	1	5,665,000	Nov. '09	0.03
N. Y. & Hond. Ros	C. A	150,000	10	2,552,000	Oct. '09	0.10
Nipissing, s	Ont	1,200,000	5	3,390,000	Oct. '09	0 37½
N.-S. St.&Coal, com.	N. S	9,876	100	1,087,836	April '09	0.15
N.-S. St. & Coal, pf.	N. S	10,000	100	479,130	April '09	2.00
Penoles**	Mex	2,500	100	8,630,000	Dec. '07	20.00
Peñoles M. & M. pf	Mex	10,000	100	258,656	Sept. '09	3 50
Pinguico, pf. s	Mex	20,000	100	360,000	Oct. '09	3.00
Reco, g s	B. C	985,000	1	527,082	April '06	0.02
Right of Way	Ont	199,418	100	294,672	July '09	0 06
Securities Corp., pf	Mex	2,000	100	42,000	July '08	3.50
Silver Queen, s	Ont	1,500,000	1	345,000	Nov. '08	0 05
Temiskaming, s	Ont	2,500,000	1	525,000	April '09	0.06
Tezuntlan Copper	Mex	10,000	100		Dec. '08	1.20
Tilt Cove, s	N. F	80,000	2	195,000	May '08	0 55
Trethewey, s	Ont	945,450	1	526,080	Dec. '09	0 15
Tyee, s	B. C	180,000	5	201,600	Aug. '07	0 63

*Mexican Currency. †Since reorganization. ‡Since August, 1905.

Industrials

W. M. McKee has recently been transferred from the St. Louis office of the Jeffrey Manufacturing Company to take charge of the Chicago office, located in the Fisher building.

The Goulds Manufacturing Company, Seneca Falls, N. Y., has been advised by the directors of the Alaska-Yukon exposition that it has been awarded the highest award at the exposition for its triplex power pumps.

The Denver Engineering Works Company announces the appointment of Walter H. Trask, Jr., as district sales manager at Salt Lake City to succeed Carroll Helmick, resigned. Mr. Trask is a mechanical engineer, a graduate of Massachusetts Institute of Technology and has been a salesman at the company's main office in Denver for the past two years.

Kolesch & Co., 138 Fulton street, New York, is getting up a circular on its Field Book pencil, which is particularly adapted for the use that its name implies, that is, in connection with the field book. The flat shape of this pencil allows it to be laid into the book without breaking the binding. Further, it is handy as a straight-edge for ruling lines. Made of the best quality lead, and of a degree of hardness suitable for such work.

The police and the United States secret-service authorities are investigating an unusual case of counterfeiting brought to their attention recently by the discovery of many spurious coins and an old suit case containing molds and metals in a ditch alongside the Erie railroad tracks. The silver was marked Dodge Manufacturing Company, Mishawaka, Ind., copper hardened. Part of the metal has been used. No dies were found. The police of other cities have been notified of the find.

The National Fire Protection Association's committee on artificial refrigeration recommends that wherever in any system graphite can be used as a lubricant in compression cylinders, that it be done. This especially applies to air compressors used in dense air systems and for air compression for purposes other than refrigeration as the temperature of the compression cylinders undoubtedly rises in some air systems to a point where inflammable vapors may be generated from lubricating oil. Those most advanced in the use of graphite for the above purpose as well as for lubrication generally, advise the use of unctuous, soft, pure graphite.

The Atlas Car and Manufacturing Company has issued catalog No. 1090 showing electric locomotives of different types. The company manufactures a varied line of locomotives and calls attention especially to the steel-plate frames instead of cast iron. The frames of its locomotives are made out of rolled-steel plate two and three in. thick, depending upon the weight. The electrical apparatus of these locomotives is the best and the company offers to quote special prices in order to introduce its locomotives into the mines. Its locomotives are made for trolley or third rail and for any voltage, direct or alternating current. Gauges anywhere from 24 in. to 4 ft. 8½ in. Locomotives from five to 50 tons.

An order for [illegible] 150-hp. three cylinder Foos [illegible] has recently been placed by the [illegible] Company of [illegible], W. Va., [illegible] the Foos Gas Engine Company of Springfield, Ohio. The [illegible] people are [illegible] of gas [illegible] power [illegible] Foos [illegible] manufacturing plants of this nature. The Foos Gas Engine Company is working two shifts to the full extent of its equipment, but is still unable to keep up with orders. A large addition to the plant is anticipated.

The Way's Pocket Smelter Company, South Pasadena, Cal., advises that its exhibit has received the highest award at the Alaska-Yukon-Pacific exposition. Persons returning from Seattle say that the Way's pocket smelter exhibit was one of the features of the mining building. It attracted a great deal of attention and has been visited by thousands of persons from all over the world. Daily demonstrations were made, and the many uses, as well as the many ways of saving money on assays were fully explained. There was always a crowd around this booth, who watched with interest the demonstrations, and none left without being fully convinced that this process was surely the simplest, most economical, yet the most practical method for preliminary testing of ores.

The Cyclone Drill Company, Orrville, Ohio, reports the largest volume of business for the month of November in the history of the company. There is an unusual activity in the purchase of the drilling outfits for all purposes. Among the shipments for the month are the following: Five drilling machines for blast-hole work for the Panama canal; six blast-hole drills for the Rio Tinto Company for railroad construction in Spain; two blast hole drills for the Walsh Construction Company; two blast-hole drills for Boynton, Church & McCoy; one large prospecting outfit for the Mangas Development Company; one core-drilling outfit for Haitii; one blast-hole drill for W. A. Denison for his railroad work in Texas; one prospecting machine for the Southern Development Company; one water-well drill for Snider & Larsen; one prospecting machine for J. D. Pitts; one water-well drill for Francisco Gamaz.

At the meeting of stockholders of the Robins Conveying Belt Company on Wednesday, Oct. 17, the following directors were elected: Senator George B. Agnew; J. T. Atterbury, of the Wall Street firm of Van Emburgh & Atterbury; C. Kemble Baldwin, formerly chief engineer of the company; Harold Binney, of the law firm of Binney, Mastick & Ogden; H. J. Cook, chief auditor of the Equitable Trust Company; Pierre Jay, vice-president of the Bank of the Manhattan Company; Alvin W. Krech, president of the Equitable Trust Company; Albert C. Wall, of Vredenburgh, Wall & Cary, Jersey City; Thomas Robins, the founder of the company. At the stockholders' meeting, the new directors elected the following officers: President, Thomas Robins; vice-president, Pierre Jay; secretary and treasurer, H. J. Cook. The Chicago office of the company will be moved from the Railway Exchange building to the Old Colony building where it will occupy the suite formerly used by the Robins New Conveyor Company. It is understood that a merger of these two companies is being effected.

The Cyclone Drill Company claims it manufactures the most extensive line of drilling machinery in the world. Besides a large number of bulletins [illegible] descriptive of various individual types of machines it publishes the following three [illegible] catalogs. General catalog No. 110, 112 pages, [illegible] and describing [illegible] drills and combination drills, operated by [illegible] steam, gasoline or electric power and [illegible] portable or [illegible] form. [illegible] and [illegible] water tanks, [illegible] and [illegible] drills and [illegible] catalog [illegible] 32 pages, illustrating and describing core drills and [illegible] prospecting and foundation testing. Blast hole catalog B [illegible] pages illustrating and describing the special types of machines designed for contractors and for quarrymen for blasting out material at the very lowest possible cost. Also illustrating and describing wash boring outfits, auger outfits and economy blast hole loaders. Any of the above publications will be sent free upon request.

Following the completion of the main machine-shop addition at the plant of the Dodge Manufacturing Company, Mishawaka, Ind., ground has been broken for an additional warehouse for finished products. For a long time the present warehouse has been inadequate to take care of the volume of business and this condition together with a firm resolve to better the service, is responsible for the new building. The plans call for a structure of reinforced concrete, 256 ft. long by 112 ft. wide, four stories high and a basement, and will cost in the neighborhood of $160,000. The first floor raised to a level with the floor of a freight car, will be used for shipping and inspection purposes, with offices for the general traffic manager and his force. A loading platform will extend the entire length of the warehouse with ample trackage for loading and moving cars with promptness and speed. The Lake Shore & Michigan Southern already has extensive yards at the Mishawaka factory, but connection with the warehouse will be made direct. Suitably placed doors will give access to and from the shipping floor. The basement and the second, third and fourth stories will be confined to the storage of products. Each will have elevator facilities and the whole equipped with the most modern appliances of the day in warehouse construction. In the new warehouse arrangement it will be possible to fill orders for standard goods, such as pulleys, hangers, pillow blocks, collars, couplings, clutches and other transmission machinery in special or carload lots as fast as the railroad company can furnish cars and pull them away.

Trade Catalogs

The Cyclone Drill Company, Orrville, Ohio. Folder. Diamondite core drills. Illustrated, 8 pages, 8x10½ inches.

Witte Iron Works Company, Kansas City, Mo. Catalog. Gas and gasolene engines. Illustrated, 8x10½ inches, 32 pages, paper.

The Jeffrey Manufacturing Company, Columbus, Ohio. Bulletin No. 18. Electric and air power coal cutters. Illustrated, 32 pages, 8x10 inches.

Allis-Chalmers Company, Milwaukee, Wis. Bulletin No. 1618. "Fighting Fires with High-Pressure Streams." Illustrated, 20 pages, 8x10½ inches.

Stromberg-Carlson Telephone Manufacturing Company, Rochester, N. Y. Pamphlets Nos. 20 to 24. Private branch exchange switchboards. Illustrated.

The Atlas Car and Manufacturing Company, Cleveland, Ohio. Bulletin No. 1090. Electric locomotives, trucks and cars. Illustrated, 32 pages, 6x9 inches.

Michigan Wire Cloth Company, Howard and Fourteenth streets, Detroit, Mich. Catalog No. 25. Wire cloth, screens, etc. Illustrated, 190 pages, 4½x7 inches, cloth.

H. B. Sackett Screen and Chute Company, Chicago, Ill. Catalog No. 31. Mine, ore and [illegible] cars, elevators, screens, buckets, etc. Illustrated, 64 pages, 6½x10 inches, [illegible].

Taylor Engineering Company, Allentown, Penn. Bulletin No. 1023. Blake and Dodge crushers. Illustrated, 8 pages, 7x9½ inches. Bulletin No. 1024. Belt conveyers, coal and coke conveyers, screens. Illustrated, 12 pages, 7x9½ inches.

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Smelting Plant of the Butte Reduction Works

A General Outline of the Equipment and the Operation Together with Some Special Features; the Slag Is Used for Culvert Construction

BY A. H. WETHEY*

The first-class ore received for treatment at the Butte Reduction Works is sampled, after crushing, by an automatic sampling device, which was designed by James Doull. This machine is an apparatus whereby the operation of taking one shovelful at regular intervals is as closely duplicated as possible, and has proved highly satisfactory. It is simple but efficient, and has been in use since 1896.

The first-class ore, after being crushed in a 10x20 Blake crusher, passes over a trommel, which separates the coarse from the fine. The coarse material goes direct to the blast furnaces, and the fine material, or screenings, is put through the calcining or desulphurizing furnaces.

There are two blast furnaces, each 42x124 in. at the tuyeres. These blast furnaces were built at the plant.

The calcining department consists of five Wethey furnaces, the structural steel work for which was furnished by the Allis-Chalmers Company, and two MacDougall furnaces. The Wethey furnaces were first adopted in 1894, and have been in continuous operation since. These furnaces have each a capacity of from 70 to 80 tons daily.

The fine ore, after desulphurizing, is trammed to reverberatory matting furnaces. These furnaces are 80 ft. long by 20 ft. wide. The heated gases pass through Worthington boilers, made by the New York Safety Steam Boiler Company. The hot calcines from the desulphurizing furnaces are discharged into hoppers

BUILDING THE SLAG IMPOUNDING WALL AT THE BUTTE REDUCTION WORKS

*General manager for W. A. Clark, Butte, Mont.

located over the top of the matting furnaces, and the material is discharged through spouts leading through the roofs of the furnaces. The methods adopted in this respect are similar to those in use in other plants. The side doors used on these furnaces are, I think, unique, and were designed by James Doull.

The matte from the blast furnaces and from the reverberatory-matting furnaces is taken to the converters in ladles of 10-ton capacity, built by the Midvale Steel Company, Philadelphia.

Electric Converters Used

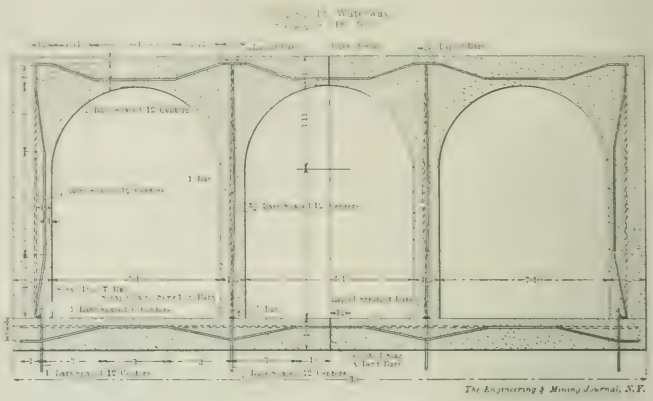
The converting department consists of three stands operated by electricity. In addition, there is a stand on which the shells are placed when newly lined, and the slag from the converters that are running is poured into the newly lined shell and the lining dried by this method. This was patented by H. L. Charles. This method of drying the lining in the converters is found to effect a considerable saving over the old method of using coke and wood.

The electric converters were furnished by the Pneumatic and Mining Machinery Company, Cudahy, Wis. The converters are 8x18 ft. The method of connecting the converters to the flue is by means of a movable hood, designed by Mr. Doull, and is shown in an accompanying drawing. The converters discharge the pig copper, running about 99 per cent. copper, into molds [illegible] operated by an electric [illegible]. The pig copper [illegible] and pickled in the Metals Chemical Company, of Laurel Hill, Long Island. The [illegible] is [illegible] the same [illegible] department.

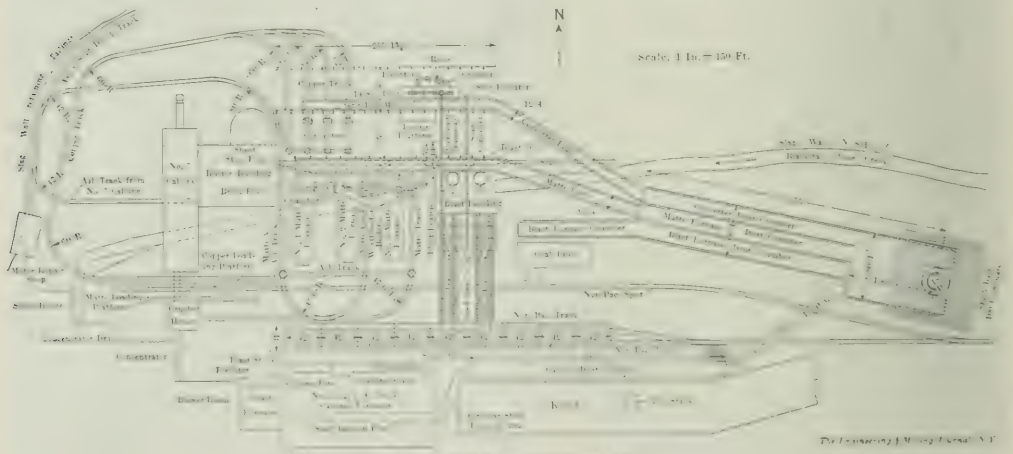
The Mining [illegible] by the Ingersoll-Rand Company, and is [illegible] 19x28x42 in., compound condensing, with air cylinders 42x42 in., furnishing 10,500 cu.ft. free air per minute at 15 lb. pressure.

There is also a 150-h.p. high-pressure Flemming engine, operating a 100-kw. Westinghouse generator, which furnishes the electric power for operating the converters, electric cranes, etc. A compound-condensing Ingersoll-Rand compressor furnishes the air at 100 lb. pressure, which is used around the works generally, and also in connection with the machines for lining the converter shells, and for operating the pneumatic machinery around the converters.

[illegible] used for lining the converters is [illegible] at the [illegible] of Crook, in the Steel Storm Mining Company, in Lyons, Idaho. [illegible] department is [illegible] a Blake crusher and Cornish rolls, and is mixed in a clay mill with a sufficient amount of clay to make it set properly when tamped into the converter shells. The converter shells are first lined with magnesite brick, furnished by the Harbison-Walker Refractories Company, Pittsburg. The shells are then lined with the mixed ore and clay to a thickness of 20 in., and tamped solidly into place with Ingersoll-Sergeant tamping machines.



REINFORCED SLAG CULVERT



PLAN OF THE FLUE [illegible] WORKS

No Underground Flues

There is an extensive system of flues and chambers for collecting the flue dust [illegible] from the various furnaces and converters, with a reinforced-concrete stack 18 ft. in diameter throughout and 352 ft. high, built by the Weber Steel Concrete Chimney Company, Chicago. This stack has been in constant service for over three years, and shows no signs of wear. Plans of the flues and stack accompany this article. The [illegible] dust chambers have an

internal area of 700,000 cu.ft. The calcine auxiliary chamber has an internal area of 75,000 cu.ft. The calcine balloon flue is 10x15x180 ft. long. The converter balloon flue is 10x15x425 ft. long. The matte furnaces are connected by a brick flue 14x10x400 ft. long. All flues and dust chambers are elevated above the surface so as to make them easily accessible underneath for collecting their contents. There is no underground flue in the plant.

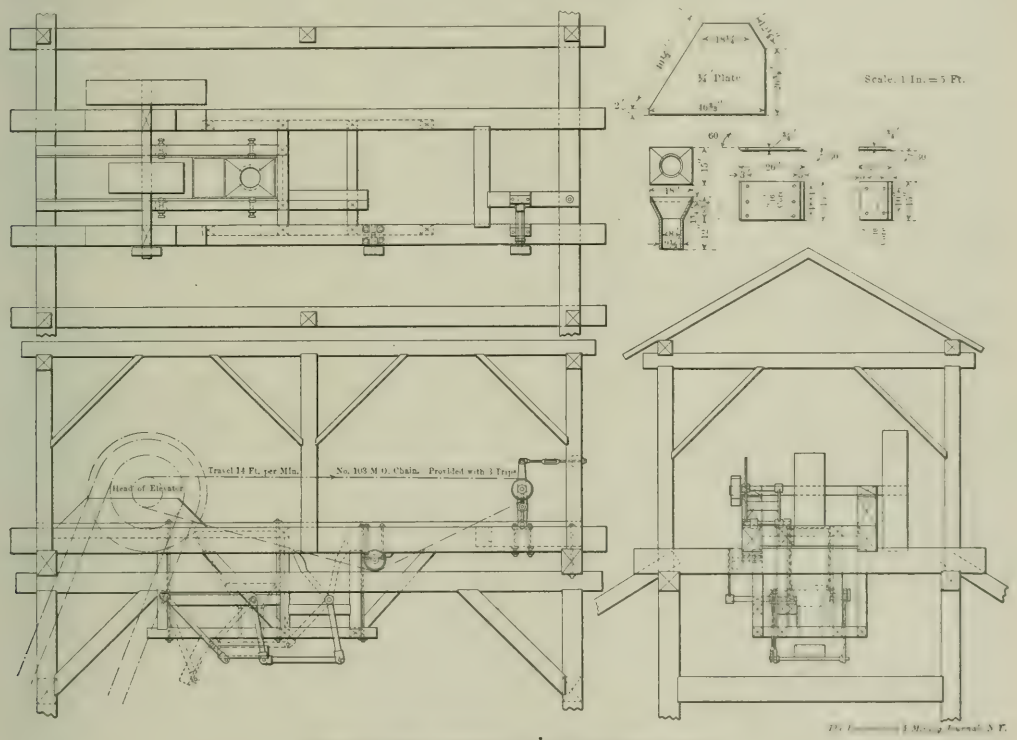
Reinforced Slag Construction

The plant is situated on the banks of Silver Bow creek. The ground here is level and considerable care has had to be taken to prevent the slag from the furnaces and the tailings from the concentrator from encroaching on the creek. In order to do this, cast-iron plates are put up along the creek and the molten slag poured in between them, and as they fill they are moved until a solid wall formed from molten slag is constructed on each side of the creek.

The tailings from the concentrator commenced encroaching upon the creek also, and to protect it a flume was built of reinforced-steel concrete. This was expensive construction, costing about $70 per lineal foot. During the last year another section has been built of molten slag in connection with steel reinforcement, as shown by an accompanying design. This method of construction is much cheaper than the concrete culvert. The concrete culvert was designed by Mr. Tilton, chief engineer of the San Pedro railroad, while the slag culvert was designed by Mr Doull.

The new Venezuelan mining law requires that all powers of attorney made in the United States for use in Venezuela should be certified in order by: (1) An officer having a seal; (2) by the secretary of state in the State where made as to the competency of the acknowledging officer; (3) by the Secretary of State of the United States as to the signature of the secretary of state of the State; (4) by a diplomatic or consular officer of Venezuela, certifying that the signature of the Secretary of State of the United States is his usual signature. Then same must be presented at the ministry of foreign relations of Venezuela for authorization.

The foundation stone of the radium works which is being built in Thomas street, Burdett road, East London, was laid on Oct. 14. The factory is being erected to treat the pitchblende found at the Trenwith mine in Cornwall.



CRUSHER-HOUSE SAMPLER AT BUTTE REDUCTION WORKS

Physiological Effects of High Temperature and Humidity

By George J. Young.*

Much has been written regarding the effects upon the human system of poisonous and other gases, but very little is to be found in mining literature concerning high temperature and humidity. Le Neve Foster says: "In still and saturated air it is hardly possible for men to do continuous work above 90 or 95 deg. F., even when stripped to the waist. At higher temperatures in saturated air the amount of work possible becomes less and less, and the body temperature may rise rapidly, though men accustomed to the heat can bear it much better than others. At temperatures above 90 deg. it becomes difficult even to remain without working. Thus, at a temperature of 93 deg. in still and saturated air, I found that, though I was stripped to the waist and doing practically no work, my temperature rose 5 deg. in two hours, and was still rising

Note: Excerpt from preliminary proofs, not revised by author, of a paper read before the ninety-seventh meeting of the American Institute of Mining Engineers.

*Professor of mining and metallurgy, University of Nevada, Reno, Nev.

rapidly when I found it necessary to come out. On the other hand, it is a well-known fact that if the air is dry much higher temperatures can be borne with ease and comfort. In collieries where the air is fairly dry and in motion, men can work well at a dry-bulb temperature of 90 deg., or even 100 deg., and in hot climates with very dry air much higher temperatures are not oppressive."

Discussing the permanent effect of high heat upon the system, Eliot Lord reaches the following conclusion: "The ultimate effect of this extreme heat on the miners' constitution is not so easily noted. The mine levels differ materially in temperature, and the assigned station of a miner is so frequently changed from one cause or another that it is impossible to obtain at present complete comparative data. That prolonged labor in hot, impure atmosphere will assuredly shorten life appears indisputable; but whether the system is permanently or materially injured by intermittent working under those conditions is more questionable. The power of recuperation appears extraordinary, and unless the strain is intense and frequent no lasting injury may be inflicted. The limits of permissible strain vary with the relative power of endurance. The action of all the bodily organs appears to be stimulated by the heat, with the exception of the stomach alone."

No Lung Troubles

Messrs. Haldane and Thomas comment on exposure to high temperatures and sudden variations of temperature as follows: "Miners are exposed to high temperatures underground and to comparatively sudden cold on coming out, often with damp clothes on. Much stress has been laid upon this fact, particularly in relation to lung diseases. Nevertheless, this cannot be an important cause of lung diseases, for colliers are similarly exposed. Moreover, in England colliers never wash or change their clothes at the pit head, while Cornish miners invariably do so in a heated building (dry) provided on the mine. The effects of high underground temperatures on men and horses are certainly of considerable interest and economic importance, and we know from personal observations that in warm and moist air underground the body temperature often rises several degrees; but we can find nothing in the circumstances connected with the mode of occurrence of miners' phthisis to suggest that high underground temperatures are in any way connected with its causation."

Charts [illegible] the immediate results of high temperatures and hot vapors, as absent-mindedness, dizziness, fainting, vomiting, and in greater results insanity and death. The final conclusion is the following: "The expected positively [illegible] to per cent. [illegible] the heat increases the bad effects of the powder fumes and natural gases, and by making repairs to the shafts more frequently necessary it indirectly adds to the occasions when disasters may occur. I also confess to the belief, which is not sustained by observations upon specific casualties, that some allowance must be made for a less active mental condition, a dulling of the faculties and a certain recklessness to which the heat sometimes goads the men. On the other hand, heat makes them more careful, except when under momentary impulses, and I have never seen American miners more careful of themselves than in these mines. On the whole, the good and bad effects of heat seem to nearly balance each other, and I think that an allowance of 5 per cent. for the casualties indirectly caused by heat would be sufficient."

No Permanent Ill Effects

The main facts brought out by these observers are that high temperatures and humidities cause, under some conditions, a notable rise in body temperature, that all the bodily organs with the exception of the stomach are stimulated, that prolonged exposure to such conditions undoubtedly lowers vitality, that intermittent exposure produces no permanent ill effects, that these conditions cannot be considered an important cause of lung diseases, and, lastly, that under abnormal conditions loss of mental control and serious bodily disturbances result.

Local physicians inform me that the average life of the Comstock miner approximates 25 years, and that the miners do not show any greater susceptibility to any particular disease than the residents of the town. I am acquainted with miners who have worked more or less continuously underground for 30 years, and who are still capable of doing a good day's work. Compared with miners of other districts the Virginia City miners may be said to be just as healthy, if not more so. The result is due in a large measure to the fact that the Virginia City miner observes certain precautions, and that the mine-managements provide the necessary facilities.

Miners are careful not to expose themselves to cold drafts, since they work stripped to the waist. On passing from a hot to a cold place a heavy coat is used to protect the bared body. Wet clothes are either removed before going to the surface, or trousers and coat worn over them. All miners take hot and cold showers after coming off shift. Frequent drinking, and the bathing of the hands, wrists, arms, and head in cold water is resorted to in all hot workings, and undoubtedly serves to keep down the body temperature, which is greatly refreshing. Frequent rests are taken at special [illegible] places in the workings to prevent the [illegible] exceedingly hot workings cold water from a hose is turned upon the miner while at work.

The effect of the underground conditions upon the blood was made the subject of a preliminary study by Prof. P. Frandsen at my request. His conclusion, given tentatively, is that "the conditions in the deep workings of the Virginia City mines do not have any particularly detrimental effects upon the composition of the blood. It appears that the main permanent effect is an increased hemoglobin content of the individual red-blood corpuscles."

Effects on Efficiency

Conditions are not favorable for a study of the comparative efficiency of miners working under normal temperatures and under those in the lower levels of the Comstock. The following conclusions are the results of my underground experience:

(1) Moderately high temperatures, from 95 deg. to 105 deg. F., with moderate humidities from 50 to 70 per cent. relative humidity, and with air currents of velocities from 200 to 300 ft. per min., do not prevent efficient work nor are they particularly uncomfortable.

(2) A higher temperature, from 110 deg. to 115 deg., together with the same conditions as above, decreases efficiency to a considerable extent.

(3) A high temperature, from 110 deg. to 115 deg., with high humidity and a moderate velocity air current, very greatly impair the miners' efficiency, and a still higher air velocity, under the same conditions, renders workings more bearable, but miners cannot work very long at one time.

(4) A moderately high temperature, from 95 deg. to 105 deg., in a saturated atmosphere with no current, becomes very trying. Prolonged exposure with much exertion is dangerous.

(5) A moderate temperature, from 90 deg. to 98 deg., in saturated air currents of a velocity from 400 to 500 ft. per min., and with more or less vitiated air, are conditions which are very trying and give a low labor-efficiency. Vitiated air will impair labor efficiency to a greater extent than a high temperature.

Mineral Production of Japan

An official report recently issued gives the gold production of Japan for the six months ended June 30 at 44,711 oz., or $[illegible]. Silver output was 1,863,508 oz. The copper produced was 13,080,033 lb., and the iron made 23,902 long tons. There was a total of 19,340,063 lb. of sulphur mined. The petroleum refined was [illegible] gal., and the coal mined was [illegible] tons.

The Development of Heavy Gravitation Stamps*

By H. S. Denny†

So much has been heard of the increased efficiency attaching to the corresponding increase in weight of the gravity stamp in the last few years, and so much of the data has emanated from the mines with which W. A. Caldecott is associated, that it is fitting he should have come forward with a pronouncement on this subject before the Institution of Mining and Metallurgy.

It may surely be taken as axiomatic that there is a critical point in the weight of a stamp which will satisfy all the contingent factors of capital outlay, operating cost, horsepower consumed, crushing efficiency, maintenance and repairs, short of which point or beyond which there will be losses in economy. Mr. Caldecott in his notes undertakes to show, not that he has established this critical point, but that the increases in weight already carried out have resulted in very appreciable improvements in economy.

Many Factors in the Problem

While I do not for a moment dispute this statement, I must say that a close scrutiny of Mr. Caldecott's paper does not appear to provide the data essential to the proper substantiation of his contentions. We are told that with 1605-lb. stamps 6.02 tons of ore were crushed per 24 hours, yielding a pulp product of which 11.66 per cent. remained on a 60-mesh screen. This is in itself not an extraordinary performance, but we are given to understand that the operating cost per ton crushed is less than that obtaining with lighter stamps, although in his summary of the advantages of heavy stamps Mr. Caldecott does not specifically make this claim. I take it, however, that as the whole question is purely one of ultimate economy, Mr. Caldecott means it to be understood emphatically that the results obtained from the 1605-lb. stamps do show a great economic improvement over the 1250-lb. stamps.

The mere facts that there is a reduction in the size of the mill building, that 30 per cent. less shafting and other moving parts are needed and that less labor is required, do not in themselves constitute a final and convincing case for the heavy stamp. There are a great many other things that form important counters in such a computation, and from my point of view I would like to see Mr. Caldecott's statements supported by supplementary figures in which the following points would be dealt with:

(1) Comparative statements of capital cost of a 1250-lb.-stamp battery as compared with a 1600-lb.-stamp battery of equal capacity, complete. The number of gravity stamps in the respective batteries would remain the same, while the cost of fine crushers for the lighter stamps would of necessity come into this statement.

(2) A power curve illustrating the fluctuating efficiency of the respective batteries on varying numbers of stamps running; together with a statement of the actual consumption of power per ton of ore crushed and a grading analysis of the pulp produced.

(3) Data as to the comparative time and labor involved in carrying out repairs to either battery, taking into consideration the heavier units of the bigger mill.

(4) A statement showing the comparative effect of loss of time in hanging up a battery of the heavy stamp as compared with lighter ones.

(5) A general statement showing that the advantage still lies with the heavier stamps taking the lives of the respective batteries into consideration, and taking into account the initial capital outlay with redemption and interest charges properly apportioned, and figuring on the respective capacities of the two mills on equal products, and finally calculating in all those other factors of time and labor interwoven in the question.

It must not be forgotten that the framing, foundation, driving gear and component moving parts must all be correspondingly heavier and more expensive, and renewal units more unwieldly; while we can readily grant that these points are of minor importance, they must not be entirely overlooked.

Two points of the greatest importance that have always been a subject of discussion and which are fraught with the greatest bearing on the capacity of the gravity stamp, are the size of the ore being fed into the mill and the coarseness of the screens used for the discharge. If the stamp mill is asked to do the work of either the stone breaker or the grinding machine, that work will be done at an economic disadvantage as there are other machines in which these two operations can be much more efficiently carried out.

Preliminary Crushing Advantageous

Mr. Caldecott says "fine breaking before milling on heavy stamps does little good," and I must confess that the figures in column B on his first table rather surprises me. Of course it is clear that with the heavier stamp it would not be economic to resort to so fine a preliminary crushing as that found most profitable with the 1050 lb. stamp, but I was not prepared to find that all the advantage disappeared when the weight of the stamp was increased to 1342 lb. According to Mr. Caldecott's figures the duty per stamp per 24 hours with equal weights of stamps was higher in the case where 54.3 per cent. of the material remained on a 1⅜-in. screen than in the case where only 1.1 per cent. of the material remained on the same screen. This result seems most extraordinary and, in order to show how remarkable it is, I herewith append some results obtained from a Rand mill by virtue of the interpolation of a fine-grinding plant between the coarse crushers and the battery.

The primary object of the installation of the fine-crushing plant on this mine was to permit of the mill being overhauled, 20 stamps at a time, without interfering seriously with the output per month. Two small jaw crushers, electrically driven and designed to reduce the ore from 2½ to 1½ in., were installed. It became quite evident after the first few days' work that the introduction of this plant was to have the desired effect. The plates and launders banked up with the additional material, and it was found necessary to make alterations to the mill water service before the increased quantity of ore crushed in the mill could be properly handled. Without the fine breakers the mill duty on 400-mesh screens averaged under 5 tons per stamp per day. After the installation of the fine breakers the duty increased to 5.6 tons per stamp per day, equivalent to a 12 per cent. increase. The figures were calculated carefully and may be taken as accurate. The average cost of milling under ordinary conditions over a period amounted to 2s. 11.657d. With the fine-breaker plant the average was 2s. 11.177d., a reduction of 0.48d. per ton milled. The objects of the installation of the plant were achieved most successfully; and the whole mill was rehabilitated without prejudice to the monthly returns.

These figures were all carefully compiled and the results were so satisfactory as to leave no room for doubt regarding the efficacy of fine crushing when used in conjunction with light stamps. It may be argued, however, that the ore was in any case being fed in too coarse a condition to the mill, and I think that when Mr. Caldecott says "hence the heavier the stamp the coarser the preliminary breaking admissible, and *vice versa*" he has hit the real truth. "*Vice versa*" would then read: "The lighter the stamps the finer the preliminary breaking admissible.

To follow this statement to its logical deduction, we find then that as Mr. Caldecott believes in the use of fine crushers with a light stamp, he must

*Discussion of a paper by W. A. Caldecott in *Bull.* I. M. M., Aug. 12, 1909, an abstract of which appeared in Eng. and Min. Journ., Sept. 25, 1909.

†Mining and metallurgical engineer, Gante 1, Mexico, D. F.

further believe that the use of the heavy stamp will do the same work that the crushers are designed to do for the lighter stamp and more economically. It appears to me that much of the problem lies in this point, and personally I have the feeling that the limitation of the weight of the stamp will be met at the line of demarcation between the crusher and the stamp-mill principle. It is difficult to imagine that ore can be reduced from 2½ to 1½ in. as efficiently and economically in a stamp mill as in a jaw or toggle breaker, because in the one instance we have anything but a positive discharge and positive feed, while in the other we have both of these points well defined; and furthermore, the power consumption in the case of the crusher is in direct ratio to the work performed, while in the case of the gravity stamp it is not necessarily so.

Further Investigation Advised

I have made special reference to this matter because a reader of Mr. Caldecott's remarks might unwittingly get the impression that Mr. Caldecott intended to say that preliminary fine crushing was in no case necessary; but this is not so, and as there are many remote places where moderately light stamps will still be used on account of great transport difficulties, the value of a preliminary fine crushing should not be lost sight of, even from his point of view.

Mr. Caldecott makes no reference to the high-speed stamps of the Morrison type installed and run on the Meyer & Charlton mine for many months in 1903. These stamps had a weight of over 1600 lb., and owing to their being operated by a crank shaft, it was possible to run them at as high as 135 blows. They registered a duty of over 9 tons per stamp per day for a considerable period. It was quite clear that the increased weight was resulting in a more than proportionate increased duty, but there were other considerations that prevented us from arriving at any settled conclusion in the matter.

Mr. Caldecott says "it will be evident the day of the stamp as a unit of crushing capacity has passed away," and in this everybody will agree with him for the reason he has stated. Whether or not the principle of the gravity stamp will ever be discarded universally is doubtful, but I do know that many attempts have been made in small plants to discard it, and with the greatest success, that is to say, there are numbers of plants in the United States today in which the stamp mill finds no place. The principle followed is coarse crushing, fine crushing, edge runners and tube mills, and when considered from the all important standpoint of capital outlay and operating costs, it has been proved in more than one case that the stamp mill is not absolutely indispensable. So far, however, the results have been obtained only from small plants, and I know of no case in which the engineer has had the temerity to lay out a large-capacity plant without the gravity stamp.

In conclusion, I think that Mr. Caldecott, now that he has begun on the ventilation of this important matter, would do a great service if he continued the subject in some of these more practical directions which I have indicated in these remarks, and as he is well placed to carry out the necessary investigation work it is just and fit that he should continue the good work begun. I would suggest, however, if the result of increasing the weight of stamps is merely to do the work which could be done by the crusher in conjunction with the lighter stamp—and this is what in effect Mr. Caldecott claims—then the matter requires grave consideration before going further, for I personally am not fully satisfied as to the wisdom of such a step. Until further details are available, I do not consider that we should be justified in assuming that the heavy stamp is an unmitigated good.

The Classification of Patents

Special Correspondence

The reclassification of patents (contrary to reports appearing in the daily press) which is now in progress at the United States Patent Office is not a new undertaking, although it has been advanced rather more rapidly of late. Several years will probably be required to finish the work unless Congress should make more liberal appropriations for the support of the scheme. This latter is much to be desired, as the work will, according to expectations of competent men, do away with two-thirds of the difficulty of searching patents, and to a corresponding extent will tend to lighten the burden of expense resting upon inventors.

The number of patents now in existence at the Patent Office is nearly 3,000,000, of which 2,000,000 or more are foreign and 900,000 or more are American. These patents have always been classified in some way, inasmuch as only by some such method could any order be maintained or any searching of patents be rendered possible. The various classes of patents, however, have always had a tendency to grow and this growth has frequently been in unforeseen directions. Probably the year 1884 is the last date in which the old classification could be said to be up to date. Subsequent to that time, the constantly increasing pressure of work in the office rendered it practically impossible to keep up examinations of cases, and at the same time maintain the classification in proper condition. As a result of the smallness of the force and of the difficulty of the situation, many lines got behind and the confusion tended to increase.

Some years ago a classification examiner was appointed in accordance with an act of Congress, and after looking into the problem he recommended certain lines of reclassification of patents, and undertook the work. The original plan of the work was to class the various patents by mechanisms rather than by the purpose of the invention, and this is the plan that, with some minor modifications, is now being pursued. For example, a punching machine may be either a machine for punching metal or for punching paper. Under the old classification it would have been placed, in the former case, under metal-working machinery, and in the latter under machinery for manipulating paper. The present idea would be to place all punching machines together in one class. The results of the classification so far as it is accomplished are being put out from time to time in bulletins, which exhibit the changes that are actually introduced. A systematic general grouping is, of course, being sought as against the present unsatisfactory and unsystematic method. There are now about 250 classes of patents and from 6 to 350 subclasses in each group. The new grouping will not only develop a better arrangement, but will seek to balance the subclasses as evenly as possible. More subclasses and subdivisions are being created to the end that patents in any particular line may be reached more easily. In general, in establishing the new subclasses, the object sought is to get together into a single subclassification all devices relating to any one feature of a given invention. Thus under the general class "gas engines" one distinct subclassification will be "spark plugs." Probably not more than 100 patents ought to figure in any subclass, if it is possible to maintain the grouping with that limitation.

Patent attorneys regard the progress of this work with much favor, inasmuch as it will relieve an extremely difficult situation and will make it possible for them to carry on their work with much greater accuracy and assurance than at present.

Value of Tantalum Ore

English dealers quote as follows: For ferro-tantalum of 65 to 75 per cent. Ta, 14s. per lb. of tantalum contained; tantalum ore of about 60 per cent. Ta, 205@220s per 112 lb. on a basis of 60 per cent. Ta at 205 shillings

The camps of Miami, Baxter Quapaw, Peoria, Spring City and Granby in the Missouri Kansas Oklahoma zinc lead district are to be supplied with fuel gas. A 16 in. main is now being laid from the Kansas gasfields

Sinking Concrete Shafts in Quicksand

In Water-bearing Alluvium Rapidity of Sinking Exceeds Other Methods. Concrete Walls Are Fireproof and Permanent; Pumping Expense Reduced

BY FREDERICK W. ADGATE*

The Cleveland-Cliffs Iron Mining Company in the spring of 1907 made preparations to sink in the Swanzy district near Princeton, Mich., a timber drop shaft, to be called the Smith shaft. Knowing the ground to be saturated with water, it was thought advisable to make a few tests to arrive at the quantity or flow of water in the overburden at this site. Accordingly several 6-in. pipes perforated most of their length were sunk a number of feet into the ground at the proposed site of the shaft, and two special Cameron pumps, with 10-in. steam end and 12½-in. water end were connected to some of these pipes. Pumping was then started and continued for some time, a careful observation being made of the hight of the water in one of the pipes which was not connected to the pumps being open for this purpose.

Continuous pumping lowered the level of the water so little that the mining company concluded that it would be a difficult operation to sink a shaft by the ordinary drop-shaft methods, and in the autumn of 1907 a contract was entered into with the Foundation Company of New York (a company which makes a specialty of sinking difficult shafts and doing other foundation work) for a reinforced concrete shaft of rectangular cross section the dimensions of which would be 15 ft. 4 in. by 11 ft. 4 in. inside.

*Western manager, Foundation Company of New York, The Rookery, Chicago.

NOTE Paper read at the Marquette range meeting of the Lake Superior Mining Institute.

Pneumatic-Caisson Method

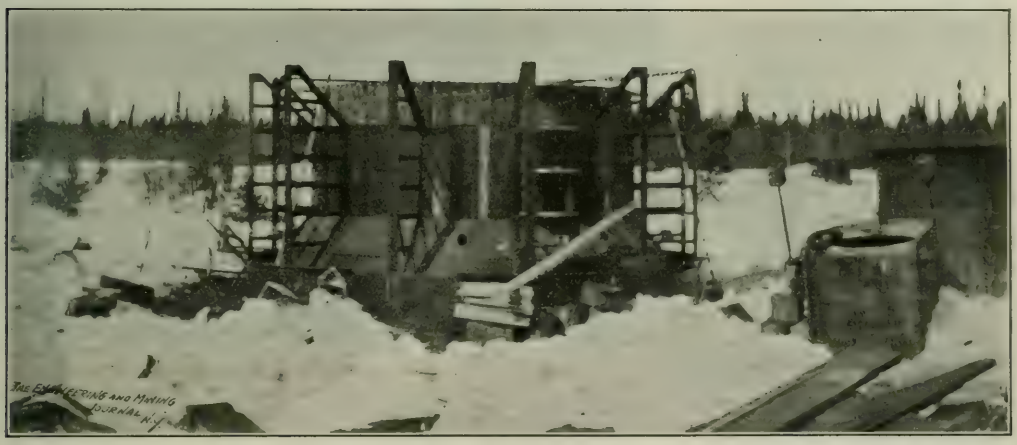
After an examination of the site and a study of the diamond drill borings, which showed about 60 ft. of water bearing overburden made up of quicksand, gravel and boulders, the Foundation Company decided to use the pneumatic-caisson or compressed-air system in sinking this shaft.

The use of compressed air in subaqueous excavations has been exemplified, and engineers have become familiar with it, by the construction of bridge piers, tunnels and building foundations, but it was first applied to shaft sinking by the engineers of the Foundation Company. To make this application successful, special devices, plans and equipment had to be thought out, tried and perfected before beginning the operation. By reason of its extended operations and wide experience, the Foundation Company was in a position to guarantee to a client a water-tight, indestructible, fireproof and plumb shaft.

Plans were submitted and accepted for a reinforced-concrete shaft to be sunk by the pneumatic process. The contract allowed 90 days for completion, and the specifications required that the shaft should be carried down plumb and water-tight, and that when solid rock was reached, a water-tight joint should be effected between the shaft and the rock.

In dimensions the shaft was 21 ft. 4 in. x 17 ft. 4 in. outside, with walls 3 ft. thick at the bottom and 1 ft. 6 in. at the top. The concrete was started on top of a timber shoe or cutting edge, which consisted of two layers of 12x12-in. fir timber, beveled on the inside, the bottom stick being shod with a heavy angle iron, and the whole strongly bolted horizontally and vertically, tying all the timber firmly together. The walls were of concrete strongly reinforced with 1¼-in. and 1-in. square steel bars, spaced 6 to 8 in. vertically and about 18 in. horizontally.

The horizontal reinforcement was designed to take the earth and water pressures, while the vertical rods mainly prevented the lower sections of the walls from pulling away from those above during sinking operations. These vertical rods passed down through the timber cutting edge, anchoring same to the concrete walls.



VIEW OF A CIRCULAR CAISSON WITH CUTTING EDGE—IN COURSE OF CONSTRUCTION

The Working Chamber

Six feet above this cutting edge and notched into the concrete wall was the deck, or roof of what is familiarly called the working chamber. It is of course necessary in using the pneumatic process to confine the air to make its use effective. This is accomplished in shaft work by building a roof or cover over the inside of the shaft, strong enough to withstand and hold any required air pressure. This roof or deck as it is technically called, may be situated at a point near the bottom of the shaft or higher up as convenience may dictate.

The deck of the Smith shaft was built

of 12x12-in. timbers strongly bolted together and further bolted to the concrete walls at the sides where the deck fitted into the notch in the concrete. These side bolts assisted in taking care of the uplift due to the compressed air on the under side of the deck. After the shaft was on the rock and a tight joint made, the air pressure was removed, and then, owing to the manner in which the deck was notched into the walls, it was readily pulled out, and the notch concreted flush with the walls.

In the center of the shaft and bolted to the upper side of the deck was the steel man and material shaft, which consists of a number of ½-in. steel sections, 48 in. diameter, bolted together with vertical steps or ladders bolted to the inside and extending from the deck to the surface of the ground. The 48-in. steel cylinder is surrounded by an air lock, called the Moran lock, which was devised and patented by D. E. Moran, one of the members of the Foundation Company. A hole, 3 ft. in diameter, was cut in the timber deck, which established a communication between the working chamber below the deck to the man and material shaft above the deck.

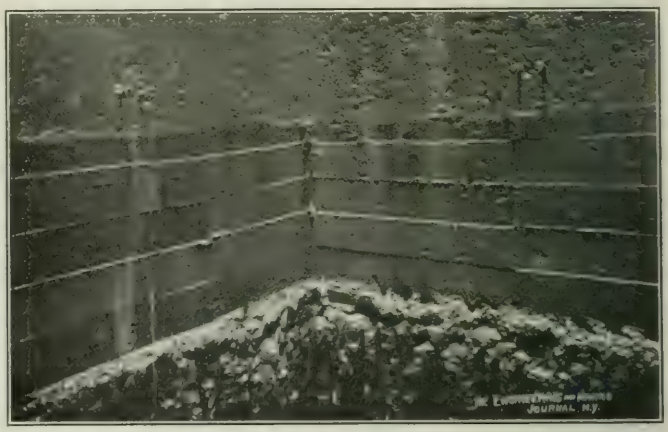
Sinking the Caisson

Work was started on the shaft Sept. 1, but owing to the unprecedented industrial activity at that time, it was impossible to get construction material, and it was not until Nov. 7 that active sinking operations began. The cutting edge was first assembled at the surface of the ground and the inside forms for the first 10 ft. built on top. All other forms were built apart from the shaft in sections 6 ft. high and of interchangeable design. The form material was 2x8 in., tongued-and-grooved plank. After the forms had been placed and concreted a hight of about 18 ft., sinking without air was resorted to until water was encountered, which occurred at a depth of about 5 ft. from the surface. Air was then pumped into the working chamber and when the water in the working chamber had been displaced by air, gangs were sent into the shaft, and excavating began.

The material was shoveled into a circular bucket and then hoisted up through the man and material shaft and air lock to the surface. The bucket was then dumped into small cars and the material removed to a point some distance from the shaft, where it was used to level up the ground, the bucket returning to the working chamber for another load. On account of the slow-setting qualities of the cement, only one gang of men was required to excavate from 4 p. m. to midnight, in order to keep apace of the erection of forms and concreting which was done during the day.

An ordinary contractor's derrick, operated by a special three-drum steam hoist, was used to handle the excavating buckets, erect the concrete forms and deposit the concrete in the walls. It was endeavored to keep the shaft lining built up above the ground at least 18 ft. all the time to permit the use of three sections of concrete forms, the lower set of forms being moved up when it reached the ground, as a result of the removal of material from the interior of the shaft and from under the cutting edge.

The shaft lining sank of its own weight until it had reached a depth of approximately 40 ft., when it became necessary to apply additional weight. The only available weight that could be procured at that time was wet sand. This was loaded upon the deck in the interior of the shaft and more added from time to time. In this manner the shaft went down steadily until it reached the rock formation on Dec. 7, exactly one month from the time air was first applied. The rock was first encountered in one corner of the shaft and proved to have an inclination of 3 ft. 6 in. in 20 ft. In order to make a water tight joint, it was necessary to level off this rock and then go down about two feet further in order to get below a seam in the rock. This rock excavation was all accomplished under air pressure. Blasting was resorted to as in ordinary open excavations; however, particular care and knowledge must be exercised to get successful results under these conditions. The rock excavation was completed Jan. 5, 1908.



JUNCTION OF CONCRETE LINING OF SMITH SHAFT WITH ROCK

Completing the Shaft

The inside top timber comprising part of the cutting edge was then removed and the walls concreted to the rock, thus presenting a solid masonry face from the rock to surface. This joint was tied to the rock with steel dowels and to the walls above by means of projecting bolts, which had previously held that part of the cutting edge taken out and replaced by concrete. Air pressure was maintained on the shaft for three days after the completion of the joint to allow the concrete forming the joint ample time to set before subjecting it to the outside water pressure. The air pressure was then gradually reduced to zero. Subsequent inspections showed that the shaft developed an accumulation of about 6 in. of water (650 gallons) in 24 hours, most of it coming through the rock. Absolutely no water, not even a seepage, was discernable through the joint. This was all that could be anticipated or hoped for, and I have since been informed that most of the leaks have stopped.

Near the collar of the shaft, an opening 7 ft. in hight by 8 ft. 8 in. in width was left in the southeast wall from which was constructed a concrete tunnel running horizontally, at right angles to the shaft. This eventually will communicate directly with the cage and ladder ways and was placed at such an elevation as to pass beneath the standard-gage tracks which will handle the ore. This tunnel has side walls and roof 18 in. in thickness, is rectangular in cross section, its length is 34 ft. 6 in. The side walls and roof, directly under where the ore trains pass, were reinforced with plain steel bars but the greater part of the roof was reinforced with 1⅛-in. steel cable which was found conveniently at hand.

After sinking operations were completed, and the temporary weight of wet sand together with the deck, was removed, holes were drilled into the walls and heavy cast iron brackets bolted against the same. These brackets carry horizontal channel irons dividing the shaft into compartments for skips, cage and a pipe and ladder way. It is futher proposed to sheath these compartments with corrugated iron or similar fireproof material.

Kidder Shaft

After the successful completion of the Smith shaft, the Cleveland-Cliffs Iron Company entered into another contract with the Foundation Company to sink the Kidder shaft, which is situated in the same district and within half a mile of the Smith shaft. Here the conditions are somewhat different. The general character of the overburden is the same, but deeper, and the ledge is more broken up and seamy. It was decided that a circular shaft was best adapted to this particular site.

Plans were accordingly drawn for a reinforced concrete structure of a circular cross-section, being 24 ft. in outside diameter and having an inside diameter large enough to provide a rectangular space 14 ft. 10 in. x 10 ft. 10 in. The walls of the shaft were built upon a fabricated steel shoe, being 24 ft. in outside diameter, where it is riveted to a steel cone plate on the inside, the slope of which extends to a hight of 10 ft., making the working chamber or caisson conical in shape. There is a circular opening, 10 ft. in diameter, at the top of the chamber or cone, to which is bolted steel sections, 10 ft. in diameter, which are carried up section by section as the structure sinks, and through which was operated a clam-shell dredge bucket. This dredging cylinder also acted as a wall of the caisson while sinking operations were conducted by the pneumatic process.

Method of Sinking

The general plan of sinking the Kidder shaft was as follows: The shaft lining was built up to a hight of about 15 ft., and two sections of the dredging cylinder connected to the top of the cone plates; a clam-shell bucket was then lowered through the 10-ft. dredging shaft to the bottom, where digging operations began. As the clam-shell displaced the material, the shaft settled by its own weight. Care had to be taken to build on the top fast enough to always keep the top of the structure several feet above the surface. This plan of sinking was followed until the shaft had reached a depth of 87 ft., where a stratum of very hard clay was discovered which the dredge refused to handle.

A steel deck or roof was then bolted to the top of the dredging shaft. This deck in turn supported a Moran air-lock, and the shaft was now equipped for compressed air operations, which were immediately begun and the shaft carried down to rock, which was found 104 ft. from the surface. The formation was so broken up and seamy that it was found necessary to continue the shaft 9 ft. into the rock, making a total excavation of 113 ft. from the bottom to the collar of the shaft, or 103 ft. below water level.

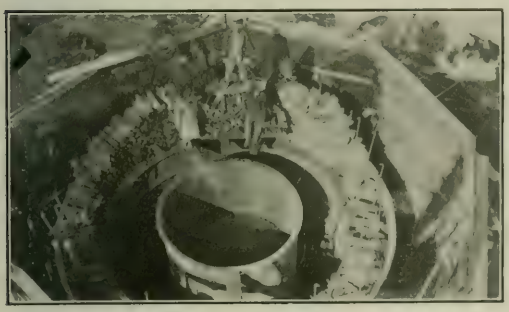
The Shoe

The cutting edge or shoe, the inside of which forms the conical space at the bottom of the shaft, deserves further mention. It weighs approximately 40,000 lb. and is made in three horizontal sections, each section being made up of 12 plates of ½-in. steel, joined to the succeeding section by a lap-riveted joint. On the outside of the bottom, there is a steel plate, 30 in. high by ⅝ in. thick, that forms the base of the cylinder and the outside form of the wall of the shaft to which the steel brackets and plates which form the cone are attached. The angle, or slope of the cone on the inside, with the outside of the shaft, is made the shape of the brackets. This slope is the ratio of 7:10, or about 40 deg. The brackets are riveted to the heavy outside plate and to all the plates forming the cone. There are twelve of these brackets, and they are made in two parts bolted together so that one part is readily detachable from that part of the steel work which necessarily remains in the concrete and forms part of the permanent wall.

Concrete Forms

In the construction of the walls of the shaft, two sets of forms were used, one on the outside and one on the inside. The outside form is made of three sections, 5 ft. high and 24 ft. in diameter. Each section is in turn made up of 6 plates of ½-in. steel bent to a 12-ft. radius on the inside; on all four sides of these plates, 4-in. angles are riveted to make the necessary connections to make the circle and also to connect the sections one to the other to make the wall continuous, proper bolt holes being punched at certain intervals in the angles to make this possible. The inside forms were also made in three sections, each section being constructed from 2x6-in. tongued-and-grooved pine held together by three sets of 4x4x½-in. angles bent to the radius that will give the necessary thickness of the wall at the various depths of the shaft.

The thickness of the walls of the shaft varies, of course, with the depth the shaft has to go and the pressures that will come on the wall. In the case of the Kidder shaft, the wall at the top is 2 ft. thick, down to a depth of 17 ft. It is there increased to 2 ft. 6 in. to a depth of 50 ft., then increased to a 3-ft. wall at this point and carried to a depth of 82 ft. and is there increased to 3 ft. 6 in. and carried with that thickness to the bottom.



ECCENTRIC LOADING DURING SINKING

DREDGE BUCKET IN OPERATION

Details of Kidder Shaft

The Kidder shaft was strengthened by a system of reinforcing steel placed in a similar manner to that described in the Smith shaft. In order to sink the Kidder shaft to the depth it finally went, it was necessary to use 375 tons of pig iron over and above the weight of the structure itself in order to overcome the excess of friction encountered and the upward pressure of the compressed air.

At a point 87 ft. below the surface a very hard stratum of clay about 2 ft. thick was encountered. After dredging some hours, without much success, the clay was penetrated at one point only and the quicksand which underlies the strata of clay started to run into the interior of the shaft, causing a run-in or slump of the ground on the outside of the shaft at one point only, which extended to the surface and threw the shaft about 6 in. out of plumb. Dredging was then abandoned and

the shaft equipped to carry on further sinking operations by the pneumatic process. This method was used until the completion of the shaft. When the shaft had been sunk into the rock about 9 ft., a concrete joint was constructed similar to that described in the Smith shaft.

Work was started on the Kidder shaft on Aug. 15, 1908, and completed Jan. 15, 1909. The maximum air pressure used on the Kidder shaft was 45 lb. above atmosphere. This is about the limit of human endurance and very dangerous to the men employed inside the shaft. At the greatest depth, two shifts of 40 min. each, constituted a day's work, and while no fatal effects followed, three of the men are to-day suffering from partial paralysis and will never wholly recover from its effects.

The Smith and Kidder shafts are typical of the advanced methods of shaft sinking through water-bearing ground which are being carried on in this country to-day. The advantages these shafts possess over the old style timber drop shaft are obvious and many. First, they shut off all surface water—doing away with the expense of pumping. Being of concrete, they are fire-proof. They do not have to be relined or renewed. They are plumb and can be completed in a much quicker time than shafts sunk through the same material by ordinary methods.

Deposits of Iron Ore near Hanover, New Mexico

A report on the iron ores of the Hanover district, Grant county, N. Mex., which have been worked almost continuously since 1899, has been published by the United States Geological Survey, forming a chapter in *Bulletin* 380. The report is based on a reconnaissance of the district by Sidney Paige, one of the Survey geologists, who discusses the geology of the district and gives analyses of the ores and statistics of production.

Topography

The Hanover area is within the mountainous region lying between Gila river on the north, the desert on the south, and Mimbres river on the east. It is drained by a southward-flowing stream with many mountain tributaries, which in times of heavy rainfall becomes a raging torrent, but whose waters after passing beyond the mountain border are lost in the desert sands. This stream carries a large amount of detrital material and the general lack of trees and shrubs facilitates the work of denudation.

Geology

The geological relations are fairly simple. A mass of igneous rock (quartz-diorite-porphyry) has intruded limestone and other sediments of Carboniferous age. In a part of the area the intrusion has caused extensive metamorphism of the sedimentary rocks, and along the contact zone ores of iron, copper and zinc have been deposited. The iron ore is principally magnetite, but at one place there is some hematite. The metamorphism is not confined to the intruded rocks, as the diorite-porphyry has suffered similar changes, though to a less degree.

The Ores

The iron ores comprise both hard and soft ores. Of the former there are three large lenticular masses and numerous outcrops that appear to have the same mode of occurrence. The soft ore occurs at several places along the contact between the igneous and sedimentary rocks. The iron content is estimated by Mr. Paige to average between 53 and 57 per cent. The following theory of the genesis of the ores is tentatively presented: "On coming to place, the heated magma, by solutions probably above the critical temperature of water, impregnated certain strata of the surrounding rocks. Adjustments, due to cooling of the porphyry, to possible volume changes in the intruded sediments, and to gravity, served to make of the contact zone a favorable locus of superheated gases. Magnetite, a mineral which several investigators have shown might be precipitated from iron silicates by reactions with lime, collected, replacing limestone, filling openings that may have gradually grown and replacing in part the porphyry mass."

Complete statistics are not available, but the output from this district since 1900 has been over 1,000,000 long tons. Most of the ore has been mined by open-cut methods, and Mexican labor is used almost exclusively.

Radium in Austria

The work at the Imperial Austrian radium factory is described by American Consul Will L. Lowrie. The factory is situated at St. Joachimsthal and has produced over $500,000 worth of radium chloride (13 grams at $45,000 to $50,000 per gram). It is extracted from pitchblende by repeated reductions. The pitchblende is taken from a worked-out silver mine near Joachimsthal, about 12 miles northwest of Carlsbad.

The government employs about 100 men at the mine, working the pitchblende chiefly for its uranium content. The radium factory is operated largely for experimental purposes. It requires approximately 10 tons of pitchblende to yield 1 gram of radium bromide, which is contained in the residue after the uranium is extracted. In the process 11,000 lb. of chemicals and 110,000 lb. of water are employed. To obtain the radium more than a thousand crystallizations and reductions have been made at the factory. These require from a few hours to several days each, becoming most difficult the nearer the approach to the radium chloride.

Plans have been prepared for a large bathing establishment at St. Joachimsthal, where baths may be taken in the radioactive water from the mine.

Geology and Ore Deposits of Goldfield, Nevada

The United States Geological Survey recently published a monograph entitled "The Geology and Ore Deposits of Goldfield, Nevada," by Frederick Leslie Ransome. The geologic structure of Goldfield is simple. The district is essentially a low, domical uplift of Tertiary lavas and lake sediments resting upon a foundation of ancient granitic and metamorphic rocks. The erosion of this flat dome has exposed the pre-Tertiary rocks at a number of places in the central part of the district and these outcrops are surrounded by wide concentric zones of successively younger formations.

The most notable features of the orebodies are their remarkable richness and their equally remarkable irregularity. The ores are almost without exception associated with craggy outcrops of silicified volcanic rock. Associated with the silicification other processes of locally intense alteration, especially the formation of alunite, have also been active. The deposits have formed along zones of fissuring, which for the most part are very irregular in trend.

Oxidized ores have supplied a large part of the gold produced during the first two or three years of exploitation, and in some mines no sulphide ores are yet known. The sulphide ores are of complex mineralogical character, native gold and pyrite being accompanied by minerals containing copper, silver, antimony, arsenic, bismuth, tellurium and other elements. A concentric crustification is characteristic of the richer ores, fragments of altered rock being covered by shells of gold and sulphides.

According to Ransome, the intimate association of unusually rich gold ores with the mineral alunite is the most remarkable feature of the deposits and proves that the ores were deposited from solutions containing sulphuric acid. Several hypotheses have been advanced to account for this acidity. The theory favored by Ransome postulates that the ore constitutents were brought up in hot solutions charged with hydrogen sulphide, a little carbon dioxide, and probably also some alkali sulphides; that the hydrogen sulphide was oxidized at and near the surface to sulphuric acid, which percolated down through the warm rocks to mingle with the uprising currents carrying sulphydric acid; and that the precipitation of the richest ores took place in the zone where the two kinds of solutions mingled and as a consequence of such mingling.

Compressed Air Calculation Short Cuts

A Chart by Which M. E. P. and Horsepower May Be Determined without Use of Complicated Formulas Involving Fractional Exponents

BY SNOWDEN B. REDFIELD

The accompanying diagram was calculated by Ward Raymond, assistant chief engineer at the Phillipsburg, N. J., plant of the Ingersoll-Rand Company. By the use of this diagram the calculations of the adiabatic mean effective pressure and indicated horsepower developed by the compression of air are reduced to their simplest possible terms.

In this diagram we have the solution of the expression

$$M\ E\ P = 3.46\ P_1\ (R^{0.29} - 1).$$

M E P refers to mean effective pressure developed in the air cylinders; P_1 is the absolute initial pressure, which in the case of an air compressor is usually atmospheric; *R* is the ratio of compression, or the absolute discharge pressure divided by the absolute initial pressure. Owing to the fact that this formula contains a decimal exponent, namely, the 0.29 power, it is rather unwieldy, and many people shrink from using it any oftener than they can possibly help. Knowing the value of *R* from the conditions of the problem, we find directly from the diagram the corresponding value of the rest of the expression, namely, 3.46 ($R^{0.29}$ — 1), and multipying this factor by the absolute initial pressure, gives the mean effective pressure right away. The four following examples will serve to show the simplicity of the operation:

Single-Stage Compression

Assume single-stage compression from the atmosphere to 60 lb. gage pressure. *R*, the ratio of compression, will be (60 + 14.7) ÷ 14.7, or 74.7 ÷ 14.7 = 5.08. Examining the diagram we find that the vertical line marked *A* corresponds to the value of *R* = 5.08. From the curve at this point we find that the value of the factor for which we are looking is 2.082. In the case of the problem the initial pressure is atmospheric, or 14.7 lb. per sq.in. absolute. Multiplying 2.082 by 14.7 we have a mean effective pressure developed in the air-compressor cylinder of 30.6 lb. per sq.in., based on adiabatic compression. This is the true theoretical adiabatic *M E P* exerted against the piston and it is not necessary to deduct the back pressure from this as in the case of the usual steam formula.

In most compressed-air problems the mean effective pressure is not wanted so often as the indicated horsepower per 100 cu.ft. piston displacement per min., and in all cases this can be found by dividing the mean effective pressure by 2.29. For the case in point, dividing 30.6 by 2.29, we have 13.4 indicated horsepower developed in the air cylinder per 100 cu. ft. of piston displacement per min. Dividing this by 100 and multiplying by the piston displacement per min. of the compressor, we have the total indicated horsepower in the air cylinder in question.

If the compression had been single-stage from atmosphere to 100 lb. the value of *R* would be

$$114.7 \div 14.7 = 7.81.$$

In looking at the diagram we find that the vertical line corresponding to *R* = 7.81, crosses the line of the diagram at the point marked *B* corresponding to a value of the factor 2.82. Multiplying this number by the initial pressure 14.7 lb absolute, we have an answer of 41.4 lb. per square inch *M E P* developed in the air cylinder. Again, dividing this by 2.29 we have 18.1 indicated horsepower developed per 100 cu.ft. of piston displacement per minute.

Compound Compression

For compound compression all we have to do is to remember that with theoretical conditions the horsepower of the low-pressure and the high-pressure cylinders should be alike, giving the minimum total power developed. In practice air compressors are designed so that this is approximately true. The curves and all the formulas are, of course, based on the theoretical adiabatic, and, therefore, we are correct in assuming that the horsepowers in each of the two stages of compression are alike. If the horsepowers are alike this means that the ratios of compression in the two stages are also alike, and consequently the ratio of compression in each cylinder for compound compression will be the square root of the total ratio of compression.

From atmosphere to 100 lb. pressure we have already found that the total ratio of compression is 7.81. The square root of this or the ratio of compression in either the low-pressure or the high-pressure cylinder is 2.8. Entering the diagram we find that the line corresponding to the value of *R* = 2.8 crosses the factor line in the diagram at the point marked *C* and corresponds to the value of the factor 1.204. Multiplying 1.204 by the initial pressure 14.7, we have the mean effective pressure in the low-pressure cylinder 17.7 lb. per sq.in. Dividing 17.7 by 2.29, we have the power in the low-pressure cylinder 7.73 indicated horsepower per 100 cu.ft. of displacement of this low-pressure cylinder. As this must be half of the total compressor horsepower of the compound compression, we have 15.46 indicated horsepower total for the two stages per 100 cu. ft. of displacement per min. Dividing this by 100 and multiplying by the low-pressure cylinder displacement in cu.ft. per min. we would have the indicated horsepower of the compressor in question.

This process may be carried through three, four, five or any number of stages of compression. All that needs to be remembered is that for multiple-stage compression the horsepower in all the cylinders is supposed to be alike; therefore finding the horsepower in the low-pressure cylinder we can multiply this by the number of stages or cylinders, giving us the total horsepower of the compressor. In order that the horsepowers shall be alike, the ratios of compression in the various stages must be alike and consequently for compound compression, must be equal to the square root; for three-stage the cube root and for four-stage the fourth root of the total ratio of compression.

Three-Stage Compression

4. Assume three-stage compression to 1000 lb. pressure. The value of *R*, the ratio of compression, will be 1014.7 divided by 14.7 or 69.2 compressions. With equal horsepower in each stage the ratio of compression in each stage and consequently in the low-pressure cylinder, will be the cube root of 69.2, or 4.11, and in the diagram we find that the value of *R* corresponding to 4.11 is marked *D*. This corresponds to the value of the factor of 1.75. Multiplying 1.75 by 14.7 we have 25.7 lb. per sq.in. mean effective pressure in the low-pressure cylinder. Dividing this by 2.29 we have 11.22 indicated horsepower per 100 cu.ft. per min. displacement of the low-pressure cylinder.

This is the horsepower in the first stage, also in each of the succeeding stages; consequently multiplying this figure by the number of stages, namely, three, we have a total horsepower of the compressor of 33.7 indicated horsepower per 100 cu.ft piston displacement of the low-pressure cylinder of the compressor per min. This divided by 100 and multiplied by the pis-

Note. Reprint from *American Machinist*, Oct. 21, 1909.

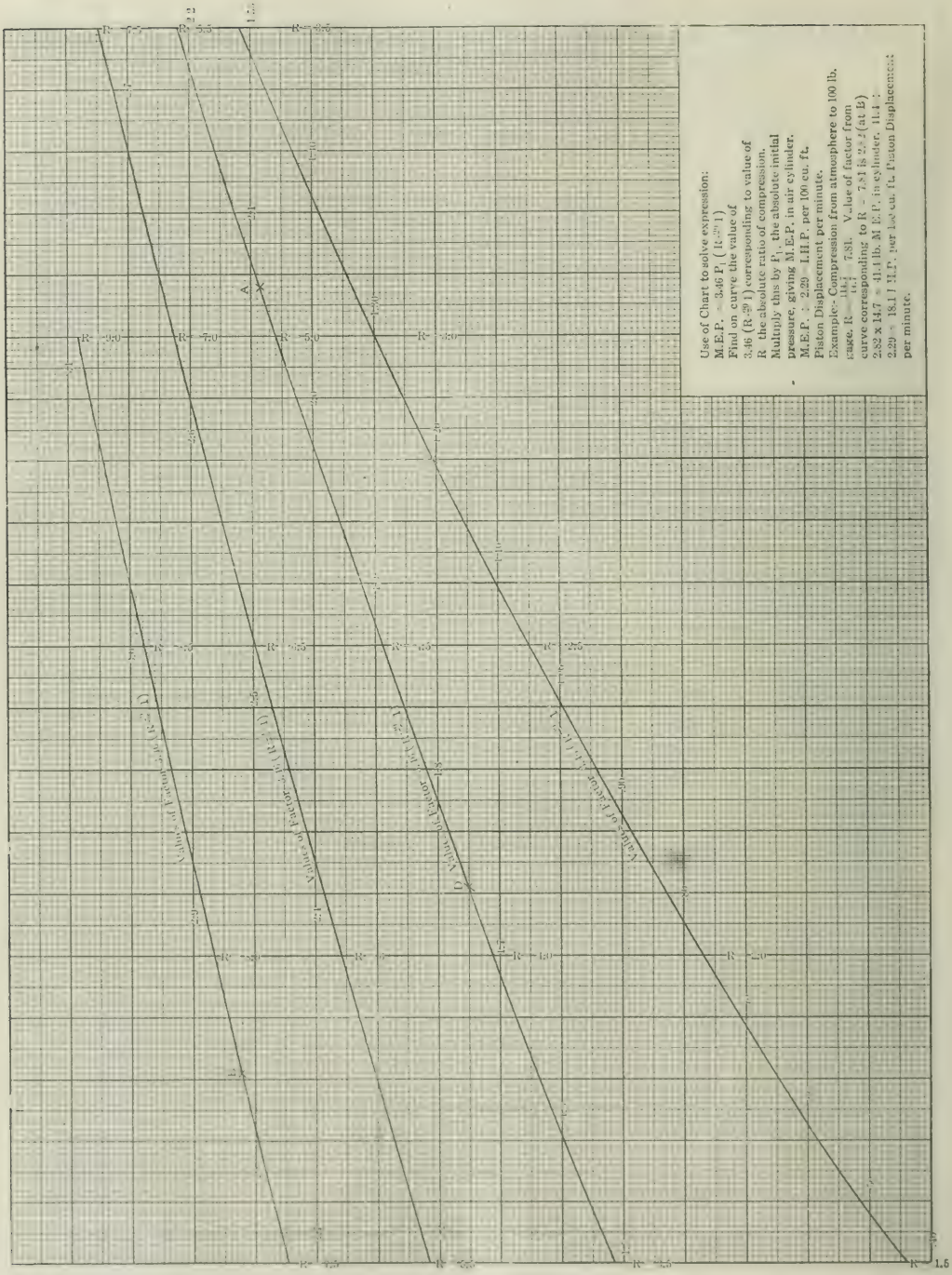


CHART FOR DERIVING MEAN EFFECTIVE PRESSURES FOR ADIABATIC COMPRESSION OF AIR FROM ANY INITIAL PRESSURE

ten displacement of the low-pressure cylinder per min. will give the total horse power of the compressor.

Utility of Diagram

A little practice with the use of this diagram will show its value for all kinds of special horsepower and mean effective pressure problems. It can be used for compression from initial pressures other than atmospheric, by the same process, simply finding the ratio of compression by dividing the absolute discharge pressure by the absolute initial pressure, whatever that may be. It must always be remembered that the mean effective pressure is obtained for any one cylinder by multiplying the factor obtained from the curve by the absolute initial pressure of that particular cylinder. The indicated horsepower per 100 cu.ft. obtained from this is always for the actual piston displacement of the cylinder in question, no matter what the pressure of air may be.

The curves may also be used for working backward, that is to find various pressures, compression between which will give a certain desired horsepower. In fact the flexibility of the diagram grows with continued use. The results obtained are closer than a slide rule will read and more than this would be hairsplitting.

Montezuma Mines of Costa Rica

The report of the manager of the Montezuma Mines of Costa Rica, Oct. 18, 1909, states that since July, 1909, 2295 cars of ore assaying an average of $11.22 gold per ton have been milled. The mill contains 40 stamps of 1000 lb. each, maximum capacity 150 tons daily. The stamps are followed by tube mills, classifiers and a 120-ton cyanide plant with agitators. The working costs at full capacity are stated to be $3.22 per ton. Water power amounting to 450 h.p. is available even during the most arid months.

The mine is variously estimated to have produced 86,000 to 150,000 tons of ore under different administrations before the present company secured it. The total amount expended by this company on development, improvements and construction from Dec. 1, 1908 to Oct. 1, 1909 was about $155,965. No figures regarding mill extraction or returns are given.

A report has been made to the State Department at Washington by George W. Ellis, the American chargé d'affaires at Monrovia, Liberia, Africa, to the effect that there are possibilities of important developments of gold and diamond mining in Liberia. One company is operating on an alluvial gold deposit with good results, and prospectors have found diamonds which have been pronounced by experts in England as of good quality and marketable size.

Gold in the Philippines*

By Henry G. Ferguson†

The gold production of the Philippines for the year 1908 shows a satisfying increase over that of 1907. In two out of the three principal districts there are mining companies which have successfully passed through the development stage and are now preparing to pay dividends. Everywhere development work is being carried on and, owing to the courage of the first pioneers, capital has begun to flow a little more freely. Those conditions which have kept investors from putting money into any Philippine industry apply with particular force to mining, for in most cases, the investor in an undeveloped mining property must wait for several years before he can expect any returns, and he must therefore be doubly certain of the safety of his investment. Under more favorable conditions the present prosperous state of the gold-mining industry might have been reached before this.

Masbate District

Of the three principal gold-mining districts of the islands, Masbate alone shows a falling off in production. This is due, not to any inherent defect in the district itself, but to a variety of causes.

Of the three stamp mills in the district, one five-stamp mill was found to have been poorly designed and therefore unsuited to the work required. It was dismantled two years ago. Neither of the two 10-stamp mills has been in operation during the year, one being idle on account of litigation and the other awaiting the reorganization of the company.

The district has suffered heavily from typhoons during the past year, the centers of no less than three passing near the mining district. The Lanang Dredging Company was a particularly heavy sufferer, as, besides having its houses and offices blown down, the dredge was wrecked and the pontoon badly damaged, though fortunately the machinery was uninjured. The accident was particularly unfortunate as it came just as operations, after two years of preliminary work under disadvantages which would have permanently discouraged many others, had finally reached a stage where substantial returns were to be expected. It is gratifying to report that this dredge is to be rebuilt.

In lode mining, continued development work is showing up large and easily worked orebodies. The ore is not as a rule of high grade, but natural conditions of the district are so favorable that mining costs should be cheaper here than elsewhere in the islands.

The chief development work of the year has been done by the Keystone Mining Company on Aroroy mountain, where the two shafts have been connected at 20 m. below surface by a drift at present 85 m. in length and a tunnel has been driven from the southwest side of the mountain a distance of 70 m. The Colorado and Eastern mining companies have both done considerable development work during the past year with very satisfactory results, the former in developing its vein system by continuing its tunnels and the latter by cutting a vein which is said to show 15 m. of workable ore. Both these companies expect to go ahead on a much larger scale during the coming year. Besides these, various individual miners have been doing steady development work, though they are greatly hindered by lack of funds.

As regards the district as a whole there has been a general realization that more extensive development work is needed before production is attempted. Therefore reorganization on a more businesslike basis is succeeding the period of depression which was the natural result of absurd overconfidence.

The district has further been benefited by the construction of a road from the village of Aroroy to the Guinobatan river. A light-house has been erected on Punta Colorada opposite Aroroy, allowing vessels to enter the harbor at night, and the harbor has been buoyed. The steamer service from Manila is better than ever before. During the year 1909 it is planned to extend the road up the Guinobatan river, through the heart of the mining district, to connect Aroroy with Masbate by telegraph, and to establish a money-order post-office at Aroroy; all of these small public improvements being things which the district needs and deserves.

Paracale District

Dredging is the chief industry in this district, and the dredge work there has already been described.[1] With regard to lode mining less has been done under the American régime than might have been expected. This delay, however, is due in great measure to the early confusion and uncertainty in regard to titles. At the present time the two principal mines of the district, the San Mauricio and the Tumbaga, both of which were formerly the property of the Philippine Mineral Syndicate, have been taken over by American capital. At the San Mauricio mine the old workings have been retimbered to permit of a detailed examination of the property, work has begun on sinking a shaft, and a 20-stamp mill has been brought out. On the Tumbaga property the old workings have been unwatered and preparations

*From "Mineral Resources of the Philippines," Bureau of Science, Manila.

†Division of Geology and Mines, Manila.

[1] Eng. and Min. Journ., Nov. 13, 1909, page 974.

made for continuing the sinking of the shafts. A Huntington mill, formerly the property of the old company, will be used for treating the ore.

There are many other groups of claims, such as the Mescla group near Mambulao, the Navotas group between Mambulao and Paracale, the San Antonio veins near Paracale, and the claims of the Aurora Exploration Company near Malagit, all of which have been worked to a greater or less extent in earlier times, which it is now proposed to reopen.

During the present year there are several improvements planned for the district aside from the mining work. The most important of these will be the removal of a reef which obstructs the entrance to the Malagit river, thereby affording excellent harbor facilities. At present there is no shelter nearer than Mercedes on the one hand and Mambulao on the other, and during bad weather the regular steamers can go no further than Mercedes, some 30 km. down the coast.

Other improvements planned for the district are the building of a telephone line and the construction of a wagon road from Indang. The Paracale Mining Association hopes to secure from the insular government some arrangement which will permit of having a resident mining recorder. At present there is unnecessarily great delay and confusion caused by the necessity of sending all papers to Nueva Caceres, the capital of the province.

Benguet Province

The Baguio mining district still holds its preëminence as the principal mining region of the islands, and during the past year work has gone steadily forward. The Consolidated Mining Company possesses a 6-stamp Hendy mill, three stamps of which were added during the past year, and a fairly complete and modern cyanide plant. The mine is worked from four tunnels having a total length of over 900 m. with about 100 m. of crosscuts. Some stopes have been opened up, but the company has wisely confined its attention almost entirely to development work, which has furnished sufficient ore for the mill. During the past year two agitators have been added for treating slimes and have greatly facilitated the treatment as well as increased the extraction. The company has installed a Wilfley table to treat the sands from the classifiers, thereby still further increasing the capacity of the plant.

The Benguet Mining Company has over [illegible] of claims, many of them of great value. Active work [illegible] the mill. The ore is treated in a Hendy [illegible] and a cyanide plant. Earlier to that of the Consolidated Mining Company.

The Camote mine is opened up by tunnels at four levels, having a total length of over 250 m. The ore is crushed in a small stamp mill made by Taylor in Manila. There are three 340-kg. stamps run by a 5 m. overshot wheel with a hemp rope drive. The capacity is about 10 tons per day.

On Gold creek, Mr. Kelly's group of claims has been developed by about 570 m. of tunnels, crosscuts and drifts, showing up large bodies of ore. Of particular interest is the discovery of rich telluride ore on the Naptong claim.

The Headwaters Mining Company was organized during the past year and has so far run three prospect tunnels in, of 18, 33, and [illegible] m. length.

Other Districts

The Aurora, Paracale and Baguio districts are the only places in the Philippines where gold mining has been carried on to any extent. Further parts of the islands, however, are prospecting, but have not as yet been developed to any extent. In Nueva Ecija a certain amount of sluicing has been carried on and small amounts of gold are obtained from native washings, but unfortunately we have no returns as to the amount of gold extracted. In the Catanduanes islands and in northern Mindanao prospecting of placer grounds is progressing. In the Surigao peninsula prospecting is being carried on by Americans, and a considerable amount of gold is washed from the streams by natives.

A MILL, ANTAMOK, BENGUET PROVINCE, PHILIPPINE ISLANDS

The Algerian mineral export in 1908 was as follows: Iron ore, [illegible] metric tons, [illegible] kg., [illegible] m., [illegible] metric tons, 300 metric tons

Comparison of the Thermal Properties of Cupels

Differences in Action of Magnesite and Bone-Ash Cupels; Temperatures of Cupellation; with Patent Brands Beads Less Likely to Spit

BY C. O. BANNISTER AND W. N. STANLEY

Although there are now a large number of cupels on the market made of materials other than bone-ash, yet little has been published on the differences met with in the behavior of these as compared with bone-ash cupels. The differences observed are many, among them being the following:

(1) If similar cupellations be carried out in patent[1] and in bone-ash cupels side by side, a marked difference will be seen in the mode of procedure of the process. The lead on the bone-ash cupel during the cupellation appears very bright and very hot, whereas the lead on the patent cupel appears to be at a much lower temperature, being comparatively dull during a considerable part of the operation.

(2) Patent cupels require a higher cupellation temperature than bone-ash cupels, and under similar conditions take a longer time to cool down.

(3) If the cupels containing silver beads be withdrawn in such a manner as to encourage "spitting," then the nature of the "spit" is quite different in the two types of cupels, there being a far greater tendency to spit on bone-ash than on patent cupels; the spit on the latter generally takes the form of a frosty appearance only, while on the bone-ash the well-known "vegetation" is obtained. Should, however, spitting be enforced on a patent cupel by bringing it out of the muffle very hot and blowing cold air on the bead, then the spitting takes the form of a burst, often a considerable amount of the silver being blown off in the case of large beads.

(4) Cupellation losses are always lower on good patent than on bone-ash cupels.

(5) If the method of inquarting small bullion beads from gold ores, etc., with fine silver be attempted on patent cupels, it will be found to be practically impossible with a mouth blowpipe, although the same operation is compartively easy on a bone-ash cupel.

It will be readily seen that these differences noted between the behavior during cupellation, etc., all depend on differences in the thermal properties of the materials of which the cupels are made, and the following experimental work has been carried out with a view of determining the diffusivity of heat, the specific heat, and the rate of cooling, etc., of the different materials.

Diffusion of Heat

Two different sets of comparisons of diffusivity were made, one up to a temperature of 100 deg. C. by the use of a steam jacket, and the other at a much higher temperature during the actual process of cupellation. Although the coefficients of conductivity have not been determined, comparative figures are given which show that there is a decided difference in the diffusivities and that this difference partly accounts for the difference in appearance of the lead during cupellation on patent and on bone-ash cupels.

For the experiments up to 100 deg. C., a steam jacket was made with top slightly hollowed upon which to set the cupels. Three makes of cupels were prepared of exactly the same shape and size. In each was placed the same amount of mercury whose temperature was recorded. At the end of 14 min., the temperature of the mercury in the patent cupels was practically constant at 91 and 89 deg. respectively, while that in the bone-ash cupel was only 60 deg. This shows that the diffusivity of patent cupels is much greater than that of the bone-ash cupels.

Experiments at Cupellation Temperatures

In these experiments, arrangements were made for determining the variations in temperature at the top and at the bottom of the cupels during the first part of the cupellation process. The temperature was gradually raised until 950 deg. was indicated and the gas was carefully regulated to keep this temperature constant; when the whole had remained constant for some considerable time, the muffle was opened for one minute, then 30 grams of lead, rolled up and bent into the shape of a horseshoe in order to fit round the thermo-couple protection tube, was inserted and the muffle closed. Meantime temperature readings were being taken every ¼ minute. An accompanying table gives the results obtained for the different cupels.

The cupels had been previously prepared to the same size, particular care having been taken to have them the same thickness in the center. The experiments could only be carried on with confidence for six minutes owing to the corrosive action of the litharge on the thermo-couple protection tube.

TEMPERATURES DURING CUPELLATION.

Time, Minutes.	Patent Cupel, Brand A.		Patent Cupel, Brand B.		Bone-ash Cupel.	
	Top, Deg. C.	Bottom, Deg. C.	Top, Deg. C.	Bottom, Deg. C.	Top, Deg. C.	Bottom, Deg. C.
	950	950	950	950	950	950
¼	930	947	935	947	935	950
½	912	944	923	945	923	950
¾	905	942	914	942	914	950
1	900	940	911	940	907	950
1¼	815	938	770	936	857	947
1½	803	935	818	929	805	945
1¾	848	927	850	919	855	942
2	866	912	868	905	887	940
2¼	874	903	881	895	908	938
2½	888	899	891	895	925	935
2¾	895	899	899	895	937	932
3	900	899	906	895	945	930
3¼	902	899	911	895	953	928
3½	907	899	916	895	961	925
3¾	909	902	920	897	967	923
4	910	905	924	900	973	920
4¼	912	908	928	905	977	925
4½	914	910	930	912	981	930
4¾	915	912	932	917	983	931
5	916	913	935	920	985	931
5¼	917	914	937	923	987	931
5½	918	915	938	926	989	932
5¾	919	917	939	928	990	932
6	920	918	940	930	990	932

Various attempts have been made to measure the temperature of cupellation muffles and also the actual temperature of cupellation, the earliest results being those obtained by James Prinsep,[2] who made trials in the same muffle with alloys containing varying quantities of gold and silver, and from his results the following approximate temperatures are deduced: Front of muffle, 601 deg.; middle, 1020; back, 1042. The next set of determinations on record was obtained by Dr.

NOTE—Abstract of paper read before the eighteenth session of the Institution of Mining and Metallurgy, London.

[1]The word "patent" is used to indicate cupels made with a magnesite base.

[2]Phil. Trans. 1828, 7096.

Rose[5] who used the Le Chatelier pyrometer and obtained results varying between 1022 and 1095 deg., according to the position in the muffle, etc.

A further set of figures is given in the text book by Lodge[6]. These were obtained by means of a Le Chatelier pyrometer, the junction being kept about ¼ in. above the lead button. The results show that at 700 deg. crystals of litharge form all about the button, at 775 deg. crystals of litharge form on the cooler side of the cupel only, while at 850 deg. no more crystals of litharge are formed.

Dr. Rose states[8] that the lowest temperature at which lead uncovers is about 675 deg., that a good temperature for the air in the muffle is 700 deg., and that litharge freezes at about 640 deg. Fulton[9] states that for silver cupellation the temperature should not be above 700, and for silver-gold alloys 750 deg.; he gives as the freezing point of litharge, 906 deg.

Summary of Earlier Results

The latest figures published on cupellation temperatures were obtained by C. H. Fulton,[7] assisted by O. A. Anderson, J. E. Goodner, and J. D. Ossa. These authors summarize their work as follows: (1) In the case of pure lead-silver buttons, a muffle temperature of at least 800 deg., and preferably one of 850, is necessary to "uncover" or start cupellation; (2) that this temperature may be lowered to 770 deg. during the oxidation of the greater part of the lead; (3) that toward the end of the cupellation or "finishing" in case of silver, it must again be raised to about 850 deg., in order to get a pure silver button; (4) that the actual temperature of the cupelling lead is always higher than the muffle temperature; (5) that the actual finishing temperature of the cupellation cannot safely be carried below 910 deg.; (6) that "feathers" or crystals of sublimed litharge on the cupel are an indication of the proper cupellation temperature, provided the air draft is not excessive. It will be seen from these figures that opinions vary considerably as to correct muffle temperatures for cupellation.

As this problem is outside the scope of the present paper, a fairly high temperature was decided on, namely 950 deg., in order to insure the rapid melting, uncovering, and cupellation of the lead in troubled. It may be pointed out that the lower the muffle temperature used in carrying out these experiments, the more marked will be the results obtained. The temperature of commencement of cupella-

[5] Metall. Chem. Soc. LXIII, 1895; p. 707.

[6] [illegible]

[7] Metallurgy of Gold [illegible] 1908; p. [illegible]

[8] Metallurgy of Lead [illegible] p. 71.

[9] Trans. Chem. and Met. Soc. Vol. IV, pp. 51-54. Also Eng. and Min. Journal, Aug. 15, 1908; p. 296.

tion is a very important matter and is at present receiving attention.

Behavior of Cupels

Curves were plotted from our experiments and on analysis gave the following results: On following the curve for patent cupels, brand A, it is seen that in the first minute, during which the muffle is merely opened, the temperature at the top of the cupel falls to 900 deg., and on the introduction of the lead button the temperature falls to 765 deg. during the next 22 sec.; then a rise of temperature immediately commences owing to the oxidation of the lead. For the first minute the rise is rapid, after which it is slow for another minute, then the temperature rises very slowly to the end of the experiment, and at the end of 6 min. the temperature is actually 30 deg. lower than the commencing temperature.

On following the other curve it will be seen that the temperature falls 15 deg. at the bottom of the cupel in the first 1½ min., due to the opening of the muffle; a fairly rapid fall of 20 deg. is next noticed, due to the introduction of the lead button, and this takes place ½ min. after a similar but more marked drop at the top of the cupel; the temperature continues to fall slowly for a further ½ min. and then becomes steady for 1 min., after which a slow rise of only 18 deg. in 2½ min. takes place.

This increase in temperature is the result of the rise in temperature at the top of the cupel which occurred at the commencement of cupellation 2¼ min. before. Finally, it must be noted that the top and the bottom of the cupel are at practically the same temperature at the end of 6 minutes.

The curves obtained with patent cupel, brand B, are very similar to those of brand A, just described, but in this case the top does get hotter than the bottom, a difference of 10 deg. being noted at the end of 6 min., by which time also the temperature is within 10 deg. of the initial temperature.

The curves obtained with the bone-ash cupel are similar to that as the commencement of the cupellation goes, but after the operation has started the temperature at the top of the cupel rises more rapidly, which the rise in temperature at the bottom is not shown until after the fourth minute, and then only a rise of 12 deg. is obtained in the remaining 2 min. At the end of 6 min., the temperature of the top of the cupel is 40 deg. higher than the commencing temperature and 58 deg. higher than the temperature of the bottom of the cupel. The chief points noted during these experiments are summarized in an accompanying table.

Comparison of Curves

The following reasons are suggested for the variations in the shape of the curves obtained. The first fall in temperature of the top is due to the cold air admitted into the muffle on opening the door. The amount of this fall will depend on the conditions of the experiment; in the patent cupels a fall is also noticed on the bottom, but not in the bone-ash cupel; this is due to the lower diffusivity of heat in the bone-ash, and therefore any change in temperature of the outside of the cupel takes longer to affect the middle. The marked fall of temperature next noted in top of each cupel is due to the melting of the lead introduced.

The bottom limit of this fall was very difficult to decide, but in every determination it came higher in the case of bone-ash, probably due to the fact that the surface of these cupels is never quite so smooth as in patent cupels. The effect of this cooling taking place at the top of the cupel is quickly shown at the bottom also of the patent cupels, a fairly rapid fall in temperature being noted; in the case of bone-ash, however, a slow but long continued fall of temperature is observed, this again being due to its low diffusivity for heat.

From the point at which cupellation commences the curves are most interesting; the rapid rise in temperature is practically the same in all three cases, and the top and the bottom reach the same temperature after the bottom has reached its minimum point in the case of the patent cupels, but while the temperature of the bottom is still falling in the case of the bone ash cupel. After the curves have crossed and the top becomes hotter than the bottom, an increase in temperature of the top and bottom takes place.

In the case of the patent cupel, brand A, the temperature is comparatively low at the end of 6 min. and the top and bottom very nearly approach the same tempera-

SUMMARY OF TEMPERATURE CHANGES.

	Effect of Opening Muffle. 1 Min.	Introduction and Melting of Pb.	Commencement of Cupellation.	Continuation of Cupellation, 3 Min.	Comparison With Initial Temp'ature.	Difference Between Top and Bottom at End of 6 Min.
Patent cupel A top	Fall of 50°	Fall of 135°	Rise of 135°	Rise of 20°	Fall of 30°	2°
Patent cupel A bottom	Fall of 10°	Fall of 3°	Fall of 37°	Rise of 18°	Fall of 32°	
Patent cupel B top	Fall of 40°	Fall of 140°	Rise of 136°	Rise of 34°	Fall of 10°	10°
Patent cupel B bottom	Fall of 10°	Fall of 5°	Fall of 10°	Rise of 35°	Fall of 20°	
Bone-ash cupel top	Fall of 43°	Fall of 102°	Rise of 140°	Rise of 45°	Rise of 40°	58°
Bone-ash cupel bottom	Fall of 0	Fall of 5°	Fall of 15°	Rise of 2°	Fall of 18°	

ture, these facts being due to the greater diffusivity and also greater specific heat of these cupels. In the case of the patent cupel, brand B, the temperature at the top and at the bottom is somewhat higher than in brand A, at the end of 6 min., being 20 and 12 deg. hotter respectively, and this is accounted for by the fact that this brand has a slightly lower diffusivity and specific heat.

In the case of the bone-ash cupel, the temperature at the top rises to a comparatively high figure while the temperature at the bottom rises very little, so that there is a considerable difference between the temperature at the top and at the bottom (58 deg.), this being due to the lower conductivity and specific heat and may in part be due to the difference in the nature of the surface of bone-ash cupels. The natural conclusion from these experiments, and one that can easily be proved by ocular demonstration, is that the temperature of the cupelling lead is lower in the patent than in bone-ash cupels, at any rate during the commencement of the operation, even when the cupels are both at the same muffle temperature. This does not hold good after the cupels are more or less saturated with litharge, and is not evident toward the end of the operation. The effect of saturating the cupel with litharge is at present under consideration, and the results of these experiments will be communicated later.

TEMPERATURES WHILE COOLING SILVER.

		Time Required for Silver to Solidfy, Sec.	Time Required for Silver to Spit, Sec.	Time Required for Outside of Cupel to Lose Visible Heat, Sec.	Time Required for Cupel to Lose all Visible Heat, Sec.
First set	Patent cupel, brand A	35	100		
	Patent cupel, brand B	27	112		
	Bone-ash cupel	10	63		
Second set hotter	Patent cupel, brand A	75	105		
	Patent cupel, brand B	45	140		
	Bone-ash cupel	15	75		
Third set	Patent cupel, brand A	...	135	111	149
	Patent cupel, brand B	..	140	129	155
	Bone-ash cupel	...	83	35	133

Specific Heat

The specific heats of these cupels were determined by means of Regnault's specific heat apparatus, corrections being added for radiation of heat during the experiment.

After experiments made for the purpose it was considered safe to assume that no chemical action likely to vitiate the specific heat results took place.

The following were the mean figures of many determinations for the different cupels between 100 and 15 deg. C.: Patent cupel, brand A, 0.215; patent cupel, brand B, 0.210; bone-ash cupel, 0.185. In carrying out these experiments confirmation was obtained of the greater diffusivity of the patent cupels, for on dropping them into the water, a maximum temperature was reached in 1½ min., while a maximum temperature was reached in the case of the bone-ash, only after 2½ minutes.

In considering these figures it should be remembered that the specific heat of solid lead is 0.031 and of molten lead 0.035, the specific heat differences of the cupels thus being magnified about six times in the temperature of lead at the melting point. The relative mass of patent cupels is much greater than of bone-ash cupels and this tends to increase the effect of any difference in the specific heats.

Bearing this in mind, it will be evident that the differences noted in the specific heats will help to explain some of the differences in the cupellation temperature curves. For example, the bone-ash cupel, having a lower mass and lower specific heat, must have a considerably lower capacity for heat, and hence, being unable to absorb the heat of oxidation of the lead button, the latter reaches a much higher temperature than similar buttons on patent cupels, for these have a greater mass, a higher specific heat, and therefore a greater capacity for heat.

Rate of Cooling

For these experiments a fairly large button of silver was cupelled with lead on the different cupels of the same size, and the cupels were removed from the muffle while the silver was still molten, and the times noted for the various changes to take place during the cooling down. The accompanying table is made from a large number of observations, in order to illustrate the differences.

From these figures it will be evident that there is a considerable difference in the rate of cooling and in the time required for the solidification of the silver beads. These differences are due to the differences in the thermal properties of the cupels, and in them is also found the reason for the fact that the nature of the "spit" on silver beads is different. It is probable that during the longer time required on patent cupels for the silver to reach the temperature at which spitting can take place, the solid surface skin of the bead becomes fairly thick and withstands rupture at the moment when the oxygen is liberated. This appears to be confirmed by the fact already mentioned that when spitting is forced a burst takes place, often accompanied by the blowing off of pieces of solid crust of considerable size. In the case of silver beads on bone-ash cupels, these reach a "spitting" temperature in less time, more can take place, the solid surface skin has become thick enough to withstand rupture; a small opening is thus created in the skin and a portion of the still molten silver inside the beads is forced through, forming the well known vegetation spit.

Conclusions.

(1) There are great differences in the thermal properties of patent and bone-ash cupels.

(2) The diffusivity of heat and the specific heat of patent cupels are greater than those of bone-ash cupels.

(3) During cupellation at the same muffle temperature, the actual temperature of the cupelling button is much lower on patent than on bone-ash cupels.

(4) Silver beads take longer to solidify and to spit on patent than on bone-ash cupels after being withdrawn from the same muffle temperature.

(5) Silver beads are much less likely to spit on patent than on bone-ash cupels, and the nature of the spit is different in the two cases.

Lime Production in 1908

Lime production in the United States in 1908, in common with other industries, decreased in both quantity and value of output. Many plants that had closed in 1907 remained closed during 1908, and some plants ran only part of the time or with diminished force.

The lime made in 1908 amounted (*Press Bull.*, U. S. Geol. Surv.) to 2,766,873 short tons, valued at $11,091,186, a decrease of 325,651 short tons in quantity and of $1,565,510 in value from the production of 1907. The value of the lime produced in this country during the last twelve years is shown in the accompanying table:

VALUE OF LIME PRODUCED IN THE UNITED STATES

1897	86,399,187
1898	6,886,549
1899	6,983,067
1900	6,797,496
1901	8,294,054
1902	9,335,618
1903	9,255,882
1904	9,951,156
1905	10,911,880
1906	12,480,653
1907	12,656,705
1908	11,091,186

In 1908 Pennsylvania ranked first in both quantity and value of output, and Ohio, Wisconsin, Missouri, and Maine followed, in the order named.

The largest use of lime is that for building, the next largest is that for fertilizer. Considerable quantities are used by paper mills, chemical works, sugar factories and tanneries. The production of hydrated lime, a comparatively new industry, requires large operations, and many new hydrating plants were established in 1908

Improvements in the Dry Air Blast

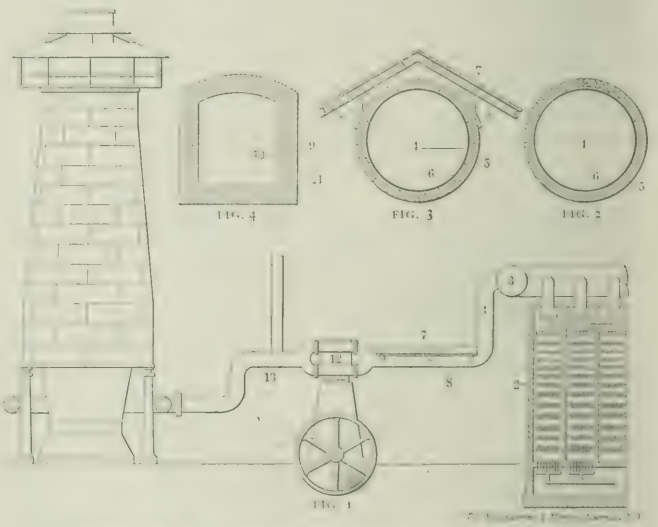
A new patent has been taken out by James Gayley, which may be regarded as a supplement to and completion of his dry-air blast. This patent—No. 935,628, dated Sept. 28, 1909—is the result of experiments and investigations made in the operation of the dry air blast. The original invention was made and operated entirely for the purpose of reducing the moisture in the air to a small and substantially uniform content. The results obtained by this are now well known and are a matter of record, to which frequent reference has been made.

In experimenting with the process, however, it became apparent that it is of importance, not only to reduce the moisture in the air to a small and uniform content, but also to supply air to the blast furnace or converter at a substantially uniform temperature, in order that the weight of air shall be uniform. The blowing engine will measure the air as it passes through, and will deliver practically a uniform volume; but the weight of the air so supplied will vary with its temperature. The air-drying plants thus far installed have generally been placed with reference entirely to convenience, especially with relation to other buildings about the furnace, and have often been at a considerable distance from the blowing engine, without recognizing any disadvantage in such an arrangement. In experimenting with the blast it has been found that the long pipes required to carry the air cause considerable variations in the temperature and consequent weight of the air as it reached the blowing engines. The pipes are subjected to the rays of the sun by day and to cooler air by night, the variation in temperature being frequently 10 to 20 deg. or more. A difference of 20 deg. F. in temperature represents a variation of about 4 per cent. in the weight of the air. In a large modern blast furnace this would make a variation of about 150 lb. per minute in the weight of air furnished.

The present patent, therefore, covers methods devised to make the temperature—and consequently the weight—of air supplied to a blast furnace or converter uniform, as well as the moisture content. In his specifications Mr. Gayley says: "The raw materials of the furnace are made as uniform as possible, but the air consumed per ton of iron is [illegible] per cent greater by weight than the raw material, and it is therefore important to deliver air to the furnace which is uniform in weight as well as in moisture content per unit of volume. The variation in the weight of the air will influence or retard the rapidity of combustion of the fuel in the blast furnace, and thus cause a change in the fusion or combustion zone of the furnace. Such a change in this zone often causes the furnace charge to stick or hang on the walls, and these hanging portions, when dislodged, cool off the furnace hearth and interfere with the uniformity of furnace operation and the grade of metal produced. These disturbances, I have found to exist independently of the percentage of moisture in the air, since air of varying temperatures can, and often does, contain the same quantity of moisture. Air of varying temperatures, however, cannot contain the same weight per unit of volume; and the purpose of my present invention is to secure better uniformity in the metallurgical process by supplying air of substantially uniform temperature and therefore substantially uniform weight, as well as of substantially uniform moisture content, to the blowing engine, and hence to the furnace or metallurgical apparatus. In carrying out this discovery when air-drying apparatus is applied to existing plants, where the air-drying apparatus is remote from the blowing engine, I jacket or otherwise protect the air conduit leading from the air-drying apparatus to the blowing engine, in order to preserve a substantially uniform temperature of the air therein, and thus supply air of substantially uniform weight, as well as substantially uniform moisture content, to the blowing engine."

In the patent drawings, which are reproduced herewith, Fig. 1 is a sectional elevation showing one form of apparatus for carrying out the invention, Fig. 2 is a section of a jacketed pipe; Fig. 3 a section of a jacket with shield; Fig. 4 a section of an underground conduit.

In the drawings, 2 represents a portion of a refrigerating and air-drying apparatus, which may be constructed in accordance with previous patents, or in any other desirable way, the function of this apparatus being to reduce the moisture content of the air to a small and substantially uniform percentage. From this apparatus the dried air enters a pipe 3, whence it passes into the air conduit 4, leading to the blowing engine. The vertical portion of this pipe or conduit 4 is jacketed, for example, as shown in Fig. 2. In this figure 5 represents insulating material forming a jacket around the pipe and spaced apart from the pipe to form an annular air space 6 between the pipe and the jacket.



APPARATUS FOR PRESERVING UNIFORMITY OF TEMPERATURE IN BLAST

Any horizontally extending portion of the pipe above ground is also preferably protected by a roof or shield 7, shown in Fig. 3, this roof or shield being double with an air space between. It may be supported on the conduit itself by brackets 8. If the conduit is under ground, it is preferably constructed as shown in Fig. 4, in which 9 is an outer wall, 10 the inner wall or conduit proper, and 11 a layer of insulating material between the two walls.

The blowing engine cylinders are represented at 12, 13 being the pipe leading from the blowing engines to the blast furnace or point of use. The patent, however, is not limited to the special arrangement shown, as any suitable means of delivering the air at a uniform temperature may be used. The terms "blast fur-

nace or converter" are intended to cover any metallurgical apparatus employing an air blast under pressure. The claims of the patent are five in number, as follows:

1. The method of operating blast furnaces or converters using an air blast, consisting in reducing the moisture content of the air to a small and substantially uniform percentage, supplying the dried air at a substantially uniform temperature and weight to blowing engines, and then forcing this air to the furnace or point of use; substantially as described.

2. The method of obtaining uniformity in the operation of blast furnaces and converters, consisting in supplying thereto air of a small and substantially uniform moisture content, and of a substantially uniform temperature and weight.

3. The method of supplying air to blast furnaces and converters, consisting in reducing the air to a low and substantially uniform temperature, reducing its moisture content to a small and substantially uniform percentage, maintaining the air thus treated at a substantially uniform temperature as it passes to the blowing engines, and then forcing said air to the blast furnace or converter.

4. In air supply apparatus for blast furnaces or converters, a refrigerating chamber, arranged to reduce the air to a low and substantially uniform temperature and to a low and substantially uniform moisture content, a blowing engine between the refrigerating chamber and the blast furnace or converter, and a conduit connecting the refrigerating chamber and the blowing engine and arranged to maintain a substantially uniform temperature of the air at the blowing engine.

5. The combination with a refrigerating chamber and a blowing engine, of a conduit connecting the same, and a conduit extending from the blowing engine to a blast furnace or converter, and means for insulating or protecting the conduit between the refrigerating chamber and the blowing engine, whereby air of a substantially uniform temperature and weight, as well as of a substantially uniform low moisture content, is supplied to the blowing engine.

The extensive onyx deposits of the Cervantes estate near Etla, Oaxaca, Mexico, have been taken under option by Consular Agent Lawton, of Oaxaca and associates. These deposits have not been systematically developed by the owners, but have been worked to some extent, and are part of extensive onyx deposits, some of which have been worked for about twenty years. The onyx is of close grain, of beautiful coloring, and fair weathering qualities, and the ease of working it, together with the extent of the deposit, makes it potentially valuable.

Ore Deposits in the Vicinity of Parker, Arizona

SPECIAL CORRESPONDENCE

For many years the region along the Colorado river, in the vicinity of the Parker Indian reservation, and on both the California and Arizona sides of the river, has been known to be a field of promise for the copper miner. Development, however, was slow until the building of the California & Arizona railroad. With the town of Parker as a center, a circle drawn on a radius of 20 miles would include within its area four important ranges, or parts of ranges, in which are copper, copper-gold and gold-ore deposits. There is one district where surface conditions indicate that lead minerals may be the basic ore carrying the gold, shallow workings having produced considerable material of this kind. These deposits occur in the Plomos mountains, 15 to 20 miles southeast of Parker. Some minerals of tellurium have also been found there.

Southwest of Parker, 18 miles, is the Riverside range, in which two companies are developing groups of claims, while the individual prospector is exceedingly busy. The ore-bearing formations are schists and limestones; the ores are copper-gold and gold, the gold tenor of those deposits now being developed being somewhat higher than in the copper ores of the other districts. West and north of Parker are the Whipple, Turtle and Copper Basin districts, the latter having been the scene of more or less activity for many years. A large area here is intensely mineralized and a number of operators are now opening ground; one company, it is stated, is mining ore of shipping grade. The Calumet & Arizona company, of Bisbee, has recently acquired the Horn group in the Turtle mountains.

ORE OCCURRENCE

The districts north and northeast of Parker have been more extensively developed and are being more vigorously attacked at present. A type of ore deposition in this district, serving to illustrate that in other mines in the same formation, is found on the property of the Arizona Empire Copper Mines Company. This property is nine miles northeast of Parker and exhibits all of the features characteristic of this area, both as to ores and geology. A geologic section from the river easterly through the Eagle, Carnation and Cyclone groups, begins at the river, with a red-brown granitoid basic rock, generally coarsely crystalline, intruded by gray porphyry dikes, along the course of which are copper-bearing veins, as yet undeveloped. This is succeeded by a gneiss in which are no mineral veins of commercial importance. Lying against the eastern margin of this gneiss is an eruptive rock (syenite), in and over which are the uptilted limestones, shales, schists and quartzites of the ore-bearing zone. These have been intruded on the bedding planes by the same eruptive. Overlying all are flows of dolerite lava.

The sediments have been folded, and the ore deposits occur in the contacts and in the fault fissures due to the folding movement. Along the lines of contact with the limestone, the shales and limestones have been silicified to a marked extent, and the exposures are much like quartz veins. Mineralization along these contacts extends into both the shales and limes, forming chamber deposits in the lime and permeating the shales as a general impregnation of the lamination and fracture planes; the whole forming an ore-bearing zone with a core, or central vein, of quartz or quartzose material heavily mineralized with copper minerals. The gangue of this central vein is usually silicious, and the minerals, to the depth attained, entirely products of oxidation. Sulphides have not yet appeared. An important feature of these deposits, commercially, is the comparatively high gold tenor. This metal is present in all the ores thus far developed in this region.

HEMATITE ACCOMPANIES ORES

Hematite in the form of specular iron is a characteristic accompaniment of all of these deposits, large masses in chambers and veinlets occurring throughout both the limestone and shales, but especially in the contact zones. These bodies invariably contain gold in varying amounts, such determinations as have been made indicating an average content in the neighborhood of $5. They will probably give place to copper or copper-iron minerals, in depth. At what depth the sulphide zone will be encountered is undertermined and will likely be first ascertained by the drilling operations about to be inaugurated by the Arizona Empire company. That the intricate system of veinlets in the mass of contact shale, now filled with oxidized copper ore, will have the mineral replaced by sulphide ores in depth, is the opinion of several prominent engineers who have inspected these holdings.

Two miles southeast of the Cyclone group, the company has acquired and will develop the Wardwell and Osborne group of six claims, where the showings are as strong and in general the same as those of the groups described. Pipe lines to the river will be laid, and the entire property vigorously developed. The Lewisohns are developing the Planet mine to the north east of this district in the same formations. The Clara Consolidated is finishing its smelting plant and railroad at Swansea. The Arizona Empire company is preparing to test its properties with a core drill to learn the depth at which sulphides occur. The working shaft will not be sunk until this drilling is accomplished.

European Methods of Entry Timbering in Coal Mines

By Henry M. Payne*

Notwithstanding the fact that in many of the coal-mining districts of Europe, timber must be imported from the Scandinavian forests, it is found in greater quantities and is used with greater prodigality than in America. In Belgium and northern France, especially, the seams are multi folded, and mining is carried on at great depths, frequently exceeding 3000 ft., and a squeeze when once allowed to start, generally necessitates abandonment of that section of the mine.

Almost universally, under these conditions, a double set of timbering is carried on, or in the case of main haulageways, brick walls are built with a special timber plate in the sides, and the cap timbers are reinforced by the two beams extending parallel to and over the center of each track, and stiffened at intervals by timbering, as shown in Fig. 1.

In cases where the top is especially bad, or where a fireclay vein immediately below the coal, gives much trouble from "puckering," an excavation is made on the lower side of the entry, and a brick or broken rock foundation is laid (see Fig. 2). Ordinary timber sets are then placed, about 18 in. apart, the caps are notched down over the post and the back is closely lagged and packed. Inside of this a second timber set is placed, the upper part similar to that of Fig. 4, the lower part taking the place of the masonry. The cost under these conditions is from 25 to 30c. per ton.

Mine Timbering in France

In the French coal district of France, in some places, steel hoops or rings are used in place of timbering. These are about the weight and section of a 12-lb. mine rail, and are placed 1 m. (3.25 ft.) apart, filled solid between with flat lagging.

The lower ends rest on longitudinal sills, which in places of extreme pressure, or at great depths, are tied, underneath the track, to prevent spreading or squeezing. These rings, the ties and the lagging are shown in Fig. 3.

In this same district, if it is not necessary to cover the whole area with lagging, a form of hook is used to hold these rings in position. These hooks are made of ½ in. to ⅝ in. round iron, and are placed at intervals of 9 in. to 1 ft. apart around the crown of the arch. These are shown also in Fig. 3.

The horseshoe-shaped rings are in two parts, clamped at the top, and fastened with steel wedges. When bent by rock pressure, they are easily removed, reshaped and put in place again. The original cost per ring is about $5, and they are used over and over again, the construction in two sections and the clamp and wedge joint permitting variations in width and hight. The flat lagging costs about 4c. per ring, equal to 1 m. distance along the entry.

In many mines in Europe, the lagging is made by fine brush and twigs, carefully trimmed in the forests, and bundled and carried into the mines, this material being cheaper than ordinary lagging.

Timbering Rooms in Germany

A favorite method of room timbering in Germany, in mines having draw slate or soft top, is shown in Fig. 4. Ordinary room props are placed about 3 ft. apart in rows from 5 to 8 ft. apart, and instead of separate cap boards to each post, one long cap board or half-round timber is wedged across the top of each row. At right angles to these, and extending from one row to the next, smaller pieces, usually poles about 2 in. in diameter, are placed, and again, crosswise of these, and parallel to each row of props, are driven short, flat pieces, so as to cover the entire area of the roof with a network of timbering. This method costs from 4 to 6c. per ton on advance work, and in mines where the old works are filled with sand by the flushing method, the cost does not exceed 4c. per ton.

The extremely low death rate per thousand men employed in these countries is attributable as much to the precautions taken in timbering as to those in the use of explosives.

During the past year, the average daily wages paid coal miners in Germany was 97c. for work in the pit, and 71.4c. for work on the surface.

It is believed that the present law in England restricting miners' working time to eight hours a day will stimulate the use of coal-cutting machinery in order to maintain the usual output.

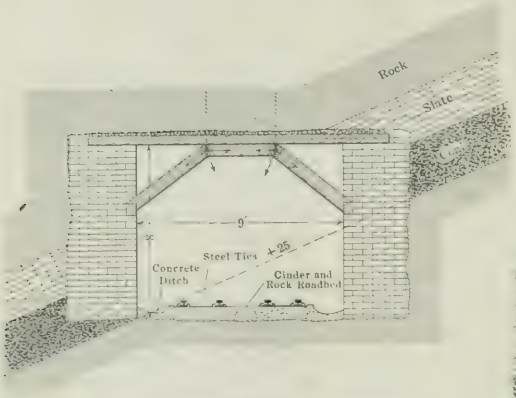


FIG. 1. TIMBERING IN A BELGIAN MAIN ENTRY

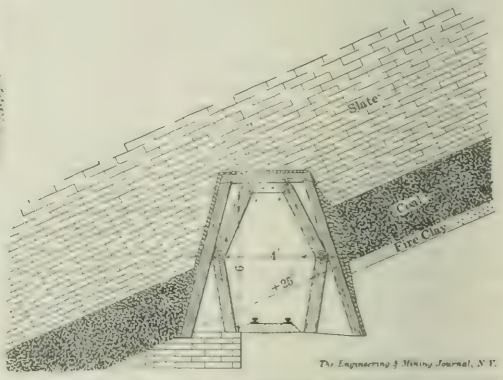


FIG. 2. METHODS OF TIMBERING A BELGIAN CROSS ENTRY

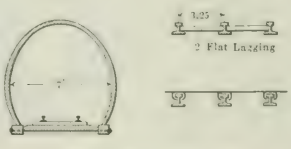


FIG. 3. French Entry Lining.

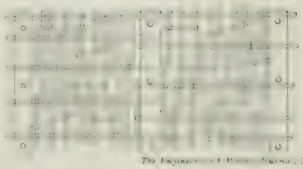


FIG. 4. GERMAN ROOM TIMBERING.

* Consulting mining engineer, Morgantown, W. Va.

A Cherry Miner's Last Message

By Floyd W. Parsons

The following diary was found on the person of a young miner, whose body was among the last to be brought out of the St. Paul mine at Cherry, previous to the final sealing. Any comment would only detract from the completeness of the message:

"November 13, 1909—Alive at 10:30 o'clock yet. Alfred, my brother, is still with me. A good many dead mules and men. I tried to save some, but came almost losing myself. If I am dead give my diamond ring to Mamie Robinson. The ring is at the post office, where it was sent. Henry Caumicent can have the ring I have in my good clothes. The only thing I regret is that my brother is here, and cannot help my mother out after I am dead and gone.

"I tried my best to get out, but could not. I saw Jim Jamieson and Steve Timko lying dead along the road and could not stand it any longer. So what is a fellow going to do when he has done the best he can? It is five minutes past 11 o'clock and the air is fine, but at times it is so bad it almost puts a fellow's light out. It is something fierce to see men and mules lying all around like that.

"To keep me from thinking I thought I would write these few lines. There is rock falling all over. We have our buckets full of water, sump water, and we drink it and bathe our heads with it. 3 o'clock, poor air and blackdamp. 4:15 o'clock, change of place. No blackdamp, but poor air.

"We lost a couple of our group. Two men tried to get out and could not get back. 7:50 o'clock, tired, hungry and sleepy, but I could stand quite a bit of this if I could get out of this hole. So what is the use of knocking when a man is down? 7:50 o'clock in the morning. This is Sunday. 8:18 o'clock on Sunday morning. There is no air. We fanned ourselves with the lids of our buckets. 9:25, and blackdamp coming both ways. 10:25, we were past the party and could not get any further. We gave up all hope. We have done all we could. The fan had better start above soon. 10:25 a.m., Sunday. Still alive, that is, you will find me with the bunch. It is 11 a.m. There are six of us: Alfred Howard, Miller, Leyshon, Sam, D. Howard, Steele, and Gus Francisco. We are still alive. The only hope is the fan.

"I think I won't have the strength to write pretty soon. 12:15 p.m., Sunday. We are having a swell time making fans. If they can't give us air, we will make some ourselves. That is the best we can do. We have three of them going. Joe Rapsel was the man who invented the fan. 3:25 p.m. The blackdamp is coming in on us. Only for the fans we would be dead. Dying for the want of air. 6:20 p.m. Now we are trying to make the bottom with the fans. We have six of them moving. One fan after another about 15 ft. apart. 9:15 p.m., Sunday. Still alive. We had to come back with our fans. 10:25 p.m., Sunday evening. We all had to come back.

"We can't move front or backward. We can stand it with our fans until Monday morning. 2:15 a.m., Monday morning. Am still alive. We are cold, hungry, weak, sick and everything else. Alfred Howard is still alive. 9:15 a.m., Monday morning. Still breathing. Something better turn up or we will soon be gone. 11:15 a.m. Still alive at this time. 12:44 p.m., Monday. Our lives are going out. I think this is our last. We are getting weak, Alfred Howard as well as all of us."—The young miner evidently succumbed before he could write good-by.

The Value of Zones in Stopping Flame

By Joseph Virgin*

There has been a good deal of comment the last two years because of the flame from dust and gas explosions passing over wet zones, causing many European engineers to criticize if not to condemn the spray method in its entirety.

Quite a number of mining engineers have been advocating zones of micaceous shales and schistose. It is not the purpose of this article to verify any of these gentlemen in their findings or statements; however, there seems to be good and sufficient reasons why flame should cross these places. In fact it would seem more wondrous to me if it did not. Furthermore, I can hardly bring myself to believe that zones of water, shales, or pure mica schist would guarantee any degree of safety. Therefore, I believe "the game is not worth the candle."

As an earnest advocate of the plan of dampening dust in any way possible, I certainly have not advocated wet zones. Nothing less than dampening all the dust, and keeping it damp will suffice. It seems to me that the enormous force generated by an explosion of dust will propel the flame across any reasonable length of zone, be it shale or water. Trying to find the value of such a force I have arrived at some reasonable conclusions even though they are crude. I trust they will cause others to investigate.

Let us consider a mine heading 1000 ft. long and 6x10 ft. in section. Such an opening would contain 60,000 cu.ft. of air, and each cubic foot would contain 0.017 lb. of oxygen. The entire 1000 ft. of entry, therefore, would contain 1020 lb. of oxygen. This oxygen will find plenty of dust for carbon, and for its expansive value we can compare it to the expansion of gunpowder, as the air contains the only source of oxygen for an explosion.

For the sake of comparison let us take ordinary gunpowder which contains about 40 per cent. of oxygen, there the quantity of powder necessary for 1020 lb. of oxygen is

$$\frac{100 \times 1020}{40} = 2550$$

lb.; consequently, 2550 lb. of powder would seem to have the same expansive force as the 60,000 cu.ft. of dusty air. Professor Abel estimates the pressure developed by blasting powder to be 43 tons per square inch. Estimating on this basis at the face of the heading, we would have a total pressure of

$$60 \times 144 \times 43 = 371{,}520$$

tons. Also 86,000 lb. pressure per square inch equals 12,384,000 lb. per square foot. This is quite a respectable pressure which would move with a great velocity.

Velocity of the Flame

Let us try, therefore, to discover what the velocity is: Now the velocity $= V = \sqrt{\frac{PA}{KS}}$. Assuming a zone of 1000 ft., and considering that $K = 0.0000000217$, then V would equal more than 100,000 ft. per minute; the flame would cross the wet zone in about 0.6 second.

Of course, if the roof rock, the sides and bottom were thoroughly wet, it would retard the flame somewhat; but I do not believe the same could be said of a dry, dusty zone of micaceous shale. I feel safe in saying that few of the advocates of such a plan would care to stand in a dusty roadway across a zone of that nature.

Captain Desborough, of the foreign expert commission, who visited these states last year, said: "Before a person can call a dust flame an explosion, it must have a velocity exceeding that of sound." Yet here we have a velocity 100 times as great, and some of our friends want to call it rapid combustion. While every mining man of experience will gladly welcome any method of arresting these flames, yet for one I firmly believe that keeping the roadways in a solid condition and the roof and sides damp is a much safer way than to have dusty zones of mica schist.

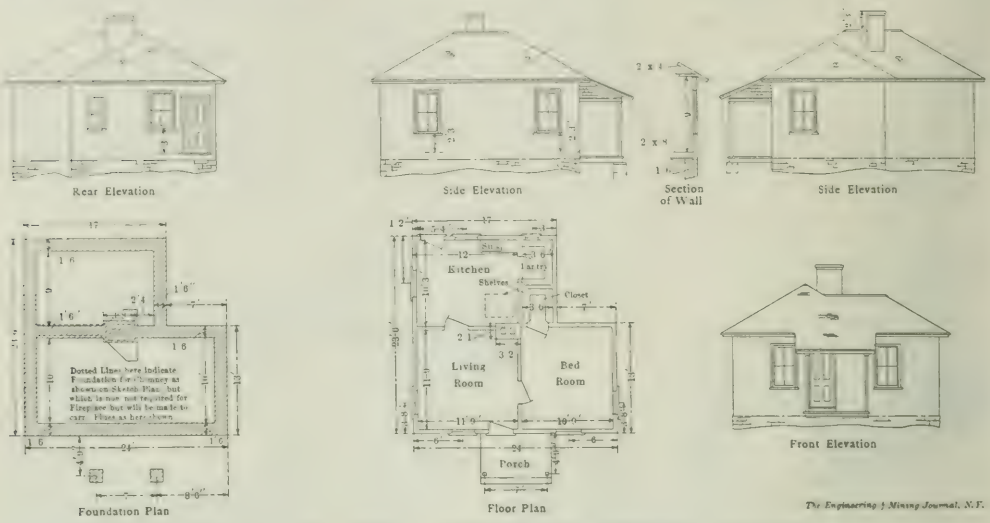
*Mine superintendent, Plymouth Coal Company, Plymouth, W. Va.

The number of coal-cutting machines employed in the mines of the Nottingham district of England has increased from 154 machines in 1907, to 173 in 1908 and 200 machines in 1909. The power used is almost equally divided between electricity and compressed air. The latter is considered safer, but electricity seems to have the advantage in cost. Considering all of the coalfields of England, however, compressed air is most used, being in the proportion of nine to seven to electricity.

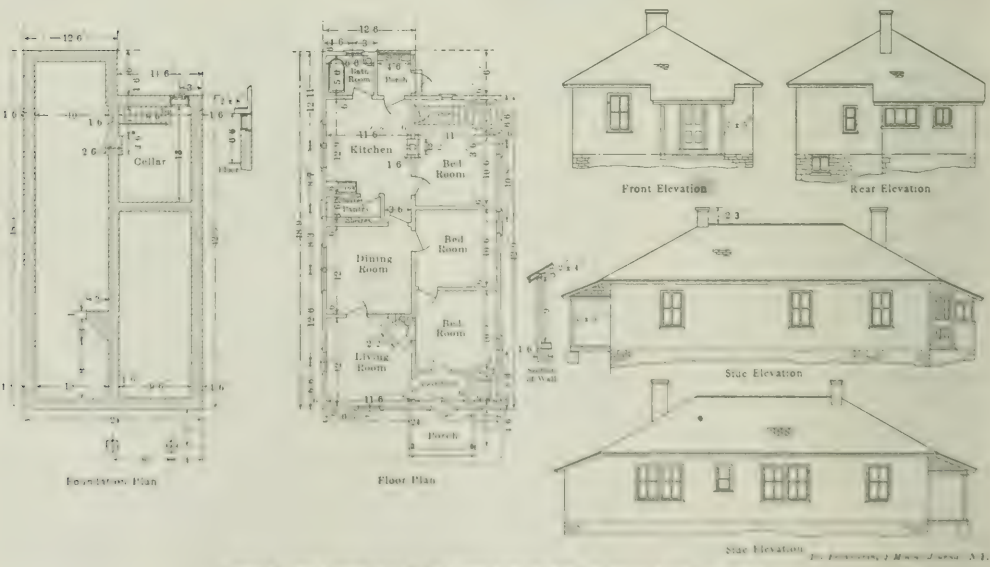
The Design of Small Houses for Coal Mining Towns

The majority of coal-mine operators today are devoting considerable attention to the sociological side of coal mining in this connection the provision of better homes for the employees is a matter of importance. It is not any great philanthropy on the part of mine owners that has prompted the present attitude. Quite the contrary is true, for the move has been prompted by the belief that better houses mean better workmen and more contented men. This in turn means higher efficiency, greater output, more profit.

The accompanying drawings show two styles of houses constructed by the Carbon Coal and Coke Company at its mines in southern Colorado. The designs, as shown, are so complete that no description is necessary. Houses of this kind when properly built and then painted in a variety of harmonious colors, rather than all roof-red, or sky-blue, present a respectable appearance and materially increase the attractiveness of a mining town.



GENERAL PLAN AND ELEVATION OF A THREE-ROOM HOUSE DESIGNED FOR A COAL CAMP



DETAILS AND DESIGN OF A SIX ROOM HOUSE FOR COLORADO COAL MINERS

Peat as it comes from the bog usually contains from 85 to 90 per cent. moisture all of which must be evaporated before burning.

The Utilization of Anthracite Culm for the Generation of Electricity

By John Clark*

The great culm banks which surround the mine openings in the anthracite coal regions have usually been looked upon by persons not fully acquainted with all the conditions, as ideal sites for the generation of electricity, because the culm can be obtained for little or nothing. Although grates have been devised for burning this cheap fuel, the problem which confronts the operator of a plant located on such a site is to obtain water. The water that is used in the mines and in the breakers, and finally finds its way into small streams, is so charged with dirt and sulphuric acid as to render its use for boiler-feed purposes impossible. In fact, if an ordinary coal shovel were thrown in the water and the site revisited in a year, no sign of the shovel could be found, the iron having been completely dissolved by the acid in the water.

In not a few locations the water is very much more expensive than the fuel, so that while ordinarily one would expect that power plants located where fuel is cheap could manufacture electricity at a very low cost, such is not the case, a kilowatt-hour of energy being manufactured in large cities remote from the coalfields for considerably less oftentimes than it is manufactured at the mining plants.

As a result of the scarcity of water, most of the plants located in the coal regions operate noncondensing. This practice is also partly due to the cheapness of fuel. However, with the use of a steam turbine the best economy is obtained when the plant operates condensing. Despite the cheapness of fuel, it is possible to realize a marked economy with simple engines if these be operated condensing. The problem, however, is to obtain the necessary water for this purpose, and it is surprising that more use is not made of the cooling tower for husbanding the supply. Plants already in operation using circulating water drawn from muddy streams, carrying grit and sand, avoid the cutting of pump pistons and cylinders by using cooling towers.

The Cooling Tower Can Be Employed to Advantage

The water coming from the condenser in a heated condition is spread out in such a way as to bring the greatest surface in contact with the greatest quantity of air, so that evaporation takes place quickly and effectively. The cooling tower, of course, does its best work when the surrounding air is dry, but radiation does part of the cooling during the winter season, as does also the contact of cool air with the heated water. Nevertheless, the bulk of work is due to evaporation. Manufacturers of modern cooling towers obtain the necessary circulation by means of fan blowers, and a fan tower is to be commended where the quantity of heat to be removed is great, or where the duty is especially severe in the hot summer months. But the cost of power necessary to operate the fans, and the wear and tear, due to moving parts, has resulted in the production of natural-draft fanless towers. The open fanless tower not only dispenses with the fans, but does away with the tank structure entirely. The apparatus is open on all sides to the air, and the natural currents are utilized.

Where sufficient ground area is available, as at the mines, this type of tower, which is simple in construction, easy of access and which requires a minimum of attention, should prove efficacious. The tower can be used in connection with either jet or surface condensers, but with the former system an aditional pump must be employed to deliver the discharge from the air pump to the top of the tower. A surface condenser is preferable if the tower is located on the roof or otherwise elevated since the discharge and suction columns balance below the tower, making the work of the pump that due solely to the hight of the tower itself. The cooling tower has done much to make feasible the operation of steam engines condensing, in places where the cooling or injection water would ordinarily be too expensive or too scarce.

NOTE. Abstract of article published in *Electrical World*, Dec. 2, 1909.

*Scranton, Penn.

Another View of the St. Paul Mine Disaster

By L. F. Wilson*

The St. Paul mine is quite distant from any city or village with a proper fire fighting apparatus, and the mining company had no means of taking care of such an emergency itself. The shafts and galleries of a large coal mine have millions of feet of timber in the supporting structures and this timber is rendered peculiarly inflammable by the accumulations of coal dust. The mine in question was operated in a modern way and its officials were of the best. Therefore, what happened to this mine can as well happen in any of the many workings in Illinois and Indiana.

It may be of interest to those who are mystified by the vague and exaggerated daily press reports, to get a description of the nature of the accident which bids fair to being the worst or, at least, among the worst which has happened in the United States. The installation of machinery and other equipment at the Cherry mine is typical of all the bituminous mines in Illinois and Indiana. These mines are not gaseous and there is ordinarily no danger from open lights. The main shaft, which extends down through three working levels, is served by two hoisting cages which are operated from the same drum in such a way that one cable is hauled in when the other is paid out. The cages do not go beyond the second level and a false floor closes the main shaft at that point. An air shaft which extends straight down to the third gallery is served by a fan running normally as a blower and discharging into the air shaft. This shaft is also used for a hoist from the third to the second vein. At the second gallery it was the custom to haul the coal across to the main shaft from whence it was brought to the surface. The men were carried up and down over the same course.

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The Hoisting Arrangement

The winding drum for the main shaft with its engine is situated in an engine room about 100 ft. from the mouth of the shaft. The engine is a duplex simple machine with a link-reverse motion. The cylinders are approximately 16x30 in. and are set quartering. The engineer sits between the cylinders and operates by bell signal only. The air-shaft hoisting engine is somewhat smaller and is in a room by itself about 300 ft. from the main-hoist engine room. Both engines, as well as the fan engine, are operated with steam from the central boiler plant. The signals used at both hoists is the pressure-bell system. That is, an air tube so arranged that the stroke of a hand air pump at one end will force up a piston clapper to ring a gong at the other. The gong rung from one end is answered from the other.

Engineer Cowley at the main hoist and engineer Raisdell at the air-shaft hoist have been severely censured by some of the miners rendered hysterical in their grief. As a matter of fact, engineer Raisdell, who operated a cage which never comes to the surface, raised and lowered his cage, at the time of the fire, as if nothing had happened and when the signals ceased to come he went over to the main hoist where Cowley was working, to assist if possible. The latter was also running the engine in response to the signals as usual. It might be stated here that the signals can only be given from one of the galleries in the mine and not from the cages themselves.

When smoke was seen issuing from the main shaft a party of four men started making trips down to assist if possible in getting the miners out. On the third or fourth trip down the engineer was signaled to hoist and then to stop, next to lower, then to hoist with all speed, he then got a bell to stop and to lower again, then no more bells were heard. Unable to decide what to do and

practiced in obeying the signals, he refused to haul away for some moments, perhaps a quarter of an hour, and when at last he did hoist the cage, 11 men were brought up dead, including those who had gone down.

The solution of the signal confusion was probably this: The cage was started up on the last trip, when a miner who wished to get up with the rest pulled the bell to stop and bring the cage back; after he got on, the cage was started up again, when another poor fellow came along and seeing the cage going up without him, brought it back in the same way. By this time the fire had caught them and no more signals could be given. It is probable that if the cage had been brought up regardless of the signals, ten of the men would have escaped. (The last one would have been left behind.)

Shortly after the fire was discovered, as is the custom, the fan was reversed. This is done in order that fresh air will be sucked down the main shaft upon the miners waiting to be hoisted instead of forcing the gases and flames toward the main shaft, as would be the case if the fan were kept running normally. In this case, however, the reversal of the fan probably caught many men in the act of mounting from the third to the second level in the air shaft. In any case it made little difference as they would have been killed in the higher level with their fellows.

As soon as the cage of dead men had been hauled up, and it was seen that the flames would soon be shooting out, a quick decision was made to seal the shafts. Railroad rails were laid across the top and boards were placed to hold the sand shoveled on top. The air shaft was sealed by blocking the fan intake with bricks secured by tearing down its housing. Many classed this action as murder of those still in the mine. As a matter of fact, however, if this course had not been taken, the flames would have burned away the timber structures and cave-ins, which would have closed the mine for months, would have resulted. Not even the bodies of the miners could have been recovered had the fire not been smothered by the covering of the only exits.

At the present writing, the mine has not been opened. Several attempts to do so have resulted in "blowing up" the fire. When entry is made, the writer predicts that it will be found that some of the men now dead in the third vein had lived for several days after the fire was discovered. One man now in that part of the mine was rescued in a French mine in six days under similar conditions.

Considering the subject of better fire protection, it is suggested that coal mines be protected by arranging worked-out rooms as havens of refuge, by fitting them up with doors, food and water, and providing to them pipes from air compressors so that they could be supplied with air under a slight pressure sufficient to keep out the smoke and gases and for breathing. Enough of these should be fitted up to allow of their quick occupation and it seems certain that, in a case like this, many lives would be saved.

Coal-Mine Accidents are Due to Violation of Mine Laws

Chief Mine Inspector Hanraty, of Oklahoma, has issued a circular with the following words of caution: It is my opinion that the cause of the many fatal and serious accidents in the mines of Oklahoma is through the carelessness, incompetency and the inexcusable ignorance of the mining law, by some superintendents, pit bosses, fire bosses and miners, who for the sake of personal gain deliberately violate all laws and destroy not only their own lives, but the lives of their fellow workers. It is hard to understand, why so many coal-mining companies will spend any amount of money for the equipment of mines to make them safe, and employ superintendents, pit bosses, fire bosses and miners regardless of their practical experience in mining.

Rules to Be Observed

No person shall enter the mine until the fire boss makes a report outside of the mine on a blackboard for that purpose, arranged where men can conveniently inspect it. The fire boss shall also make a written report after each examination; if there is any standing gas discovered, he must leave a danger signal across every entrance to such place, and if there is sufficient gas for one place to be dead lined, the whole entry must be dead lined; and no person other than the mine officials, shall pass beyond said danger station until such standing gas has been diluted and dispersed by a current of air, and not by brushing. The dangerous practice of gas being brushed out is positively prohibited. The fire boss shall not allow any person to enter or remain in any part of the mine through which a dangerous accumulation of gas is being passed into the ventilating current from any other part of the mine. The mine must also be examined on idle days or Sundays, if any day men are required to work in any part of the mine. Mine foremen and fire bosses should devote their entire time, during working hours, providing for the safety of the miners and other employees, and should not be required to perform the duties of coal hustlers.

In all mines generating firedamp, and containing dangerous coal dust, the coal company should furnish the pit boss a thermometer, a barometer and a hygrometer, and the fire boss should keep a daily record of the reading of each instrument. He should also keep informed of the conditions of the atmosphere in the different parts of the mine; and when the moisture falls too low, steam should be admitted into the intake air until the mine atmosphere has again come up to the proper standard. As long as the air in the mine is kept at one standard, as regards water vapor, the coal dust will be a minor factor. The air in the mine should sweep the working face in sufficient volume to give at least 200 cu.ft. per minute, per person, employed in each split. Swift air currents are the best as they will not deposit their moisture as fast as slow-moving currents.

Mine foremen and fire bosses should understand and realize the responsibility of their positions. They are charged with the duty of seeing that the mining law of this State is enforced and obeyed. The position of mine foreman is not an easy one, and can never be, as long as three-fourths of the men employed in coal mines are not practical miners, and one-half of them ignorant of the English language. A few years ago mining was a trade, and all the men who mined coal took pride in being skilled miners. They went to work in the mines when they were boys, and everyone was trained to do his work well, but of late years mining has been revolutionized in that respect and mining is becoming a "lost art." When the skilled miners of a few years ago struck for higher wages and better conditions of employment, thousands of unskilled laborers were imported to take their places. The vast majority of these men never saw a coal mine. And, when the practical miner returned to work, he discovered the trade his fathers taught him gone, as the unskilled miner had a system of producing coal with less work (but more danger), than he, and the skilled miner was forced to adopt the same system to compete with them. This unpractical system of mining has produced a lack of discipline, which is startling. There seems first to be little supervision, and second, there is a lack of respect for authority, and disrespect for the mining laws, which were enacted for their protection. The reckless miners, superintendents, mine foremen and fire bosses who wilfully violate the law should be arrested and prosecuted, and should never again be allowed to work in the mines of this State. I must confess these may seem extreme remedies, but it is better to do that than to fill our graveyards with innocent victims and make hundreds of widows and orphans through their ignorance, carelessness and indifference to the laws.

It is not enough that we pay accident insurance or make provisions for the bereaved families. Suffering and bereavement have no money equivalent. Prevention is better than compensation or death.

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The Cost of Mining

A book under this title by J. R. Finlay, recently published by the McGraw-Hill Book Company, is undoubtedly a remarkable work. We speak of it in our editorial columns rather than among the book reviews because of the part that we have had in its production and its elucidation of principles that we have emphasized during many years. About six years ago we inaugurated a discussion of the cost of mining, which became Mr. Finlay's inspiration. During the last two years he contributed to our pages a noteworthy series of articles that form the basis of his present work, but he has greatly elaborated and added to them, and has handled an extremely intricate subject in a masterly way. H. C. Hoover in his "Principles of Mining," published recently—another masterly work—has treated of the same fundamentals. Mr. Finlay's book—a natural supplement to Mr. Hoover's—applies the principles in a discussion of the cost of producing coal and the metals, and an analysis of the affairs of many of the great mining companies. While both are distinctly professional treatises, they are written especially with a view toward the commercial side of mining, and if our bankers, *entrepreneurs* and promoters will study them there will be an improvement in the status of the mining industry.

Briefly the theory is that the only profit in mining is the difference between the value of the produce and the costs of all kinds, whether they be capital or what are commonly called "operating" charges. Stated thus simply, the theory is self-evident, but in practice it commonly disappears from sight partly because of ignorance, partly because of complexity of the necessary accounting in the case of extensively ramifying enterprises, and partly because it does not suit stock-jobbing purposes to look the problem squarely in the face. We think the last is the predominant reason.

Mines are a great form of wealth. From the investment standpoint many mines are as secure as real estate in the city of New York, but few except those who are expertly engaged in mining know this, and 99 per cent. of the bankers of the country would look askance upon Calumet & Hecla stock as security for a loan. Their attitude is due primarily to ignorance and the beclouding of the mining industry by improper promotions. We referred recently to the operations of a certain class of promoters as the sore upon the industry, but it is the operations of a higher class that constitute the real disease. When the common over-valuation of the majority of mines for stock-jobbing purposes is exposed, as sooner or later it will be, some of the eminent financiers will take notice, and the mining industry will be established upon a sound basis. The books of Mr. Hoover and Mr. Finlay are powerful contributions in this direction.

The Nitrate of Soda Position

The world's supply of nitrate of soda, which comes almost entirely from Chile, has been increasing, but under conditions which are not encouraging to the producers. For some years past the production had been practically controlled by a combination which fixed the quantity that was to be marketed each year, and apportioned the output to the several *oficinas* which were members of the combine. Last year sales of nitrate fell off decidedly, on account of the general depression of trade in the United States and Europe, and there was much dissatisfaction among producers. The agreement expired March 31, 1909, and was not renewed. Most of the larger companies owned in England and France were willing, but the Chilean companies refused to enter into a new agreement; and since that date there has been no restriction, each *oficina* producing and selling all that it could. The result has been a large output, which has been in excess of the demand, and a resulting fall in prices. In the nine months from July 1, 1908, to March 31, 1909, the production was 29,000,000 quintals, or at the rate of 3,222,000 quintals a month; in the seven months from April 1 to Oct. 31, 1909, it was 29,300,000 quintals, or 4,186,000 quintals a month. This was far in excess of the increase in sales which has been made this year.

The result of the light trade of last year and the present conditions is shown in the reports of a number of English companies operating in Chile for the year ended June 30 last, which are published in the London *Economist*. The net profits of these companies—eight in number—were £531,105 in 1906-7, but fell to £340,500 in 1907-8 and to £108,501 in 1908-9. Their dividends decreased from £218,730 in 1907-8 to £68,150 in 1908-9; while pay-

ments from surplus fell from £119,415 to £27,014. The present outlook for an improvement is not encouraging.

The present overproduction is largely due to the higher prices obtained through the combination, which made the nitrate business profitable and drew many new producers into the field. It was mainly the influence of these new enterprises, restricted in their quotas by the syndicate, which led to the refusal to renew the combination last year. Moreover, they must be taken into account in any future agreement, should a new one be formed. Under Chilean law a mining concession once granted must be continuously worked, or else forfeited. Should a concession pass into other hands, say by the foreclosure of a mortgage or the bankruptcy of the holder, the obligation to work it continues on the mortgage holder or purchaser. The holders of the new concession must have some share or allotment in any new combination, so that any restriction of production must come chiefly on the older companies. It does not seem probable, however, that there will be a new agreement at present. Meantime the farmers of the world are getting much cheaper nitrate.

The condition of the nitrate industry has been reflected in the course of prices, which are lower this year than ever before, though there has been, as stated above, an increase in consumption over 1908. Thus in New York in the early part of 1908 the quotations were $2.37½ per 100 lb. for spot, and $2.45 for futures; near the close of the year they had fallen to $2.17½ for spot and $2.20 for futures. The current quotation in New York at the present time is $2.07½ for spot and $2.10 for futures; although deliveries in the United States in the 10 months ended with October, increased from 235,850 tons in 1908 to 275,440 tons this year. The increased sales were offset by overproduction to an extent sufficient to make a weak market.

The Pittsburg Coal Company

The stock of the Pittsburg Coal Company, which for a year past had been almost neglected, has recently furnished some sensation on the exchanges. In New York and Philadelphia there has been heavy buying as well as in its home market. The persistent nature of these purchases has led to a belief with many that they come from one source—whatever that may be—and are not such an ordinary demand for investment as sometimes occurs when the property of an industrial company seems to present good opportunities.

The reports as to the buying of the stocks have been various. The favorite one at first was that the buyers were eastern parties who also controlled the Consolidated Coal Company, and this was not set at rest by positive denials from the people most directly concerned. A consolidation of these two companies would form the largest coal company in the United States, with a commanding position both for seaboard and western trade, and this consideration seems to have given rise to the rumors. Another report was that the purchases of stock were in the interest of the United States Steel Corporation, which has recently shown a disposition to increase its ownership of coal which may be tributary to its other operations. Some other rumors have been started but on such slight basis that they seem to be hardly worth mentioning.

The latest news is that a number of large holders in Pittsburg have agreed not to dispose of their interests, believing it best to prevent the control of the company from passing away from its home city. Since this announcement was made, the buying of the stock from outside has almost entirely ceased.

The Garfield Plant

The American Smelter Securities Company in a recent statement to the authorities of the New York Stock Exchange for the first time gave its official indorsement to the stories that have been told as to the high cost of the Garfield smeltery. Indeed, it has outdone all of the unofficial estimates. It says that the Garfield plant is of 2250 tons daily capacity, and its cost has been about $6,000,000. Estimating the annual capacity at 800,000 tons, this is $7.50 per ton of annual capacity, which makes it, we believe, the most costly copper-smelting plant on record.

We understand that the management of the Garfield plant has now overcome about all of its infantile difficulties. It is a source of professional regret that the management of the American Smelters' Securities Company will not permit its officials to contribute any technical articles about the construction and initial difficulties of this plant, and the interesting metallurgical innovations that have been inaugurated, and after trial have been condemned or adopted. The policy of the American Smelters' Securities Company in this respect, like the policy of the American Smelting and Refining Company, is an exemplification of the undesirable principle of secrecy in the arts against which we, and others, have so often declaimed.

It is worth while to direct the attention of our readers to the series of articles on ore dressing in the Cœur d'Alene by Mr. Wiard, that is now running in the JOURNAL. Mr. Wiard has had personal experience in the district whereof he writes and before beginning his articles visited it anew to review the latest practice. Our technical literature has been lately enriched by many importance contributions respecting the art of ore dressing. Most of these have been, however, essentially descriptive. Mr. Wiard strikes a new note in his analytical and critical consideration of the subject, pointing out what has been found good and what bad, and his articles are particularly useful and noteworthy because of his discriminating comments.

The De Beers Company is preparing to reopen on Jan. 1, the Dutoitspan mine, one of its largest diamond producers, which has been closed since early in 1908. The diamond market suffered from a sudden cessation of buying which followed the panic in the latter part of 1907 and the subsequent depression. America is the largest buyer of diamonds, but European purchasing also fell off as the depression of trade extended. As business has revived, the buying of diamonds has been renewed, and the DeBeers Company is preparing to meet the demand. The sale of diamonds, which are almost wholly a luxury, is a good index to the general prosperity.

The accident last week in the London mine, which fortunately did not result in any fatality, calls attention to the importance of three things at least, viz., the danger that lurks in any inflammable building over the mouth of a mine, the usefulness of means for talking from the surface to the underground workings, and the importance of having an escape outlet.

Views, Suggestions and Experiences of Readers

Comments on Questions Arising in Technical Practice and Debatable Points Suggested by Articles in the Journal

CORRESPONDENCE AND DISCUSSION

Speed of Pelton Wheel

In the JOURNAL of Sept. 11, 1909, p. 527, appears a note on the speed of Pelton wheels and referring to a rather disastrous experiment by some mining company. We take the liberty of discussing a statement which might otherwise produce a wrong impression.

No name is attached to this article, so that we do not know the authority for the statements there given. The writer evidently found one-third spouting velocity to be the correct peripheral velocity for some particular water wheel. This, however, does not apply at all to tangential wheels of proper design. It is possible to alter the discharge angles of water-wheel buckets so as to get the best efficiency points at different percentages of the spouting velocity, but only at some sacrifice in the maximum efficiency obtainable. The best results are invariably obtained where the pitch circle of the wheel runs at the speed of from 42 to 48 per cent. of the spouting velocity. Any wheel which gives a higher output at any other spouting velocity than those falling within these percentages is capable of giving a still greater output and, therefore, greater efficiency, if redesigned to work within these limits.

Mention is also made that the wheel ran faster except when the compressed air was over 100 lb. pressure. To obtain the best results under the conditions where this wheel was used, especially if water storage is of value, it would have been highly advisable to use an automatic device for regulating the size of the stream automatically to correspond with the requirements of the compressor. A cheaper method and the one ordinarily in use in large water-wheel driven compressor plants, is that of providing a large air storage and running the wheel and compressor up to full speed until a large storage of air is obtained at a pressure somewhat in excess of that normally used, when the water is automatically shut off thus stopping the compressor; and when the air pressure falls sufficiently the valve is automatically opened, permitting the wheel and compressor to run at normal speed until the maximum air pressure is again attained. A little more expensive installation, however, will provide automatic means for regulating the stream to the air requirements at all times, and thus upon small plants without considerable air storage prove more effective.

We shall be very glad to know the name and location of the mine which had this trouble, as there is no question but that if they have the water available at the mine the compressor could still be run more economically by water than by electric transmission.

GEORGE J. HENRY, JR.,
Chief Engineer, The Pelton Water Wheel Company.
San Francisco, Cal., Nov. 11, 1909.

Peat in Canada

Reference was made in the JOURNAL of Nov. 20, 1909, to the peat plant now in course of erection on the peat bog recently purchased by the Canadian government. Since this reference is slightly in error, as were some of the Canadian papers, I submit a short description of the plant and process to be employed.

With a view of supplying the fuel-testing plant, now in course of construction, with cheap peat of good quality, the government purchased for use by the Mines Branch a peat bog at Alfred, near Caledonia Springs, Ont., covering approximately 300 acres. This bog has an average depth of 8 to 9 ft., and is a fair sample of the many peat bogs of Canada.

During the past season the bog has been leveled and sampled, and about five miles of ditches have been dug for the purpose of draining, which required the employment, on an average, of about 10 men. A storage shed, blacksmith's shop, office, and the necessary tracks and auxiliary machinery for feeding the peat machine have been installed. The peat machine, invented by A. Anrep, of Sweden, is the one most extensively used in Sweden, Russia, and other foreign countries.

Briquetting forms no part of the process. The *modus operandi* is as follows: The crude peat, as dug from the bog, is put through the peat machine which thoroughly disintegrates and pulps it. After leaving the machine the pulped peat is transported by conveyers and cars to a forming machine, which cuts the peat pulp into bricks 6x4x3 inches.

After air-drying on one side they are turned over and air-dried on the other, then stacked for more complete drying, and finally stocked in a storage shed. The original peat in the bog contains about 85 per cent. moisture, which is reduced by the drying process to about 25 per cent. In this condition the peat bricks are admirably adapted for gas producers, also for domestic purposes, yielding a fine white ash without clinkers.

When in running order this plant will have a daily output of about 30 tons, employing about 12 men during the summer months. The process and machinery employed are in no sense experimental since they are similar to those now in use in many commercial plants of Europe. The peat fuel used in the gas producer at the experimental plant will be supplied from the Alfred bog; the balance is intended to be used in the surrounding villages.

The estimated cost of one ton of air-dried peat at the bog will be about $1.75. This price, together with the cost of transportation for short distances, will make the total cost of peat—to yield a fuel value equivalent to one ton of good coal—considerably lower than that of coal.

EUGENE HAANEL,
Director of Mines.
Ottawa, Ont., Nov. 23, 1909.

Crushing in Cyanide Solution

Will some reader of the JOURNAL be so good as to state what concerns, together with their location, were using concentrators after crushing in cyanide solution before filtering, and also any companies concentrating after filtering, previous to 1904.

New York, Nov. 22, 1909. H. W. F.

Smelting Practice of the Tyee Copper Company

In commenting on my article on the "Smelting Practice of the Tyee Copper Company," in the JOURNAL of Nov. 6, 1909, Thomas Kiddie, now manager of the Northport Smelting and Refining Company at Northport, Wash., has sent me the following important note on the chemical reactions which took place in the reduction of the barite ores:

"The solution of the problem would probably have come sooner than it did, but for the reason that at first I worked on the assumption of being able to flux the $BaSO_4$ with the alumina of the ore (it being a schist) to form aluminates. This did not work out and much trouble ensued by the constant reduction of the $BaSO_4$ to BaS and its precipitation along with the $Cu_2S + FeS + ZnS$.

"However, after getting a suitable silica flux—which we did in purchasing Mullan (Idaho) silicious ore—and high oxidation and keeping the coke down to a minimum, a 42 per cent. copper matte was pro-

duced from a charge consisting of practically two-thirds burnt ore and one-third raw ore. The $BaSO_4$ was evidently reduced entirely to BaS first, as no SO_2 was found in the furnace gases."

This explanation more fully explains the chemical reactions referred to in the original article.

GEORGE W. MAYNARD.

New York, Nov. 24, 1909

Air Compressor Valves

In the JOURNAL of Nov. 6, 1909, is a description of what purports to be an improvement in discharge valves for air compressors. This article is of special interest to one associated for several years with one of the leading builders of air compressors in the United States, for in it is recognized a step backward into types of construction now used only by those builders who as yet have not been able to improve upon the old forms.

As the article says, air-compressor speeds are limited by the amount of pounding which the discharge valves will stand, and the statement is made that 150 r.p.m. is the usual limit for air compressors of from 4- to 24-in. stroke. This is old-style construction, for at the present day two of the leading manufacturing companies are running air compressors of their design at the speeds shown in the accompanying table. Moreover, these machines are for direct-connected electric drive and consequently these maximum speeds must be continuously maintained throughout the working day, and generally the night also. Furthermore, there is no chance to slow down from time to time when the air pressure is normal, resulting in a slower average speed, as with a steam driven compressor. Such high speeds as these have been made possible only by improvement in valve design and especially in the number of discharge valves used in a cylinder of given size.

MODERN COMPRESSOR PRACTICE.

Stroke, In.	R.P.M.	Piston Speed, Ft. per Min.	Stroke, In.	R.P.M.	Piston Speed, Ft. per Min.
14	250	583	8	300	400
16	225	600	10	275	459
18	200	600	12	250	500
21	180	630	14	225	525
24	160	640	16	200	533
27	140	630	20	180	600
30	130	650	24	160	640
36	107	642	30	135	675

An essential for an air-compressor discharge valve is that it shall have plenty of guiding surface. The valve shown in the cut, accompanying the article referred to, is exceedingly lacking in guiding surface, as it must depend for this upon the guiding pin *B* in the center and the rim of the valve lip.

An examination of modern valves made by first-class manufacturers will show guiding surfaces three, four or more times as great as given by the design under discussion. This is accomplished by a cylindrical sleeve of large diameter replacing the guiding pin. Furthermore, another essential of the efficient discharge valve is to have free air passage around the rim of the valve. Such construction as the alternate ports and grids marked *E* and *F* in the cut, serves to defeat this especially if the grids are of any appreciable width. If they are not of any appreciable width the so-called "guiding portion" around the lip of the valve is just that much cut down. Also with narrow grid bars it is easy to imagine a tendency to wear the valve lip in ridges, thus quickly removing any guiding tendency on the part of the grids.

As shown in the cut, it would also appear that the valve spring, which is of conical form, is altogether inadequate. A successful spring, to stand the strain of long and continued air-compressor service, must have more length than would be possible with the construction shown to give enough elasticity and also greater wire gage to have the proper stiffness.

Next, the claim made for the valve in question that there is effective cushioning above the lip of the rim is rather weak, for this cushioning does not take place until the lip has been lifted up above the top of the ports and begins to enter the shallow pockets in the guide block. The motion after this time is very limited and it is hard to imagine any effective cushioning, especially with the large clearance volume between the valve and guide block. There is, however, some cushion in the chamber *B*, but this chamber is small and without relief to the outside air, so that if the valve were ever positively opened all the way, it would either be against great pressure in *B* or else the air would have to be squeezed out of this space. This squeezing out would tend to hold the valve open due to the vacuum formed by the next downward movement, resulting in delay in the closing of the valve. This effect would be most undesirable, as may be imagined.

Such a suggestion as to make the valve in two parts, that is, by hot riveting the stem in place in the main body of thevalve, is extemely questionable. Any valve made in two parts and held together by riveting is practically certain to break apart in a short time. The severe pounding received by these valves in their every-day, continuous operation is more than such construction would stand. First-class manufacturers in these days are cutting their valves from solid material in order to do away with just this feature. This is true even where some of the builders do use a valve with a small stem for light service, such as poppet inlet valves for small machines.

There is one feature in regard to this valve which has a little to commend it, and that is, that the guide being entirely free from the cap and held down only by a spring, the difficulty of exactly alining the valve guide with the seat is done away with. However, when the cap and guide are in one piece, in first-class construction, all of the contact surfaces in the cylinder casting are machined at one operation with one suitably formed tool, and then the valve is ground in place with a dummy cap, so that the alinement is as nearly perfect as machine tools can make it.

Comparison of weights with effective areas proves nothing unless it is found that, running side by side in actual practice, the new valve will last as long as the heavier valves with which it is compared. Anybody could make a valve which would be extemely light, as this simply means cutting away more metal. The question is, however, how long will it stand the pounding?

S. B. REDFIELD.

New York, Nov. 12, 1909.

Methods for Assaying in Cyanide Plants

W. H. Seamon, as quoted in the JOURNAL Sept. 25, 1909, p. 608, mentions a method using aluminum and sulphuric acid to precipitate the gold and silver from cyanide solutions. I have been using aluminum but in a different way. Aluminum sulphide, Al_2S_3, is made by fusing lead, sulphur and aluminum in the proportion to satisfy the equation

$$3Pb + 3S + 2Al = Al_2S_3 + 3Pb$$

The Al_2S_3 forms a slag and may contain a little lead which does no harm. The aluminum sulphide decomposes water evolving sulphuretted hydrogen. It will keep in a stoppered bottle for any length of time.

I take 6 A.T. (175 c.c.) of solution, acidify with sulphuric and boil to destroy all the free cyanide; then add a little Al_2S_3, the gold and silver immediately precipitating as sulphides; filter, dry and scorify or run down in a crucible, cupel and weigh. The commercial use of Al_2S_3 is open to the same objecton as aluminum, i.e., the solution must be acidified.

ALGERNON DEL MAR

South Pasadena, Cal., Nov. 15, 1909

Lime Emulsion Feeder

A description of a machine designated as a lime emulsion feeder appeared in the JOURNAL, Nov. 20, 1909. We wish to advise that U. S. Pat. No. 552,092, issued December 3, 1895, covers this machine entirely, and it is known as the Ayton intermittent thick pulp extractor, of which we are the sole manufacturers.

CHALMERS & WILLIAMS, INC.

Chicago, Ill., Dec. 1, 1909

Fire in London Mine of Tennessee Copper Company

By N. H. Emmons*

Following are the facts which have been much exaggerated by the daily papers regarding the fire in the London mine of the Tennessee Copper Company, near Copperhill.

The mine ore bins caught on fire at about 3:30 p.m., Nov. 29, from sparks thrown by a locomotive. The building being constructed entirely of wood, and being very dry, the fire spread rapidly and water could make no impression upon it; the flames rushed to the top of the breaker house, about 120 ft. high, and consumed the entire building in a short time. The crusher, 24x36 Blake type, fell from a hight of about 75 ft, demolishing the engine that was directly below it.

TYPE OF INCLOSED SHAFT AND CRUSHER HOUSE AT TENNESSEE COPPER COMPANY'S MINES

Shaft Set Afire from Falling Burning Timbers

The London shaft is inclined 74 deg. from the horizontal, and the timbers falling from the crusher house set the shaft timbering on fire and gave notice to the men below who, however, had also been notified through a speaking tube that the breaker was on fire. There were 54 men in the mine, of which 12 were on the fifth level. All of these men climbed up to the fourth level and four to the third, the other eight taking refuge in a drift so as not to be overcome by the smoke from the falling timbers. The 46 men were taken out through an open cut which had been a ladder way, but from which the ladders had been taken out on acount of blasting. Ladders were put into this open cut and the 46 men taken to the surface without having experienced any ill effects from the smoke. The four men from the fifth level claimed to have called to the others to follow them and thought they were doing so, but the other eight men must have become panic stricken, for they did not follow.

The smoke soon filled the upper levels, except at the open cut, to such an extent that no one could go down for the imprisoned men, and work was started on the first level putting in a brattice at the crosscut to the shaft, the shaft being about 100 ft. in the footwall at the first level and 300 ft. at the fifth level. As soon as the brattice was put in this level cleared rapidly, and the fresh air blowing down from the winzes to the second level cleared that up, but more slowly. It was found impossible to put a brattice on the second level on account of the heat and smoke. A compressed-air line was brought in from the Burra Burra mine, about a mile away, using partly an air line and partly a water line, already in, the pipe being laid to the open cut at the London mine. Fire hose was then attached to the pipe line and taken down from level to level. It was found that the ordinary 90 lb pressure blew off the connection to the fire-hose, so the pressure was reduced to 50 lb at the air compressor. This hose was carried down from level to level and men lowered through winzes with ropes as soon as they could stand the heat and smoke.

Oxygen Helmets Not Used

The United States Geological Survey sent the equipment of oxygen helmets from the Knoxville, Tenn., station on a special train furnished by the Louisville & Nashville Railroad Company; Mr. Ramsey, in charge of the Knoxville station, came to instruct rescuers in the use of the helmets. By the time the relief reached the mine, which was between 5 and 6 p.m. on Nov. 30, the air was clearing up rapidly and it was found that the men could stand the smoke without the use of the helmets. They were tried, but the men, never having seen them before, were afraid to use them.

Three men were lowered to the fourth level at about 10 p.m., and reached the imprisoned men at 11:30. They found them in a small stope where there was running water from a diamond-drill hole, the men having barricaded the drift to the stope to keep the fumes out. The men were all in good condition and naturally very glad to see their rescurers. They were weak from lack of food and from the limited supply of air in the stope, but after having been given something to eat and brought to the surface they felt all right and walked to their homes, about a mile away.

OPEN CUT AT LONDON MINE THROUGH WHICH MEN WERE RESCUED—LADDERWAY SHOWN AT THE LEFT

On account of the small amount of burning timber in the shaft, and knowing there was running water on the lower levels, at no time did the management have doubt but that the men would be found alive and in good condition. Great credit should be given to J. V. Bohn, general superintendent of the Tennessee company's mines, and to Gus Shepherd, foreman of the London mine, who did not leave his post until the report had come up that the men had been found and were in good condition; Shepherd worked con-

*General manager, Tennessee Copper Company, Copperhill, Tenn.

tinually for 48 hours. Men, as usual in such cases, volunteered to go into the smoke and a wire had to be stretched around the mine and guards placed to keep back those who wished to go down to the rescue of their comrades. So far as the company is able to determine, the loss from the fire is fully covered by insurance.

Mining Legislation at Washington

SPECIAL CORRESPONDENCE

Senator Dick, chairman of the Senate Committee on Mining, intends to push the bill establishing a bureau of mines, during the coming session. He states that he believes the chances for the passage of the bill will be better during the coming winter than ever before. This is partly because of the occurrence of several serious mining accidents of late which it is alleged could have been avoided by the use of proper precautions. It is the belief of the promoters of the bureau of mines bill that this measure would have tended to advance the use of the proper precautionary measures at the mines in a way that no existing statutes or regulations do. The opinion is that such a bureau would speedily succeed in developing the use at the various mines of the known precautions and safeguards. Whether this opinion is correct or not there is apparently a substantially better disposition toward the bill than in the past. This is considerably aided by the elimination from the senate of Senator Teller, of Colorado, who was one of the most strenuous opponents of the bill and who charged that the measure tended merely to the establishment of Government places and did not provide for any additions or improvements in mining methods, these being worked out by practical men and not by Government employees in Washington. The bill which Senator Dick expects to urge is extremely moderate and will do little more than transfer from the Geological Survey some of its present work, turning this over to the proposed bureau of mines and creating the proper staff for the bureau and endowing it with a few additional functions. This will follow the lines of the Dick bill of the last Congress. Senator Dick believes there will be little trouble in getting action on the measure, particularly as the prospects do not favor much general legislation at this session, that leaving the way more clear for action on special bills.

The opinion now prevailing in Congress is that no measure radically changing the mining legislation of the country is likely to be passed at this session despite the recommendations which the Secretary of the Interior has made. The Territories are clearly of a different status to a general act, so that only Alaska will be left and even the conditions existing there of its remote [illegible] Then there is also heard the argument that it is unwise to disturb a system which has existed for many years without having some exceptionally good warrant for so doing. This system is the existing method of disposing of Government coal lands. The view just indicated is taken by influential men in both chambers of Congress and it is apparent that they are prepared to offer determined resistance to any other plans than their own. Opponents of the conservative group are, however, clamoring for additional legislation and are urging the necessity of introducing some plan of leasing coal lands and other mining and mineral lands including phosphate deposits, so that they will not pass into private ownership. Senator LaFollette has already reintroduced his bill reserving from entry the mineral rights to coal and other materials mined for fuel, oil, gas, or asphalt, underlying the public lands of the United States and providing for the sale of surface rights and the leasing of the mineral rights upon these lands. Mr. LaFollette's Indian coal-land bill has already been introduced in the same form as in last Congress, and its author proposes to push these two measures, but with little hope of securing immediate action upon them.

William Metcalf

William Metcalf, for many years a high authority in the steel trade, died at his home at Pittsburg, Penn., Dec. 5, aged 71 years. He was born in Pittsburg in 1838 and graduated from the Rensselaer Polytechnic Institute at Troy, N. Y., in 1858, returning immediately to his native city. His first active employment was in the Fort Pitt foundry and after two years there as a subordinate he was made foreman of the gun department in which many of the heavy Rodman and Dahlgren guns used during the Civil War were cast. About 1865 he left the Fort Pitt works and entered on his own account into the manufacture of crucible and other special steels, in which he acquired a high reputation. He continued this work under the firm of William Metcalf & Co., until about 1882, when his works were merged in the Braeburn Steel Company, which he organized and of which he remained president until his death.

Mr. Metcalf was well known as an engineer as well as a steel manufacturer, and was a constant student of methods and practices in his business and of the uses to which steel is applied. He made many experiments on the manufacture and properties of steel, and the results of some of these were embodied in a notable paper written by him some 20 years ago and published in the Transactions of the Institute of Mining Engineers. This paper attracted wide attention both in this country and Europe, and not only led to much discussion but also to the carrying out in consequence of its recommendations of many important changes in steel manufacture and in the treatment of the metal in forges and rolling mills. Besides the paper mentioned he wrote many technical articles and several books on the subject, which are considered standard authorities. He was always open in his methods and believed thoroughly in sharing the results of his work with his fellow engineers and manufacturers.

Mr. Metcalf was for many years a member of the American Institute of Mining Engineers and was president of the Institute in 1880. He was also a member of the American Society of Civil Engineers and served as president of that body in 1893. He was a member and for two years a vice-president of the American Society of Mechanical Engineers; a member of the Engineers' Society of Western Pennsylvania and of the British Institution of Civil Engineers. In his native city he had many interests and was highly respected, taking a prominent position on important public occasions.

The Copper Consolidation as Conservator

Promoters of the deferred copper combination have invented a seductive argument, says *The Evening Post*. The combination they propose to effect is not like other combinations. It is in the interest of "conservation." There is a popular demand that the natural resources of the country be conserved. Well, this combination will greatly help. This country produces, say, 60 per cent. of the world's copper supply. It consumes only a third, more or less, of what it produces, and the balance is sold to foreign consumers. Why should foreigners be permitted to consume our copper at 12 or 13c., when a combination can be formed to make them pay 14 or 15c.? Every pound of American copper mined and sold is gone forever out of the country's natural resources. Why should it be given away?

Smelting in Bond

In a letter to the collector at Perth Amboy, N. J., the Secretary of the Treasury writes that: "Section 24 of the tariff act of Aug. 5, 1909, relating to the smelting and refining of ores and crude metals in bond, provides that the special charge against the bond may be canceled upon the exportation of the actual amount of lead produced from the smelting or refining, or both, of such ores or crude metals.

"In view of this provision of law, it now becomes necessary to assay base bullion for the purpose of determining the percentages of lead contained therein as well as to assay ores for the lead content, and you are, therefore, directed to have all base bullion which is imported and placed in bonded memory assayed for the lead content."

The Census Schedules for Mines and Quarries

SPECIAL CORRESPONDENCE

Census Director Durand has completed the special census schedule which is to be used generally in taking the census of mines and quarries for 1910. This schedule has been anticipated with much interest by mining experts and operators, because of the unsatisfactory character of the schedule used in the last census period and the feeling that many of the questions then asked were unreasonable or unduly inquisitorial.

The new schedule has been materially modifield as compared with its predecessor of 10 years ago. It will be supplemented by a series of special schedules relating to the various kinds of mining products. The work in this respect is to be carried on in close conjunction with the Geological Survey and the schedule has been shaped under the advice of the latter bureau to some extent. The supplementary schedules for the various kinds of mining products are not yet completed but will be in hand within a very short time. The general schedule has not yet been published but is now in final form.

General Description

Question 1 calls for a description of mine or quarry: and adds, "If the information given on this schedule embraces more than one mine or quarry, give the name and location of each on supplemental schedule."

The data called for are: The name of mine or quarry; name of operator and, if operator is not owner, the name and address of owner; also the number of mines or quarries covered by this report. The location of mine or quarry; the post-office address of general office. The period covered by the report; the character of organization, as individual, general partnership, limited partnership, incorporated company, cöoperative association, or other. The number of proprietors and partnership members, if a nonincorporated organization; the number of proprietors, if any, regularly performing manual labor in or about mine or quarry; the number of stockholders, if an incorporated organization, on the last day of the period covered by report.

Particulars of Working

Question 2 calls for the time in operation and hours worked, specifying the number of days in operation during the year. Days when shut down for repairs, or for other causes, and there was neither development work nor production, should not be included. Number of hours normally worked by wage earners per shift and per week. (The prevailing practice followed during the year, without attempting to indicate variations from this practice. All that it is desired to know is the practice generally prevailing in respect to the hours of labor of employees.)

Capital and Property

Question 3 calls for capital invested and area of mineral and other lands, including amount of capital, both owned and borrowed, invested by operator, but not including securities and loans representing investments in other enterprises. Mineral and other lands: Number of acres owned or leased by operators, including only lands actually pertaining to the mining property covered by this report, not undeveloped lands elsewhere owned by the same operator. The answer should give in detail mineral or coal lands (acres); timber land not included above (acres); other land (acres); total (acres), showing all owned by operator; held under lease by operator; sublet to others.

Employees

Question 4 calls for salaried employees; number Dec. 15, 1909, as per pay roll. If data are not obtainable for that day or month, the data for the nearest representative or normal day, stating day and month, are to be given. The answer should specify: Salaried officers of corporations; superintendents and managers; clerks, stenographers, and other salaried employees; total number, specifying whether men or women.

Question 5 calls for wage earners, including employees paid by ton, car, yard, or other unit. The answer should give the number, Dec. 15, 1909, as per pay roll. If data are not obtainable for that day or month, data are to be given for same day as for inquiry 4. Answers should include all persons working in connection with mine or quarry, whether employed directly by owner or working for lessee, contractor, or other. Include overseers and foremen receiving wages and performing work similar to men over whom they have charge; those whose duties are wholly supervisory should be reported under second item of inquiry 4. The answer should give separately those employed directly by operator, as engineers, firemen, machinists, carpenters, and other mechanics; miners, quarrymen and stonecutters; miners' helpers (16 years or over); all other employees (16 years or over); boys under 16 years; total employed directly by operator. Also those employed otherwise, as by contractor, etc. Finally the total employed directly and otherwise, specifying whether under ground or on surface. The number of women, if any, employed in or about the mine or quarry, and included above, should be stated.

Question 6 calls for wage earners, including employees paid by ton, car, yard, or other unit: Number, as per pay rolls or time records on the 15th of each month of the period covered by report. if data are not obtainable for that day, data for nearest representative day to be given, specifying those employed directly by operator, and employed otherwise, as by contractor, etc.

Question 7 calls for salary and wage payments: Total amounts paid in salaries and wages during the year covered by this report. Wages to be net wages, after deducting charges for supplies furnished by the company to miners or quarrymen and stonecutters, such as explosives, lamp oil, blacksmithing, etc., as well as charges for power, hoisting superintendence, etc. Amount paid for contract work not to be included, if not done by the regular employees; should be reported under inquiry 9 The answer should give: Salaried officers of corporations; superintendents and managers; clerks, stenographers, and other salaried employees; wage earners, paid by unit of time, ton, car, foot, or yard; include payments to contract miners compensated by these units; miners and others compensated by share of product, including total amount paid to block lessees, leasers, tributers, and all others performing work for share of product, after royalties charged have been deducted, and finally the total payments. Also amount charged to miners, quarrymen and stonecutters for explosives, lamp oil and blacksmithing charges, etc., as well as charges for power, hoisting, superintendence, etc., deducted from gross wages in computing net wages above, and rate of royalty received by operator if any work done is compensated for by share of product.

Materials and Supplies

Question 8 calls for materials, supplies and fuel: Total cost of all used during the year covered by the report. This inquiry relates to all materials and supplies of every description and fuel used during the year covered by the report for any purpose in connection with the development or operation of the mine or quarry. It includes the cost of lumber and timber used for repairs, mine supports, track ties, and all other purposes; iron and steel for blacksmithing, rails, frogs, sleepers, etc., for tracks and repairs; renewals and repairs of tools; explosives and oil used directly or sold to employees; water for boilers and other purposes; machinery supplies, etc. The answer should give total cost of all materials (other than fuel) and supplies used during the year; cost of fuel and rent of power; amount paid, if any, for freight on above which has not already been included; total cost of materials, supplies and fuel, and freight on same.

Miscellaneous

Question 9 calls for miscellaneous expenses; amount paid during the year for rent and royalties; taxes; contract work not included in answer to inquiry 7, including tunneling, shaft sinking, boring test holes, etc., during the year, if not done by employees hired directly by this operator; rent of offices and buildings,

other than at mine or quarry, use of patents, insurance, ordinary repairs of buildings and machinery, advertising, damages, traveling expenses, and all other sundry expenses. Finally the total.

Question 10 calls for development work, including total cost of all development work during the year, whether done directly by regular employees or by contract.

Power Used

Question 11 calls for power; mechanical power employed in or about the mine or quarry, either owned or rented, including number and horsepower of all engines, motors, water wheels, etc., used for hoisting, ventilating, pumping, or other purposes. The answer should give separately: (1) Power owned, as steam engines, gas engines, water wheels, water motors, and other power, specifying the kind; electric motors. A separate statement should be made of (2) power rented from other establishments, and of the name and address of establishment supplying rented power. Answers should give (3) name of stream or lake from which water power is obtained to generate power, whether direct or electric.

Information to be Confidential

It is understood that all information given will be held confidential. No publication will be made of any individual or corporation report, the statements being used only in making up the totals in each State or other division.

The Smoke Question in Shasta County

Special Correspondence

The executive committee of the Shasta County Farmers' Association has recommended to the association that the modified decree of Judge Marshall, of the U. S. Circuit Court for the district of Utah, be the basis of settlement of the "smoke question" to be made with the Mammoth Copper Mining Company, of Kennett, Cal. To this the association has agreed. The main points of Judge Marshall's modified decree were:

(1) All sulphuric acid arising from the treatment of copper ores shall be neutralized by oxide of zinc or other effective agents, so that no sulphuric acid shall exist in a free state.

(2) That the fumes and gases from the copper furnaces, when freed from sulphuric acid as aforesaid, shall pass through a bag house and be filtered so that such filtration shall result in removing from the fumes and gases all solid matter held in suspension, including copper, lead and arsenic and solid sulphates emitted from the neutralization of the sulphuric acid in the fumes and gases.

(3) That the gases, after passing through the baghouse, when discharged into the atmosphere shall not contain to exceed 0.75 per cent. of sulphuric dioxide, by volume.

(4) That the gases passing through the baghouse shall be discharged in such a manner that they will be diffused in it so they will not do any damage or injury to crops, trees or other vegetation, or to domestic animals, or cause any inconvenience or discomfort to the complainants, or any members of the family of the complainants.

The decree further provides for means of inspection of the smelting plant by a committee of the growers, from time to time, for the purpose of seeing that the decree is being acted under good faith.

This is virtually an approval of the baghouse plan. In order to make the contract binding between the copper company and the farmers a friendly suit will be brought. The baghouse is to be in operation by next April.

Ballinger on the Coal Land Laws

Secretary Ballinger, of the Department of the Interior, makes the following remarks in his annular report:

As regards new legislation the present coal-land laws respecting the States and Territories as well as Alaska should be supplanted by an act fully meeting existing as well as future conditions. The inducements for much of the crime and fraud, both constructive and actual, committed under the present system can be prevented by separating the right to mine from the title to the soil. The surface would thereby be open to entry under other laws according to its character and subject to the right to extract the coal. The object to be attained in any such legislation is to conserve the coal deposits as a public utility and to prevent monopoly or extortion in their disposition. This may be accomplished either through a leasing system by which the title would remain in the Government under proper regulation and supervision by the Secretary of the Interior or through the sale of the deposits, and in either case with restrictions on their mining and use which would control the minimum output and conserve the deposits as a public utility.

I believe the most advantageous method will be found in a measure authorizing the lease or sale of the coal deposits in the lands, subject to forfeiture for failure to exercise the rights granted, under such reasonable regulations as may be imposed. An exploration period of at least one year upon a permit basis, at a nominal charge, would insure to the applicant the necessary preliminary knowledge upon which to make the lease or purchase of the coal deposits and venture the necessary investment for operation. The maximum unit authorized for the one would safely be made from three to five sections, provided no greater surface rights be granted than will give proper facilities to reach and extract the coal deposits.

In case of failure of the lessees or grantees to open and operate the coal deposits under reasonable limitations and to maintain an output reasonably suited to the deposits, and in case of combinations as to price or limitation of output, title should be forfeited by proceedings in court for that purpose. Government mine supervision would doubtless be necessary to enforce the conditions and limitations under the grant.

The above suggestions with reference to the disposition of coal deposits are equally applicable to the oil and gas fields in the public domain, and similar legislation as to lands containing the same is hereby recommended. Indeed, the very nature of these two important mineral resources requires that their disposition be in terms of quantity of their product extracted rather than that of acreage.

Pending the enactment of new legislation as affecting coal lands, all known coal areas were withdrawn from entry for classification and appraisement through the Geological Survey.

Mount Lyell Company, Tasmania

The Mount Lyell Mining and Railway Company, according to the report of Robert Sticht, general manager, was employing on June 30, 1909, slightly in excess of 1900 men, 942 being employed at the reduction works, 150 in the railway department and 842 in the mines. The number of men employed at the company's Mount Lyell mine was 339; at the North Lyell, 480; at the Lyell Tharsis, 7, and at the Crotty, 7. The extraction of pyrites for smelting and acid-making purposes continues at the Iron Blow open cut. Most of the ore, at the date of the report, was coming from below the No. 4 bench, which consequently necessitates the greater portion being raised by the incline hoist. The top three benches have already reached the limit of their usefulness and are now being permanently battered. Underground work has been resumed in the sixth and seventh levels, where preparations are being made for connection with the extension of the incline hoist.

At the North Lyell mine the most important work has been the completion of the station at the 1100 level and the connection between the main and auxiliary shaft. At the 1000-ft. level extraction continues from five stopes, four of which are still on the first or ground floor. The 850-, 700-, 500-, 400- and 300-ft. levels are all being worked. Open cutting is being carried on chiefly for the purpose of obtaining filling for the underground depletions. At the reduction works four furnaces were in blast, as usual.

Details of Practical Mining

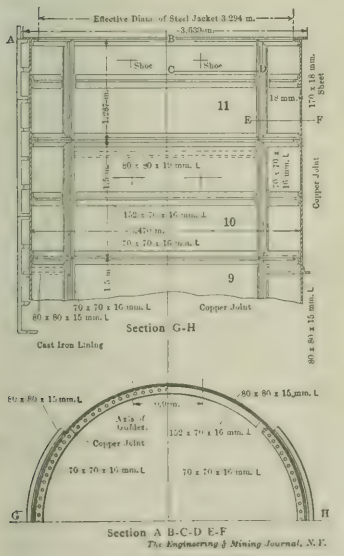
Notes of Interest to Prospectors and Operators of Small as Well as Large Mines. Things That Have to Be Done in Everyday Mining

REPORTS FROM EXPERIENCE

Readers of the JOURNAL are invited to contribute to this department. Articles should be brief, thoroughly practical, and preferably illustrated by drawings or sketches. Our draftsmen will prepare properly any kind of a pencil sketch that is intelligible. Something that is an old story in one district may be quite unknown in another. Articles accepted and published are suitably paid for.

Repairing a Cast-Iron Shaft Lining

Inspection of the cast-iron lining in one of the shafts of the Harchies colliery in Belgium disclosed a horizontal crack, at a depth of 200 m., from which a number of radiating fissures extended up and down, covering a vertical distance of about 10 m. On account of the leakage

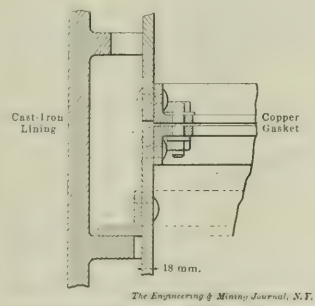


CAST-IRON SHAFT LINING

of water, and because the strength of the lining was in doubt, it was decided to reinforce the lining with an inner jacket of steel and concrete. The method employed is described in *Annales des Mines de Belgique*, Vol. XIV, No. 2.

The inner jacket was composed of 11 rings, each 1.5 m. wide, made of sheet steel 18 mm. thick; each ring comprised four segments, the joints between which were made by angles riveted to the edges of the sheets and then bolted together. A gasket of copper 3 mm. thick was put into each joint. The center of the segment was reinforced by a horizontal ring of T-iron, riveted in place. The sections of the jacket were supported in position by horizontal rings of angle riveted to the outside, which then rested on the interior flanges of the cast-iron permanent lining.

In order to make a water-tight connection between the inner and outer walls, the intervening space was then filled with cement grouting; 29,750 kg. of cement were required for this purpose. Finally, in order to solidify the surrounding strata, cement was injected through eight stop-



DETAILS OF THE HORIZONTAL JOINT AND SEAT

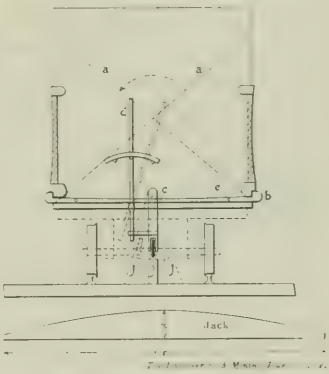
cocks in the walls, after which the inflow of water was greatly diminished. The reduction in the diameter of the shaft necessitated the offsetting of the hoisting guides past the steel jacket; the guides were supported on cast-iron shoes riveted to the plates. The details of construction are shown in the accompanying drawings.

An Improved Chuck Block

Where inside amalgamation is done by plates on the chuck blocks, the difficulty caused by the accumulation of sulphides or other heavy particles on the tops of the chuck blocks may be done away with by the simple expedient of making the upper angle of the block a sharp one, thus insuring a steep slant on all parts of the plate. Daniel McKinley, amalgamator of the Laurentian mine at Gold Rock, Ontario, designed such a set of blocks, making 3 sizes, 4-, 5- and 6-in. respectively, to keep pace with the wear of the dies.

Automatic Trip for Ore Cars

The automatic tripping device shown in the accompanying illustration is used at a number of mines at Iron Mountain, Mich. By means of this device it is possible to dump one car on any one of three piles. This is accomplished by a lever *d* in



CAR WITH AUTOMATIC TRIP

front of the car, which may be set in three different positions. Beneath the car is a small wheel which strikes a jack *j*, set between the rails at any required position on the stock pile. As the wheel passes over this jack it is lifted and the catches *b*, which hold the side doors, are released and the doors opened. The arm of the catch *b* is slotted at *c* to give free movement when the wheel encounters the jack. Similar catches are operated on the other end of the car by a connecting rod through *e*. One jack is set in the center of the track and the wheel strikes this when the lever is in a vertical position. The other two jacks are set a little off center and are encountered by the wheel when the lever is set at one side. The car tender at the skips sets this lever for a certain stock pile before the car leaves the shaft. During the winter months, 100,000 tons of ore are handled per month in this way from a single shaft.

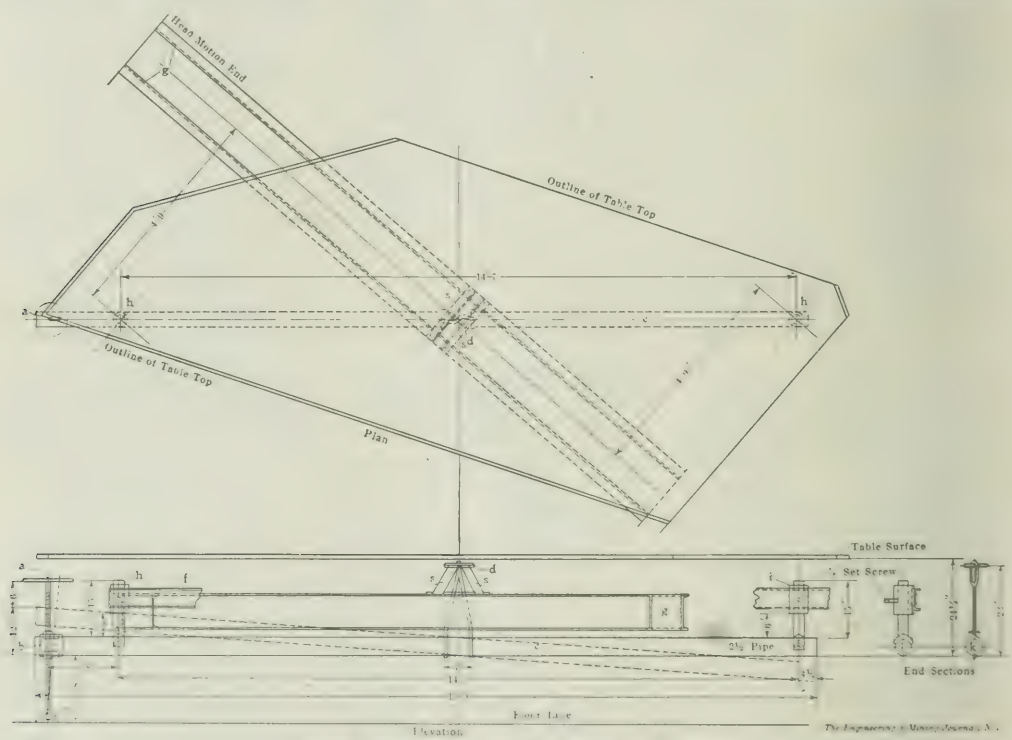
At the Pewabic mine a similar car is used for sending ore to the various bins, but instead of the automatic trip being changeable the side dump car has a movable bottom *a*, extending from the center to the top so as to deliver the ore on either side of the car, but not on both sides at once.

Rearrangement of Tipping Device for Overstrom Tables

So much force was required to operate the wedges provided for regulating the tipping motion on the Overstrom concentrators installed in the hard-rock mill of the Bertha Mineral Company at Austinville, Va., that a delicate adjustment of the tables could not be obtained easily. They were therefore rendered unsuitable for the close work required. To overcome this difficulty, W. O. Borcherdt, assistant superintendent, devised the regulating device, shown in detail in the accompanying drawing, by which any desired adjustment of the table may be procured by simply spinning a hand wheel which communicates its motion to a 4-in. pipe hung from the frame of the table.

This hand wheel, shown at *a*, is attached to a feed screw and nut from an old 3¼-in. Ingersoll drill. This is provided with a ball joint *c* in the floor socket to allow the necessary play. At *b* there is a short section of 5-in. pipe with slot to retain the nut sleeve and permit slight lengthwise motion of the 4-in. wrought-iron pipe *e*, which is also slotted so that forward, backward and sidewise motion is permitted. The dotted lines show the extreme position for the 4-in. pipe, which has a 6-in. range of motion. Standards of 2½-in. pipe, shown at *h*, connect the 4-in. pipe to a 5-in. channel iron *f*, which partially supports the frame of the table. The 9-in. channels *g* carry the weight of the table to concrete foundations at either side, and support the standards *s*, on which the 1-in. turning pin *d* bears: the 4-in. pipe hangs from this pin by 1½-in. iron straps clamped about it with ⅜-in. bolts. This arrangement is shown at *k*. The old wedge socket of the original device is shown at *i*; *j* is a section of the 4-in. pipe showing 2½-in. pipe standard and method of securing it to the 5-in. channel.

Besides making the most delicate adjustment of the table possible and easy, all but two of the concrete supports formerly required are done away with by this arrangement and much clearance is added under the table.



TIPPING DEVICE FOR OVERSTROM CONCENTRATING TABLE

In mine surveying many errors are made through faulty office work, more, in fact, than through field errors. Two men doing the same work by the same method may make the same mistake. By first calculating by logarithms, and then having the check figured independently by traverse tables, a mistake is practically impossible.

Handling Cyanide Precipitate

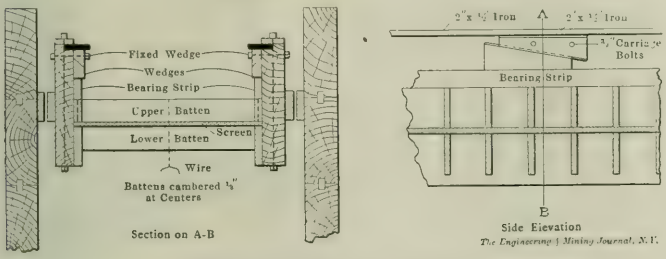
Crushing and fluxing dried gold and silver precipitate is expedited, and dusting and chance for loss minimized by charging fluxes and precipitate together into a mixing barrel. This may be made of an oil barrel of wood or iron, a whisky barrel, or even a beer keg by providing a bolted hand-hole cover for charging and discharging. The barrel can be rotated by being placed loose on two rollers, one of which is power driven; or simple gudgeons, consisting of a 6-in. length of 2-in. pipe with a pipe flange, can be attached to either end of the barrel.

For power driving, one nipple can be made long enough to receive a pulley, or the belt may be placed directly around the barrel. A few short sections of pipe, some pebbles or just scrap iron will assist in breaking lumps of precipitate. A thorough mixing which expedites melting will be effected in a few minutes. If it is desired to add niter, this should be mixed in coarse lumps after the fluxed precipitate is withdrawn from the barrel. A mixture containing a considerable quantity of short zinc and niter, thoroughly ground together, has exploded with a mild, prolonged roar while being heated in the

crucible, lifting the furnace cover and discharging the contents of the crucible into the melting room.

Method of Fastening Screens on Hancock Jigs

The method illustrated in the accompanying drawing is used in the hard-rock mill of the Bertha Mineral Company, at Austinville, Va., to hold the Hancock jig screens firmly in position.



BATTENS AND WEDGING FOR JIG SCREENS

A bearing strip is forced down on the upper battens by wedges. The battens are cambered ⅛ in. at the center, so that when the wedges are driven into position and the battens forced down upon the screen the greatest pressure is exerted at the center where there is the greatest tendency for the screens to become loose. A wire is drawn about each pair of upper and lower battens. This method has given great satisfaction.

Check System at the Cabin Branch Mine

At the Cabin Branch pyrites mine situated about 1½ miles west of Dumfries, Prince William county, Va., a simple and effective method for keeping track of the ore mined by each man is in operation. All stope work is done on contract and each skip raised must pass inspection before being accepted; it is therefore necessary to have an accurate record as to who sends up each load.

To insure this each man or, rather, contractor is designated by a number and on going underground gets from a rack in the shaft house a bunch of brass tags on each of which his number is punched. On the side of the skip a short piece of pipe, closed at the bottom, is so fixed that when the load is dumped the tag, placed in it by the miner sending up the load, is deposited in a box placed to receive it. The inspector takes the tag and files it on its nail on a file hung upon the wall of his office. At the end of the shift he is then able to fill out a record of the ore sent up from each working face, crediting it to the proper men. Short or slaty skiploads are rejected, i.e., not credited to the miners, so that after the first little trouble is encountered on this score. As an aid in the bookkeeping all men on stope work are designated by odd numbers, those on development by even ones. Using tags and an automatic dump as described, the necessity of a tender to follow the skip is done away with.

FORMS FOR RECORDING ORE MINED AND ADVANCE MADE.

First Half Mo.	1		2		15		Totals.
Check No..... Date.....	A. M.	P. M.	A. M.	P. M.	A. M.	P. M.	
Good							
Short							
Slaty							
Location							

First Half Mo.	1		2		15		Totals.
Check No..... Date.....	A. M.	P. M.	A. M.	P. M.	A. M.	P. M.	
Incline							
Raise							
Heading							
Location							

FORM FOR RECORDING SUPPLIES CHARGED AND TOTAL WAGES DUE.

First Half Mo. Check No.... Date.....	1	2	14	15	Supplies.	Total Due.
Location						
Powder						
Fuse						
Caps						
Oil						
Sunshine						

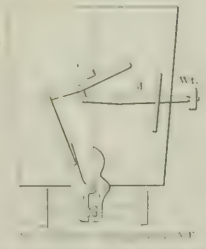
Recording System

The top man at the shaft, or inspector, sends in his report to the office each night, and it is entered into ledgers arranged according to the forms shown.

Stope work is paid for by the skip or ton of ore loaded into the skip and incline, heading and raise work by the foot of advance, so separate columns are ruled off for recording these figures. The miners furnish their own powder, fuse, caps, oil and "sunshine" (paraffin), for which they sign requisitions as it is issued to them by the commissary. These slips are turned into the office at the end of each day and entered in a book with pages divided as shown for a period of half a month. At the end of each day by reference to the ledgers the exact amount due each man may be determined at a glance. Similar ledges may be used to carry the totals for the entire mine.

Cable Grip for Ore Cars

The accompanying illustration shows a simple and effective cable grip for ore cars where the endless rope haulage is used. The jaw *A* is operated by a system of levers and toggle joint. *A* is stationary. The wearing portion *B* of the jaws is ¾x1½x4 in. and is easily taken out and renewed when badly worn.



ARRANGEMENT OF CABLE GRIP

The lug *C* is fastened to the car which prevents the toggle-joint lever from passing beyond the center. The jaws are held in place on the cable by means of a weight on the end of the lever *D*.

Skips Replacing Ore Chutes

At the Liberty Bell mine, at Telluride, the vein is in a uniform fissure with a pitch of about 53 deg. from the vertical, and carries an ore which is a mixture of quartz with a talcy mud. Chutes were formerly used down which to slide the ore from the upper workings to the main haulage tunnel, but the water made a paste with the mud, sealing the cracks in the chutes, and finally causing them to burst by hydrostatic pressure. To replace these chutes the mine now uses a bottom-dumping skip, designed by S. A. Worcester and Charles A. Chase. This is hoisted, when empty, by an over-balance counterweight.

The skip has a capacity of 11,000 lb. and is attached by links to a cage about 12 ft. above it. The weight of skip and cage is 9000 lb., making a total weight when loaded of 20,000 lb. The counterweight weighs 14,500 lb., thus balancing the cage and skip and ½ the average ore load. Men and timbers are hoisted on the cage when the skip is empty, an effective pull of 5500 lb. being available for that purpose by the over-balance counterweight. The 1⅛-in. plow-steel cable balances itself throughout. The speed is regulated by a brake, a 20-h.p. motor being connected to the sheave for use only when it is desired to lower the skip from its usual stopping place above the ore pocket to the main level for timbers, etc.

The operation of the device is as follows: The filler, or pocket, holds 4 mine cars of ore (one skip load) and is so placed that the skip is in position below the filler when the cage is at the station level. Thus the cage can be loaded or unloaded while the skip is being filled. The skip then makes its trip, dumps automatically, closes its door and returns while the skip tender is dumping cars into the pocket. The skip dumps into a chamber which is divided into two compartments, one for ore and one for waste. From these the material is drawn through finger chutes into a forebay which holds a load for the tunnel car.

Single Skip Compared to Double

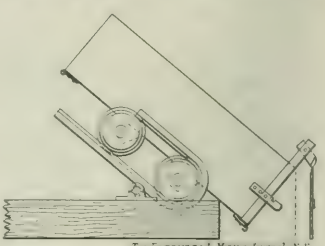
The "peak of load" for two balanced skips is the weight of rope (1150 ft. in this case), plus the skip and ore, because it is necessary when changing levels to hoist unbalanced. A 40- or 50-h.p. motor would be necessary to do this at reasonable speed. The monthly difference in interest in favor of the single skip is $120 to $150. Danger resulting from the difficulty of watching two compartments at once is eliminated. The single skip has more than one-half the capacity of the double arrangement, as it is always ready to move on signal, while the double compartment skips are seldom ready to move at the same instant. In the present instance the dip and angle allow the use of the sheave hoist and tail rope, giving constant rope balance and making the hoist materially smaller and cheaper than a double-drum hoist.

Car and Tipple for Headings

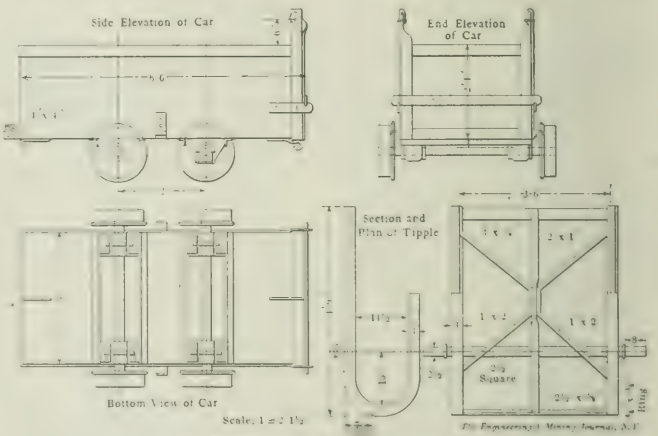
The Republic and Tennessee companies, in their newer slopes on Red mountain, Ala., hoist in 10-ton skips which, in headings are filled from 2-ton cars, dumped by tipples directly into the skips. The drawings accompanying this article show the details of the cars and tipples used in headings by the Tennessee Coal, Iron and Railroad Company. The cars are extremely strong and simple in construction. They are made of ⅜-in. steel, braced and reinforced as shown. By having the body of the car low and long, 2 ft. 4 in. x 6 ft. 6 in., several advantages are gained. In the first place the cars are made easy to load, a very important consideration. This construction, on account of the low center of gravity, also adds stability and reduces the liability of the car to overturn or jump the track; at the same time the long body does not make tipping excessively difficult. Two men who are always available when the skip is at any station, easily send the cars into the tipple with sufficient force to dump them.

Having the body of the cars so low, also allows the dump end of the car to be hung 6 in. above the side, thus giving an opening sufficiently wide to allow the ore an easy passage from the car. This is particularly necessary with these iron ores which break in quite large pieces which would be liable to block the dumping, were not sufficient clearance provided. Fig. 2 shows car in tipple in position of dumping the extra clearance caused by leaving the movable end hung above the sides of the car being brought out by the dotted lines.

The tipple is of the simplest construction, being constructed of pieces of 40-lb. track rail curved back, so as to grip the wheels of the car, and cross-braced with a 3x⅝-in. iron at the track end, and a 2½ x ⅝-in. iron on the curve, 7 in. above its base. A lateral brace, 2x1 in., connects these cross-braces and it is twisted at the center so as to be riveted to pieces of similar material, with the larger dimension placed vertically. A piece of 2½x2½-in. iron is used for the axle. 8 in. being allowed at either end for bearing. Usually there are two tipples at each station; one to receive the cars from the heading on either side of the slope. The slope is driven 9 ft. below the footwall of the ore so that ample fall is provided for dumping from the headings into the skip.



OPERATION OF TIPPLE IN HEADING



CONSTRUCTIONAL DETAILS OF CARS AND TIPPLES

A consular report notes that there is a good field in Siberia for the introduction of improved American gold-mining machinery. Germany is not a strong competitor in this line, and it is only recently that English manufacturers have begun to realize its possibilities. Mining machinery is one of the few articles admitted into the country free of duty.

Personal

Mining and metallurgical engineers are invited to keep THE ENGINEERING AND MINING JOURNAL informed of their movements and appointments.

John P. Cosgro has been in Chicago on a short business trip.

Edwin J. Collins, of Duluth, Minn., is examining properties in Alaska for clients.

Norval J. Welsh is on an examination trip through eastern Sonora and western Chihuahua, Mexico.

H. C. Wilmot, of Salt Lake City, Utah, has been in New York for two weeks past, and has now gone West again.

Lucien Merritt, president of the Red Warrior Mining Company, has returned to Duluth, Minn., from a visit to Utah.

Marion L. Thomas left the City of Mexico, Nov. 30, for Ocotlan, Oaxaca, expecting to be absent about two months.

Edward V. d'Invilliers, of Philadelphia, has resigned his position as consulting engineer to the Rhode Island Coal Company.

Milton O. Knauss has been made superintendent of the Empire Steel and Iron Company's furnace at Macungie, Pennsylvania.

R. S. Burdette, of the Keystone Copper Smelting Company, Tapalpa, Jalisco, Mexico, has gone to New York on professional business.

Jacob H. Taylor, well known as a coal operator and coal-mine owner, celebrated his ninety-first birthday on Nov. 24, at his home in Baltimore.

Albert L. Tucker has been appointed manager of the Union copper mines, North Carolina. He had charge of the mines several years ago.

L. R. Wallace, of Morenci, Arizona, superintendent of the Detroit Copper Mining Company's smelter, is in New York on business for the company.

A. B. W. Hodges, of Grand Forks, B. C., has been visiting the Shattuck-Arizona copper mine at Bisbee, Arizona, for which he was recently appointed consulting engineer.

Arthur T. Marks, who left Butte, Mont., last March to take over the management of the Nile Valley Gold Mining Company, Egypt, anticipates returning to the United States next May.

Sidney J. Jennings has been placed in charge of exploration and examination of new properties for the United States Smelting, Refining and Mining Company, and will become a vice-president at the next meeting of the directors.

H. S. Stark has resigned the position of general manager of the Combination Fraction Mining Company, Goldfield, Nev., and Charles D. Wilkinson has been appointed in his place.

S. A. Beman, formerly of Cripple Creek, Colo., and later of Searchlight, Nev., is now superintendent of the Buena Fe Mining Company, in the Cerro del Torro, Jalisco, Mexico.

Dr. L. D. Ricketts, general manager of the Greene-Cananea interests at Cananea, Mexico, was in Morenci, Ariz., recently. Dr. Ricketts is also president of the Morenci Water Company.

Dr. C. Offerhaus, recently of New York, has accepted a position with the firm of Paul Schmidt & Desgraz, metallurgical constructors of Hanover, Germany. He has been a frequent contributor to the JOURNAL.

Harry L. Day was elected president of the Hummingbird Mining Company at the annual meeting of that company held in Burke, Idaho. Mr. Day is also manager of the Hercules mine which adjoins the Hummingbird ground.

Louis B. Godin, formerly superintendent for the Castellana Consolidated Mines, Ltd., in Tepic, Mexico, is now in the Guadalupe y Calvo district of Chihuahua to take charge of development work for the same English interests.

The Pocahontas Fuel Company announces the appointment of E. O. Parkinson as its Norfolk manager. Mr. Parkinson is now agent of the Norfolk & Western Railway Company, at Norfolk, Va., and will take up his duties before Jan. 1.

Carl Scholz, coal-mining engineer for the Rock Island system, accompanied by W. Weston, engineer in charge of the mining department of the Moffat road, has been making an extended examination of the Yampa coalfield of Routt county, Colorado.

Percival Roberts, of Philadelphia, and Samuel Mather, of Cleveland, O., have been chosen directors of the United States Steel Corporation in place of William Edenborn and Marvin Hughitt, resigned. Mr. Roberts was formerly president of the American Bridge Company. Mr. Mather is of the firm of Pickands, Mather & Co., iron-ore miners and shippers.

Charles Kirchhoff has resigned his position as editor of the *Iron Age*, of New York, after 32 years of service in that position. Mr. Kirchhoff has been identified with the *Iron Age* and has done much to give that paper its present high standing in the iron and steel trades. He was at one time assistant editor of the ENGINEERING AND MINING JOURNAL, and has done much work in connection with the Geological Survey, and in the general technical field.

Obituary

W. Y. Williams died at Lorain, O., Dec. 1, aged 66 years. He was for many years well known in the steel industry, and was an expert in the manufacture of bessemer steel, in which he had introduced many improvements. He was born in Wales, but came to this country when a young man. Over 40 years ago he became associated with the Cambria Steel Company, of Johnstown, later with Andrew Carnegie and then with the Edgar Thomson plant at Braddock, going to Lorain when the works there were built. He leaves a wife and five children.

Societies and Technical Schools

Mining Engineering Society of the Massachusetts Institute of Technology—At the October meeting George A. Packard delivered an address, relating various incidents of his recent mine examinations in the West. The November meeting was held jointly with the Harvard Mining Club; Prof. R. H. Richards spoke on "Development of Hindered Settling Apparatus," giving results of his own experimental work.

Southern Appalachian Coal Operators' Association—This association was organized at a meeting of coal operators from Tennessee and southeastern Kentucky, held in Knoxville, Tenn., Nov. 19. The officers chosen were: President, B. A. Morton, Knoxville, Tenn; first vice-president, H. M. Lafollette, Lafollette, Tenn.; second vice-president, M. J. Moss, Pineville, Ky.; third vice-president, James Woolridge, Knoxville, Tenn. The selection of the secretary was left to the executive committee which has called a meeting for Dec. 20, at which time it is hoped to get all of the operators from the Jellico field present who were unable to attend the first meeting.

Asociación Mineros de Zacualpan—This society was organized at Zacualpan, Mexico, some months ago and now has a membership representing 20 different mining companies and numerous individuals. The object of the association is the advancement of the science and practice of metallurgy and mining in the district and it will serve as the intermediary for the publication of authentic data regarding same. The association has commodious club rooms and in the reading room the principal mining and scientific periodicals and several daily papers will be kept on file. A room has been fitted up where a collection of minerals, ores and plans of the district will be kept, and a committee has been appointed to gather from the official and ecclesiastical repositories historical data which will be permanently filed in the archives of the association. The officers are as follows: Mauricio Morales, president; Emilio Gutierrez, first vice-president; Joseph Nibel, second vice-president; George Dillon, third vice-president; L. N. Shaw, secretary; Estolio Diaz, pro secretary; Constantino Estrada, treasurer; H. L. Scaife, J. M. Platt, F. Rivas Guemas, Teodomiro Suarez, T. D. Hastings and Francisco Conejos, directors.

Special Correspondence from Mining Centers

News of the Industry Reported by Special Representatives at Butte, Denver, Salt Lake City, Goldfield, Cobalt and Toronto

REVIEWS OF IMPORTANT EVENTS

San Francisco

Dec. 1—The withdrawal from entry by the President of over 3,000,000 acres of petroleum-bearing lands in California, Wyoming, Utah and Oregon strikes California harder than it does the other States. These lands have been examined by the Geological Survey and determined to contain oil and gas. They have been heretofore taken up under the placer-mining laws, and it is now desired that special laws be passed by congress as to their entry and sale. It is supposed that the Government will ultimately use large quantities of oil on the ships of the navy and the oil lands are to be set aside for this purpose. Meantime several foreign countries have agents in California for the purpose of contracting for oil from the selling companies of the State. One very large contract has already been made with the agent of a foreign country at the rate of $1 per barrel.

The Producers Transportation Company has closed the gap in the hills through Palonia pass and the pipe line is now complete from the Coalinga field, in Fresno county, to tidewater. Oil is now the leading mineral product of California, the output last year having exceeded that of gold by several million dollars. The stoppage by the Government of further entry of oil lands is a fine thing for those who already own lands, but it will doubtless, to a great extent, stop further prospecting operations for a time at least.

The Anti-Débris Association at a recent meeting adopted resolutions about dredge mining which are of importance as showing the intentions of this association toward that industry. It was this association which, after years of work, virtually killed the hydraulic-mining industry in the central part of the State. The resolutions referred to, state that the association has become convinced that the operations of dredgers on the American, Yuba and Feather rivers, has done damage to the rivers and that especially on the Feather river, dredging operations have been carried on without system or organization, tending to greatly raise the flood plain of the river. The association wants the California Débris Commission to take charge of dredging, as well as hydraulic-mining operations, so as to improve the river. This request is made on the stated ground that while some of the dredging companies have shown a desire to operate without injury, others have been reckless.

The association announces its determination to continue to bring suits against certain companies doing supposed injury to rivers as it has against hydraulic-mining companies even though possessing permits from the California Débris Association. The association wants the commission to examine into the whole question so that new laws may be passed if necessary and the dredgers brought under similar restrictions to those applying to the hydraulic mines. The association plainly says that while thus asking the coöperation of the Débris commission, it reserves the privilege to act at all times as it sees fit to protect the rivers and adjacent lands irrespective of any action taken by the Débris commission. In other words, if the commission does what the Anti-Débris Association wants it to do, the association will remain quiescent, but if not it will do what it wants anyhow. So thus a challenge is thrown down both to the Débris commission and to the dredge operators as well.

Considerable interest is being manifested just at present in the magnesite deposits of California, though more particularly in the production of building material from this substance. There are many known deposits, though few have been developed owing to the fact that most of them are at distances from railroad transportation that prevent their profitable working. The deposits in Tulare county are the most productive. Most of the material is used in the manufacture of wood pulp for paper though some is used for making carbonic-acid gas. More or less building material is being made, such as floors, tiling, wainscoting, etc. As yet there being some doubt as to the proper kind of binder to make the material lasting. Several companies have been organized which have issued prospectuses intended to sell stock and in which many untruthful statements are made. Thus far no magnesite brick of any value has been made in California, though many attempts in that direction have been made. Even the flooring has not stood the tests satisfactorily in several instances. The wainscoting, however, has been much admired and is in demand. Some large buildings have used magnesite lately for several purposes. What seems to be most wanted here is a good technical man who understands this mineral substance thoroughly and can turn out a uniform product so that there will be no failures.

Butte

Dec. 7—The strike of railway switchmen throughout the Northwest has seriously affected the Butte mines. The Boston & Montana mines ship ore over the Great Northern railway to the smeltery at Great Falls. The other operating companies of the Amalgamated, including the Anaconda, Butte & Boston, Trenton and Washoe companies, ship ore over the Butte, Anaconda & Pacific railway to the Washoe smeltery, Anaconda. The North Butte and Coalition companies also ship ores to the Washoe smeltery. The W. A. Clark properties, which include the Original, West Stewart and Elm Orlu mines, ship ore to the Butte Reduction Works, in Butte, the ore being conveyed from the mines to the smelter over the street-railway line. The East Butte ore is being treated at the Pittsmont smeltery in the southern part of Butte. The majority of the small independent operators send the ore to the Washoe smeltery at Anaconda. While those companies which send ores to smelteries in Butte have an advantage over those which do not, yet all of the mines without exception were affected by the threatened failure of the coal supply. The coal situation to date is relieved by the fact that the Wyoming and Utah coal can still come over the Oregon Short Line and the Butte, Anaconda & Pacific roads, which are not affected by the strike. The Great Falls smeltery on the Great Northern, however, has closed and the mines at Butte shipping to it are closed. Of the Amalgamated properties, the Mountain View, West Colusa, East Colusa, Pennsylvania and Leonard are all closed. The railroads are endeavoring to resume without the striking switchmen, but as yet without any great effect on the traffic by freight.

It is probable that the Gilmore & Pittsburg railway, planned to run from Salmon City, Idaho, to Armstead, Mont., will be continued 24 miles to Dillon, Mont. The present route of the road taps several rich-mining districts in Montana and Idaho. It is thought possible that the road may eventually be extended to Whitehall, where it can make connections with the Northern Pacific's main line.

President Wolvin, of the Butte & Superior Company, has announced that, after considering a number of sites for the new zinc concentrator, the company has decided to build the mill on its own ground at the mine. Work on the foundations will be begun at once and it is

expected that the mill will be in operation March 1. It will have an initial capacity of 750 tons and will be built in units so that enlargements can be made. A new compressor is being installed which, with the one already on the property, will furnish air for 30 drills.

Denver

Dec. 4—Dredging in Summit county has, during the season just closing, reached the highest point in its career to date. The production as estimated by the daily press is, however, away and above that which will have actually been made. It has been stated that the output would total sums from $750,000 to $1,000,000. The production is rather less, being to date approximately as follows: Colorado dredges (two boats), $150,000; French gulch dredge, $150,000; Reliance dredge, $50,000; total, $350,000. This is nearer the mark, though it is difficult to arrive at any accurate estimate, as the companies are not giving out their actual returns.

The Reliance company, which is the pioneer of those working in the district, is dredging on French creek, about three miles from Breckenridge. This boat has been improved during the season by the installation of a new bucket line, consisting of 42 buckets of 5 cu.ft. capacity each, in close-connected link, together with installations of machinery of latest pattern, and the dredge is in better condition than at any time in its history.

The French gulch dredge is operating about one mile nearer Breckenridge. This dredge was not new when installed, but a year or so previously had operated unsuccessfully on ground near Golden. This result at Golden was laid rather to the low gold content than to the dredge. The machinery was moved to Breckenridge, and placed on a new hull, which was constructed under the direction of Frederick Estep, of California. Some changes were made in the general plan, and additions made to the machinery, including, among other things, new electric equipment. The operation of this dredge during this, its first season, has been entirely satisfactory, both as regards the running and the saving of the gold, which runs in some cases as much as 80c. per cu.yd., though the average has been much lower, probably about 25c. At this, it is an exceptionally rich deposit. The capacity of this boat is 3000 cu.yd. per diem. The bucket line is of the close-connected type, the capacity of the buckets being 5 cu.ft. each.

The Colorado Gold Dredging Company has operated two dredges continuously throughout the season, one on the Swan river, and one on the Blue river, five miles below Breckenridge. These boats are at present the largest in the district, having 9-cu.ft. open-connected buckets. The dredge which has been operating on the Blue river has been closed for repairs for about six weeks. A new bucket line of extra heavy construction will be installed this winter, and the old buckets will probably be added to those of the Swan river dredge, making it a close-connected type. The new buckets are of special design, and are said to be the strongest and heaviest 9-cu.ft. buckets ever built. The ground on the Swan river is said to have averaged 20c. per cu.yd. The ground at the confluence of the Swan and Blue rivers is said to have run from 40 to 60c. per cu.yd. for the last running of the Blue river dredge. Of course, this cannot be accepted as an average value. The boats have excavated at the rate of from 3500 to 4000 cu.yd. per working day.

The Reliance dredge will be run all winter, as the company has installed a device to prevent freezing of material on the stacker. The Colorado company will probably close very soon. The French gulch company will attempt to run until Jan. 1. It is problematical whether operations can be carried on efficaciously through the winter; it is evident that the two last named companies consider not.

The Reliance company has drilled in lower French gulch, and has found some very rich ground on its property. The drilling has shown that the old French gulch channel splits at the junction of Nigger gulch with French gulch, and from there to the Blue river, some three miles, there are two distinct and rich channels. Some added drilling has been made on the Blue river placers, known locally as the "Lambing property," and it is probable that a modern dredge will be installed next year. The Blue river placers have been proved to contain a large acreage of pay gravel between the mouth of French gulch and Swan river.

The dredges receive their power from the Central Colorado Power Company. All the companies own their own machine shops.

It has been frequently stated by the daily press that a large number of dredges will probably be in operation in Summit county within the next few years. This statement is misleading, as it is well known that there are but two or three tracts of dredgeable ground which remain unequipped.

There has been but little hydraulic mining in the Breckenridge district this year, but it is stated that considerable money will be expended for hydraulic equipment on properties in the vicinity the coming year. Hydraulic mining on a large scale has never been successful in this county.

The Cripple Creek drainage tunnel during November was advanced 298 ft. The full distance driven to Dec. 1 is 11,705 ft. The heading has been driven over 700 ft. into the granite of Beacon hill, and its extreme hardness has prevented more rapid progress. No moisture is observable in the breast of the tunnel, so tight is the rock, but it is expected that one of the numerous dikes traversing this section may soon be encountered and with it a flow of water. The minor water course tapped last month continuous to flow at the rate of about 100 gal. per min., but the water is carried off in the ditch and in no way interferes with work.

In anticipation of the results to be expected from the deep drainage tunnel, when the 3000 ft. of driving yet remaining is completed, properties on Beacon hill are making preparations to extend operations below the present water level. The El Paso is preparing to sink a shaft with three compartments from the present water level. The Gold Dollar Consolidated and the Henry Adney are also making similar plans.

Salt Lake City

Dec. 4—A suit for $3,870,000 has been filed by Col. E. A. Wall against the Utah Copper Company and D. C. Jackling, manager, and an injunction is asked to prevent the company from paying any more dividends until the suit is settled. It is charged that the Utah Copper has during the last four years stoped from the Amanda property, owned by Wall and adjoining the Utah Copper, 215,000 tons of ore valued at $6 per ton. This would bring the total damage to $1,290,000 but recent laws treble the damage against men or corporations which without right extract ore from the property of another and under this law the amount sued for is $3,870,000. Colonel Wall further alleges that the manager of the Utah Copper made a sworn statement before the State board of equalization Feb. 8, 1909, that 1,881,818 tons ore were extracted from the mine during 1908, at a net profit of $556,819 equivalent to 30c. per ton. And that during the last half of 1908 the Utah Copper paid two dividends amounting to $596,387, or $39,568 more than the net earnings of the company were sworn to be. He avers that the company statements show that only 6,000,000 tons of ore exist and that the 2,000,000 tons mined thus far this year have a lower copper content by 4 lb. per ton than previously and that at this rate the mine will be exhausted before the suit is settled. He asks that the court quiet title to the Amanda property forever in his favor, that the Utah Copper Company be made to account to him for the ore extracted, that his engineers and accountants be allowed to investigate the company to determine the exact amount due, and that meantime the company be restrained from paying any dividends.

The bear market on Tintics has resulted in the closing down of five properties, the East Tintic Gold King, Montana, Zuma, East Crown Point and Black Jack. The companies all have good showings which justify further development but there is no market for the treasury stock and under existing circumstances assessments are considered unwise so that the treasuries being de-

pleted there is no other course than to cease operations until more favorable times.

Cobalt

Dec. 2—The annual meeting of the Cobalt Central will be held in Augusta, Me., Dec. 17, and a stormy meeting is expected. It is understood that new interests will demand an investigation relating to loans made to the company, and which it is alleged have not been shown in the financial statement.

Norman R. Fisher, manager for the Temiskaming company, has returned from a visit to the Port Arthur region, bringing samples of silver ore. The property from which these were taken is one on which a small amount of work was done some years ago. The formation in which the silver was found is believed to be a continuation of the slates of Silver islet. The vein matter consists of calcite carrying leaf silver and argentite. Mr. Fisher gave it as his opinion that the country offered possibilities for the finding of silver. The Silver Islet mine, worked years ago, is near the north shore of Lake Superior, and had to be abandoned on account of water.

At the annual meeting of the Nova Scotia company, the shareholders will be asked to approve a by-law authorizing the directors to make application for an increase of the capital stock of the company by 500,000 shares, par value $1, this stock to be distributed pro rata among the shareholders at 50 cents.

The annual report of the Rochester mine informs the shareholders that over 400,000 shares of the new increase in capital has been taken up at 10c. per share. This will give sufficient funds to work the mine.

The Temagami Reserve Company has acquired control of the Gavin Hamilton property, Elk Lake district, and the Floyd mine, west Coleman. The former property is a mile outside of Elk lake, and much work has been done. Silver was found in narrow veins on the surface. The Otisse-Currie is controlled by the same group, and it is understood that this will also be included in the merger. It adjoins the Otisse in the Silver Lake district, and has some silver showing.

Toronto

Dec. 4—Revelations made in connection with the trial of an important mining suit at North Bay, indicate the need of an investigation by the Ontario department of mines. John Caley, of Latchford, and F. A. McIntosh and Samuel McLaughlin, prospectors, claiming one-[illegible] interest in the property now known as the Bartlett mine, Gowganda, sold to McIntosh & McLaughlin for $[illegible]. The claim was based on an agreement by which Caley was to provide the information which "made the discovery" from the department of mines, which would enable the prospectors to find the O'Kelly location and stake claims around it. The exact situation of the O'Kelly location was being kept secret, but Caley, it is claimed, secured a map from someone in the department on which it was marked. Acting on this information McIntosh & McLaughlin secured the claims afterward sold to the Bartlett Syndicate. The defense set up was that the map was incorrect, and that Caley had also promised to obtain copies of the applications for the O'Kelly claims which he had failed to do. After evidence had been heard the case was settled out of court.

Mexico

Dec. 1—President Diaz has signed the new mining law. The few changes made by congress meet with general approval throughout the country, and the law as it now stands covers the complex questions arising in the mining industry in probably the simplest and most complete manner of any country in the world. F. F. Barker, a prominent attorney, is arranging a translation into English, with index and commentary notes that will shortly be published in book form.

For the three months ended Sept. 30, Mexico exported to the United States metals valued as follows: From Aguascalientes, copper 3,071,439 pesos; from Chihuahua, silver and lead bullion 703,823 pesos; from La Luz, Guanajuato, gold and silver concentrates, 34,517 pesos; from Parral, gold, silver and lead ores 328,925 pesos.

The Toluca Electric Light and Power Company, and the Sultepec Electric Light and Power Company, of which R. J. M. Donley is general manager, has completed arrangements to supply the town of Zacualpan, Mex., with electric light, and are bidding for power contracts with the various mining interests in the district.

La Blanca mine of Pachuca has ordered the following equipment for the new cyanide plant: Eight Pachuca tanks 15 ft. in diameter by 60 ft. high; six Dorr classifiers and three pulp thickeners, 30 ft. in diameter. The above order is placed through Grothe & Carter, Mexico City. The representatives of the Krupp company in Germany are supplying six Krupp seamless tube mills, 4x20 feet.

The Guanajuato Light and Power Company has increased its capital from $[illegible] to $12,000,000. The additional capital is required for the extension of its transmission lines and the erection of new plants. This company furnishes power for the mining, manufacturing and agricultural enterprises of Guanajuato, La Luz and Irapuato. Nicholas Rose is manager.

W. R. Ramsdell, of Guadalajara, has formed a company with American capital to acquire from Carlos Romero, of Etzatlan, the properties known as the Refugio, Las Animas and Tres Estrellas mines in the Hostopaquillo district, and the Amajac Reduction Works in Etzatlan, Jalisco. The capital is $2,500,000. Mr. Ramsdell is president, and C. A. Sidler, of Sunbury, Penn., is secretary and treasurer. The mines taken over by the new company are all old producers, and were owned and operated successfully by the Guadalajara house of Romero de Parra. Several millions of pesos were supposed to have been taken out of the Refugio mine by this family. It is the intention of the Ramsdell company to start new development work at once on the Refugio and Las Animas mines and reequip the reduction works with Deister tables, tube mills and cyanide plant to handle the milling ore from these mines.

London

Dec. 1—The results of the working of the Mount Lyell Mining and Railway Company, Ltd., of Tasmania, for the half year ended Sept. 30, have been cabled to London from Melbourne. The net profit for the period is £139,850.

The most important development has been the proving in the North Mount Lyell mine of payable bornite ore at the 1100-ft. level. The company is doing a good business in the manufacture of agricultural fertilizers and in order to take advantage of this increasing trade new superphosphate works are to be erected at Fremantle.

The Dunderland Iron Ore Company, which has spent a large amount of money in trying to work low-grade iron ores in the north of Norway, is creating a further issue of £250,000 in 6 per cent. prior lien bonds with a view to saving the property for the present proprietors. If the whole amount is subscribed, it is estimated that after paying off all creditors, including the holders of existing prior lien debentures, there will be a sum of £75,500 for working capital. Of the amount offered, £200,000 has been underwritten, so that if the whole issue is not subscribed there will be £33,000 for maintenance and future expenses. Experiments have been recently made with a new wet magnetic separator, designed by Mr. Ullrich and the results are so encouraging that further trials, which so far have been conducted at the Krupp works in Germany, will be made on a full-sized machine at Dunderland. It is hoped that the fresh capital now being raised will enable the successful treatment of the ore to be sufficiently demonstrated, so that further capital necessary for installing machinery on a working scale will be obtainable. The sum which is now being obtained for working capital is not large but the directors hope that it will lead to the enterprise being ultimately made into a profitable concern.

Mining News from All Parts of the World

New Enterprises, Installations of New Machinery, Development of Mines and Transfers of Property Reported by Special Correspondents

THE CURRENT HISTORY OF MINING

Alaska

The Iditarod strike is declared to be one of the most important in the history of Alaska. Other camps are being deserted and a stampede is in full swing.

The season of heavy gold receipts at the Seattle assay office ended Dec. 1 with a total of $11,733,489 for the six months beginning June 1. This is a falling off of $5,775,141 from the amount for the same period in 1908. The lack of water for sluicing has operated this year against a larger yield.

It is reported that the Copper River railroad has been completed to Tiekel river, 102 miles from Cordova, and that line is cleared for 98 miles further. This probably means that the line will be completed to the Bonanza mine in 1911, possibly by the end of 1910.

Hubbard-Elliot—The company will make large ore shipments via Cordova this winter. The first consignment, 400 tons, is at Tiekel, the end of the railroad. The ore will go to Tacoma.

Ebner—This mine at Juneau will resume development. H. F. Tripp is in charge.

Bear's Nest—A crew is at work sinking the old shaft in this property at Douglas.

Golden Gate—This mine, Chicagoff island, has shipped its first bar of bullion.

Arizona

Cochise County

Copper Queen—The November ouput was 9,666,000 lb. of copper.

Gila County

Arizona Commercial—The November output is about 400,000 lb. of copper. Work on the 700-ft. level is interfered with by water and pumps will be installed to help the situation.

Graham County

Detroit—This company at Morenci produced in November 1,894,000 lb. of copper.

New England & Clifton—The company's property will be sold at Portland, Me., Dec. 17, to satisfy claims. The bonded indebtedness is $145,000 and the floating debt $22,000. Nearly $250,000 has been raised for this property. Edward M. Bristol is managing director.

Shannon—The November output was 1,400,000 lb. of blister copper, slightly less than for this month, last year. The railroad will be completed in 60 days It is claimed that this road will effect a saving of 1c. a pound in the cost of production.

Pima County

Imperial—The November output was 700,000 lb. The production for three or four months has been below normal, owing to the fact that in the Mammoth mines, part of the group owned by the Imperial company, the grade has fallen off as a result of running into a country much broken by an intrusive porphyry dike. An incline winze is being sunk from the 800-ft. to the 900-ft. level to get out of this low grade, which averages better than 3 per cent. The output of the Imperial mines for the six months ended July 1 has been approximately 1,000,000 lb. of copper per month. The company has three drills testing porphyry ground at Imperial with the expectation of developing an important tonnage of 2 per cent. ore, in which case a concentrator will be built and the smeltery enlarged.

Helvetia—Owing to advance in smelting rates shipments have been discontinued.

Pinal County

Arizona-Hercules—This property east of the Ray Consolidated is being drilled. Twelve holes finished are reported in ore and it is also reported that a hole east of the Ray fault at 400 ft. has penetrated the Ray schist which here is overlaid by 100 ft. of dacite. W. P. Dunham is president.

California

Butte County

Big Blue Lead—This mine at Bangor, recently started, has its drain tunnel in 1500 ft., and it will be run 500 ft. further to Poison Oak ravine, when an upraise will be made to reach the gravel. The gravel is cemented and will be milled.

Cape Horn—Levi Cohn has finished installing the machinery at this mine to handle the water and active operations have begun.

Spring Valley—This hydraulic mine near Orovolle will be worked again as a drift mine.

Empire—This gold dredge at Oroville, which capsized some time since, has been put into commission again after being remodeled.

Eldorado County

Maginness, Wren & James are opening the Lone Star, Wild Rose and Old Abe mines, south of the Union mine near El Dorado.

Slug Gulch—At this gravel mine, formerly the Ensley, at Fairplay, they are making good clean-ups.

Orum—At this property, El Dorado, O. A. Ingraham, manager, specimen ore is being taken out of the shoot recently discovered.

Union—At this mine, El Dorado, the 1600-ft. shaft is the deepest vertical one in the county. Extensive development work is being carried on by Superintendent Effinger.

Oro Fino—It is expected that operations will shortly be resumed on this mine at Big Cañon.

Kern County

E. A. McCreadie, of San Francisco, has leased to Oscar G. Rodgers 17 mines in the Amalie district, including the Zada, Costly, Fawn and Lorene. An option to purchase has also been given.

Stockton Creek—Operations have come to a standstill at this mine owing to financial difficulties of the lessees.

Nevada County

Champion—George E. Fitzgerald is the general manager of the new company which takes over these Nevada City mines Dec. 1. A new deep central shaft will be sunk.

Ridge—This mine at Columbia hill is being developed under the management of William H. Landrigan and a 500-ft. tunnel has been driven under the gravel channel.

Pittsburg Consolidated—Preparations are being made to sink below the 1000-ft. level.

Austin—This mine, near Nevada City, L. S. Austin, owner, is being worked by leasers who are crushing ore from the 300 level.

Mountaineer—Now that the first section of the vertical shaft on this Nevada City mine has been "holed" through, the extensive surface plant will be started up and ore will be taken out of the 400 level. The shaft will be continued to a depth of 2000 feet.

Aurora—It has been decided by the stockholders to reopen this Grass Valley mine.

Red Ledge—At this mine, Washington, the ditch has been dug, and in the spring the mill of the Eagle Bird will be moved to the property.

Plumas County

Langhorst—A strike has been made in this mine near Cromberg. The lode found in the tunnel is 8 ft. wide.

Shasta County

Carnegie—At this group of mines,

seven miles from Kennett, Fred Bowler, manager, a 20-stamp mill will be erected.

Milkmaid—A crushing of 180 tons from this mine at French gulch netted $10,000 on the plates.

SIERRA COUNTY

George A. Sandborn, William Spencer and others, of Eclipse, have taken options on mining ground of P. A. Brangier on Mooreville ridge. The claims extend from the Kohl hydraulic diggings up the ridge to within two miles of the Bellevue property.

Omega—The mill of this gravel mine at Forest, W. G. Sharwood, manager, will now be run with three shifts instead of one, repairs made to the air shaft permitting more men to work underground.

Tightner—H. L. Johnson has mortared 300 lb. of the specimen rocks taken from this mine, and has realized $12,000 from it.

[illegible]—This mine at Forest is being reopened by J. M. Fly and Harry Gray, of Nevada City. There is an 800-ft. tunnel on the property.

Dreadnaught and Rose—C. D. McGonigal, manager, says it is the intention to thoroughly develop these properties at Alleghany and Pike City, respectively.

TUOLUMNE COUNTY

Jumper—A contract for a 350-ft. shaft on the west vein has been let.

Yrma—Sinking has begun at this mine to develop the 8-ft. vein which has been discovered.

Colorado

TELLER COUNTY—CRIPPLE CREEK

The November production of the Cripple creek district of Colorado amounted to 62,715 tons of gold ore, of a gross value of $1,298,487. Total gold production for the entire 11 months of the present year was $14,503,212.

El Paso—It is rumored that J. Harry Avery, backed by the A. E. Carlton interests, will oppose the Allen L. Burris administration at the coming meeting in March. The company has declared an extra dividend of 1c. per share, making a payment of $2,000,000 in dividends.

American Eagles—Very rich ore has been discovered by sub-leasers in a block north of the main shaft at the second level. The property is under lease to the Colorado Mines Investment Company.

LAKE COUNTY—LEADVILLE

Resolute—A tunnel is being driven from the foot of the hill to cut the large zinc and lead bodies that have been opened near the surface on this property in the [illegible] district. Shipments are being made regularly from the upper workings and are averaging [illegible] the usual medium [illegible] ore.

[illegible] hill and as development work proceeds in the ore zone it becomes stronger.

Ibex—Fire in the Hopemore property has suspended work in No. 4 shaft of the Little Jonny, as the smoke is so dense that it is impossible for men to work. Determined efforts are being made to control the fire.

SAN JUAN DISTRICT

Tomboy—The November crushing was 3,300 tons, yielding bullion $39,000 and concentrates $30,500; making a total of $69,500. The expenses were $43,500, leaving profit, $43,500. Expenditure on permanent improvements, $1533.

Mineral Queen—This property, in Porcupine gulch, has been sold for $35,000 to H. M. Bateman, of Philadelphia, representing the Colorado Copper Company, which will develop the property.

Bonanza—The Lake company, of Pittsburg, will install machinery on this group and develop.

Gold Hunter—The company is expecting to resume. Howell Hinds is president.

Golden Fleece—A strike of telluride ore is reported in this property near Lake City.

Idaho

COUER D'ALENE DISTRICT

Lucky Calumet—The mine, west of the Snowstorm, will install a 4000-ft. aërial tramway.

North Fork Smelting and Mining Company—The company has been organized by Maurice Blanchard, Carson Morrow, John Ponzetti, I. S. Daly and B. A. Glover, to operate the experimental smeltery at Enaville. If the tests prove a success, the plant will be enlarged and contracts taken for custom ore.

Caledonia—On the lower level a strike of native silver has been made.

Butte & Coeur d'Alene—An oreshoot 225 ft. long and extending from the 307- to the 507-ft. level has been uncovered.

Jack Waite—This company has recently been incorporated by Patrick Burke, Peter H. Schmitz and George Keibler, to operate the Jack Waite group.

North Bunker Hill—At 100 ft. a strike of lead-copper ore has been made.

Indiana

CLAY COUNTY

Secretary [illegible] Hridlen, of the Block coal field, states that the mild weather of this past month has put a [illegible] on coal production, to be the lowest [illegible] for many years. During October the output of this district was [illegible] tons, and [illegible] tons. Since this demand has set in [illegible] and the operators have been [illegible] time [illegible] and [illegible]. The Indiana [illegible] tion of the country being the largest market. The coal going to the Northwest is usually in cars sent from that section. There is now a large amount of coal standing on sidetracks and in the big yards.

GIBSON COUNTY

A report that a fire had started recently in the Princeton mine from faulty and illegal shot drilling, brought Assistant State Mine Inspector Pearce to the mine, resulting in the arrest of three miners on charges of placing blasts improperly. Pleas of guilty were entered. Several other cases are pending.

Kansas

The manufacture of spelter has been resumed by the Chanute Zinc Company, north of Chanute. The plant has been shut down since July, when it was crippled by a fire.

Michigan

COPPER

The November mineral production is reported as follows: Baltic, 2,402,000; Champion, 2,580,000; Trimountain, 762,000; Franklin, 124,000; Victoria, 208,000; Mohawk, 1,170,000; Wolverine, 1,024,000 pounds.

Lake—This shaft is bottomed at the sixth level, while a plat is being cut to crosscut to the lode. In sinking in the footwall side from 90 to 100 ft. behind the present working lode, another copper lode was cut 20 ft. above the sixth level. The shaft entered this formation from the hanging-wall side and the portion of the lode so far exposed is well charged with copper. At the fifth level, the crosscut has reached the hanging wall side after passing 135 ft. of the lode and showing a good grade of rock. A second mill test on 185 tons taken from the side of this crosscut gave a mineral return of 82 lb. per ton. Preparations are completed for daily shipment of 150 tons.

New Baltic Exploration—This company has encountered an amygdaloid copper-bearing formation. A drill core shows it to be about 70 ft. wide. This company is to be turned into the New Baltic Mining Company, capital at 100,000 shares, 50,000 of which will pay for lands of the Exploration company and the remaining 50,000 shares will be kept in the treasury for development.

Osceola—Crosscutting is under way from the 1250-ft. level of both shafts to cut the lode. Drifting on the lode at 500 ft. continues yielding stamp rock. A drift from the 650-ft. level will be started. At the 850-ft. level the drift from No. 2 shaft is on the same grade of stamp rock, and the drift from the same level of No. 4 shaft, which passed out of the copper bearing portion of the lode due to faulting, is getting into a charged [illegible] [illegible] ft. [illegible] the lode.

Mass—Openings on the new Mass lode are showing indifferent results. Drifting is in progress from the 13th, 15th and 17th levels tributary to "A" shaft and also in the adit opening.

IRON

Mineral Mining Company—The company will erect steel shaft house and other buildings at the James mine, Iron River.

Cambria—The company has drills at work within the city limits of Norway.

Minnesota

Roy—This property on the Vermilion range promises to be a producer next season. The La Chance, adjoining, is drilling.

Montana

BUTTE DISTRICT

The estimated output of the Butte camp for November was 29,586,000 lb. of copper distributed as follows: Boston & Montana, 8,085,000; Anaconda, 7,752,000; North Butte, 3,486,000; Butte & Boston, 1,028,160; Washoe, 795,600; Butte Coalition, 4,410,000; Parrot, 443,120; Trenton, 786,640; W. A. Clark, 2,100,640; East Butte, 595,200; miscellaneous, 102,000; total, 29,586,300 pounds.

Butte & Balaklava—The shaft is down 1400 ft. Between 50 and 75 tons of ore are being shipped to the Washoe smeltery, Anaconda, daily from the 100- and 300-ft. levels.

Amalgamated—The shaft at the Gagnon mine is now down 400 ft. and is being sunk 100 ft. per month. The shaft is 4-compartment, two of which will be used for the skips, one as a sump shaft, and one for a cage to carry drills, water and timber.

Nevada

ESMERALDA COUNTY

Florence-Goldfield—A new discovery of ore has been made in the block of ground formerly worked by the Engineer's lease. In the mill, amalgamation has again been established on the plates below the stamps, and the use of carpets to catch the free gold abandoned.

Oro Fino—D. P. Marvel has made two shipments of ore from his property, 24 miles south of Goldfield.

Sandstorm—Plans are completed for the merger of the Sandstorm and Kendall companies into one corporation. The name of the new company will be the Sandstorm-Kendall Mining Company, with a capital of 2,000,000 shares of assessable stock. George Wingfield will likely be president.

Diamondfield-Black Butte Consolidated—Suit has been filed in the district court against this company for $20,000, the combined accounts of several creditors.

Goldfield-Nighthawk—H. B. Lind has secured a lease upon the property of this company, and will start sinking to strike the Red Top vein at depth.

Pittsburg-Silver Peak—Interests friendly to this company have purchased the property of the Silver Peak-Valcalda company at Blair, and its 12 patented claims will be prospected by the former company under the management of Edmund Juissen. The main Silver Peak tunnel will be extended into the Valcalda property, and will afford the outlet for the ore.

NYE COUNTY

The estimated value of the production from the mines of Tonopah for the week ended Nov. 27 is given at $124,050, the tonnage being made up as follows: Tonopah, 3250; Montana-Tonopah, 1052; MacNamara, 300; West End Consolidated, 160; Midway, 200; total, 4962 tons.

Mayflower-Bullfrog Consolidated—A new vein has been discovered in the main workings of the mine at Pioneer, from which ore running from $25 to $35 per ton is being mined.

Sierra Oro—Crosscutting at 212 ft. is being prosecuted, and 45 ft. more of driving will cut to the boundary of the Barnes lease where ore is known to exist.

Bullfrog-Pioneer—Shipments at the rate of $1000 per day are being maintained by this property. A new discovery has been made upon the 256-ft. level, supposed to be the continuation of the main oreshoot on its downward course.

Montgomery Mountain—Tom Kilker and associates have taken a lease upon a portion of this property at Bullfrog. Work has been started from the bottom of a 100-ft. shaft. A crosscut will be driven in the rhyolite-basalt contact, upon which contact the orebodies of the Shoshone occur.

Keane-Wonder—A new strike has been reported from this property at Bullfrog.

Toquima—The Fairview-Round Mountain Mines Company secured an injunction against the Toquima company from using the waters of Shoshone creek, and the sheriff shut off the water to the mill. An attachment was also served upon the Daisy company to cover costs. The Fairview company established its rights to 2465 in. of water in said creek, and the Toquima company was using it.

WHITE PINE COUNTY—ELY

Nevada Consolidated—Production for November was 5,764,000 lb. of copper. Work is being pushed on the fifth reverberatory at the Steptoe works and is expected to be ready for operation about Jan. 1. In the matter of exchange of stock, it is announced that about 96 per cent of the Cumberland-Ely shares has been exchanged for Nevada Consolidated stock, and all of the holders of the $1,000,000 bonds of the Nevada Northern Railway Company have traded them selves of the [illegible] as well as [illegible] of the Nevada Consolidated bondholders, there being only about $50,000 of the latter now outstanding.

New Mexico

SIERRA COUNTY

Ivanhoe—This property in the north end of the Black Range district is in operation again under the control of the El Paso Home Mining Company, Martin Fishback, engineer.

Elephant—This property in the Black Range district will resume and install machinery. D. S. Scoville, of Chicago, is in charge.

Oregon

BAKER COUNTY

Amazon—Progress is being made on this property, the drift tunnel being 70 ft. in good ore.

Quartz Basin—About $5000 has been spent in developing this group, owned by George Hemler.

Ben Harrison—This group of quartz claims has been sold by W. A. Gilliam to a New York syndicate.

Phoenix—This property is equipped with a 10-stamp mill, which the lessees, Wilson & Hoppe, have had in operation for several months with profitable results.

GRANT COUNTY

Cougar—This gold mine is being operated by the National Mining and Leasing Company. The mill has been remodeled and an all-slime process installed. Theodore L. Lammers, Granite, is manager.

Pennsylvania

ANTHRACITE COAL

Philadelphia & Reading Coal and Iron Company—The earnings for October were $3,444,846; expenses, $3,192,781; net earnings, $252,065. For the four months of the fiscal year, July 1 to Oct. 31, the statement shows: Earnings, $8,860,001; expenses, $8,835,022; net earnings, $24,979. As compared with the corresponding four months of 1908, this shows decreases of $1,244,038 in gross earnings and of $459,110 in net earnings.

South Dakota

Homestake—The strike situation is unchanged. The company holds firm for an "open shop" and has closed down practically all work and according to reports will remain closed for at least six months. In the meantime, electric installation for light and drills is being made throughout the mine. The company has been employing about two-thirds union men and the issue was drawn over a pending proposal for a "closed shop" and a 7-hour day. Many of the union laborers are leaving the camp.

Gold Dollar—The company at Crown Hill has purchased the cyanide plant of the Eleventh Hour company and is moving it from Iron creek.

Holy Terror—A suit has been brought by Charles Morgan, of New York, to force close a $50,000 mortgage.

Utah

JUAB COUNTY—TINTIC DISTRICT

Golden Chain—The Golden Chain has absorbed the Ajax on a basis of share for share. The former has a 1,000,000-share capitalization and the latter 300,000. The deepest shaft on the combined property is the Ajax, 1100 ft. which is well equipped with machinery and will be used to accomplish speedy development of the Golden Chain. The Ajax is an old producer.

Iron Blossom—The No. 1 shaft has been closed down indefinitely. The reason given is that the smelters have advanced the treatment charges on this low-grade copper-silver ore to a prohibitive figure. The profits from the shipments from this shaft have been expended in prospecting from the shaft and this work will now be discontinued. The No. 3 or north shaft will continue work and shipments as usual.

Grand Central—The shaft has reached a depth of nearly 2200 ft. Drifting on this level will be started for the orebody which has been cut on the 2100, 2000 and 1900. The raise from the 1900 is also still in ore.

Raymond-Illinois—A diamond drill has been put at work on the 1500-ft. level. Sinking below the 1500 level would entail large expense for pumping, hence the exploration by the drill. If the drill develops ore to justify it a large pumping equipment will be installed and shaft sinking resumed.

Black Jack—The mine has been closed down following the policy of the other Knight properties. Negotiations are pending for the developing of the Black Jack through the deeper workings of an adjoining property.

Tintic Standard—The shaft is down 700 ft The last 35 ft. was Cambrian quartzite, considered in that district as an unfailing guide to the orebodies. E. J. Raddatz, Salt Lake, is manager.

O. K.—This property in West Tintic, 15 miles from Tintic Junction, is resuming development.

Dragon Iron—Under a new contract, shipments of iron ore to the United States smeltery have been resumed.

Centennial-Eureka—The Holden tunnel is in 600 ft. This tunnel is to furnish an outlet for the ore as well as for the water, thus reducing the lift by the pumps 500 ft. A pumping plant to handle the heavy water flow is to be installed, and an electric-power plant and air compressors

SALT LAKE COUNTY

Golden Lion—This company has been incorporated to develop the new strike in the Hesport property, Big Cottonwood. Mr. Hesport owned the property single-handed for many years during which time he [illegible] the [illegible] ft. The [illegible] to 6 ft. The ore is copper with several ounces of silver and some gold.

Columbus Consolidated—The first shipment of ore from the new strike averaged 4.35 per cent. copper; 21.4 per cent. lead; 41 oz. silver; and $1.70 in gold. This body is an entirely new one and runs parallel to the body, in which the previous work has been done.

Eagle Bird—The company's finances have been adjusted and development work will begin at once. Jacob Myers, Salt Lake, is manager.

Utah Apex—The 200-ton concentrator has been started satisfactorily. Developments are reported to have demonstrated the continuity of the orebody to 1700 feet.

Utah Metals—Work has been resumed on the merged properties of the Bingham Metals and the Bingham Central Standard companies. The 300-ft. tunnel will be advanced, and drifting on the fissures cut is expected to open other orebodies.

SUMMIT COUNTY—PARK CITY DISTRICT

Daly-West—The mine is not to cease operations as rumored. About 175 men are employed underground and 75 men on top and in the mill. Since the Ontario drain tunnel was reopened it has been extended to the Daly-West shaft at the 2100-ft. level. A winze is being sunk in ore from the 1700 level and a drift is being run on the 2100 level to cut this orebody.

Snake Creek—Preliminary details have been completed and bids for driving the three-mile tunnel, 10x7 ft. in the clear, will be accepted. G W. Lambourne is manager.

Daly-Judge—With the installation of the new compressor, now on the road from the factory, the output of the mine will be doubled. The zinc plant is treating 80 tons of ore per day and will soon have its capacity doubled also. The zinc product goes to the Grasselli Chemical Company.

Silver King Consolidated—A cage has been installed in the winze from the 1100-ft. level and the hoisting of ore has commenced This ore comes from the 1500-ft. level from a fissure about 3 ft. wide Entry to the shipping list by a mine located in a section of the district that has long been unfavorably considered opens up an interesting prospect for greater activity in Park City

American Flag—After four years, work has been resumed on the 1100-ft. level Sinking is to be resumed and the shaft continued to 1200 ft. The discontinuement of work was caused by flooding due to the cave in the Ontario drain tunnel

Virginia

[illegible] This [illegible] has been [illegible] to develop [illegible] East [illegible] A [illegible] Franklin [illegible]

Washington

FERRY COUNTY

Tom Thumb—This mine has been unwatered to the 300-ft. level. Manager J. L. Harper states that 400 tons of ore is ready for shipment.

Kettle River—This company is installing a concentrating plant of 50 tons daily capacity. The ore is silver-lead, and the shaft down 135 ft. E. W. Scothern, Toppenish, is manager.

STEVENS COUNTY

Bornite—The company is driving a 5x7-ft. tunnel, and will continue the work all winter.

North Star—This property has 650 ft. of development completed, and expects to ship ore soon.

First Thought—A strike of gold ore has been made at this property. The mine is now shipping fifty tons of ore daily to Trail. The mine is owned by Pat Burns.

Oriole—The company has purchased the assets of the Morning and Mammoth company, and will transfer the machinery to the Oriole. Regular shipments will be made through the winter.

YAKIMA COUNTY

Gold Hill—Free milling gold ore has been found in sufficient quantity to justify development. New tunnels are being driven, and machinery will be purchased. Frank X. Nagler, North Yakima, is secretary.

Wyoming

At French creek, nine miles west of Holmes, James Dixon is developing a copper-gold property. At Devil's Gate, James Farrell is also working a copper-gold mine.

Rambler—This mine at Holmes, has shipped during the year more than 1500 tons of high-grade copper ore, part of it to Denver and the rest to Omaha, to which place all of the output is now going. Experiments to concentrate the platinum in the ore are being made by the metallurgist, Robert A. Marr, with reported success. The crude ore is said to contain from ½ to 4 oz. of the precious metals of the platinum group and the mine has already marketed several thousand dollars worth of these metals.

Duchess—This gold mine west of the Rambler is being operated by C. G. Sherman, of Denver.

Sherence—The property, six miles northwest of Holmes, is working steadily A road will be built to connect with the Rambler road at Albany, the nearest shipping point on the Laramie & Hahns Peak railroad

Florence—This gold property, at Keystone, is under option to a company which is planning to install a cyanide mill. The Keystone [illegible], near the Florence, will [illegible] if the deal is consummated.

Canada

British Columbia

Consolidated—The October production of the Trail smeltery was $412,865. The copper furnaces treated 36,100 tons and the lead furnaces 4933 tons. The production for four months is $1,881,447.

Highland United—This company controls 11 properties at Ainsworth, the principal of which is the Highland mine. This is a lead-silver property equipped with a mill in which $60,000 additional equipment is being installed. John S. Airheart is in charge.

British Columbia Copper—The company has placed orders for the necessary material for a fourth blast furnace which is to be 48x360 in., or 10 ft. longer than the present furnaces. It is also planned to extend No. 1 and No. 3 furnaces 10 ft. each. For the present it is not the intention to run the fourth furnace, this being planned as a reserve so that three furnaces may be in constant operation, for which the company has ample converter capacity. The ores of the New Dominion company will be smelted at Greenwood when its mines resume operation.

Ontario—Cobalt

Cobalt shipments for the week ended Nov. 26 were as follows: Nipissing, 259,328; La Rose, 262,298; Drummond, 220,000; Crown Reserve, 183,310; McKinley-Darragh, 43,903; City of Cobalt, 41,325; O'Brien, 63,993; Trethewey, 65,000; Beaver, 50,000; total, 1,189,157 lb. During November shipments from Cobalt were about the same as for the month previous, an aggregate of 4,959,651 pounds.

St. Lawrence-Cobalt—This company is putting in a plant on an island in Sasaganiga lake, and will commence operations.

Right-of-Way—A new 2-in. vein of high-grade ore has been encountered at the 75-ft. level.

Silver Cross—In sinking the shaft at 125 ft., diabase was found below the Keewatin, and in the former formation a good calcite vein carrying silver was discovered.

Victoria—The hoist house at this property was burned.

Rochester—This company is sinking a new shaft on the vein recently found.

Trethewey—A statement issued in connection with the sale of treasury stock estimates the ore reserves in sight at between 5,000,000 and 6,000,000 oz. The company has cash on hand, $200,325; ore sacked and in transit and due from smelters, $82,633; ore on dumps estimated to yield $450,000; ore developed underground, $2,500,000; total assets, $3,232,958.

Gifford Extension—The main shaft is down 200 ft. with a 10-ft. sump. A contract has been let for 300 ft. of crosscutting to reach the 27-in. vein cut by diamond drill and afterward tapped by crosscut at the 80-ft. level.

Ontario

Wetlauffer—This mine, at South Lorain, has shipped 58,000 lb. of silver ore.

O'Brien—On this mine, Miller lake, Gowganda, otherwise known as the Gates property, a strike has been made at the 100-ft. level 42 ft. in the crosscut. A 6-in. vein of calcite carrying silver has been encountered. Ore is being extracted. A 2-in. vein of high-grade ore has also been struck in the east drift at the same level.

Mexico

Chihuahua

Rio Plata—The October recovery was 57,147 oz. silver and the operating expenses $10,328, leaving net operating profit, $16,649, exclusive of tailings stored. The Pelton water wheels have been installed and the cyanide plant, now on one-third capacity, will soon be running full capacity.

Guerrero

La Dicha—This property of the Mitchell Mining Company, of New York, will be sold to cover the liabilities against it. A reorganization is being planned.

Pacific Copper Company—This company, owning a copper deposit in La Union district, 30 miles east of Zihuatanejo, is developing. W. S. Cockerill, of Mexico City, is in charge.

Dolores & Rio Grande—This English company is operating in the Guadalupe district. A. M. Bourne is manager. The ore is gold-silver bearing. An increased treatment plant will be installed.

Jalisco

Almoloya—The Almoloya copper mine, Ameca, has been sold by George E. McCormick to the Almoloya Mining Company, of Mexico City.

San Jose de las Agujas—A small reduction plant is being erected to treat the low-grade ore on the dump at Mascota. H. M. Sunde is the owner.

San Luis Potosi

Santa Eulalia—This mine, owned by J. T. Murphy, has been sold to the Empire Zinc Company, of Denver.

Sonora

Ramona Consolidated Mining Company—This company, with a capital of $2,500,000, has been organized to succeed the Ures Consolidated Company in control of the mine at Ures. The deal is being handled by Malcolm Green & Co., Boston.

Greene-Cananea—The November output was 1772 tons of copper containing 70,379 oz. silver and 460 oz. gold.

Dawson—Recent acquirement of funds from an issue of additional stock has enabled this concern to promise deliveries of bullion by Jan. 1.

Independencia—Work has been resumed on a moderate scale. This is an old property in the Sahuaripa district with gold and silver showings. W. E. Pomeroy is in charge.

Dos Cabezas—New machinery is being set up and additions made to the working force. The mill is in operation.

Africa

West Africa

Gold production of the Gold Coast and Ashanti in October was 15,957 oz., being 2168 oz. less than in September. For the 10 months ended Oct. 31 the total was 248,305 oz. bullion in 1908, and 200,520 oz. in 1909; a decrease of 47,780 oz. The bullion reported this year was equal to $3,944,331, or 190,824 oz. fine gold.

Rhodesia

The gold production in Rhodesia in October is reported at 52,904 oz. fine, making the total for the 10 months ended Oct. 31 this year 511,795 oz. In 1908 some of the reports were made in bullion, so that no comparison by quantities can be made. By values the total for the 10 months was $10,278,513 in 1908, and $10,483,209 in 1909; an increase of $204,696 this year.

Other products reported for the 10 months this year are 221,085 oz. silver; 73 tons copper; 819 tons lead; 13 tons tungsten ore; 23,940 tons chrome ore; 328 tons asbestos. The coal production, all from the Waakie mines, was 141,933 tons.

The number of men employed at the mines in September was 1687 whites and 35,691 negroes, a total of 37,378. The deaths of natives at the mines during the month were 168, or at the rate of 56.48 per 1000 per year.

Madagascar

Exports of gold from this French colony for three years have been 64,844 oz. in 1906; 72,100 oz. in 1907; and 99,995 oz. in 1908. The total production in 1908 was 101,242 oz., or $2,092,672. The production is improving, and is expected to reach 120,000 oz., or $2,480,000, this year. The most important workings at present are the placers on the Mortage & Grignon concession near Antisirane, in the district of Diego-Suarez. These placers yielded about 35 per cent. of the total production last year.

Asia

Indo-China

The mineral production of the French colony of Indo-China in 1908 included 312,061 metric tons of coal, an increase over 1907 of 17,030 tons; 18,055 tons of lignite, an increase of 2993 tons; 10,443 tons zinc ore, an increase of 4943 tons; and 164 tons of tungsten ore, a gain of 35 tons.

Korea

Oriental Consolidated—The 220 stamps crushed in September 28,381 tons. The gross receipts for the month were $112,871 and operating costs $62,677, and development costs $1727, leaving $48,466 net.

Metal, Mineral, Coal and Stock Markets

Current Prices, Market Conditions and Commercial Statistics of the Metals, Minerals and Mining Stocks

QUOTATIONS FROM IMPORTANT CENTERS

Coal Trade Review

New York, Dec. 8—The coal trade in the West is unchanged so far as demand is concerned. There is a steady call for steam coal, but domestic coal has been rather quiet owing to the mild weather which has followed the recent cold spell. In some quarters coal has been hurried forward under the apprehension that the switchmen's strike in the Northwest may extend to the middle western roads and tie up transportation. Otherwise there is no special change. The Lake trade is over for the season, but there is an apprehension that considerable coal will have to be forwarded to the Northwest by rail this winter, as the Lake deliveries did not come up to expectation.

In the East the bituminous coal trade is rather quiet but generally steady. Low prices continue to rule as supplies are abundant. Car shortage is still a feature in the trade.

The anthracite trade shows nothing new. At many collieries there is continued trouble on account of scarcity of water, and operators are looking anxiously for heavy rains.

In the bituminous fields both miners and operators seem to be preparing for a struggle over the mining rates and contracts for next year, although the present agreements will not expire until March 31 next.

Coal Traffic Notes

Anthracite shipments in November were 6,027,800 long tons; being 454,041 tons more than in October, and 198,309 tons more than in November, 1908. For the 11 months ended Nov. 30, the total shipments were, in long tons:

	1908.	1909.	Changes.
Reading	11,315,418	10,767,783	D. 551,635
Lehigh Valley	9,423,239	9,276,932	D. 146,307
N. Y. Central	7,725,550	7,252,586	D. 472,964
Erie	9,149,386	8,638,047	D. 511,339
Del. & Hudson	5,851,202	5,584,685	D. 267,517
Pennsylvania	5,496,526	5,372,592	D. 123,934
Erie	6,476,889	6,478,092	I. 1,203
N. Y., Ont. & West.	2,848,406	2,474,652	D. 373,854
Total	58,879,076	56,194,147	D. 2,684,929

The total decrease was 4.5 per cent. The Erie had a very small increase; all the other companies show losses, the largest cuts being on the Lehigh Valley, the Philadelphia & Reading and the Delaware, Lackawanna & Western. The November shipments were larger than those for any preceding month this year, except March.

Coal tonnage of the Pittsburgh & Buffalo Coal company in November amounted to [illegible] tons, against [illegible] tons in November, 1908. The company handled 421,139 tons of Pittsburgh coal, 351,050 tons of Kanawha coal, 772,182 tons, a decrease of 116,449 tons from last year. The Broad Top coal originates on the line.

New York

Anthracite

Dec. 8—The anthracite market is essentially a weather market and promises to remain so for some time to come. Aside from the regular steady trade there is little doing at present.

Schedule prices for large sizes are $4.75 per lump and $5 for egg, stove and chestnut, f.o.b. New York harbor. For steam sizes, quotations are nominally unchanged at $3.10@3.25 for pea; $2.25@2.50 for buckwheat; $1.75@2 for buckwheat No. 2 or rice; $1.35@1.50 for barley; all f.o.b. New York harbor.

Bituminous

The principal incident in the bituminous market this week is the close of Lake shipments and the cessation of the demand for coal for the West. No more is going to the Lake Erie ports and business has turned entirely upon the seaboard. Immediate result has been rather a surplus of coal offering and a weakening of prices from 5 to 10c. a ton, which does away with all the recent advance.

The far East is buying slowly and the demand from the shoalwater ports seems to be pretty well satisfied. All-rail trade is good. The Sound ports are doing better and are taking considerable coal.

Car shortage continue to be a serious feature in the market, and mines are having great difficulty in securing cars enough to keep them going. The situation is worst on the Baltimore & Ohio, but other roads are feeling it to a considerable extent. Transportation is slow and irregular on account, chiefly, of lack of motive power.

The talk of a general strike on the railroads has hustled up some buyers who do not want to be caught without supplies in case of trouble.

In the coastwise vessel trade there is not so large a supply of vessels and they are asking more on account of the risk of storms at this season of the year. Rates have advanced and $1 per ton is now asked for large vessels from Philadelphia to Boston, Salem and Portland, and 70c. for small boats from New York to points beyond Cape Cod.

Birmingham

Dec. 6—Coal production in Alabama is again up to the mark of the years ago. The production during the latter part of September, in October, November and December—the bad weather and holiday period notwithstanding—will bring up the total output for 1909 to about what it was in 1908. The labor situation is being relieved a little by a steady influx of men. The demand for coal is strong and steady.

The coke demand increases right along and some purchases of coke from other parts of the South by Alabama consumers are noted.

Five men lost their lives in Alabama coal mines during the month of November.

Chicago

Dec. 6—The coal market in general continues prosperous; there is no sudden change, actual or impending, in the skies. Steam coals find larger demand every week; domestic coals are in good supply generally among retailers and the wholesale trade depends on weather conditions. With every cold wave—and the lowest thermometer reading has been registered at the beginning of the present week—there is a larger demand for coal by retailers and consumers. Under these conditions the coal market becomes solely a market of domestic retailers—the steam trade taking care of itself largely.

Illinois and Indiana coals continue to bring $2@3 for lump, $1.75@1.85 for run-of-mine and 95c.@$1.15 for run-of-mine. The higher-grade coals are most in demand, with the demand weakest for fine coals.

For coals from east of Indiana the market remains comparatively steady, the consumptive capacity of buyers of Hocking, Smokeless, West Virginia splint and of gas coals remaining steady and large. The little demurrage coal on tracks tells of shippers' negligence in ascertaining close market conditions.

Cleveland

Dec. 7—Lake trade is over for the season. The closing rush of the trade has cleared out stocks of lump and nut and left the market overloaded with slack. A renewal of warm weather has almost stopped domestic sales.

Prices are inclined to be easier. Middle district coal is $1.40 for 1½ in.; $1.15 for ¾-in.; $1.05 for run-of-mine, and 60c. for slack; all at mine, with 70c. freight to Cleveland. No. 8 district brings $1.35 for 1½-in., $1.05 for ¾-in., 95c for run-of-mine and 60c. for slack; all at mine, with

90c. freight to Cleveland. Pittsburg is unchanged at $2.10 Cleveland for run-of-mine. Massillon domestic is steady at $2.95 Cleveland for lump and washed nut.

Indianapolis

Dec. 6—The mild weather of the past month and the railroad switchmen's strike in the Northwest have not been conducive to a large output from the Indiana mines. The demand for coal during the first week in December is the lightest experienced for years and in consequence men are working on an average of about four days a week.

Eighteen mines, mineral rights and timber tracts owned by the Indiana Southern Coal Company were deeded to the Alliance Coal Company Dec. 2. The property is in Vigo, Clay, Sullivan and Greene counties. The deed was executed by John K. Seifert, receiver for the Indiana Southern Company, which was one of the large interests of John R. Walsh. The price named is $1,500,000. The Alliance Mining Company is a holding company for the bondholders and it is said that plans are under way by which the mines will pass to operators.

Pittsburg

Dec. 7—The coal market is recovering from the irregularities caused by the close of the Lake season, and prices are steadier. Leading producers are holding out for $1.15 on mine-run and lump, $1.25 on ¾-in. and $1.40 on domestic coal, both for prompt and for contract. In some instances these prices may possibly be shaded, but leading producers are adhering to them absolutely. Slack is firmer also, at 65@75c. The higher price represents the minimum of some producers, but is not often paid.

Connellsville Coke—The chief transaction reported in the week was a contract for 12,000 tons of furnace coke monthly over 1910 at $2.80, ovens, to an eastern consumer. A sale of 2000 tons of furnace coke for shipment over the next fortnight was made at $2.80, and another sale of 1000 tons of prompt furnace coke at $2.90. The central western furnaces which have not yet closed for next year continue to hold off, looking for lower prices. Water shortage has been a factor and promised to close some operations, but the weather has just changed and there is a reasonable prospect that the water supply will improve in time. Both prompt and contract furnace coke may be quoted at $2.80@2.90, with prompt foundry at $3@3.25 and contract foundry at $3.25@3.50 at ovens.

The *Courier* reports the production in the Connellsville and lower Connellsville region in the week ended Nov. 27 at 445,988 tons, a gain of 34,000 tons over the previous week. Shipments are reported at 5190 cars to Pittsburg, 8398 cars to points west of Pittsburg and 855 cars to points east of Connellsville, a total of 14,443 cars.

St. Louis

Dec. 6—Unless the cold wave for which the coal men have been so patiently waiting turns up shortly, the coal market of St. Louis will be in a state of complete demoralization. There is practically no domestic coal moving. Summer-time prices have prevailed throughout the fall at the yards and retailers have been unable to realize any margin. This is the first year in the history of the trade where there has been no advance in retail prices in the fall and winter. This is all the worse as the summer prices this year were lower than ever before in the history of the business. With the tonnage light and with no profit for either wholesaler or retailer the coal industry as a whole is in very bad shape this year.

Operators in the inner group have almost all without exception been losing money for the past 18 months and it is now getting to a point where a number of mines will be unable to keep floating much longer. The only hope seems to be that there may be some high prices during February and March owing to the anticipation of a strike in April. A wage scale has to be signed on April 1 by the operators in Illinois and it is certain that an agreement will not be reached without serious trouble. A number of points will have to be adjusted. During these dull times the operators in the inner group have realized that they were unable to pay the miners the present rate and compete with the low mining rate in southern Illinois. In fact, the southern Illinois mines, which have about 10c. per ton the advantage in the mining rate and a better coal, have taken half of the market away from the inner-group mines. The inner-group operators realize that unless they secure a more favorable differential, their existence is threatened.

Standard 6-in. lump is still held at $1.10 mine or $1.62 St. Louis, though the tonnage has fallen off decidedly; 2-in. lump is bringing 90c. mine or $1.42 St. Louis; 3-in. nut is quoted at 80c. at mine or $1.32 St. Louis and 1½-in. steam nut is bringing 50c. at mine or $1.02 St. Louis. Nut and pea are worth 30c. at mine or 82c. St. Louis; while 2-in. screenings are 10@20c. at mine or 62@72c. St. Louis.

Staunton, Mt. Olive or Springfield district 6-in. lump is still sold for $1.50 at mine; though during the past week this price has been shaded liberally; 2-in. lump is held firm at $1.20 per ton at mine or $1.72 St. Louis; 2-in. nut at 85c. mine or $1.37 St. Louis.

Carterville 6-in. lump brings $1.60@1.75 at mine or $2.27@2.42 per ton St. Louis; 3-in. to 2-in. nut is held at $1.35 at mine or $2.02 St. Louis; 1½-in. screenings are quoted at 35c. at mine or $1.02 St. Louis.

Franklin county 6-in. lump is fairly active at $1.80@2 at mine or $2.47@2.67 St. Louis; 3-in. to 2-in. nut is still in strong demand at $1.50 at mine or $2.17 St. Louis.

The condition of the anthracite market is bad. Eastern shippers persist in sending grate and egg that cannot be sold on the eastern market to St. Louis on consignment. With the market already choked and the weather exceedingly warm it makes these sizes impossible to move at anything like the circular. In fact, bigger concessions are being made on hard coal now in this market than at any time in recent years. Chestnut is still scarce and is in strong demand.

Foreign Coal Trade

Belgian Coal Trade—Imports and exports of fuel in Belgium, 10 months ended Oct. 31, metric tons:

	Imports.	Exports.	Excess.
Coal	4,794,710	4,255,919	Imp. 538,791
Coke	254,502	842,460	Exp. 587,958
Briquets	122,809	470,082	Exp. 347,273
Total	5,172,021	5,568,461	Exp. 396,440
Total, 1908	4,850,991	5,064,243	Exp. 213,252

The exports of coke are chiefly to France; of coal to France and Germany.

United States Coal Exports—Exports of coal and coke from the United States, with coal furnished to vessels in foreign trade, 10 months ended Oct. 31, long tons:

	1908.	1909.	Changes.
Anthracite	2,334,281	2,359,661	I. 25,380
Bituminous	7,559,612	8,102,784	I. 543,172
Total exports	9,893,893	10,462,445	I. 568,552
Steamer coal	5,045,490	5,139,259	I. 93,769
Total coal	14,949,383	15,601,704	I. 652,321
Coke	498,907	730,720	I. 231,813

Canada took this year 8,246,920 tons of coal, or 78.8 per cent. of the total. The coke went chiefly to Mexico and Canada. Other large exports were 553,466 tons of coal to Cuba and 526,969 to Mexico.

United States Coal Imports—Imports of coal and coke into the United States, 10 months ended Oct. 31, long tons:

	1908.	1909.	Changes.
Anthracite	15,029	3,178	D. 11,851
Bituminous	1,279,579	993,720	D. 285,859
Total coal	1,294,608	996,898	D. 297,710
Coke	95,650	143,150	I. 47,500

Canada furnished this year 827,469 tons of coal and nearly all the coke. Australia supplied 145,149 tons of coal; Japan, 9274 tons. Imports are chiefly on the Pacific Coast and in the northwestern border States, though some Nova Scotia coal comes to New England.

Welsh Coal Market—Messrs. Hull, Blyth & Co., London and Cardiff, Wales, report prices of coal as follows on Nov. 27: Best Welsh steam, $4.02; seconds, $3.84; thirds, $3.60; dry coals, $3.84; best Monmouthshire, $3.48; seconds, $3.36; best small steam, $2.28; seconds, $1.92. All prices are per long ton, f.o.b. shipping port, for cash in 30 days, less 2½ per cent. discount.

Iron Trade Review

New York, Dec. 8—The iron and steel markets continue rather quiet and most people believe that the usual end-of-the-year dullness has set in a little earlier than usual. This may easily be the case in view of the very heavy business of October and November. A further feature of the market is the pronounced disposition of sellers to discourage buying too far ahead by jobbers and speculative interests.

There has been comparatively little buying movement in pig iron, most new business reported being in small lots either to fill gaps or to supply foundrymen for orders in excess of expectations. Moreover there is a general disposition to believe that prices have advanced too much, and buyers will undoubtedly try to get concessions on third-quarter business. This can be done, they think, by holding back at the present time.

In finished material new business is rather quiet, although specifications on contracts continue heavy, and the mills are full of business. A disposition on the part of some jobbers to order heavily in a rather speculative way has been checked by the large sellers. About the only exception to the general tendency is in structural steel, in which several large contracts have come forward lately, while others are understood to be pending.

No concerted action has been taken yet about prices of Lake Superior iron ore for next season. It is understood, however, that one or two of the large selling interests have taken some contracts for 1910 delivery at an advance of 40c. a ton on this season's quotations. The expectation is that such an advance will be general.

Canadian Iron Bounties—A statement of the bounties on iron and steel paid by the Dominion government in the fiscal year ended March 31, 1909, is as follows: Dominion Iron and Steel, $1,067,529; Algoma Steel, $304,789; Hamilton Steel and Iron, $252,312; Nova Scotia Steel, $130,354; Lake Superior Corporation, $45,801; Canada Iron Furnace Company, $39,968; Canada Iron Corporation, $9726; Ontario Iron, $6888; Canada Iron Company, $3743; John McDougall & Co., $3394; total, $1,864,614, to 10 companies.

Baltimore

Dec. 7—Exports for the week included 77,000 lb. scrap tin to Rotterdam. Imports included 2000 tons spiegeleisen and 1575 tons manganese ore from Great Britain; 14,050 tons iron ore from Cuba.

Birmingham

Dec. 6—Manufacturers of pig iron in the Southern territory have for a little of the product for delivery during December, are holding their product at $15 per ton for No. 2 foundry. Some resale iron is selling, though not in a very great amount, under that price, from 25 to 50c. lower. The rumor that iron is still selling under $14.50 per ton is not to be verified. The make in the South continues at high-water mark. The production in November in Alabama is estimated at 175,500 tons of coke iron and 3000 tons of charcoal iron. This is about 5000 tons over the October make.

Charcoal iron holds firmly at $22 per ton.

Foundries and machine shops in the Southern territory are melting a good tonnage. The railroads are giving satisfaction in moving out the product promptly.

Chicago

Dec. 6—Weakness in general marks the pig-iron market, and in the lines of finished goods it is whispered that the furnaces never before, at the hight of a supposedly busy season, were able to deliver goods so promptly. The inference is obvious; the consumer has caught up to present and prospective requirements, and will not buy largely. The pig-iron world seems to consider this not an unmixed blessing. In the last week, sales of pig iron have been chiefly in small lots of Northern No. 2 at $18.50@19 and Southern No. 2 at $14@14.50 Birmingham—$18.35@18.85 Chicago.

General conditions in the iron and steel market continue good, the sales of railroad supplies, structural supplies and other fundamental shapes continuing large. Pig iron is now sold mostly for second and third quarters, with small increase in even inquiries for third and fourth quarter. The market indeed seems to have turned to deliveries within the next six months as a fixed requirement in the pig-iron industry. Coke continues to bring $5.50 for the best Connellsville, but with sales very light.

Cleveland

Dec. 7—Lake insurance expires tomorrow, and navigation will be officially closed. A few scattering cargoes may come down, but most of the big boats are being laid up as they come in.

Pig Iron—Little new business has been done, but iron on contracts is being taken in large quantities, and foundries are all busy. Prices are well held in the absence of sales, and there is no disposition to make concessions. Quotations are $17.75@18 for basic, $18.25@18.50 for No. 2 foundry, $17.25@17.75 for gray forge, $19.50@20 for Lake Superior charcoal.

Finished Material—Bar iron, steel bars and spikes have supplied most of the new business. There is complaint of slow deliveries on contracts. Jobbers report a large trade in bars and structural steel.

Philadelphia

Dec. 8—The pig-iron market is quoted down still more and only a small amount of business has been done. The negotiations for further deliveries of basic pig begun a week or two ago have not resulted in sales. The assurances are given that present quotations will be the price when the arrangements as to shipments are concluded. Foundry irons have quieted down though all consumers have not yet covered for the first quarter. Forge iron also is quiet. Northern No. 2X is quoted at $19@19.50; gray forge is close to $18, with Southern makes offered at about the same figure.

Steel Billets—The excitement over early deliveries of steel billets has about subsided. Nearly every consumer has stock in hand or contracts covering requirements from 30 to 60 days.

Bars—The bar mills book orders for new work faster than old orders are executed. Large orders are exceptional.

Sheets—A large amount of business has been done consisting of assorted orders, chiefly for distributors for this territory. Manufacturers have quoted figures on early spring deliveries but have booked no such business as yet.

Pipes and Tubes—Work in all branches using pipes and tubes is abundant and business is going to the mills for late deliveries.

Plates—Very little business has been done this week but a large amount is still hanging fire, some of it for delivery as late as second quarter. Prices are firm and another advance is said to be contemplated.

Structural Material—All interest is centered in the business in sight for the coming winter and spring. A large amount of work is in sight for railroads and buildings.

Scrap—Dealers are endeavoring to accumulate scrap and are offering better prices for railroad scrap which is quite abundant, but is held at high prices. Heavy melting steel is scarce and the dealers are under contract to deliver a good deal which they have not yet secured.

Pittsburg

Dec. 7—New buying in pig iron and finished steel continues extremely light, but specifications are still coming in at a good rate in most lines. Production is kept up to the highest possible notch. There is no likelihood of any increase in market activity this month.

Finished-steel prices show practically no change, steel bars being 1.45@1.50c. and plates and shapes 1.55@1.60c., the lower prices being done only in exceptional cases. The current demand for sheets and tinplates continues good.

Pig Iron—The market has been almost lifeless, but prices have not receded. Inquiry is negligible, but shipments are well taken. The market f.o.b. Valley furnace—90c. higher delivered Pittsburg—stands as follows: Bessemer, $19; basic and No. 2 foundry, $17@17.25; forge, $16@16.25; malleable, $17.25. The higher prices, where named, are for delivery in first quarter or first half of next year. The bessemer average for November was $19, Valley, 69,300 tons figuring in the compilation. The total purchases of the five independent steel works—Cambria, Lackawanna, Jones & Laughlin, Republic and Youngstown Sheet and Tube—on this movement, which began late in May last, amount to a little over 400,000 tons, while total market transactions in the period were well above 500,000 tons. The basic average for November is reported at $17.49, Valley, or $18.39, Pittsburg, but owing to the incidence of some sales when the market was temporarily excited the average thus reported is above the average of daily quotations, which would run below $17.25 for the month.

Steel—Fancy prices are being asked for billets when they are offered at all, as high as $29, Pittsburg, in some cases, while the quotation of $27.50 named a week ago is purely nominal. The market may be quoted roundly at $28@28.50, with forging billets and small billets commanding large premiums. Some sales of sheet-bars for first quarter have been made at $29.50, maker's mill.

Ferromanganese—The market is quiet but strong, at $45@46 for prompt and $45.50@46 for first quarter, f.o.b. Baltimore, freight to Pittsburg being $1.95 per ton.

Sheets—There was some rioting at Bridgeport, O., last week, caused by the American Sheet and Tin Plate Company's attempt to resume operations at its Aetna-Standard plant, containing 23 mills. The attempt has been temporarily abandoned. This was the only sheet plant involved in last summer's walkout at which not even a partial resumption had been made. The company has 186 sheet, jobbing and light-plate mills, or 163 outside of the Aetna-Standard plant, and practically all of these were running last week, although some were not obtaining full output. The independent sheet mills are running full with scarcely an exception. There is good buying, and mills have already sold about three months' production into next year. Prices are firm at 1.75@1.80c. for blue annealed, 10 gage; 2.40c. for black and 3.50c. for galvanized sheets, 28 gage; $1.70 per square for painted and $3 for galvanized corrugated roofing.

St. Louis

Nov. 6—As we approach the end of the season the demand for pig iron slows. The market in general is quiet at the same prices that have been prevailing. A little business is being closed, here and there, for shipment for the second quarter at $15@15.25 f.o.b. Birmingham, or $18.75 @19 St. Louis. Furnaces all have nearly their entire tonnage sold up and consequently the market, though quiet, is in a healthy state. The demand for iron from local furnaces is strong and they are entirely sold up.

Iron Ore—The demand for 50 per cent. Missouri iron ore continues to be very strong at $3.75 per gross ton, f.o.b. St. Louis.

The new ore washer at Greenville, which was recently put in operation, is turning out ore regularly and expects to increase its tonnage rapidly.

Foreign Trade in Iron and Steel

Iron and Steel Exports—Exports of iron and steel, including machinery, from the United States for the 10 months ended Oct. 31 are valued by the Bureau of Statistics of the Department of Commerce and Labor at $127,985,824 in 1908, and $128,170,458 in 1909; an increase of $184,634, or 0.14 per cent. The leading items of exports were, in long tons:

	1908.	1909.	Changes.
Pig Iron	37,089	48,575	I. 11,486
Billets, ingots & blooms	94,852	98,522	I. 3,670
Bars	42,625	71,128	I. 28,503
Rails	175,462	211,820	I. 36,358
Sheets and plates	85,058	141,363	I. 56,305
Structural steel	100,527	74,473	D. 26,054
Wire	111,139	123,849	I. 12,710
Nails and spikes	31,717	38,727	I. 7,010
Pipe and fittings	96,188	132,347	I. 36,159

Exports of mining machinery were valued at $3,227,793 in 1908, and $3,671,206 in 1909; an increase of $443,413 this year.

Iron and Steel Imports—Imports of iron and steel and of machinery into the United States, 10 months ended Oct. 31, were valued at $16,389,753 in 1908, and $23,516,177 in 1909; an increase of $7,126,424, or 43.5 per cent. The leading items of the imports were, in long tons:

	1908.	1909.	Changes.
Pig iron	73,383	111,624	I. 38,241
Scrap	3,748	25,522	I. 21,774
Ingots, blooms, etc.	7,762	13,372	I. 5,610
Bars	15,800	13,968	D. 1,832
Wire-rods	9,503	9,514	I. 11
Tin plates	51,368	49,351	D. 2,017
Sheets and plates	1,976	3,058	I. 1,082

The increase in scrap was mainly in heavy steel scrap for use in the basic open-hearth furnace. Structural steel, usually a small quantity, increased from 2299 tons in 1908 to 5327 this year.

Iron Ore Movement—Imports and exports of iron ore in the United States, 10 months ended Oct. 31, long tons:

	1908.	1909.	Changes.
Imports	560,824	1,298,836	I. 738,012
Exports	262,113	433,623	I. 171,510

Of the imports this year 725,185 tons were from Cuba and 168,875 from British North America. The balance was chiefly from Spain and Norway. The exports were chiefly to Canada.

Manganese Ore Imports—Imports of manganese ore into the United States for the 10 months were 154,698 tons in 1908, and 178,112 tons in 1909; an increase of 23,414 tons.

Metal Markets

New York, Dec. 8—The metal markets generally show little change from last week. Consumption evidently continues good, and price changes have been small.

Gold, Silver and Platinum

UNITED STATES GOLD AND SILVER MOVEMENT

Metal.	Exports.	Imports.	Excess.
Gold:			
Oct. 1909..	$ 9,379,402	$ 7,034,164	Exp. $ 2,245,438
" 1908..	1,952,574	3,785,705	Imp. 1,833,131
Year 1909..	106,652,236	38,139,557	Exp. 68,512,679
" 1908..	70,889,954	42,213,678	" 28,676,276
Silver:			
Oct. 1909..	4,053,745	4,017,884	Exp. 35,861
" 1908..	4,378,015	3,746,863	" 631,652
Year 1909..	47,342,861	37,258,414	" 10,084,447
" 1908..	43,159,395	34,539,067	" 8,620,328

Exports from the port of New York, week ended Dec. 4: Gold, $3,781,900, chiefly to Brazil and Argentina; silver, $1,034,352, chiefly to London and Paris. Imports: Gold, $422,404, from France and the West Indies; silver, $57,598, from Mexico and South America.

The December price of pure silver in Mexico, which will serve as the basis for calculating the stamp tax for the month, as fixed by the Secretary of the Treasury in conformity with the law, is 33.17 pesos per kg.—equal to 51.38c. per troy ounce. Prices for previous months this year have been: January, 31.82 pesos per kg.; February, 33.11; March, 33.72; April, 33.04; May, 33.16; June, 34.16; July, 34.39; August, 33.74; September, 33.30; October, 33.63; November, 33.17 pesos.

Gold—Supplies of gold on the open market in London were abundant and prices continued at 77s. 9d. per oz. for bars and 76s. 5d. per oz. for coin. The Bank of England took most of the gold arriving. In New York about $1,000,000 in gold were taken for shipment to South America, mainly on London account.

Platinum—Business continues on very good scale and prices are well held at $29.50 per oz. for refined platinum. Iridium is scarce and there has been a sharp advance in prices, so that dealers are now asking $35.50 per oz. for hard metal, which is an alloy of platinum and iridium.

Our special correspondent writes from St. Petersburg, under date of Nov. 11, that prices continue to advance. Demand is good and the market is strong. Production is increasing owing to the high prices. At Ekaterinburg small quantities of crude metal, 83 per cent. platinum, can be obtained at 6 rubles per zolotnik—equal to $22.56 per oz. In St. Petersburg the same grade of metal is quoted by the large dealers at 23,000@23,500 rubles per pood—equal to $22.79 per oz., average

NEW YORK.—The silver market has remained steady during the past week, and closes firm in London at 23¾d., on buying supposed to be for the Continent of Europe.

SILVER AND STERLING EXCHANGE						
Dec.	2	3	4	6	7	8
New York....	51½	51½	51½	51½	51⅝	51⅝
London.....	23⅞	23⅞	23¾	23¾	23¾	23¾
Sterling Ex..	4.8780	4.8775	4.8775	4.8780	4.8785	4.8780

New York quotations, cents per ounce troy, fine silver; London, pence per ounce sterling silver, 0.925 fine.

Exports of silver from London to the East, Jan. 1 to Nov. 25, as reported by Messrs. Pixley & Abell:

	1908.	1909.	Changes.
India.....	£ 8,359,623	£5,858,500	D. £2,501,123
China.....	571,400	1,829,300	I. 1,257,900
Straits.....	164,885	114,614	D. 50,271
Total.....	£ 9,095,908	£7,802,414	D. £1,293,494

Indian exchange in London was 16.125d. per rupee.

Copper, Tin, Lead and Zinc

Dec.	Copper. Lake, Cts. per lb.	Copper. Electrolytic, Cts. per lb.	Copper. London, £ per ton.	Tin. Cts. per lb.	Lead. New York, Cts. per lb.	Lead. St. Louis, Cts. per lb.	Zinc. St. Louis, Cts. per lb.
2	13⅜ @13½	13 @13¼	58⅜	31⅞	4.40	4.25 @4.27½	6.17½ @6.20
3	13⅜ @13½	13 @13¼	58⅜	31⅞	4.40	4.25 @4.27½	6.17½ @6.20
4	13⅜ @13½	13 @13¼	....	31¾	4.40	4.25 @4.27½	6.15 @6.20
6	13⅜ @13⅝	13 @13¼	59¼	31⅞	4.40	4.25 @4.27½	6.15 @6.17½
7	13⅜ @13½	13⅜ @13¼	59	31⅞	4.40	4.25 @4.27½	6.15 @6.17½
8	13⅜ @13½	13⅜ @13¼	59	32⅛	4.40	4.25 @4.27½	6.12½ @6.17½

London quotations are per long ton (2240 lb.) standard copper. The New York quotations for electrolytic copper are for cakes, ingots and wirebars, and represent the bulk of the transactions made with consumers, basis New York, cash. The prices of casting copper and of electrolytic cathodes are usually 0.125c. below that of electrolytic. The quotations for lead represent wholesale transactions in the open market. The quotations on spelter are for ordinary Western brands; special brands command a premium.

Copper—During the week ending with Dec. 8, business has been on a small scale, relatively speaking, although some millions of pounds have been sold. However, sales have to average over 4,000,000 lb. per day to take care of the current output. In Lake there has been scarcely anything done and the quotations are quite nominal. Electrolytic has been sold both for domestic and foreign delivery, chiefly the latter. For that reason prices have been affected to a considerable extent by the fluctuations of standard copper in London. As late as Dec. 6 some fairly large sales were made upon low prices, but since then there has been a better feeling and some improvement in prices realized upon business actually done. Several of the producers have continued to hold aloof from the market, reportedly asking prices much above the prevailing basis of business. The close is steady at 13⅜@13½c. for Lake copper, and 13⅛@13⅜c. for electrolytic cakes, wirebars and ingots. Casting copper is quoted nominally at 12⅞@13⅛c. for the week.

Copper sheets are 18@19c. base for large lots. Full extras are charged, and higher prices for small quantities. Copper wire is 15¼c. base, carload lots at mill. Business is active.

It appeared that toward the end of last week in London the realizing movement, coincident with the Standard Oil decision, had about exhausted itself and prices began to harden. The undertone, however, remains undecided and the close is cabled at £59 2s. 6d. for spot and £60 2s. 6d. for three months.

Refined and manufactured sorts we quote: English tough, £62 10s.; best selected, £62 10s.@£63 10s.; strong sheets, £73 10s.@£74 10s. per ton.

Exports of copper from New York and Philadelphia for the week were 5680 long tons. Our special correspondent gives exports from Baltimore at 2468 tons copper.

Tin—The bull party had all its own way in the London market. Transactions were heavy at rapidly advancing prices, and the close is cabled as steady at £146 for spot and £147 15s. for three months. The strength of the London market did not exert much influence on consumers in this country. There was some business done between dealers, but consumers followed a hand-to-mouth policy buying spot material only. The latter is well controlled, selling at a premium over the import price. The close in the domestic market is about 32¼ cents.

Visible stocks of tin on Dec. 1 are reported as below, in long tons:

	In Store.	Afloat.	Total
London.....	7,915	4,499	12,414
Holland.....	2,497	187	2,684
U. S., one Pacific ports....	2,337	2,590	4,927
Total...	12,749	7,276	20,025

The total shows an increase of 1301 tons over the stocks on Nov. 1, and of 72 tons over those on Dec. 1 of last year.

Lead—The market is steady, with a fair business doing at 4.25@4.27½c. St. Louis, and 4.40c. New York, for ordinary brands. The price of the American Smelting and Refining Company for desilverized continues to be 4.40c., New York. Special brands of lead have fetched a rather large premium in the St. Louis market.

The London market is again lower, at £12 17s. 6d. for Spanish lead, and £13 for English.

Spelter—The demand continues very light, and there has been more pressure on the part of the sellers to place their current output. Prices have yielded from day to day and the close is weak at 6.25@6.32½c. New York, and 6.12½@6.17½c. St. Louis.

New York quotations for spelter, Dec. 2 and 3, were: 6.32½@6.35c.; Dec. 4, 6.30@6.35c.; Dec. 6 and 7, 6.20@6.32½c.; Dec. 8, 6.25@6.32½ cents.

The London market is unchanged at £23 for good ordinaries, and £23 5s. for specials.

Base price of sheet zinc is now 8c. per lb., f.o.b. La Salle-Peru, Ill., less 8 per cent. discount.

Other Metals

Antimony—The market continues dull, and is not expected to improve this month. Cookson's is quoted at 8⅛@8½c. per lb.; Hallett's, 8@8½c.; U. S., 7⅞@8c.; with 7⅝@7¾c. named for outside brands.

Aluminum—The price of aluminum is unchanged at 20@23c. per lb. for ingots. The higher price is that asked by the American producer.

Quicksilver—Business is fair and the market continues strong. In New York the quotation is $52.50 per flask of 75 lb. for large lots; for small lots 72@75c. per lb. is asked by jobbers. The San Francisco quotation is $50.50@51.50 per flask for domestic orders, and $2 less for export. The London price is £9 15s. per flask, with £9 17s. 6d. asked by jobbers.

Nickel—Large lots, contract business, 40@45c. per lb. Retail spot, from 50c. for 2000-lb. lots, up to 55c. for 500-lb. lots. The price for electrolytic is 5c. higher.

Magnesium—The price of pure metal is $1.50 per lb. for 100-lb. lots f.o.b. New York.

Cadmium—Current quotations are 65@70c. per lb. in 100-lb. lots at Cleveland, Ohio. In Germany 450@475 marks per 100 kg., at factory in Silesia.

Imports and Exports of Metals

Exports and imports of metals in the United States, 10 months ended Oct. 31, are reported as follows, in the measures usual in the trade:

Metals:	Exports.	Imports.	Excess.
Copper, long tons	257,802	112,168	Exp. 145,634
Copper, 1908...	258,969	75,065	Exp. 183,904
Tin, long tons...	369	36,952	Imp. 36,583
Tin, 1908.....	192	29,294	Imp. 29,102
Lead, short tons.	76,702	92,115	Imp. 15,413
Lead, 1908 ...	60,848	91,279	Imp. 30,431
Spelter, sh. tons.	2,331	8,039	Imp. 5,708
Spelter, 1908....	2,410	824	Exp. 1,586
Nickel, lb.	9,597,093	16,974,435	Imp. 7,377,122
Nickel, 1908 ...	8,880,840	15,415,275	Imp. 6,534,435
Aluminum, lb....	6,648	6,272,943	Imp. 6,266,295
Antimony, 1908.	.....	6,901,591	Imp. 6,901,591
Platinum, oz.....	.....	98,161	Imp. 98,161
Platinum, 1908.	.....	31,892	Imp. 31,892
Quicksilver, lb.	490,193	.....	Exp. 490,193
Quicksilver, '08	214,015	.....	Exp. 214,015
Aluminum, value	$464,753	.....	Exp. $464,753
Aluminum, 1908	291,364	.....	Exp. 291,364
Ores, etc.			
Zinc oxide, lb.	28,610,250	.....	Exp. 28,610,250
Zinc oxide, '08.	20,708,007	.....	Exp. 20,708,007
Zinc dross, lb...	13,424,440	.....	Exp. 13,424,440
Zinc dross, '08.	14,580,283	.....	Exp. 14,580,283
Zinc ores, gr'ns	11,121	88,219	Imp. 77,098
Zinc ores, 1908	24,411	41,052	Imp. 16,741
Antim'y ores, lb.	304	4,386,708	Imp. 4,386,404
Antim'y ores, 1908	2,520	2,400,584	Imp. 2,398,064
Chrome ores, tons	.....	32,613	Imp. 32,613
Chrome ore, '08	..	..	..

Estimated fine contents of ore imported August to October, 6,808,834 lb. Copper, lead and nickel include the metal contents of ores, matte, bullion, etc. The exports given include reëxports of foreign material. Chrome ore was not reported separately last year.

Spanish Metal Exports

Exports of metals and minerals from Spain, nine months ended Sept. 30; reported by *Revisa Minera*, in metric tons:

Metals.	1908.	1909.	Changes.
Pig and manuf. iron	24,866	44,416	I. 19,550
Copper	10,245	12,569	I. 2,324
Copper precipitate	15,745	13,678	D. 2,037
Lead	140,244	141,461	I. 1,217
Zinc	815	907	I. 92
Quicksilver	1,800	1,488	I. 312
Minerals.			
Iron ore	5,758,935	5,801,699	I. 42,764
Manganese ore	16,593	10,782	I. 5,811
Copper ore	893,308	847,702	D. 45,606
Lead ore	2,493	2,741	I. 248
Zinc ore	87,978	97,158	I. 9,180
Pyrites	1,088,707	1,020,775	D. 47,932
Salt	464,233	441,232	D. 23,001

Imports of phosphate rock, 104,509 tons in 1908, and 113,123 in 1909; increase, 8614 tons.

Zinc and Lead Ore Markets

Joplin, Mo., Dec. 4—The highest price paid for zinc was $55, the base of zinc-sulphide ore ranging from $50@$52.50 per ton of 60 per cent. zinc. The base price of zinc silicate ranged from $28@30 per ton of 40 per cent. zinc. The average price, all grades, was $49.26 per ton. Lead was in better demand, but there was no change in prices, $53 per ton being paid for grades running from 78 to 82 per cent. metal. The average price, all grades, was $52.86 per ton.

There was a material relief in the car situation, and the smelters shipped some of the zinc ore that has been purchased but had not been removed from the bins of the producers from lack of cars. Buying the past week was steady and prices were firm, the production being purchased closely.

SHIPMENTS, WEEK ENDED DEC. 4.

	Zinc, lb.	Lead, lb.	Value.
Webb City-Carterville	4,944,420	962,250	$151,580
Joplin	2,502,310	159,260	69,905
Miami	1,015,240	269,180	29,468
Duenweg	1,142,530	32,520	28,635
Prosperity	740,650	102,560	21,603
Galena	796,170	38,580	20,926
Badger	770,810	.....	19,656
Alba-Neck	480,370	6,570	12,659
Carthage	401,670	.....	10,443
Oronogo	409,290	30,210	9,957
Quapaw	329,280	30,210	8,703
Aurora	349,540	.....	6,925
Granby	371,550	6,500	6,678
Cave Springs	297,120	.....	6,537
Spurgeon	296,400	43,680	6,338
Jackson	130,240	.....	3,191
Carl Junction	66,600	3,690	1,894
Zincite	62,610	.....	1,691
Stott City	65,930	.....	1,648
Sarcoxie	61,260	.....	1,470
Totals	15,233,990	1,685,240	$419,907

49 weeks.....561,001,450 82,960,570 $13,707,328
Zinc value, the week, $375,261; 49 weeks, $11,445,719
Lead value, the week, 44,646; 49 weeks, 2,261,609

MONTHLY AVERAGE PRICES.

Month.	Zinc Ore. Base Price. 1908.	1909.	All Ores. 1908.	1909.	Lead Ore. All Ores. 1908.	1909.
January	$37.60	$41.25	$35.56	$38.46	$46.88	$62.17
February	36.63	36.94	34.92	34.37	49.72	50.50
March	36.19	37.40	34.19	34.71	49.90	50.82
April	35.40	38.63	34.08	37.01	52.47	55.63
May	34.19	40.06	33.39	37.42	56.05	56.69
June	33.06	44.15	32.07	40.35	60.48	57.52
July	34.55	43.06	31.67	41.11	59.90	53.74
August	36.53	48.25	33.42	44.54	60.34	57.60
September	37.63	47.70	34.44	44.87	54.59	56.11
October	35.96	49.50	33.28	45.75	52.63	55.02
November	39.13	51.31	35.02	48.29	54.53	53.94
December	42.75	.....	39.63	.....	49.68	.....
Year	$36.63	.....	$34.31	.....	$53.93	.....

NOTE—Under zinc ore the first two columns give base prices for 60 per cent. zinc ore; the second two the average for all ores sold. Lead ore prices are the average for all ores sold.

Platteville, Wis., Dec. 4—The highest price paid this week for zinc ore was $51 per ton; the base price, 60 per cent. zinc, was $50 per ton. The base price paid for lead ore was $53@54 per ton.

SHIPMENTS, WEEK ENDED DEC. 4.

Camps.	Zinc ore, lb.	Lead ore, lb.	Sulphur ore, lb.
Platteville	585,220	.....	256,900
Highland	483,700	.....	.....
Mineral Point	450,000	.....	.....
Benton	330,450	.....	.....
Days Siding	166,000	.....	.....
Cuba City	160,410	86,225	.....
Galena	80,000	.....	.....
Rewey	67,000	.....	.....
Harker	60,880	50,000	.....
Total	2,383,660	136,225	256,900
Year to Dec. 4	128,316,555	8,768,430	14,436,115

In addition to the above there was shipped to the separating plants, at Platteville, Galena and Mineral Point, 1,328,890 lb. zinc concentrates.

Chemicals

New York, Dec. 8—The general chemical market shows a little change and a firmer tone prevails in most directions.

Imports and Exports—Imports and exports of chemicals and raw materials in the United States, 10 months ended Oct. 31.

	Imports.	Exports.	Excess.
Copper sulph. lb.	.....	2,184,082	E. 2,184,082
Copper sul., '08	.....	7,239,349	E. 7,239,349
Bleach, lb.	73,023,928	13,964	I. 73,009,964
Bleach, 1908	58,557,323	121,511	I. 58,435,812
Potash salts, lb.	317,907,275	2,275,454	I. 315,631,821
Potash salts, '08	203,102,928	821,727	I. 202,281,201
Soda salts, lb.	12,883,902	593,798	I. 12,290,104
Soda salts, 1908	9,673,552	694,303	I. 8,979,249
Acetate lime, lb.	.....	59,767,732	E. 59,767,732
Acetate, 1908	.....	49,652,450	E. 49,652,450
Nit. of soda, tons	330,598	7,299	I. 323,299
Nitrate, 1908	262,007	8,785	I. 253,222
Phosphates, tons	10,977	929,585	E. 918,608
Phosphates, '08	21,027	1,099,095	E. 1,078,068
Sulphur, tons	23,813	31,902	E. 8,089
Sulphur, 1908	18,751	20,046	E. 1,295
Pyrites, tons	585,919	.....	I. 585,319
Pyrites, 1908	557,418	.....	I. 557,418
Magnesite, lb.	58,517,784	575,805	I. 57,941,978
Magnesite, 1908	.....	.....	.....

Figures for magnesite are for four months, July-October; not reported prior to July 1, 1909. Estimating sulphur contents of pyrites, total imports of sulphur this year were 257,900 tons. Exports include reëxports of foreign material.

Copper Sulphate—Business remains quiet and prices are unchanged at $4 per 100 lb. for carload lots and $4.25 per 100 lb. for smaller parcels.

Arsenic—The market is inactive again, but prices are rather firmly held, white arsenic being quoted at 2¾@2⅞c. per lb. for both spot and futures.

Nitrate of Soda—Statistics of nitrate in the United States on Dec. 1, as reported by Messrs. Mortimer & Wisner, New York, in long tons:

	1908.	1909.	Changes.
Stocks, Jan. 1	5,900	9,140	I. 3,240
Imports 11 months	265,850	322,958	I. 57,108
Total supplies	271,750	332,098	I. 60,348
Deliveries 11 months	257,850	313,048	I. 55,198
Stocks, Dec. 1	13,900	19,050	I. 5,150
Afloat for U. S.	50,000	100,000	I. 50,000

Quantities afloat include all cargoes due to arrive at United States ports by March 15 next.

Current quotations are 2.07½c. per lb. for spot nitrate, with 2.10c. asked for futures.

Mining Stocks

New York, Dec. 8—The general stock market this week has been variable but rather uninteresting and with a slight tendency to lower prices. The railroad strike in the Northwest and the fear of further labor troubles have had an unfavorable effect upon the market, while other considerations, including rates for money, have tended to discourage speculation.

Some sales of Homestake of South Dakota were made on the Exchange this week at $76.25 per share, which is a slight advance over the previous sales.

On the Curb the copper shares were irregular with some tendency to lower prices, but with no very marked changes. Upon the whole business was rather uninteresting. Nevada gold stocks were heavy and rather weak. The Cobalt stocks were also inclined to be dull, with prices a little easier.

Boston, Dec. 7—Copper shares have been unsettled during the week, owing to the apparent hitch in the proposed copper merger. Net declines have been comparatively slight, however. Lake Copper continues in the foreground. After a break from $63 to $54 it has recovered to above $60 again. Considerable inside profit taking was indulged in on the sharp bulge and an effort has been made to hold the price down so as to admit of repurchase of the stock. A surprise was sprung on the street when it was announced that the company had sold 3000 shares of treasury stock at an average price of about $45 per share. The company still retains 15,000 shares in its treasury of the authorized 100,000. It is generally conceded that this mine has made a phenomenal showing.

Considerable manipulation has entered into the market movements of North Butte and the price broke $4.37½ to $59.67½. Even when the market showed strength this issue was weak and the recent large buyers have been the late sellers. At times strength was shown in some of the Lake Superior issues, particularly the lower priced ones.

The stocks lately mentioned as likely to go into the proposed copper combine have been the weakest, although Amalgamated has been persistently strong. The price is up some $2.37½ net from that of a week

ago. Market operations are largely professional, although brokers' offices have a full complement of customers at times who are looking on rather intently.

Nothing startling has developed on the Curb. Boston-Ely had a break to $1.87½ on the calling of a 50c. assessment, but rose sharply to just under $3.50 on good reports.

STATISTICS OF COPPER.

Month.	United States Product'n.	Deliveries, Domestic.	Deliveries for Export.
I	112,135,200	51,862,624	38,499,797
II	103,700,817	43,578,118	30,968,496
III	117,058,661	48,871,964	59,191,043
IV	113,574,292	47,546,010	65,110,111
V	118,356,146	61,163,325	70,542,753
VI	116,567,493	60,591,116	70,966,457
VII	118,277,603	75,520,083	75,018,974
VIII	120,597,234	59,614,207	48,382,704
IX	118,023,139	52,105,955	50,077,777
X	124,657,709	66,359,617	56,261,238
XI	....	....	....
XII	....	....	....

VISIBLE STOCKS.

	United States.	Europe.	Total.
I	122,357,266	124,716,480	247,073,746
II	144,130,045	118,574,400	262,704,445
III	173,284,248	117,140,800	290,425,048
IV	182,279,902	115,024,000	297,303,902
V	183,198,073	114,050,320	297,248,393
VI	169,848,141	127,352,960	297,201,101
VII	154,858,061	150,928,960	305,787,021
VIII	122,596,607	171,492,160	294,088,767
IX	135,196,930	197,993,600	333,190,530
X	151,472,772	210,224,000	361,696,772
XI	153,509,626	222,566,400	376,076,026
XII	....	236,857,600	....

Figures are in pounds of fine copper. U. S. production includes all copper refined in this country, both from domestic and imported material. Visible stocks are those reported on the first day of each month, as brought over from the preceding month.

Monthly Average Prices of Metals

SILVER

Month.	New York.		London.	
	1908.	1909.	1908.	1909.
January	55.678	51.750	25.738	23.834
February	56.000	51.472	25.855	23.706
March	55.365	50.468	25.570	23.227
April	55.505	51.428	25.133	23.708
May	52.795	52.905	24.377	24.343
June	53.663	52.538	24.760	24.166
July	53.115	51.043	24.514	23.519
August	51.683	51.125	23.858	23.588
September	51.720	51.449	23.877	23.743
October	51.431	50.923	23.725	23.502
November	49.647	50.703	22.933	23.351
December	48.766	......	22.493	...
Total	52.864	......	24.402	.....

New York, cents per fine ounce; London, pence per standard ounce.

COPPER

	NEW YORK.				LONDON.	
	Electrolytic		Lake			
	1908.	1909.	1908.	1909.	1908.	1909.
January	13.726	13.893	13.901	14.280	62.386	57.688
February	12.905	12.949	13.098	13.295	58.786	61.198
March	12.704	12.387	12.875	12.826	58.761	56.231
April	12.743	[illegible]	12.928	[illegible]	58.331	57.363
May	12.598	12.893	12.788	13.238	57.387	59.338
June	12.675	13.214	12.877	13.548	57.842	59.627
July	12.702	12.880	12.933	13.363	57.989	58.556
August	13.462	13.007	12.930	13.296	60.500	59.193
September	13.388	12.870	13.600	13.210	60.338	59.021
October	13.354	12.700	13.646	13.030	60.139	57.551
November	14.130	13.125	14.386	13.354	63.417	58.917
December	14.111		14.411	......	62.943	...
Year	13.208		13.424		59.902	

New York, cents per pound. Electrolytic is for cakes, ingots or wirebars. London, pounds sterling per long ton, standard copper.

TIN AT NEW YORK

Month.	1908.	1909.	Month.	1908.	1909.
January	27.380	28.060	July	29.207	29.125
February	28.978	28.290	August	29.942	29.966
March	30.577	28.727	September	28.815	30.293
April	31.702	29.445	October	29.444	30.475
May	30.015	29.225	November	30.348	30.859
June	28.024	29.322	December	29.154	...
			Av. year	29.465	.....

Prices are in cents per pound.

LEAD

Month.	New York.		St. Louis	London.	
	1908	1909.	1909.	1908.	1909.
January	3.691	4.175	4.025	14.469	13.113
February	3.725	4.018	3.868	14.250	13.313
March	3.838	3.986	3.835	13.975	13.438
April	3.993	4.168	4.051	13.469	13.297
May	4.253	4.287	4.214	12.938	13.225
June	4.466	4.350	4.291	12.600	13.031
July	4.744	4.321	4.188	13.000	12.563
August	4.580	4.363	4.227	13.375	12.475
September	4.515	4.342	4.215	13.125	12.781
October	4.351	4.341	4.215	13.375	13.175
November	4.330	4.370	4.252	13.538	13.047
December	4.213	......	......	13.166	......
Year	4.200	......	......	13.439	......

New York and St. Louis, cents per pound. London, pounds sterling per long ton.

SPELTER

Month.	New York.		St. Louis.		London.	
	1908.	1909.	1908.	1909.	1908.	1909.
January	4.518	5.141	4.363	4.991	20.563	21.225
February	4.788	4.889	4.638	4.739	20.875	21.563
March	4.665	4.757	4.527	4.607	21.075	21.438
April	4.645	4.965	4.495	4.815	21.344	21.531
May	4.608	5.124	4.458	4.974	19.906	21.975
June	4.543	5.402	4.393	5.252	19.000	22.000
July	4.485	5.402	4.338	5.252	19.031	21.969
August	4.702	5.729	4.556	5.579	19.350	22.125
September	4.769	5.796	4.619	5.646	19.563	22.906
October	4.801	6.199	4.651	6.043	19.750	23.200
November	5.059	6.381	4.909	6.231	20.875	23.188
December	5.137	......	4.987	......	20.625	......
Year	4.726	......	4.578	......	20.163	......

New York and St. Louis, cents per pound. London, pounds sterling per long ton.

STOCK QUOTATIONS

NEW YORK Dec. 8

Name of Comp.	Clg.
Amalgamated	87⅝
Anaconda	49½
Balaklala	2 1/16
Braden	5 5/16
British Col. Cop.	7¼
Buffalo Mines	‡3½
Butte Coalition	30
Colonial Silver	½
Combination Fra.	.47
Con. Ariz. Sm.	2 1/16
Cum. Ely Mining.	9¾
Davis-Daly	5¼
Dominion Cop.	‡7
El Rayo	2 9/16
Florence	‡2⅞
Furnace Creek	05
Giroux	11⅛
Gold Hill	‡2
Goldfield Con.	7 11/16
Granby	101
Guanajuato	2
Guggen. Exp	240
Hanapah	15
Kerr Lake	7⅞
McKinley-Dar.	‡.84
Miami Copper.	18¾
Mines Co. of Am.	¼
Montezu. of C. R.	5
Mont. Sh. C.	‡1
Nev. Utah M. & S.	1¼
Newhouse M. & S.	3¼
Nipissing Mines	10¾
Ohio Copper	5¼
Old Hundred	⅝
Pacific Sm. & M.	1⅝
Silver Queen	.25
Stewart	1⅛
Tennessee Copp'r	.39
Tri-Bullion	1
United Copper	7½
Utah Apex	5½
Utah Copper	58¾
Yukon Gold	5¼

‡Last quotation.

BOSTON Dec. 8

Name of Comp.	Clg.
Adventure	7½
Allouez	55
Am. Zinc	35
Arcadian	5½
Arizona Com.	44⅞
Atlantic	12
Boston Con.	21¼
Calumet & Ariz.	102
Calumet & Hecla.	645
Centennial	37½
Con. Mercur	.16
Copper Range	81
Daly-West	8
East Butte	11½
Franklin	16
Greene—Can	12½
Hancock	20½
Isle Royal	25
Keweenaw	4
La Salle	16
Mass	7½
Michigan	7
Mohawk	60
Nevada	27⅞
North Butte	60½
Ojibway	9
Old Dominion	51½
Osceola	‡157½
Parrot	29½
Quincy	84
Rhode Island	‡10½
Shannon	15½
Superior	62
Superior & Bost	14½
Superior & Pitts	15⅜
Tamarack	65
Trinity	10⅞
U. S. Smg. & Ref.	53
U. S. Sm. & Re., pd.	52⅞
Utah Con.	45
Victoria	4
Winona	8
Wolverine	145
Wyandotte	2½

‡Last quotation.

N. Y. INDUSTRIAL

Am. Agri. Chem.	45¼
Am. Smelt. & Ref.	99
Am.Sm. & Ref., pf.	‡110
Colo. Fuel & Iron.	50¾
Federal M. & S., pf.	‡88
National Lead	88½
National Lead, pf.	‡110¼
Pittsburg Coal	26⅞
Republic I. & S.	46½
Republic I. & S., pf.	106
Sloss-Sheffield	88½
Standard Oil	654
U. S. Steel	91
U. S. Steel, pf.	124⅜
Va. Car. Chem.	48⅜

BOSTON CURB

	Low.
Ahmeek	220
Chemung	15½
Chino	9
Gila	8
Indiana	7¾
Mason Valley	1⅞
Ray Central	2⅜
Ray Con	‡20½
San Antonio	9⅜
Yuma	1¼

Furnished by Hornblower & Weeks, N. Y.

ST. LOUIS Dec. 4

N. of Com.	High.	Low.
Adams	.40	.30
Am. Nettie	.09	.07
Center Cr'k	2.00	1.75
Cent. C. & C.	87.00	86.00
C. C. & C. pf.	85.00	84.00
Cent. Oil	115.00	100 00
Columbia	9.00	7 00
Con. Coal	18.00	17 00
Doe Run.	110.00	100.00
Gra. Bimet.	.30	.25
St. Joe.	12 50	11 00

LONDON Dec. 8

Name of Com.	Clg.		
Dolores	£1	10s	0d
Stratton'sInd.	0	3	3
Camp Bird	1	9	0
Esperanza	2	16	0
Tomboy	0	19	3
El Oro	1	5	9
Oroville	0	9	9

Cabled through Wm. P. Bonbright & Co., N. Y.

NEVADA STOCKS. Dec. 8.

Furnished by Weir Bros. & Co., New York.

Name of Comp.	Bid.
COMSTOCK STOCKS	
Belcher	1 05
Best & Belcher	62
Caledonia	.40
Chollar	.26
Comstock	.33
Con. Cal. & Va.	89
Crown Point	‡ 95
Exchequer	.43
Gould & Curry	.28
Hale & Norcross	.47
Mexican	1.50
Ophir	1.72
Overman	.61
Potosi	.60
Savage	.50
Sierra Nevada	48
Union	61
Utah	09
Yellow Jacket	1.05
TONOPAH STOCKS	
Belmont	.60
Extension	.47
Golden Anchor	...
Jim Butler	.10
MacNamara	.27
Midway	.14
Montana	80
North Star	‡.02
Tono'h Mine of N.	6.50
West End Con	.24
GOLDFI'D STOCKS	
Adams	‡.01
Atlanta	10
Blue Bell	02
Booth	08
C.O.D. Con	.06
Columbia Mt.	.05
Comb. Frac.	.45
Cracker Jack	‡.01
Dia'dfield B. B. C.	.01
Florence	2.62½
Goldfield Belmont	04
Goldfield Daisy	08
Great Bend	03
Jumbo Extension	11
Kendall	‡ 02
Lone Star	‡.02
May Queen	.04
Oro	.03
Red Hill	.03
Sandstorm	‡ 05

Name of Comp.	Bid.
Silver Pick	.08
St. Ives	.05
Triangle	‡.01
BULLFROG STOCKS	
Gibraltar	‡.02
Homestake King.	‡.01
Mont. Shoshone C.	1.25
Tramp Cons.	.04
MISCELLANEOUS	
Cumberland Ely.	9.50
Giroux	11.25
Greenwa'r Copper	.06
Nevada Con.	27.50
Nevada Hills	.70
Nevada Smelting.	.75
Nevada Wonder	.60
Nevada-Utah	1.43¾
Penn-Wyoming	...
Pittsburgh S. Pk.	.65
Ray Central	2.37½
Ray Con	22.50
Round Mt. Sphinx	‡ 05

COLO. SPRINGS Dec. 4

Name of Comp.	Clg.
Acacia	.07
C. C. Con	.03
Dante	.07½
Doctor Jack Pot	.07¾
Elkton	.72¾
El Paso	.64
Findlay	‡.10
Gold Dollar	.11
Gold Sovereign	.04½
Isabella	.19⅞
Jennie Sample	.07⅞
Jerry Johnson	.09½
Lexington	.48½
Mary McKinney	‡.49
Old Gold	.04½
Pharmacist	.03
Portland	.83
U. G. M.	.07
Vindicator	.82
Work	.06⅞

Assessments

Company.	Delinq.	Sale.	Amt.
Arcadian Copper, Mich	....	Mar. 1	$0.50
Boston Ely, Nev	Dec. 23	.....	0.50
Camp Bird Min. Co., Colo	Dec. 13	.....	0.002
Chemung Copper, N. M	Jan 1	Jan. 2	1.00
Con. Virginia, Nev	Dec. 20	Jan 10	0.25
Crown Point, Nev	Nov. 30	Dec 20	0.10
Exchequer, Nev	Dec. 15	Jan 5	0.05
Golden M. & M., Utah	Jan 15	Feb. 4	0 002
Hancock Min., Mich	...	Feb. 1	1.00
Mexican, Nev	Dec 6	Dec 29	0.10
Mineral Flat, Colo	Dec. 11	Jan 6	0.01
Mountain Dell Con., Utah	Dec 21	Jan 10	0.01
Palmyra G. & C., Utah	Dec 29	Jan 19	0 002
Potosi, Nev	Nov 12	Dec 6	0.10
Seven Bros. Pioche, Nev	Jan 15	Feb 4	0.002
Sheridan M. & M., Ida	Nov 20	Dec. 20	0.002
Silver Hill, Nev	Dec 23	Jan 14	0 05
Union Con., Nev	Dec 22	Jan 13	0.10
Utah Ideal, Utah	Feb 1	Feb 20	0.00½
Winona, Mich	Dec 1	Jan. 1	1.00
Yellow Jacket, Nev	Nov. 18	Dec 22	0.10

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Ore Dressing in the Coeur d'Alene District—III

Workmanship in Mills Good. Crusher Plants Designed for Capacity. Roll Practice Fair. Movable Pillow-block Roll Best Adapted to Conditions

BY EDWARD S. WIARD*

It is seen from the preceding sections of this article that, while the mills in the Cœur d'Alene district are situated on hillsides the floors do not rest upon terraces cut out of them. The Hercules is an exception, the floors to a large extent being laid on earth terraces fronted with retaining walls of masonry. In the majority of cases the posts of the frame and walls arise from the alluvium at the bottom of the hillside, or, as in the case of the Bunker Hill mill, from the ground, and the hillside must be regarded as forming the rear side of the building. The hillsides proper furnish support for the bins and crushers only. In laying the foundations of the majority of the mill structures longitudinal trenches were cut, the bottom being filled with concrete. On the concrete 12x12 timber sills were laid and from these arose the posts, so disposed as to occupy the corners of rectangles from 14 to 20 ft. on a side. In Fig. 2 is shown how one vertical unit arises through the mill. It will be understood that there are four braces to a post at each level, only two being shown in the diagram. The lower posts are invariably 12x12 in.; above the trommel line 8x8-in. posts are employed.

The 8x8 system is built up to such hights at the various bents as to give the usual quarter pitch to the roof when the roof joists with their boarding and shingles are laid upon them. Gabled roofs supported on queen trusses are to be seen at the Standard and Mammoth mills and a few of the secondary structures. A feature of the Standard and Mammoth roofs is the employment of dormer windows. The sky line of the usual quarter-pitched

FIG. 1. THE MORNING MILL, COEUR D'ALENE DISTRICT

*Mining engineer, Denver, Colo.

shingled roofs which, it will be understood, slope with the long axes of the mills, is not infrequently dropped at convenient points to permit of a range of windows Skylights are never employed. The roof of the main mill structure always covers the roll bin and sometimes a portion of the front of the receiving bin, as, for example, at the Last Chance mill, or the whole of it as at the Hercules mill. The roll bin almost invariably occupies the whole width of the mill building.

General Mill Framing and Foundation Design

Fig. 2 is a purely diagrammatic drawing and not a scale detail from any particular mill. At the level at which a floor section is shown in detail would be placed the jigs. Jig floors have a slope of ¼ in. to the foot to permit of hosing into the drains. The drains usually discharge into the housing of elevators raising fine ore. Floors are usually double, the upper surfacing being 1½- to 2-in. lumber. Local pine from the region adjoining lake Cœur d'Alene is generally used. Douglas fir or Oregon pine is used particularly in bin construction, or where large sticks are required. Imported Belgian cement is much used for foundation work. In making the walls of the structures, 12x12 wall plates are used, and spacings from 14 to 20 ft. filled in with 2x4 or 4x6 studding. A double window is placed between each pair of wall plates. To the studding and wall plates is spiked the cover consisting of two thicknesses of 1-in. boards usually laid vertically, although occasionally the inner shell is laid diagonally to increase the stiffness of the frame. Battens cover the edges of the boards of the outer shell. Most of the retaining walls fronting terraces and supporting bins are built of slabby pieces of quartzite quarried from the nearest accessible bluff. Sand for construction in mills already in operation is obtained from the tailings from the fine jigs. The coarse tailings make excellent concrete

Grease Superior to Oil.

For supporting shafting plain boxes provided with screw top grease cups are gaining in favor in the district Cast iron cups are better than brass as the threads of the latter are very easily stripped With the exception of the dynamo or motor there is no machine or journal about a concentrating mill which cannot better be lubricated by grease than oil Oil is a very wasteful lubricant when used with plain boxes, and if ring oilers are placed on shafting the wells either fill with a [illegible] or if kept in good condition they take up too much of the [illegible]. At the Last [illegible] [illegible] them are no better, [illegible] [illegible] the results obtained from plain boxes with grease cups, and [illegible] [illegible]. The grease which [illegible] [illegible] the boxes is a more efficient guard against the entrance of grit. The rapidity with which the flames spread in the fire which destroyed the old Morning mill was attributed to the saturation of the timbers with oil from the shafting boxes. On rebuilding the mill grease cups were used throughout.

Such, briefly described, are the methods of construction and arrangement of the mills. The workmanship in the framing is always excellent and the construction of the machines about the mills, as for example the elevators, shows remarkable technical skill and knowledge. Other details of construction will be dealt with in the sections which follow. Owing to subsidence of foundations under heavy weights and heavy vibrations or insufficient footing for the columns, some of the mills have been bothered by shafts getting out of line. While the frames which have been described furnish an excellent support for trommels, shafting and jigs they yield to the vibrations caused by vanners and Wilfley tables. If settling tanks are supported by the frame at even so short a distance from the ground as 10 ft. the vibration is sufficiently great as to seriously interfere with settling and classification. Indeed I am of the opinion that, all things considered, a steel frame with concrete floors partially laid on the solid and partially suspended would more adequately assist in coping with the mill problems than the wooden construction now in vogue. It would have the stiffness that the wooden frame lacks, and, contrary to general belief, it would be warmer in winter and cooler in summer. If such a frame were placed on a gently sloping site the launders could be carried under the floors in roomy conduits, retreatment of various kinds of ore being kept ahead or down the mill. The dark, damp corners with the pervasive dripping from multitudes of launders carried under the floors are a disagreeable feature, to say the least, of the mills of the district. Some details of construction are best made of wood; this is emphatically the case with trommel housings The securing of wooden members to steel offers no great difficulties.

Costs in Mill Construction

In connection with mill frame and foundation construction the following costs are about typical of the district Undressed local lumber fetches about $16 per 1000 laid down at Wallace, for surfacing an additional 50c. per side is asked The imported Belgian cement costs $4.70 per bbl. at Wallace in carload lots For loading and hauling 75c. per ton mile is a fair estimate and a two-horse team costs $9 per day of nine hours The eight-hour day is in vogue Mill carpenters receive $4 per day, laborers $3 In general the cost of erecting and equipping mills [illegible] from $[illegible] per ton of capacity in large plants, to $300 per ton in smaller ones.

Ore Bins and Gates

The typical mill-bin construction of the district is shown in Fig. 3. The crusher is placed, with its bell or hopper in the floor under the chutes, in the center of the four left-hand chutes and the ore from them passes over four grizzlies with a slope of 9 in. to the foot. The usual wear of the grizzlies at the center binding rod is shown in Fig. 4 in which dotted lines show the original outlines of fittings. This is an excellent example of

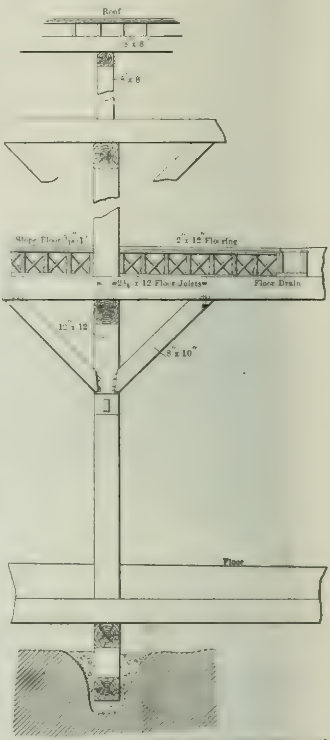


FIG. 2. VERTICAL UNIT OF INTERIOR OF COEUR D'ALENE MILL

the wear of iron where the direction of flow of ore is changed.

Ore is brought to the crusher from the other hoppers by a conveyer belt. At the crusher end the conveyer discharges on a grizzly, the oversize feeding into the crusher Below the crusher the streams of undersize and oversize join and pour on a conveyer belt whose direction of travel is nearly at right angles to the long axis of the receiving bin. This conveyer discharges into the roll bin. The lower conveyer is covered with a narrow shed The front of the receiving bin is covered with a lean-to shed, the upper part of the bin being exposed A shed, with sheathing of corrugated iron and with sufficiently high openings at

either end to allow the passage of a standard-gage engine, covers the top of the bin. Every other tie on the top of the bin is cut out to allow the ore to fall into the bin. The bottom of the bin is not lined. Wear on the top timbers due to the impact of ore is serious here as elsewhere in the district. The usual protective device for these timbers is a plank or timber nailed to the top of the cross timbers. These makeshifts do not, however, protect the sides of the timbers. A better device would be a chilled casting with sides and pointed top and secured by lag screws or bolts. At the Bunker Hill rock house pieces of old trommel plate have been nailed to the cross timbers. The Mammoth bin shown rests upon a terrace cut out of the solid rock, the surface being trued with concrete. This a good feature as decay of the sill timbers invariably follows where bins rest on gravel benches.

Inverted Lake Superior Gates used

The usual gate for the bins is one or more boards with handles held by cleats in the chutes. By worrying these boards against their rests the bin tender produces a more or less steady flow of ore on the grizzlies or the conveyer belts. At the storage end of the Morning receiving bin the discharge ends of the chutes are closed by boxes hinged into the sides of the chutes, the front end being supported by levers which are overhead. When the chutes are closed the other end of the lever rests under a stud fastened to the wall of the lean-to shed. Cars are filled at the chutes and dumped into the hopper over the crusher. At the Last Chance mill in addition to chute boards there are rack and pinion gates. At the Bunker Hill rock house the bins are provided with curved sheet steel gates which seem to be a curious inversion of the Lake Superior gate. Fig. 5 illustrates the principle of this gate. The diagram shows the gate in the closed position. To open the hand wheel is turned clock-wise while facing it. In the wide open position the steel surface *a b c d* forms a portion of the bottom of the chute which is cut out so as to allow it to be depressed. A partial rotation of the hand wheel opens or closes the gate and it will be seen that it is impossible for ore to jam it. In the Bunker Hill gate the axis *b c* is raised above the stream of ore discharging from the chute and the gate is closed by forcing an edge corresponding to *f e* down through the stream of ore. In the closed position the lower edge of the curved shield rests upon the bottom of the chute, the bottom of which is not cut out. Despite the difficulties attending the complete shutting off of the ore with the Bunker Hill gate it is probably better for regulating the flow of the ore but no better than an ordinary chute board. The Lake Superior gate is best adapted to filling cars but it might with advantage be placed back of chute boards. The ordinary rack and pinion gate is an abomination.

Conveyers

With the exception of that connecting the rock house and South mill of the Bunker Hill Company and a portion of the one at the Last Chance the conveyer belts are very nearly flat; the Mammoth mill belt for example has a slope of but 6 deg. The typical conveyer belt used in the district is a flat cotton belt of 8-ply thickness, 14 or 16 in. wide and provided with steel flights at either side in the manner shown in Fig. 6. The flights are secured to the belt with elevator bolts. The belt travel is low, 150 to 160 ft. per min. The belt is supported by 5-in. cylindrical idlers made of pipe or wood placed 18 to 24 in. apart. This style of conveyer is preferred to the troughed form and has in some cases replaced it. In point of repairs and length of life it appears to be superior to the troughed belt. At the picking plants which have been described, and connecting the rock house of the Bunker Hill company with the mill are flat rubber belts with slight lips. The slope of the Bunker Hill belt is 19 deg. 45 min., the belt is 24 in. wide and of 8-ply thickness and supported by idlers of 5 in. diameter set 12 to 14 in. apart. The shafts are steel pins driven into the wood. The ore fed to the belt is 1½-in. size and smaller and manifests no tendency to roll back. There is, however, considerable adherence among the damp ore particles.

Rock Breakers—Features of Operation and Construction

Only very exceptionally will the largest pieces of ore received from the mines fail to enter the opening of a 9x15 crusher of the Blake type. The ultimate reduction by breakers is to a maximum average size of 1½ in. In the larger mills only is more than one machine used to effect the comminution and in these the plant was apparently installed with the view of obtaining capacity rather than preserving low ratios of crushing.

Owing to the more or less circular grouping of the grizzlies about the hoppers of the gyratory crushers, in vogue in a number of the mills, it is impossible to rotate the hopper so that the arms of the spider will not receive the impact of ore. Many of the spider arms are badly worn in the manner shown in Fig. 7. The dotted lines in the sketch show the original outlines of the arms. It would seem that the providing of an adjustable armor for the spiders is a matter worthy of the attention of the makers of gyratory crushers. At the Bunker Hill rock house I saw a protecting device for a three-armed spider consisting of a heavy ring which fitted over the spider body and three arms fastened to the ring to which were riveted steel saddles which fitted over the spider arms. This armor was held in place by its weight. In a number of the mills the hoppers of the crushers are protected by

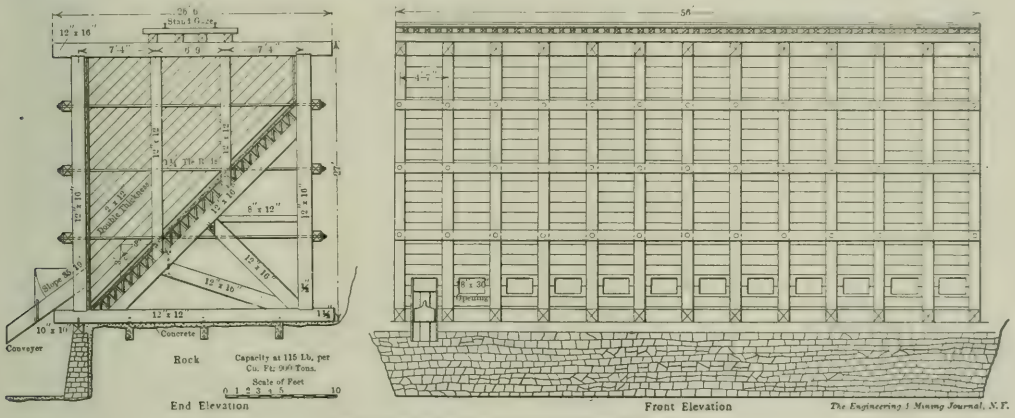


FIG. 3. RECEIVING BIN OF THE MAMMOTH MILL

gores of chilled iron, Fig. 8. The gores are held in place by bolts passing through the edge of the hopper.

At the Standard mill zinc for setting concaves is melted in a ladle of about 5 gal. capacity supported over the fire of a forge by a half-ton chain block. The forge which is situated about 20 ft. in front of the crushers is made of a section of trommel plates and blast is supplied by a small blower driven by a Pelton wheel. The chain block is secured to a crawl placed at a sufficient hight to allow it and its load of melted zinc to be rolled over the crushers. At the Federal companies' properties where gyratory crushers are used grease has successfully been substituted for crusher oil. The grease is introduced into a piece of 4-in. pipe which, with the elbow at the lower end, is 31½ in. long. At the elbow the pipe is reduced to 1-in. size. This pipe is screwed into the bottom of the crusher under the eccentric and the junction at that point supports the whole device. The 4-in. pipe stands out from the side of the crusher and is slightly inclined to the vertical. At its upper end is a screw cap which is tapped and threaded for a ¾-in. screw stem. The upper end of the screw stem is provided with a hand-wheel and the lower end with a disk. As will be readily seen from the foregoing description, the device is simply a long grease cup.

Blake Crushers In General Use

The common size of breaker of the Blake type used in the district is a 9x15. In the catalogs of the makers of this type of machine a very curious difference of opinion as to their capacity is to be found. Under columns headed "Capacity to 1½ in." in tabulated statements as to sizes, weights, etc., are given tons of rock per hour, and this figure varies all the way from 5¾ to 15. There is always the statement that the capacity will vary to some extent with the character of the rock fed, i.e., whether the rock breaks with a snap or merely mashes. How these figures are obtained and what they really represent I do not know.

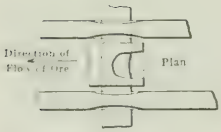
The proportions of a crusher have a great deal to do with its capacity. Consider the case of a piece of rock or ore which is touching both plates at the end of the stroke, or when the plates are closest together. The amount which the piece of rock will drop between the jaws preparatory to being crushed will depend, first, on the angle between the plates (the more acute this is the greater the drop), and second, on the amount of the stroke (the greater the stroke the farther the piece will drop before being nipped by the return of the movable jaw). Of course, the greater the downward movement at any point the greater the capacity. In the sectional diagrams shown in the catalogs the jaws are always shown full of rock grading from the finest at the mouth to pieces occupying the whole width of opening at the top. If a crusher is filled up with coarse rock it will stall frequently or throw off the belt. To borrow an analogy from roll theory the feeding must be regulated to give free crushing rather than choke crushing. When the crusherman shoves a large piece of rock into the jaws of the crusher he has to wait until it has broken up into a number of pieces before feeding any more. The other principal factor affecting capacity is the area of discharge opening.

In the Cœur d'Alene mills the largest pieces of rock fed to the crusher will be nipped near the top of the usual 9x15 opening, and to make the width of opening greater than nine inches would add very little to the capacity. In the catalog capacities are roughly proportional to the area of the receiving opening. Now, from my point of view breadth of opening increases the capacity far more than greater width. If the millmen of the Cœur d'Alene could purchase a series of Blake crushers with openings ranging from 15 to 28 in., the width remaining constant at 6 in., they would be in a better position to cope with the breaking problem than they are at present. In many camps the size of the ore brought to mills from the mines is about the same as in the Cœur d'Alene, so the foregoing statement is of general application.

If the rock from the mines were of such a size that a 12x15 opening were needed and such a size crusher were manufactured, other factors such as angle of jaws and stroke remaining the same, the capacity would be but little greater than that of a 9x15 crusher receiving 9-in. rock. The fines settle in the jaws much faster than the rock yet unreduced to the limiting size. The amount of rock which can be put through a crusher is limited not only by the belt coming off or the crusher stalling. Long before this point is reached ominous happenings occur: The crusher runs hot and the babbitt wears out rapidly; the caps of the swing-jaw bearings loosen frequently; the edges of the toggle seats give away. With rock of a maximum size which will just enter and be nipped by the jaws of the crusher, and from which undersize below 2-in. ring has been removed, I believe that, under Coeur d'Alene conditions crushing to 1½ in., the maximum safe capacity of a cast-iron, 9x15 Blake crusher is reached at nine tons per hour. In the district, with periods of rest, the Blake forms of crushers are fed through the whole 24 hours. The periods that the crusher is running empty probably amount to about 4 hours out of the 24; the proper amount to feed is consequently 180 tons.

Comparatively long strokes are the rule and these are obtained by lengthening the pitman. A couple of simple diagrams in which two pitmen of different length and toggles and jaws are represented by straight lines, the beginning and end of the stroke being obtained by striking arcs with a compass, will make this clear. The increased capacity thus obtained is at the expense of a considerable variation in size of the product. The No. 1 rolls never have any return of oversize and are consequently capable of taking care of the largest amount of rock from the crusher as well as nipping pieces which exceed 1½ in in size. By reducing the stroke of a Blake crusher it is possible to make a product comparable to that from a Dodge crusher. As was remarked above, fines either made by crushing or in the ore fed to the crusher readily work down through the mass of rock in

FIG. 4



GRIZZLEY BARS AND WASHERS

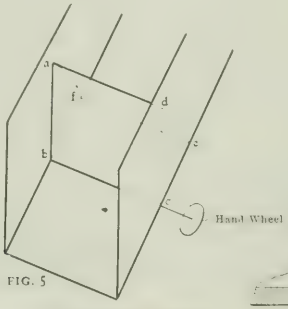
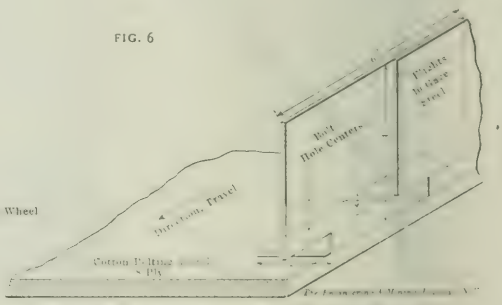


FIG. 5

ROTATING GATE CHUTE

FIG. 6



METHOD OF ATTACHING FLIGHTS TO CONVEYER BELTS

the jaws; and if run-of-mine ore is put directly into the crusher without screening in a grizzly, startling tonnages can be put through Blake crushers even as small as the 9x15 size. At one of the old mills of the district the rate of feed in this size machine was 20 tons per hour, or 400 tons of unsized ore per day of 24 hours. The ore was rather softer than any which is mined in the district at present. During high-water periods this mill was run entirely by a single Pelton wheel. Governing of the speed of the machinery was entirely done by the crusherman. He was chosen for his huskiness and ability to keep his eyes glued on a certain shaft pulley in front of the crusher. The rule he followed was, "Jam the crusher with fines and feed lightly with coarse rock." The most successful of these human governors, I believe, is still living in the district and, at the last account, prospering.

free the water from grit. At the Hercules mill curved toggle plates are employed. It is claimed by the foreman that these will break before the pitman if a hammer head inadvertently falls into the crusher.

Roller Mills

The practice of the Cœur d'Alene district in respect to roll speed is shown in the accompanying table. The theoretical capacity of the rolls is based upon a weight of 115 lb. per cu.ft. of broken ore. The actual tonnages given as passing through the rolls are approximate estimates made by me. The column headed "R. P. M., Argall," is obtained from data furnished by Philip Argall in his paper, "Sampling and Dry Crushing in Colorado." Argall's figures were obtained from a large experience gained in crushing Colorado ores of widely varying character.

SPEED AND CAPACITY OF SOME COEUR D'ALENE ROLLS

	Size.	R.P.M.	R.P.M., "Argall."	Dia. Largest Piece, Approx., In.	Width Roll Opening, In.	Tonnage 24 Hours Estimated.	Theoretical Ribbon, Tons 24 Hours.
B	14x38	50	37	1¼	¾	500	3242
C	14x36	56	46	¾	¼	300	1062
D	14x36	85	63	¾	1/16	175	404
E	14x36	55	40	1¼	½	90	2086
F	12x36	84	35	1⅛	¾	400	4097
G	12x36	40	46	⅝	¼	250	650
H	16x30	60	51	1	½	150	2601
I	14x30	67	64	½	⅛	150	526
J	10x30	81	76	¾	1/16	100	229
K	12x24	58	80	½	⅛	150	315

Remarks—Column 8 gives theoretical tonnage per 24 hours with roll speed given in column 3. *C*, wet crushing coarse-jig middlings; *D*, wet crushing fine-jig middlings; *E*, wet crushing coarse-jig middlings; *B* and *F*, dry crushing whole feed to mill; *G*, *H*, *I*, *J* and *K*, wet crushing jig middlings.

Grease Best Lubricant for Crushers

I consider that grease is a better lubricant for the pitman and frame bearings of a Blake crusher than oil and that it is better brought into contact with the shaft by large grease cups than wells. In applying grease cups to a crusher made with lubricating wells, the upper portion should be filled with babbitt and a hole drilled and tapped to receive the grease cups. After drilling and tapping a shallow waste well for oil-lubrication, grooves for distributing the grease should be made in the babbitt of the cap and base of the frame bearings and in the top and gib babbitt of the pitman. I also prefer coiled springs to cylindrical blocks of rubber at the end of the spring rod; the latter under repeated flexure quickly lose their elasticity For medium-sized crushers a spring made of ½-in. rod coiled into 10 or 11 coils of 1-in. pitch and having an outside diameter of about 4 in. will furnish the proper tension for keeping the toggles in place. Coiled springs are used exclusively in the mills of the district. The excellent water-drip device, recommended by Earle C. Bacon, of the Farrel Foundry and Machine Company, for keeping the grease in the pitman and bearings cool and stiff is not used in any of the mills. In resorting to it extra precautions should be taken to

Under the head of remarks it will be seen that the majority of the rolls selected as exemplification of the district practice do wet crushing. The two sets of roll speeds given are, therefore, not quite comparable though they should be very nearly so when the feed to the rolls is thoroughly dewatered. Argall's data are certainly founded on sound conceptions and are the most complete available to the engineer. My reason for introducing this tabulation is to show that no theory of roll speed has been evolved by the district, each mill being a law unto itself in this respect.

Three Causes for Mediocrity of Results

Taken as a whole the roll work exhibited here is not very impressive. This cannot be attributed to poor workmanship in the machines used, rolls of standard make being employed in all the mills. Some of the contributory causes to the poor showing are: (1) Experienced men are not employed to operate the machines or their operation is left to the jigmen who are too much occupied with their regular duties to give them proper care. (2) In wet crushing adequate dewatering devices are not used above the rolls. (3) In fine crushing only partial choke crushing is practised. (4) The rolls are often set in dark, inaccessible locations

Dewatering Devices Not Satisfactory

With respect to the second point I found that two types of dewatering device are used in the district, namely, shaking feeders with screens and false bottom, and small plug tanks of V-shaped cross-section. The former type is generally used for coarse middlings, the latter for the finer sorts. With moderate amounts of water and feeding coarse pieces of ore the shaking dewaterer may be very successfully employed, and an example of this may be seen at the Mammoth mill. Here, over the No. 3 set of rolls which receives coarse-jig middlings ranging in size from 4 to 10 mm. and the low-grade hutch sands from jigs receiving a feed ranging in size up to 6 mm., is a

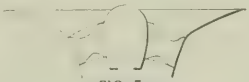


FIG. 7

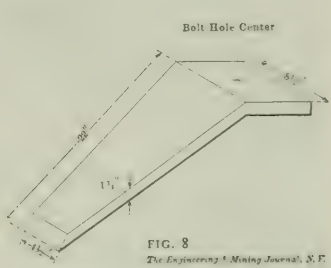


FIG. 8

The Engineering & Mining Journal, S. F.

GORE OF CHILLED-IRON HOPPER FOR GYRATORY CRUSHER

shaking dewatering device the appearance and mode of operation of which may be gathered from the following description.

The feeder with screen and false bottom is supported at the four corners by rods. These rods at the lower or feeder end are bent into hooks or eyes which surround the ends of two transverse rods secured to the under side of the feeder. Four studs support the upper ends of the rods and these are bent around them as on the transverse rods below. The front rods or those nearest to the rolls are longer than the rear ones to an extent that gives the feeder a slope of about 4 in. to 1 ft. The feeder and supporting rods rock on the supporting studs. Motion is first given by an ordinary jig eccentric to a rocker shaft which is connected with the eccentric by a lever and rod. The lever is firmly fixed to one end of the rocker shaft. At the other end is a second lever which is connected to the feeder pan by a rod. For regulation of the length of stroke of the feeder the second lever is slotted and provided with a slide. To a pin passing through this slide is secured the rod, the other end of which is secured to the feeder. A vertical rod

is also secured to this pin and terminates at a third lever. Depression of this third lever and the slide of the second one below is effected by a long horizontal rod connected to a vertical hand lever on the jig floor. In front of the lever handle, so that it may be grasped by the fingers while the palm is on the handle, is a spring pawl which engages in the teeth of a curved rack. When the slide in the second lever is depressed the stroke of the feeder is diminished and is increased by a reverse movement. The efficiency of such a device diminishes as the size of feed and the feeder decrease. If used for fine ore, when the screen is new, water will pass through the bed of ore and screen with a fair degree of freedom, but the very performance of its function quickly brings the dewatering to an end. When the water leaves the bed of ore in the feeder the ore is left in a pasty condition due to coherence of the damp grains of ore, the amount of such coherence being inversely proportional to the size of the grains. In this condition it very readily fills the small holes of the screens. Ultimately the screen becomes waterproof. This blinding action is aggravated in the case of the Cœur d'Alene mills by the presence in all classes of [illegible] amount of finely [illegible] particles of wood.

The [illegible] to the V tanks is that the [illegible] is only partial and the stream from the plug is with difficulty spread evenly over the width of the roll faces. The effect of splashing water into rolls with the ore is to cause uneven distribution of the feed across the roll faces. Also in fine crushing the advantages of choke crushing are lost. Then, too, corrugation of the rolls, after being once started, increases very rapidly when water is introduced into the shells, for it follows the troughs, carrying the ore with it. In many of the mills the rolls run without the covers so as to render more easy the task of keeping them in eye. In such cases the grit splashing from the roll faces is extremely destructive to the bearings and largely accounts for the unsightly appearance which many of the rolls present. For dewatering fine material for rolls nothing is better in my estimation than mechanical rake or scoop dewatering devices, the overflow from them being led into conical tanks, the sludge formed from the settlement being introduced under the rolls for washing the faces and transporting the feed in the spouts below.

FIG. 9. BUNKER HILL AND SULLIVAN MILL. COEUR D'ALENE DISTRICT

Only Partial Choke Feeding Employed

The matter of employing only partial choke feeding in fine crushing might properly have been considered also under (1) as it results from failing to keep the nuts tight on the rolls and the roll faces heavily pressed against one another. If water is introduced into the rolls with the ore it is evident that the speed of entry is increased whether an inadequate dewatering device is introduced into the spout or not, as the sheet of ore in the water is thinner to compensate for its greater velocity, and grains cannot lie abreast of one another at the crushing points. Argall has shown that the percentage of finished product decreases as the set of the rolls and size of ore fed to them is diminished. By finished product he means that portion of the ore which is undersize and will not be returned to the rolls. He also shows that by employing choke feeding the percentage of finished product may be largely increased. In many of the mills there are middling circuits without a vent; that is, the middlings from a group of jigs pass to rolls and back to the trommel line from which they came. Under this condition it is impossible to prevent the rate of feed at the rolls from going up by leaps and bounds if loosely set. The practice of making periodical sizing tests of the middlings before it enters and after it leaves the rolls is to be commended.

Rolls Often Situated in Inaccessible Places

The situation of rolls in dark, wet and not readily accessible places is another handicap to their operation. If the location be disagreeable the men delegated to look after the rolls will avoid it as much as possible, to the detriment of the work

being performed by the machines. If the rolls be located in an inaccessible position, necessary repair work will be avoided as much as possible. In many of the mills the first two sets of rolls are mounted on pedestals or framed supports above the floor in order to make the boot of the elevator accessible from the floor level; this arrangement naturally increases the difficulties attending dismantling and assembling the rolls when shells are being changed. The dollies are mounted on wooden beams, the tracks being made of strips of sheet iron. As the tracks are parallel to the long axis of the roll frames the suspended shell and shaft can only be moved in a fore and aft direction, and such a crude device can usually be moved only by using a bar under the dolly wheels. In raising a shell much time is lost in tying slings of chain or heavy rope and securing chain blocks. Chains and ropes are very treacherous for this kind of work, the best device being loops made of carefully spliced wire rope. On account of spoutings, elevators, etc., much freedom of movement with carriers cannot be obtained. Under the usual prevailing conditions the changing of a set of shells occupies from four to eight hours. Under best conditions it should not occupy more time than two hours. And without exception, the shutdown of one set of rolls means the stoppage of the entire mill. The ability to keep his mill running long periods is regarded as a cardinal virtue in a foreman.

The ideal way of installing rolls is to place the whole battery side by side on the same foundation line. No spouting, shafting or belting should intervene between them and the roof, nor should any devices such as elevators be placed between them. The bottom of the frames of the rolls should be set even with the floor and the space assigned to the rolls flooded with light. Ample space should be provided around each roll and in front of them. The rolls should be driven entirely from one side by a countershaft located beneath or behind the roll floor. The single-belt drive on two pulleys of the same diameter located on the same side of the roll is the best. A track should run the whole length of the roll floor and lead into the repair shop. Over the rolls and spanning the whole width of the roll floor should be a light crane of the type whose movements are controlled by chains reaching the floor below. In some large establishments the extreme practice prevails of unbolting a set of rolls out of repair at the foundation, removing it by a crane and substituting another in perfect repair.

All the usual methods of reducing corrugations and removing flanges are practised. Well cared for shells never flange, and, receiving feed under 8 mm. in size, corrugate to an inappreciable degree. The best way to remove corrugations is to put the shells in a lathe without removing them from the cores or hearts. Despite the foregoing criticisms the roll practice of this district is no worse than in a large number of mills all over the continent.

Movable Pillow Block Rolls Generally Used

The usual pattern of roll to be seen consists of a low heavy-base frame, two rigid pillow blocks and two movable pillow blocks sliding on the frame, nests of springs and master bolts, etc. The "pin-pointed lever" style of roll is to be seen in a few mills in the district, the Allis Reliance roll being used at the Last Chance mill. This latter type of roll, though, is no longer the fashion. Argall has claimed that they tend to develop end thrust, an argument the truth of which I cannot see, providing the axes of the shafts are parallel in all positions of the movable roll; and it is not obvious to me why this type of roll should lose its parallelism more readily than any other. In regard to wear at the pin points my experience has been that where the rolls were not kept clean the pins and lever were very quickly worn to an alarming degree, in some cases to such an amount that the levers had a very perceptible sidewise wabble while crushing. On the other hand, where the rolls were housed and kept scrupulously clean no trouble of this kind manifested itself.

The very best work that I have secured with rolls crushing wet ore was with a battery of Reliance rolls. An improvement on the usual design would be to provide the lever pins with removable bushings. The greater number of parts in the lever style of rolls makes a greater risk of bolts and other parts becoming loose under vibration. Working under the best conditions, however, they are far less liable to chokeups, as they yield more readily to sudden increases in the rate of feed than do the movable-pillow style of roll. Some makers of the pillow-block roll provide removable slides in the pillow block to receive the wear, but none, so far as I know, for the frame. This is on the principle that moving parts exposed to wear or abrasion cut faster than stationary parts which receive pressure from them. Nevertheless the frame does become seriously worn in time.

When the rolls of this type are new the movable pillow blocks slide on the frame readily enough, but in time grit becomes lodged between the contact surfaces, cutting them and opposing free motion. Unless frequently cleaned the movement of the pillow blocks becomes sluggish. If there be lost motion from wear and opposition to motion from grit and worn contact surfaces the movable pillow blocks first tend, when beginning to crush, to rise up about the lower rear edge, after which they begin to slide. Under this condition sliding contact and wear are greatest at the rear ends of the blocks. At one of the mills I saw movable pillow blocks which, owing to greater wear at the lower rear ends, had a slope of an inch to the foot. The wear had proceeded to the extent that the nut of the master spring rod was resting on the frame of the rolls. I regard the wear of the slides and the sluggishness of the movable pillow-block type as serious faults, but do not see how they can be overcome.

In the lever style of rolls the pin joint is not in a position so exposed to grit and that style of joint could be made grit-proof. Argall's movable roll was mounted on a U-shaped piece which rested on friction rollers at either side. In wet crushing, if this device were adopted, trouble would probably ensue from the flattening of the rollers chafed by grit. The advocates of the rigid roll would probably say that the way out of these difficulties would be to rigidly fix the boxes. Without going into the merits of that type of machine it need only be said that with fine crushing, at least, the advantage to be obtained from choke crushing by spring rolls is too great to be lightly put aside.

Special Lever Roll Would Be Adaptable for Wet Crushing

Under the conditions which have been outlined as existing, the movable pillow-block style of roll, another name for which is the straight-line roll, is preferable to the lever type and is more generally liked by the millmen. The straight-line roll is simpler in its construction, more free from vibration and hence the loosening of nuts, etc., and more free from racking sidewise movements than the lever type as displayed in the Reliance roll. But with this roll or a similar one as a basis I believe that a roll could be designed for wet crushing which would be superior to it under all conditions of service. In such a design ample bearings should be provided at the pin joints and the levers should be rigidly joined together to secure the advantages derived by Argall from his U-support, the maintenance of parallelism of the roll faces.

In the matter of bearings I prefer a single-piece box, and for wet crushing a liner or bearing bushing of bronze. In wet crushing hot boxes seldom occur, the evaporation of water on the faces of the roll parts and the convection of heat by the water flowing through them keeping the bearings sufficiently cool. The main thing to guard against is grit and in assisting to do this a one-piece bearing is better than a two-piece and bronze is more resistant than babbitt. A bronze bushing not only lasts longer but is very quickly replaced by a new one when worn out. For alining and securing the shafts in position nothing is better or more simple than plain collars. The collars on the Reliance roll had a projecting edge which encircled the ends of the boxes; this was a very excellent guard against the entry of grit, for whether the collars shifted their position somewhat or not, a protective layer of grease supported by the collar was always maintained.

The No. 1 rolls are always equipped with cast-iron shells obtained from local foundries. They cost 4.5c. per lb., laid down at Wallace. Midvale or Latrobe rolled shells, which are used for the other sets, cost 7.5c. per lb. at Wallace. Worn-out cast shells are sold for $16 to $20 per ton when mixed with soft scrap, the higher price being paid when there is a large proportion of soft cast iron. Mixed iron and steel scrap sells for $5 per ton.

Maintaining Highways over a Caved Mine

At the Chapin mine, Iron Mountain, Mich., where the caving system of mining is employed at a depth of about 1200 to 1400 ft., the surface of the ground has caved, forming a pit nearly one-half mile long, 800 to 900 ft. wide, and 100 to 130 ft. deep. It is necessary to maintain a street crossing, a foot path, two railway tracks, the St. Paul and the Northwestern, one 12-in. air pipe and a 28-in. sewer pipe. This sewer pipe carries away the water pumped from the mine, in addition to the sewage of the city. Records for a number of years show that the sinking of the ground along the Chicago & Northwestern track was quite uniform, averaging ⅝ in. per day, or 19 ft. per year when the caving system was first employed. It is now less than ¼ in. per day. This refers to the portion of the track shown in the accompanying photograph where the pipe and street crossing are maintained. No sudden movements of any importance have been noted.

The Chicago, Milwaukee & St. Paul railway was built into the city after the pit was formed, and it has been filling and lifting the track since 1898. This company only has an easement across the caved ground, and, of course, it has no claim against the mining company for damages. The St. Paul railway has a gravel train at work all the time to keep up the tracks over the mine.

The St. Paul crossing is at a place where the mine work is carried on more actively, and the settling is from 20 to 25 ft. per year, being much more than where the Northwestern track crosses. The fill is 128 ft. high while the slope distance on the side is 225 ft. In keeping up the track flat cars, loaded by steam shovel, are used for hauling gravel. They are dumped by means of a plow which is drawn by the locomotive. The cars are placed in the desired position and the brakes set. The plow is connected with the engine by means of a 1½ in. cable. All the dirt is delivered on one side of the car. Three tracks are kept up across the mine. The center one is the main line, the other two, one on either side, are usually from 2 to 5 ft. long and are simply used as a bench or shoulder from which to dump the dirt and thus maintain a wide embankment. As the track settles the ties are lifted on the outer track and the earth tamped underneath. When these are brought up to about the level of the main line, the work is then diverted and the main line lifted until it is in its true position. As the mine goes deeper and the ground settles, the base of the fill is ever widening and as a result the railroad gains but very little on the sinking.

The work of the Chicago & Northwestern railway is much simpler inasmuch as its right of way is near the street, as shown in the photograph, and the settling is less. This company has been maintaining its track here since 1897. The mining company, of course, has to keep up the street crossing, and in doing so maintains one side of the embankment for the Northwestern railway. The street crossing settles approximately 8 ft. per year, and this is kept up by a number of wagons filling in with all the waste dirt from the mine. The railroad brings in a few trainloads of earth intermittently as needed. In the fall, before winter sets in, additional wagons are put on to haul in sufficient material to bring the road up as nearly level as possible. The street, which is kept up as a public highway, is 50 ft. wide.

FILL AT CHAPIN MINE SHOWING NORTHWESTERN TRACK, WATER PIPES, FOOT PATH AND STREET

The pipe lines mentioned are side by side, being mounted upon pillars 20 ft. apart, and built of wooden blocks, as shown in the illustration. The pipes are on rollers to take care of the expansion and contraction. Between each of the large supports shown in the illustration there is a smaller one upon which a 2¾x24 in. jack screw is mounted. As the entire line settles these jacks are given a few turns until the pipe is brought to a level position, and then it is wedged in place on the main pillars. After the jacks have been extended their full length they are taken down and the foundation for them is built up and the jacks replaced. In this way both water and air lines have been maintained for a number of years without any serious accident. On top of the pipes a framework has been constructed which forms a foot path across the mine.

Chromite in Canada

There has been little variation in the output of chromite in Canada during the last four years. According to the figures given by the Department of Mines, the total shipments in 1908 were returned as 7225 tons valued at $82,008, made up of 3472 tons of concentrates, valued at $45,300, and 3753 tons of crude ore valued at $36,708. The shipments in 1907 were 7196 tons, valued at $72,901. The production in 1906 was larger than for either one of these years, being given as 9035 tons, valued at $91,859. Figures giving the imports of chromite into the United States from Canada, however, show that more chromite was produced than is shown by the Canadian returns.

The chromite is mined in the Eastern townships of Quebec, chiefly in the township of Coleraine at Little Lake St. Francis and Black Lake, by the Dominion Chrome Company and the Black Lake Chrome and Asbestos Company, both operating under one management.

There have been many attempts to solve the secret of perpetual motion. The nearest approach to that ideal—though its inventor makes no claim to have discovered it—is a timepiece devised by the Hon. R. J. Strutt, Lord Rayleigh's son, which consists of two leaves of aluminum, an exhausted glass tube, and a fraction of a grain of radium. The radioactivity of the radium causes the aluminum leaves to move once a minute, and with a wireless coherer a bell rings at each movement. For 10,000 years at least the wonderful energy inherent in the microscopic piece of radium will, it is calculated, continue to act, and nothing whatever needs to be done to the clock once it is set going.

The Ruble Hydraulic Elevator*

By J. McD. Porter.†

In many of the old placer-mining districts are still to be found large tracts of gold-bearing gravel not suitable to be worked with a dredge, because the bed is too shallow or the gulch too narrow. Frequently there is not enough grade to handle the gravel successfully by ground sluicing or a bedrock flume, or it contains too many boulders to be worked successfully with the ordinary pipe or tube hydraulic elevator.

FIG. 1. THE RUBLE HYDRAULIC ELEVATOR AS OPERATED WITH ONE GIANT

In southwestern Oregon, two practical placer miners named Ruble, after working for years trying to make money out of placer ground containing many large boulders, invented and patented a hydraulic elevator of an entirely new type, and one that has been found to work very successfully in flat ground and in gravel containing many large boulders. It is an extremely simple contrivance.

A few years ago I acquired the property near Pierce City, Idaho, known as the American placer mine. Various attempts had been made to work this ground. A bed-rock flume had been installed by one company, an Evans elevator by another, and still other methods were tried on a smaller scale. All were unsuccessful. I installed a Ruble elevator, and it has proved very satisfactory. Working under 100-ft. (pipe) head, the ground has been handled at a cost of a little less than 8c. per cu.yd. The conditions at the American mine are exceptionally hard, the boulders being large, heavy and numerous. Basalt boulders, up to a size of 32 in., have been elevated to a hight of 16 or 17 ft., with a 4-in. nozzle stream, under 100-ft. head. Boulders larger than this size are blasted.

Operation of Giants in Connection with Elevators

At the American mine, a foreman, two pipemen, and two laborers are required per day of 24 hours to operate the elevator, which is the 25-ft. size, having 25 ft. of grizzly 8 ft. wide. This elevator handles from 280 to 300 cu.yd. per day. In ground containing fewer and smaller boulders the capacity would be much greater and the cost of operation much less per day and per yard. At first I used two pipemen on each shift, one driving the gravel to the elevator, the other elevating it, each using a No. 2 giant with 4-in. nozzle. Later, I changed to No. 3 giants, using 5.5-in. nozzles, which enabled me to use all the water in one stream, dispensed with one pipeman on each shift, and materially reduced the cost of operation. I also found that I could handle about 25 per cent. more yardage in this manner than by dividing the water into two streams. Fig. 1 shows the operation of the elevator with one giant, the sluice discharging in the foreground; Fig. 2, the operation with one giant.

The elevator is so constructed that it is impossible to choke it. The elevator giant, or the giant that elevates the gravel is placed in line with, and about 50 ft. from, the elevator, which leaves room for the field giant to pile up gravel in front of the elevator. The water is then shut off from the field giant, turned into the elevator giant, and the gravel run through the elevator. While this is being done, the field giant may be moved and reset, if necessary. In deep, undrainable ground, a water lift is attached to the side of the elevator, to carry off all the water after using. The foreman and laborers can reset the giant while the pipeman keeps the water continually at work. The sluice boxes may be cleaned up in about 2 hours, while the water is being used in the field giant. The laborers break up the large boulders, cut and burn brush, move and set the giants, help move the elevator, and make themselves generally useful.

FIG. 2. THE RUBLE HYDRAULIC ELEVATOR WITH TWO GIANTS IN OPERATION

Construction of the Elevator

The Ruble elevator is a combination of grizzly, undercurrent, and elevator. It separates the fine gravel from the coarse rock and boulders while in transit up the elevator, and does it perfectly. The fine gravel, sand, and gold drop through the grizzly into an apartment underneath the grizzly, out of reach of the force of the hydraulic stream which is lifting the heavy rocks to the dump. The fine gravel, with its contents, is now acted upon by the water of the elevator giant, after it has lost its force, and with this water is delivered by means of an inclined, smooth floor under the grizzly to

*Paper read before the Spokane meeting of the American Institute of Mining Engineers, September, 1909.

†Mining engineer, Spokane, Wash.

the sluice, which is the gold-saving department of the elevator. The fine gravel and sand, after passing the sluice are delivered to a dump separate from the boulder dump. Operating with fine material only, the sluices are closely and finely riffled, and are much wider than the usual sluice used for coarse rock, thus furnishing a large gold-saving area in a short sluice.

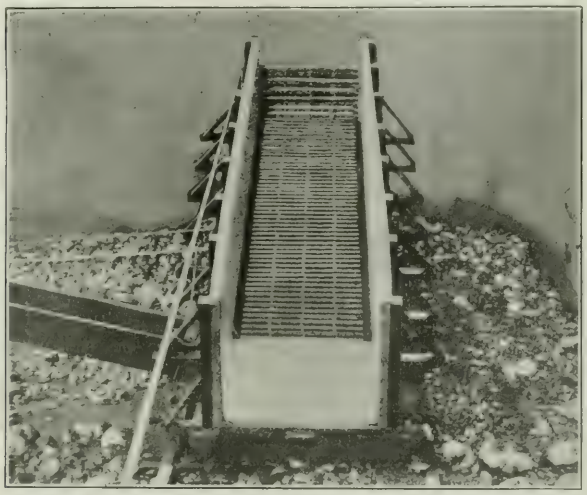


FIG. 3. GRIZZLY USED WITH THE RUBLE HYDRAULIC ELEVATOR

This appliance solves in an inexpensive and economical manner the difficult problems of inadequate dump, deep and undrainable ground, and the handling of heavy boulders and wash. It effects a close saving of gold and an economical use of water and time. Fig. 3 shows the interior appearance of the grizzly; also the sluice swung from its bearings with the apron of approach removed in order to move ahead.

The elevator rests on rollers, placed on skid poles on the bed rock, and is easily moved. When the gravel is washed from in front of the elevator and the space in the rear is filled with boulders and tailings, the bed rock is cleaned up, a horse is hitched to the elevator, and it is moved forward to a new position nearer the gravel bank, leaving room for a new boulder dump in the rear. When horses are not available, the elevator can be moved by hand with a capstan. At the American mine the elevator is moved three or four times each month. It requires from 1 to 1.5 days to move and reset it. The sluice boxes are usually cleaned up every second day. No time is lost in cleaning up, as the field giant is kept at work during that time.

Advantages of the Elevator

A few of the points of merit of this elevator are: (1) It handles larger rocks with less water, than other types of elevators. (2) It dispenses with the boulder crew, either at the mine, ground sluice, sluice box or dump, except in rare cases. (3) It saves the gold, and the gold-saving department may be protected by lock and key. (4) The gravel is picked up in close proximity to the giants, the gold immediately extracted, and the boulders and other waste material dropped back on bed rock previously worked off, instead of being transported a long distance to the dump. It makes its own dump. Fig. 4 shows boulder dumps left by the elevator.

FIG. 4. BOULDER DUMPS LEFT BY RUBLE HYDRAULIC ELEVATOR

Strange as it may seem at first thought, it is easier to elevate the gravel than it is to drive it along the level bed rock, as is shown when the water is divided into two equal streams, the field giant being unable to keep the elevator giant supplied with gravel. In driving the gravel along on the bed rock, the water has more or less downward pressure, causing more friction, while on the approach and the grizzly, owing to the inclined construction, it is lifting the gravel and boulders, causing less friction or dragging.

Ventilation of Subways

A suggestion has been made by Robert E. Booraem, a mining engineer of New York, whereby the ventilation of the subway system in that city may be improved. The idea is, in brief, to make a 5-in. opening throughout the curbing on each side of the street. The curbs will be made of iron, the flues being practically continuous for the length of the subway, except, of course, at street crossings. These flues connect with the upper corners of the tunnel. Surface water is caught in a suken gutter covered by grating.

In addition to the natural tendency of the heated subway air to rise, moving trains will push the foul air out ahead of them and suck in fresh air behind them automatically. Thus the escape of dust and foul air will be distributed evenly along the subway route, avoiding the unpleasantness to pedestrians caused by sudden puffs through the present sidewalk gratings.

Further, abundant ventilation and a little daylight will be afforded to the subway in case of accident causing the stoppage of trains; smoke from fires caused by short circuits can escape; and opportunity is given to flush out the subways occasionally by a hose from the surface.

The Uyuni district of Bolivia is exporting a good deal of argentiferous zinc ore.

The Magistral Copper District, Mexico

By P. A. Babb*

About 12 km. southwest of the town of Ameca, state of Jalisco, Mexico, and along the northern slopes of the range limiting to the south the rich and verdant Ameca valley, there is an interesting copper camp, the importance of which is but becoming appreciated. A quarter of a century and more ago this section was favored with some attention because of the shallow concentrations of native gold along the weathered outcrops which was easily removed with quicksilver in arrastras; but nothing of a formal nature developed from this work. Isolated patches would run from 6 to 20 grams per ton, but most of the outcrops would average nearer 2 grams, and at a few meters of depth the best ore would drop to this average. The camp was practically abandoned until a decade ago, when all but two of the present properties were free ground. Six years ago the present most important property was for sale at 2000 pesos, and today it has ore worth over $1,000,000 blocked out for smelting. Several properties denounced within the last six years are now under options for prices ranging from 25,000 to 125,000 pesos, though none are extensively developed.

Ameca is the terminal of a branch of the Mexican Central Railroad, and several American railroad men and prospectors made their headquarters there. The Magistral district was the nearest mineralized ground, and, as usual in such cases, everybody did "a bit of mining on the side." Several veins were denounced, and small crews of native miners started tunnels and prospect shafts. In this particular region the rains of the wet season are heavy and the result is that the denudation of the outcrops follows closely behind the advance of weathering in the veins; therefore, at a few meters of depth sulphides almost invariably appeared, often across widths of several meters between good walls. The experienced prospectors immediately realized that here was something that smacked of a real copper camp, and capital was approached for serious operations. The camp is now in that stage where the labor of the prospector is about to bear fruit; there is already one "mine" in operation, and several promising prospects are about to pass to incorporated concerns.

Veins Form Crests of Ridges

In the state of Jalisco, the Central Plateau of Mexico juts out through the western Sierra Madre, beginning along the Rio de Santiago and south embracing all that section about Ameca, extending to the west nearly to the Mascota district. The ancient land surface, presumably of the characteristic cretaceous sedimentaries of the Central Plateau, is for the most part concealed by recent lava flows, and only occasionally are limestone strata disclosed. The Ameca river in its valley-forming processes has worn its way through the lava capping and the underlying and vein-bearing eruptives, and disclosed the limestone. The slopes left behind the advancing and deepening river bed have been subjected not only to the rains from the north, but also to the wear of the drainage from the lava mesas to the south. The result was, the formation of deep and narrow arroyos along the upper slopes, widening into embryonic valleys with gentle slopes as the Ameca or main valley is entered. In the Magistral district the irregular degradation of the slopes has disclosed the veins which form the ridges due to their presenting more resistance to denudation than the country rock; while between them have formed the arroyos feeding into larger streams that cut across the veins and pass into the Ameca valley.

The veins form an east-west system, are fairly persistent along their strike and occur entirely within the eruptive rock. The particular rocks at Magistral seem to resemble more those of the western Sierra Madre than of the Central Plateau, and the thought comes easily to one that they may form sort of a connecting link between the sedimentaries of the latter and the igneous mass forming the former. The body of the eruptive is a greenish-colored hypersthene-andesite, but the most northerly vein is cut by a hornblende-granite and one of the veins to the south of the district forms altogether in this rock; all the others, however, thus far are limited to the andesite.

MAGISTRAL MINE, AMECA, JALISCO

SHAFT HOUSE, ZAPOTE MINE

Impoverishment Expected at Water Level

The veins, except where occasionally under remnants of the capping rock, outcrop strongly, and at properties such as Zapote and Magistral, where there is relatively little vegetation, present a splendid surface showing. The veins are fault-fissures; the principal or east-west veins are, so to speak, master-faults, while certain cross veins which branch from the east-west veins are perhaps from readjustment of local strains along weakened lines. The general dip of the principal veins is to the south. The walls as a rule are well defined and accompanied by a taley selvage. The gangue is the country rock itself; sometimes almost unaltered rock, again little-altered breccia, cemented by silica, or perhaps the entire rock altered and replaced by amorphous forms of silica. Interesting fracture zones are in places encountered, clearly showing their cause to have been from increase in bulk due to the altera-

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tion of hornblende or hypersthene to chloritic minerals.

The ore is chalcopyrite, clean above the water level, but accompanied by iron sulphides as depth is reached. It is strongly suggested that an impoverishment in the copper may be found as the workings eventually pass below the water level. An ounce of silver is ever present, and one or two grams of gold. The gangue is made up of silica, and silicates yielding about 1 per cent. lime, 2 to 3 per cent. iron and about 6 per cent. alumina.

Well defined oreshoots make up the workable bodies, varying in width from 2 to 15 m. of ore between good walls, while the length will average perhaps in the neighborhood of 60 m., although over 100 m. occur in several cases. There is a sort of compensation in the narrower veins in that the shoots are frequent and near together, while the rather limited work done in the larger bodies indicates that in these the shoots are much farther apart.

District Only Partly Developed

The only mine of the district is the Magistral, in which may be seen several splendid bodies of sulphide ore. This property claims, and it appears reasonable, to have over $1,000,000 in sight. The mine is being handled by experienced men and properly opened up. But a small part of the property has been explored.

The Magistral mine, operated by an American company, is ready for its reduction plant, and the management is now placing orders for a 150-ton reverberatory furnace, meanwhile conducting experiments to determine the equipment of a concentrating mill.

The Zapote, Almoloya and Los Timones are partly developed properties of considerable promise, and sufficiently developed to guarantee a future. The former is under option to American interests, the second to Mexico City operators and the third is being incorporated in the United States in preparation for working *en forma*. Other prospects with good ore, but in earlier stages of development, are the Cerritos, Ocotes, Palo Alto and Vetas Grandes.

The general grade of ore will not support shipment in its crude form to the custom-smelting centers nor in many cases to a smeltery erected in the immediate section, and concentration will be necessary before marketing. Fortunately, most of the ores thus far developed are amenable to this treatment. Water for concentration mills is not in abundance, but in reclaiming in settling tanks it is likely that no real obstacle will arise here. In the camp are many elements for cheap [illegible] [illegible] for the [illegible] [illegible] [illegible] [illegible] low [illegible] [illegible] [illegible] amount of water has yet been met in any of the properties. The ground is heavy and in main levels requires substantial timbering; on the other hand, timber is very cheap. The ore occurs in well defined shoots, can be mined in large tonnages and without sorting. The camp is today in its infancy, only a small proportion of the probable productive ground being under development.

Dredging in California

Special Correspondence

Notwithstanding the activities of the Anti-Débris Association against the California dredge-mining industry, it is not making so much headway in prejudicing the people against the dredges as its friends hoped. It may be recalled that some months since an anti-dredge convention was called at Sacramento, where it was expected that resolutions condemning gold dredging would be adopted on general principles. But it turned out that some people in that region thought the dredging was doing more good than harm. At any rate, a committee was appointed to look up the whole matter and report, not to the convention which appointed the committee, but to the California Débris Commission and the Anti-Debris Association.

After a somewhat exhaustive examination of the conditions existing on the American, Feather and Yuba rivers, at the mouths of which most of the dredging is being done, the committee has reported that no damage whatever is being done on the American and Yuba rivers. Several very large dredges are operating on the American river in the vicinity of Folsom and also on the Yuba about Marysville. On the American it is found that no damage whatever is being done. On the Yuba the dredgers are commended for their work because they not only keep the river in its course, but use the tailings as embankments for the impounding of old débris from former hydraulic-mining operations. Regarding conditions along the Feather river, which includes the Oroville dredging fields, the committee contends that some harm is being done and that the water level is being raised. This is due, however, to the operations of a few of the many dredging machines in that locality, most of them doing their work at such a distance from the river proper that no harm can possibly result. These few dredging companies can be readily brought to see that they are doing damage to the industry in which their [illegible] [illegible] and it is "up to" the other dredging companies to make them conform to [illegible] [illegible] on the subject. Otherwise they will [illegible] [illegible] [illegible] with the Anti-Débris Association.

It is quite gratifying for the people of California to know on the authority of such a committee as that referred to, that gold dredging may be carried on in important sections without any damage whatever being done to rivers or adjacent lands.

New Operation

The San Joaquin Power and Gold Mining Company has been organized at Fresno to work the channel of the San Joaquin river near Millerton between Fresno and Madera counties. It is proposed to tunnel a mountain above Millerton for 1½ miles and change the river course so as to bare the river bed for six miles around the mountain along the Horseshoe bend. J. G. Anderson, of Fresno, is the prime mover in the enterprise. About 27,000 ft. of river bed have been located in the Horseshoe bend and covering the river channel.

Two dredging companies are engaged in prospecting ground along the Merced river near Snelling, Merced county. The Yosemite Gold Dredging Company has two drilling outfits at work on the Dale ranch, and the Oro Light and Power Company has two at work between Merced Falls and Snelling. These companies have taken bonds on several ranches near the river and intend thoroughly prospecting them. Meantime the dredge of the Yosemite company continues steadily at work.

Tellurium

No use has yet been discovered for tellurium. It is classed as a metalloid and is supplied as a chemical curiosity in the form of a black powder and as a metallic-looking substance with a fine columnar crystal form, in color somewhat resembling tin. Some of the compounds of tellurium have an offensive, all-pervading, and ineradicable odor. Chemists who have been experimenting with tellurium say, according to the U. S. Geological Survey, that after three months' exposure to sun, wind and rain, the clothing worn by them while they were making these experiments, although it had not come into contact with the tellurium compound, was still so unpleasantly scented that it had to be destroyed.

Since the Mexican Southern has acquired the railroad to Taviche, Oaxaca, and is pushing the grading steadily toward that camp, it is evident that all ore shipments from Taviche and from mines between Taviche and Ocotlan will soon be carried over the new road. The Oaxaca & Ejutla Railway will, therefore, have to find some other freight or show a decreased tonnage. A concession for a railroad from Ejutla to the Pacific has been secured by C. A. Hamilton and associates who may use a route already surveyed.

The Care of Small Steam Boilers

What Should Be Done to Render Them Safe and Keep Them in Condition; Some of the Dangers Caused by Incompetency and Neglect

BY WARREN O. ROGERS

The most common kind of small boiler is known as the vertical fire-tube, and is built in two types, as shown in Figs. 1 and 2. It is practically a locomotive boiler set on end, and consists of a shell in which is placed an internal firebox. It also has two heads, into which are expanded the tubes through which the hot gases pass from the fire to the stack. As the furnace plates and tubes are entirely surrounded by water they cannot burn if kept free from mud and scale and a proper water level maintained. Fig. 1 shows what is termed a through- or dry-tube boiler; Fig. 2 illustrates a submerged type, which is preferable to the dry-tube design as there is less trouble from overheated top tube sheet and tube ends.

These boilers are suitable for use where floor space is restricted, for hoisting work, excavations and wherever a small amount of steam power is required. They are also a favorite, owing to their low first cost and simplicity of installation; being easily moved from place to place they are greatly used on construction work of various kinds. Such a boiler is not economical, however, in the use of fuel, because the hot gases have a short passage through the tubes, and also because there is a lack of good circulation of the water within the boiler, while the outside surface is exposed to the cooling effect of the air.

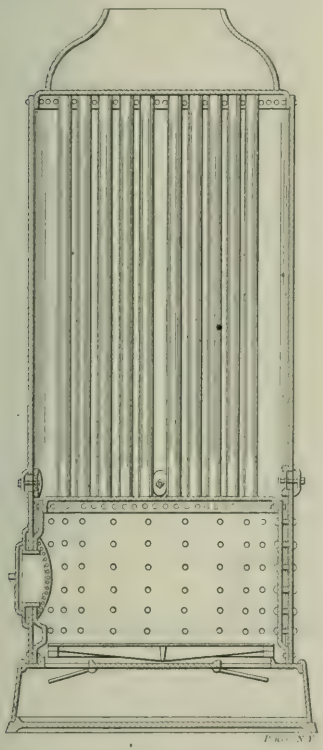

FIG. 1. A COMMON TYPE OF UPRIGHT BOILER

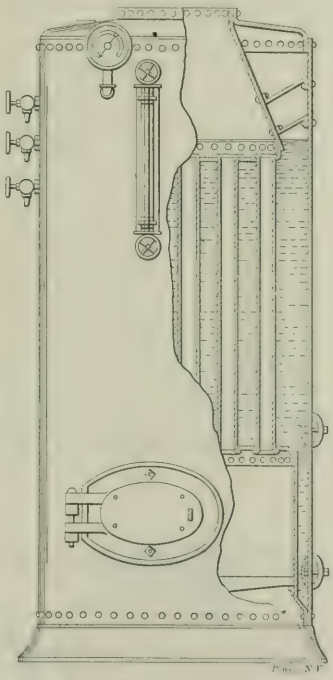

FIG. 2. SUBMERGED TYPE OF VERTICAL BOILER

By noting the construction of the boiler illustrated in Fig. 2, it will be evident that the matter of water level is important in order to keep the upper tube end protected from the flame. Low water is a common fault with the hoisting engineer, because his attention is concentrated on the management of the engine in hoisting and lowering its load and, becoming absorbed in the hoisting work, the boiler end is neglected.

In one instance recently, while passing an upright hoisting boiler, I failed to find any water showing in the water glass, although there was a good fire on the grate and a steam pressure of 80 lb. shown by the steam gage. In another instance the water level just showed at the bottom of the gage glass as it rose and fell in the act of ebullition. When the engineer's attention was called to the state of the water level he said he had "neglected it a little." Not only should the water show at the proper level, the second gage, but it should also be checked by means of the gage cocks by occasionally blowing them out during the day. This is something that is almost universally neglected in all types of boiler.

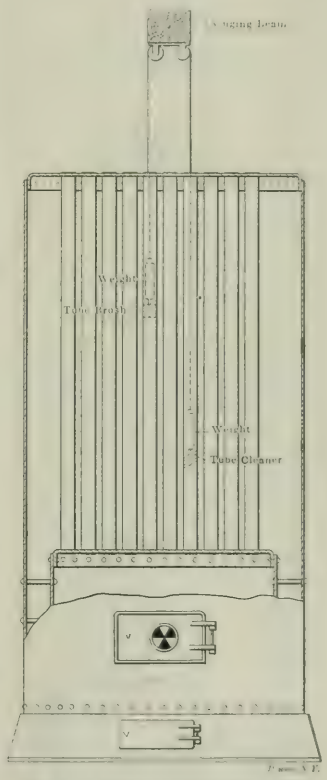

FIG. 3. METHOD OF CLEANING TUBES

One fault in boiler operation, altogether too common, is that of forcing a new fire in order to get up steam in a hurry. The results of such a procedure,

NOTE—Reprinted from *Power*, Nov. 16, 1909.

on a vertical boiler of the type shown in Fig. 1, is to cause a greater expansion of the inner portion of the boiler over that of the outer shell, which causes leakage of the tubes in the crown sheet. When this occurs the leakage soon forms a deposit on the interior of the tube

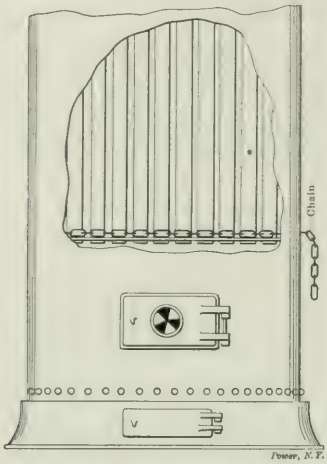

FIG. 4. CHAIN USED FOR REMOVING LOOSE SCALE

which not only reduces the heating surface but obstructs the draft. Naturally the ashpit must not be allowed to become filled with ashes, as the grate will warp and burn.

The steam gage also requires particular attention because it is subjected to abuse,

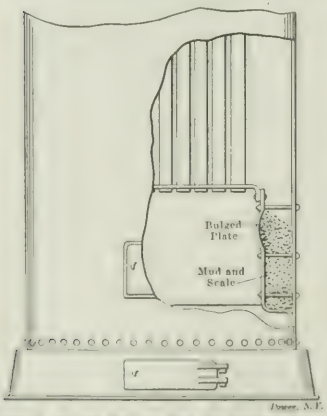

FIG. 5. PLATE BULGED DUE TO OVERHEATING

and the glass face soon becomes broken. When this happens the pointer or hand easily becomes bent and may thus register a false pressure. If the safety valve happens to stick the pressure becomes excessive, which is doubtless the cause of many explosions of this type of boiler. If a heating boiler is blown down once a day it is most preferable. Once a week would probably be more like the actual practice. As the feed water comes from almost any source it is evident that the blowing down at stated intervals is essential in order to clean out the mud and loose scale. At least once a day is absolutely necessary.

Another matter that should have the engineer's attention is that of the fusible plug. It should be examined at least every three months, and in cases of bad water, where scale is liable to accumulate rapidly, the plug should be examined every time the boiler is cooled down for cleaning, as scale is liable to form over the fusible metal and prevent the steam pressure from bursting through the scale after the heat has melted the fusible metal in the plug in case low water does occur. There is more danger from this occurring where the plug is placed in the crown sheet than when placed in any of the tubes, as is sometimes the case.

Owing to the fact that the pressure in the vertical boiler tends to force the inner and outer cylinders apart, staybolts are used to prevent such a happening. The method of placing these staybolts is shown in Fig. 1. These staybolts are usually placed 4 in. center to center and, therefore, each staybolt will withstand the pressure of a surface 4 in. square.

In upright boilers handholes are provided, there being three or four on a level with the crown sheet, or lower tube sheet, depending on the size of the boiler. There will also be one or more at the bottom of the mud space. These handholes are for the purpose of cleaning out scale and mud, and should be removed each time the boiler is cooled down for washing out. It is not sufficient to open the blowoff valve and allow the water to run out and then fill up the boiler and get up steam again. When cleaning a boiler all openings should be accessible, and suitable tools used to remove the scale from the crown sheet, such as a hose and nozzle, chain and tube cleaner.

If the boiler is placed in a temporary position a convenient method of cleaning the tubes can be arranged as shown in Fig. 4. This consists of a scraping chain or bracket having suitable pulleys attached, over which runs a rope to which weights are supported. To one weight a tube cleaner is attached and to the other a tube brush. As the tube cleaner is forced down through the tube, due to the weight, the other weight is drawn up, the brush sweeping the tube clean. This device is a labor-saver and can be arranged to operate with almost any type of vertical boiler, regardless of size.

The use of a chain for removing scale is shown in Fig. 4. A stiff wire, say a piece of telephone wire, is inserted through one of the handholes on a level with the crown sheet, and out either through the same hole or one next to it. The wire is attached to the chain and the chain is then pulled through the handhole and around out through the other opening. Then water is turned on through the hose and the chain worked back and forth, thus assisting the loose scale out of the handhole. Precaution should also be used in thoroughly washing out the lower parts of the boiler, as an accumulation of mud or scale will cause the plate forming the walls of the firebox to burn and bulge, as shown in Fig. 5. This will necessitate a large patch, which is undesirable, or a new plate.

Frequently a new or dirty boiler will prime, and a badly proportioned boiler will also cause the same trouble. This is most noticeable when the boiler is being worked up to full capacity. In the case of foaming or priming in a new boiler, which is due to oil used in the process of manufacture, the remedy is to blow down often, avoid forcing the boiler, use care in opening the throttle and keep the water level at the proper hight. Opening the fire doors for a few moments and closing the throttle will relieve a case of foaming, but will not remove the trouble.

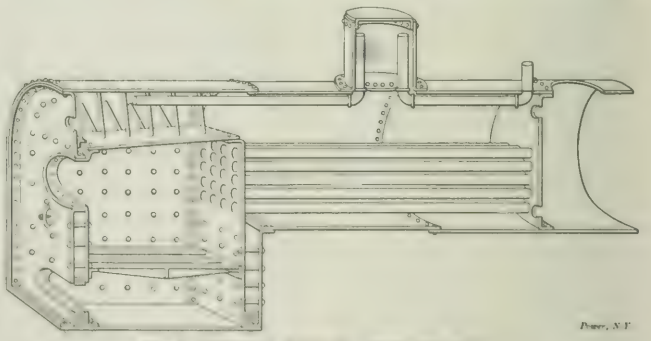

FIG. 6. SECTIONAL VIEW OF A PORTABLE BOILER

In Fig. 6 is shown a type of boiler frequently found where a portable steam generator is required. It is of the locomotive type and is usually mounted on wheels or skids. In this boiler the method of staying the front flat surface is

shown, and it is at once evident that more precaution against low water should be taken than in the case of the upright boiler, as the crown sheet is directly over the hot fire on the grate, and covered at best with only a few inches of water. It is also evident that scale and mud are to be avoided. If not, the crown sheet will become burnt and when the plate

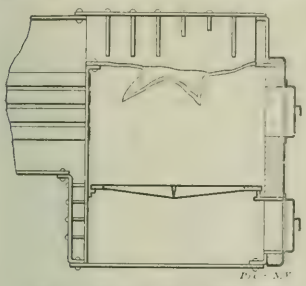

FIG. 7. FAILURE OF CROWN SHEET

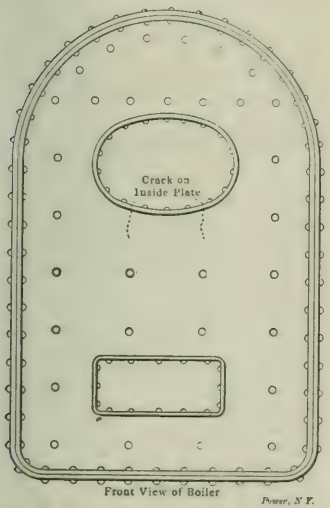

FIG. 8. SHOWING CRACKS ON INSIDE PLATE

has become weakened enough, the staybolts will pull out and an explosion occur with a result similar to that shown in Fig. 7, if no worse accident happens. Mud and scale should be washed out of the waterleg and the boiler thoroughly cleaned at stated intervals, depending on the condition of the water used.

The greatest trouble found with most upright and portable locomotive types of boiler is due to lack of care. Usually they are in charge of men who have no engineer's license and when the day's work is done, the fire is banked and the engineer forgets all about his boiler until it is time to get up steam in the morning. Naturally, the boiler does not get the attention in the matter of cleaning that it should, hence many are operated in a dangerous condition.

The old adage that a leaky boiler will not explode is strongly believed in if actual conditions as found are a criterion, especially where excavation work is being carried on. Numerous instances of leaky plates, joints, staybolts and rivets were seen on a recent visit to works where these two types of boiler were employed for hoisting purposes and supplying steam to drills, pumps, etc. In one instance the mud sheet was cracked on both sides of the fire door, as shown in Fig. 8, and a small-sized Niagara was streaming down the front of the boiler. In another case the same defect had developed and a repair had been tried by calking copper into the crack, but this questionable job did not hold and consequently the boiler was put out of commission.

How many of these boilers are operated day after day under such conditions is a query, but it would seem that a kind providence watches over men who unhesitatingly jeopardize their lives with unsafe boilers.

American Blast Furnace Progress

Referring to some recent records of blast-furnace production—including one of 918 tons of bessemer pig in one day by Edgar Thomson K furnace—James M. Swank says, in the *Bulletin* of the American Iron and Steel Association, that 32 years ago, in 1877, it was said boastfully in one of the publications of the association that "as late as 1850 the furnace that would make 50 tons of pig iron a week with any kind of fuel was doing good work; now there are many furnaces in Pennsylvania that make that much iron in a day, while a few make 75 tons a day as a regular product, and two—Isabella and Lucy furnaces at Pittsburg—have made over 100 tons a day for a week at a time." But the interest of our readers will be increased when they read what follows:

In 1881, four years after the above statement of good work by Pennsylvania furnaces was written, our report of the production of iron and steel in the United States in the census year 1880 appeared. In its pages, in a chapter devoted to some notable achievements of our iron and steel works, we gave the following details of the best work of our coke furnaces that had been recorded up to that time. These details indicate steady progress in blast-furnace practice from 1875 to 1881.

Isabella Furnace No. 1, at Etna, Penn., 75x18 ft., made 702 gross tons of pig iron in one week in 1875. Isabella Furnace No. 2, 75x20 ft., made 770 tons in one week in November, 1875, its best day's work in the same week was 116 tons. In one month in 1875 it made 3163 tons. No. 1, which had been widened to 20 ft., made 1130 tons in one week in 1881.

Centennial Furnace of the Cambria Iron Company, at Johnstown, 75x20 ft., made 578 tons of pig iron in one week in May, 1877.

No. 2 furnace of the Pennsylvania Steel Company, at Steelton, Penn., 75x20 ft., on fuel consisting of one-third anthracite and two-thirds coke, made 2916 gross tons of pig iron in November, 1878, 725 tons in one week, and 107 tons in one day.

In the week ending March 28, 1879, Lucy Furnace No. 1, at Pittsburg, 75x20 ft., made 857 gross tons of pig iron; in the seven days ending March 31, 1879, it made 945 tons; in the month of March it made 3684 tons, a daily average of 118 tons. On November 21, 1880, it made 202 tons in 24 hours.

One of Laughlin & Company's Eliza furnaces, at Pittsburg, 61x16 ft., made in one day in 1880, 130 gross tons of pig iron; in two consecutive days it made 253 tons.

On March 28, 1880, Furnace A of the Edgar Thomson Steel Company, 65x13 ft., made 113 gross tons of pig iron, with a consumption of 1965 lb. of coke per ton and with ores yielding 54.02 per cent. Furnace B, 80x20 ft., made 208 tons of pig iron on Nov. 22, 1880. Furnace C, 80x20 ft., made 224 tons of pig iron on April 28, 1881, the fuel consumption being at the rate of a ton of coke to a ton of pig iron. The best week's work of Furnace C in 1881 was 1357 tons and the best month's work was 5598 tons.

Neshannock Furnace, at New Castle, Penn., 60x16 ft., made 679 gross tons of pig iron in one week in December, 1881, its daily product being 82, 83, 91, 97, 104, 108, and 114 tons.

The furnace of the Low Moor Iron Company, at Low Moor, Va., 75x18 ft., made 110 tons of pig iron on Oct. 8, 1881, each ton weighing 2300 lb.; 703 tons in the week ending Oct. 8, 1881, and 2563 tons in September, 1881. The fuel used was coke made from New River coal.

Riverside Furnace of the Riverside Iron Works, at Wheeling, W. Va., 75x16½ ft., made 829 gross tons of pig iron in the week ending Nov. 6, 1881. The daily record was as follows, omitting fractions: 113, 115, 113, 121, 121, 121, and 122 tons.

No. 1 furnace of the Joliet Steel Company, at Joliet, Ill., 72x20 ft., made 126 gross tons of pig iron in one day in 1881; 788 tons in the week ending April 8, 1881, and 3276 tons in the month of April, 1881.

From the facts that have been presented it would appear that the first furnace in this country to make 100 tons of pig iron in a day was one of the Isabella furnaces, which feat was accomplished in 1875, as shown above.

United States Consul Will L. Lowrie reports that radium has been discovered by Dr. J. Knett, mineralogist of the Austrian government for the Carlsbad district, in the Carlsbad thermal springs. It is claimed by some scientists that the curative properties of the Bohemian thermal springs are due in a measure to the radioactivity of the water.

Design of Bits for Power Drills

By Edward K. Judd*

In the Journal of June 12, 1909, appeared the translation of a paper presented by de Gennes before the Société de l'Industrie Minérale on the selection and use of bits for power drills. That part of the paper which treats of the method of using bits and advocates a higher degree of intelligence in the sharpening and tempering of drills is exceedingly well grounded, and it is, perhaps, true that American mining men have been remiss in that phase of the question. Assuming that the translator has correctly interpreted the remarks made, however, several points appear on which American practice differs so radically from that attributed to French practice as to afford an excuse for the following remarks:

The three points that seem to invite discussion are stated by M. de Gennes substantially as follows: (1) The bit having a concave cutting edge (Fig. 3) is the one

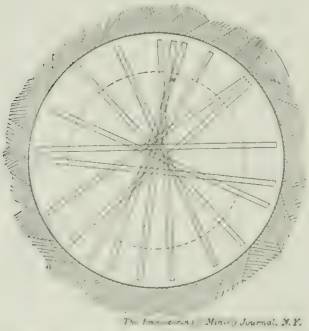

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Fig. 1. Impacts of chisel-edged bit

most commonly used. (2) With a convex edge, the corners have less work to do and the center of the bit gets most of the wear; this feature is still more pronounced in the case of a pointed bit. (3) While working in hard rock, a bit having acute edges can be used, at full stroke, without choking the hole with cuttings; to avoid this difficulty while working in a soft rock, a bit with obtuse cutting edges should be used.

American practice seems to condemn the concave edge as a source of weakness and confine bits of this type to service in coal or very soft rock only, such as shale. To cite examples, the edges of bits employed with coal moderatters of the puncher class have a pronounced concavity, and the cutting edges of jumper drills as used in coal and very soft rock are also concave. From every point of view it is apparent that the corners of a bit with a convex edge must do the larger part of the work of drilling, and in this shape the corners are the very parts that are least fitted to stand this; in a highly tempered drill they would be apt to crack off, and in a drill of softer temper they would quickly become blunt. M. de Gennes is quite right in attributing the more rapid wear on the corners of such a bit to the fact that the rock at the center of the hole is weakened by the impact of the corners, leaving less work to be performed by the center of the bit.

Convexity to Take Wear from Corners

When speaking of the convex-edged bit, however, his statement that the wear is concentrated at the center for the reason that the rock will not be weakened by advancing corners, but will be solid clear to the center of the hole, does not seem to be supported by either theory or observation. To arrive at the theoretical considerations in favor of giving drill bits a convex rather than a straight or a concave edge, let us suppose a straight, chisel-edged bit to be working in the bottom of a hole. As the drill is turned, it does not revolve on its geometrical axis, since the hole will, of course, be somewhat larger than the long dimension of the edge of the bit. The marks made by the successive impacts of the drill will, therefore, cross one another eccentrically, as illustrated in Fig. 1, in which, it might be explained, the area of the inner, dotted, circle is only one third the area of the hole.

The rock at the center is, therefore, weakened much more, per impact, than the rock at the margin, since the blows are distributed over a wider area toward the perimeter. The corners of the drill thereby get most of the wear. Furthermore, in hand drilling, and to some extent also in machine drilling, the bit rarely lies accurately in the axis of the hole when the blow is delivered. The difference between the diameter of the bit shank and of the hole is sufficient to permit the bit to stand at a considerable inclination with respect to the axis of the hole, as in Fig. 2. In this position, if the edge of the bit were concave or even straight, the corner or angle on the side toward which the bit is inclined would receive nearly the entire force of the blow, blunting it if the temper were soft and probably breaking it if the temper were hard.

Whether or not this theoretical reasoning is correct, the truth of the fact just stated, that the corners of a bit get more wear than the center, can be substantiated by a few moments inspection of the dull drills delivered to any mining blacksmith to be sharpened. What is true of the chisel-edged bit which has been the subject of discussion up to this point would seem to hold for a cross or star bit having straight edges. To equalize the work performed by a bit, therefore, nothing is easier than to throw a little added burden upon the central portion by making the edge convex (Fig. 4) so that its center will work in advance of the corners and thus loosen the rock somewhat for the latter. If this convexity be carried to excess, making a pointed bit, it is quite possible that the center might then have to do more than its share of the work, as explained by M. de Gennes on the ground that fragments break away successively from the periphery of the hole, leaving the point to perform all of the work for the next few blows. It is a part of the blacksmith's art, therefore, to adjust the curvature of the cutting edge so as to equalize the wear for rock of given character.

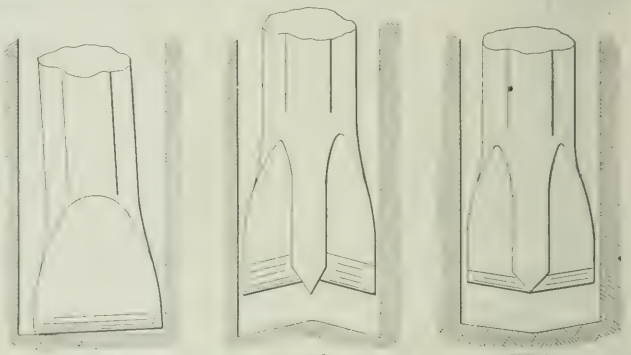

FIG. 2 FIG. 3 FIG. 4

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Chisel, concave and convex bits

Pulverizing Action in Hard Rock

In discussing the sharpness, or acuteness, of the cutting edge, M. de Gennes attaches most importance to the relative amounts of the cuttings produced by an acute and by an obtuse edge, his idea being that an acute edge, working in a soft rock, will yield more voluminous cuttings than can be discharged readily by the churning action of the drill. In American practice this consideration is altogether subordinate, the main effort being to adjust the acuteness of the cutting edge and its tempering to accord with the hardness of the rock. The drill is not expected to perform the functions of a sand pump and

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the excessive volume of cuttings from a soft rock are given extra space through which to escape past the point by reducing the thickness and the length of the wings of the bit. The result of driving a bit with acute edges at full stroke against a hard rock would be disastrous; if the steel were tempered hard enough to withstand the blunting effect, it would, in all probability, wear away by fracture.

It is useless to require a drill to do any actual cutting in a very hard rock; the action resembles more closely a pulverizing, as in a mortar, and for this purpose an obtuse angle is not only more efficient, but it also allows the bit to be formed in a more stocky, substantial manner.

The temper of a drill for use in a dense rock should be only of moderate hardness, so as to obviate splintering of the steel. For a soft rock the edge should be sharper, so that it can actually cut the rock, and its temper may be hard if desired. By then making the wings thin, more space may be left for the escape of the cuttings without detracting unduly from the required strength of the bit. In the absence of any accurate experimental data on the subject, the foregoing more or less theoretical remarks are presented in the hope that others may be tempted to bring forward any practical observations at their command.

Consolidated Goldfields Report

SPECIAL CORRESPONDENCE

The annual report of the Consolidated Goldfields of South Africa, Ltd., contains a survey of the condition and prospects of the mining industry of the Transvaal. The opinions expressed carry weight because they represent the views of those who have a large stake in the country and who have at their command expert advisers, political, commercial and financial, to report on every subject that affects the mining industry.

As a general survey of the mining situation in South Africa the report deserves great praise, but as a business statement of the company's affairs, it must receive unfavorable criticism.

The report embraces four separate reports: the report of the directors, summarizing the financial position of the company and describing the policy that is being pursued; a report by the joint managers in Johannesburg containing a large amount of statistical matter of general interest as well as information as to new legislation passed or proposed that has a bearing on the mines; a report by the superintending engineer dealing more especially with the working results and prospects of the company's mining interests; and a report by the consulting engineer in Rhodesia as to the interests of the company in that country.

NATIVE LABOR SUPPLY

With regard to the directors' report, the paragraphs which attract most attention are those dealing with the native-labor supply, because during the last few months a shortage has been experienced, due partly to the repatriation of the Chinese and partly to a decrease in the number of natives recruited. The report says that the existing supply is inadequate to the increased demand caused by the expansion of the mining industry and states that special efforts are being made to remedy the deficiency. The hope is also expressed that the Act of Union which will come into force next year will facilitate a satisfactory solution of the unskilled-labor question by insuring uniformity of policy. While a warning note is sounded as regards labor, it is satisfactory to find that no serious crisis is anticipated in the near future by the officials of the company, an opinion which agrees with the views recently expressed by the Prime Minister, General Botha, who, on sailing for South Africa, said that he did not view the labor question with the least apprehension, and expressed the opinion that the supplies of native labor in South Africa were by no means exhausted. In this connection attention may be drawn to the satisfactory manner in which the shortage of labor is being met by increased efficiency in the natives. On the Simmer & Jack mine, for example, the average number of natives employed during the last financial year was 12 per cent. less than were employed during the previous year, although the tonnage milled was increased by about 6 per cent. These results are encouraging and must help to allay the fears of those who anticipate a labor famine.

AMORTIZATION

Another important matter, of interest to all South African mine shareholders, and referred to in the directors' report, is the question of redeeming capital. Although mines are wasting assets it is not customary for the individual mines to make provision in their accounts for the redemption of property account. Shareholders are supposed to create their own sinking funds out of the dividends that they receive. The directors of the Goldfields propose to meet this point by appropriating a certain sum out of profits for writing down the value of their investments in the crushing mines. This year the sum of £500,000 is appropriated in this way. No information is given as to how this amount is arrived at. It would be interesting to know what life the directors give to their dividend-paying mines and this information would be of especial value to the shareholders of the respective mines and would enable them to adopt the same cautious policy of making provision for redemption of capital.

The capital thus set free is [illegible] vested in new undertakings in [illegible] vaal, Rhodesia, West Africa and Siberia. It is noticeable that the company is apparently not investing [illegible] but is turning its attention [illegible] Rhodesia, West Africa and Siberia. With regard to Rhodesia the company's interests are described at some length by the consulting engineer, but with regard to West Africa and Siberia very meager information is given. It is known that the company has embarked on a considerable scale in West Africa and it is surprising that no detailed information is given as to the amount of money invested, as to the capital of the concerns invested in or as to their prospects. The company's balance sheet and profit and loss account are drawn up in the most condensed manner and no detailed information is given regarding the earnings on the expenditure, nor is there any list of investments.

The operations of the year have allowed of a dividend of 7s. per ordinary share being paid, a result which the shareholders will probably consider satisfactory. However, what they may fairly consider unsatisfactory is the noncommunicative character of the report and accounts as regards detail. The investments of the company in West Africa and Siberia are dismissed in a few lines of the directors' report. There are no engineers' reports about these investments and no figures as regards expenditure. The lack of frankness regarding these important investments as well as the whole of the investments of the company is to be deprecated considering the standing of the Consolidated Goldfields of South Africa, capitalized today at about fourteen millions sterling. The directors owe to their shareholders not merely a general survey of the company's holdings but a detailed statement drawn up on business lines showing how, where and on whose advice the shareholders' money is invested. The report as it stands is of far too general a character and would not be tolerated by the shareholders of any important commercial company.

There are indications that the working of the ocean beach black-sand mines along the California coast will be undertaken again this winter. A number of beach claims have been located recently along the San Andreas beach below Aptos in the curve of Monterey bay, and farther south, especially near Point Sal, some beach mines are again to be operated. These beach mines or black-sand mines as they are generally called, will pay during one winter and then for three or four years seem to be almost barren. After a few years, however, it is said that they will again pay, the waves having meantime concentrated the material sufficiently to leave gold enough for profitable working. The beaches, however, cannot be worked steadily.

Discussion of Explosives in Coal Mines

The Experimenting Being Done Is Leading to the Production of an Explosive That Will Not Flame and Yet Will Not Shatter the Coal

BY FRANK F. MORRIS*

In view of the large amount of time and attention being devoted by experts, engineers, inspectors and operators to the subject of explosives for use in coal mines it should be of interest to those not personally in touch with the subject to become familiar with the distinguishing physical properties of the present day so-called "safety" explosive and particularly how it differs from black blasting powder which has been so long popular for use in coal mines.

There are a great many formulas being employed for "safety" or "flameless" powders but for the purposes of this article a powder has been selected which is made according to a formula popular among powder manufacturers and it has been chosen because it is probably as generally used as any "safety" explosive on the market today.

The black powder tested was a 3F powder of the type which has been in use in coal mines for years.

Chemical analyses of the two powders gave results as follows:

BLACK POWDER.

Sodium nitrate	71 08 per cent
Sulphur	11 37 per cent
Moisture	32 per cent
Charcoal	17 23 per cent
	100 00 per cent

SAFETY POWDER

Moisture	5 30 per cent.
Nitroglycerin	28 43 per cent
Sodium nitrate	31 51 per cent
Carbonates	trace
Starch	20 71 per cent
Wood pulp	14 05 per cent
	100 00 per cent

The physical tests were made by the use of special apparatus adapted to the purpose, which has been installed at the Allegheny Arsenal at Pittsburg, Penn., by the Government. This apparatus represents the most approved and modern methods of testing powder either at home or abroad. The best ideas of the various foreign testing stations have been put into practice, thus affording exceptional opportunities for a study of the subject under consideration. In this connection I desire to thank the officials in charge of the testing station for the free use of the apparatus out of working hours.

The physical tests made were in order to determine the following characteristics of the powders:

1. To determine the disruptive power.
2. To determine the merits of each powder when fired in the presence of gas or coal dust or both coal dust and gas.
3. To determine the heat developed upon detonation or the calorific value of the explosive.
4. To determine the rate of detonation.
5. To determine the quickness of the powder unconfined.
6. To determine the length and duration of the flame given off from a stemmed shot and also from an unstemmed shot.

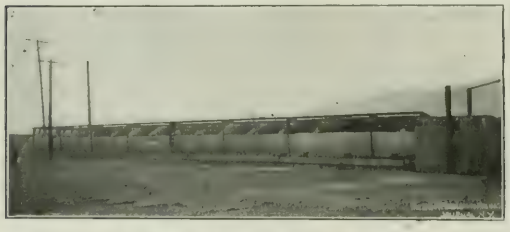

FIG. 1. THE NO. 1 EXPERIMENTAL GALLERY AFTER AN EXPLOSION OF GAS

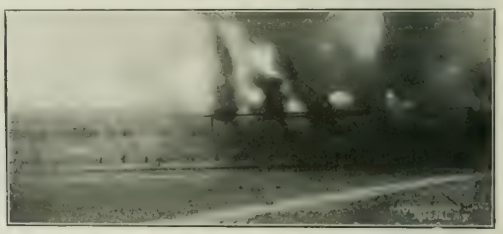

FIG. 2. THE NO. 1 EXPERIMENTAL GALLERY AFTER AN EXPLOSION OF DUST

TESTS ON DISRUPTIVE POWER

The disruptive power of the explosive was tested by three methods, namely; "the ballistic pendulum," "the Trauzl lead blocks" and "the Hichel pressure gages."

The ballistic pendulum method is the one adopted by the English testing station as the standard for determining the unit disruptive force of explosives. The pendulum at the Pittsburg testing station consists of a mortar weighing 31,600 lb. suspended freely on concrete pedestals.

In front of the mortar and placed on a track parallel with its direction of swing is a small cannon mounted on a truck. This cannon when assembled is 36 in. long and 24 in. outer diameter, having a smooth borehole [illegible] in. deep and [illegible] in. diameter, centrally placed and extending longitudinally into the tube. In this the charge is placed and special methods used for obtaining standard conditions of tamping. After charging, the truck is rolled up until the face of the cannon is 1/16 inch from the muzzle of the mortar. It should be noted that the apparatus is so erected that the center lines of boreholes of the cannon and of the mortar are coincident.

The charge is electrically fired, the expansion of the gases producing a measureable swing of the mortar. This swing is determined by a recording device at the back of the mortar which may be read to 1/100 inch.

A charge of ½ lb. of 40 per cent. nitroglycerin dynamite is used as a standard for tests with the ballistic pendulum. The average of the results of a number of tests shows that such a charge produces a swing of 3.01 in. The problem then is to find what weight of charge of the unknown explosive is necessary to produce an equivalent swing of the mortar.

In charging the "safety" explosive it was tamped firmly with 1 lb. of dry fire clay. The black powder was tamped with 2 lb. of dry fire clay and hammered hard. Three tests were made with each powder and an average obtained, care being exercised that similar conditions were obtained in all tests. The results were as follows:

AVERAGE SWING BY RECORDING DEVICE.

With 300 grams of "safety" explosive	2 99 in.
With 375 grams of black powder	3 02 in

WEIGHT OF EQUIVALENT IN DISRUPTIVE POWER TO ONE HALF POUND OF STANDARD

"Safety" explosive	302 grams
Black powder	374 grams.

From these results it is apparent that [illegible] grams ([illegible] lb.) of the standard [illegible] per cent. dynamite is equivalent in

*[illegible]

disruptive power to 302 grams of the "safety" explosive and to 374 grams of the black powder. These results determine the weight of charge used (unit disruptive charge) in ascertaining their relative merits in the presence of gas and dust.

Another method of determining the disruptive force of explosives is the Trauzl lead block. It is the standard method adopted by the Fifth International Congress of Applied Chemistry and is used at the Belgium testing station as the official means for determining the disruptive force of explosives.

The lead blocks used were cylindrical, 200 mm. in diameter by 200 mm. high. Each had, previous to being used, a central cavity 25 mm. in diameter and 125 mm. deep. In this the charge was placed.

The charges of the "safety" explosive were made up as follows: Three charges of 10 grams each were accurately weighed and placed in small tinfoil cartridges, a detonator containing 1½ grams of fulminate of mercury and chlorate of potash placed in the middle of the charge, the charge packed firmly and uniformly about the detonator and finally the tinfoil crimped over the top leaving the fuse wires extending out from the charge.

In like manner one charge of the black powder was made. These small cartridges were placed at the bottom of the boreholes of the several lead blocks used and carefully and uniformly tamped with 50 c.c. of dry sand. The cavities were measured before and after the explosion, the average enlargement produced by the three shots of the "safety" explosive being 169 c.c., while that by the black powder was only 19 c.c. An average of several shots of the standard 40 per cent. dynamite shows an enlargement of the borehole of 300 cubic centimeters.

It will be noted that the results obtained with the lead blocks are not comparative with those obtained by the pendulum. The gases formed in the case of the lead-block test with black powder have time to escape through the line of least resistance or the borehole before the point of maximum temperature and pressure is reached, whereas the contrary is true in the case of a rapidly detonating explosive like dynamite. The lead-block method of testing for disruptive power is therefore not reliable for comparing powders of different classes because of the introduction of the variable element, rate of detonation.

It should be observed that in the ballistic pendulum the pressure measured is that developed through the borehole, while in the lead blocks the contrary is true, the measurement being of the forces developed in all directions except through the borehole. If the gases formed in combustion are not developed quickly enough to exert pressure on the walls of the cavity before the pressure in the direction of the borehole is released, these gases will follow out through this line of least resistance and their strength be lost.

A Third Method for Determining the Disruptive Power

The third method used for determining the disruptive power of the explosives under investigation was by means of the Bichel pressure gages. These are two heavy cast-steel cylinders constructed with a view to withstand the very heavy pressures developed by explosives when detonated while confined.

By this method the products of combustion are retained and may be removed for subsequent analysis. The cylinders have capacities of 15 and 20 liters respectively. The smaller one is 80 cm. long and 50 cm. in diameter. The second one is of the same diameter but longer. These cylinders, which lay on their sides, are anchor bolted firmly into concrete pedestals. They are provided with strong steel caps which are bolted firmly into place against heavy lead washers, making an air-tight joint. A stout cross bar hooked and bolted over the cap further reinforces the joint. The gages are equipped with an exhaust pump by means of which a vacuum of 10 mm. of mercury column may be obtained; also a recording device for measuring the pressure developed.

By charging density, as referred to the use of explosives, is meant the ratio between the volume of the charge used and the volume of the chamber in which the explosive is detonated. In order to obtain the pressure developed in its own volume by any explosive it is necessary to know this charging density.

But it has furthermore been found that in the case of the Bichel gages, the superficial area of the inside of the cylinder exerts an immediate cooling effect on the gases so that the full pressure which could otherwise be obtained is prevented by this cooling surface. It is for this reason that the second gage was adopted. Whenever this gage is used, steel cylinders are placed in the chamber. These are of a size such that the volume of the chamber is always kept constant while increasing the superficial area. The volume of the chamber in all tests is 15 liters, the cooling surface being increased or decreased by the blocks used. By plotting the pressures against the cooling surfaces a curve is obtained which, if continued, intersects the line of pressures at zero surface area, thus determining the true pressures developed.

A series of calibrations were also made on the recording device. By these it was found that a movement of 0.56 of a mm. of the indicator-spring pencil showed a pressure per 1 kg. per sq.cm. developed against the walls of the chamber. A charge of 100 grams was used of the "safety" explosive and 200 grams of the black powder.

Results were obtained with three surface areas in the powders tested. Calibrations gave these areas as follows:

	Inside Surface Area.
With the small gage (capacity 15 liters)	3914 sq.cm.
With the large gage (capacity 20 liters with one large cylinder reducing capacity to 15 liters)	6555 sq.cm.
With the large gage (with three small cylinders reducing capacity to 15 liters)	7624 sq.cm.

To obtain the pressure developed in its own volume the pressure free from surface influence has but to be applied to the charging density. The results were as follows:

PRESSURE DEVELOPED.

	"Safety" Explosive	Black Powder
Density of powder	.98	1.25
Pressure developed eliminating surface influence (kg per sq.cm.)	40.95	51.38
Pressure developed in own volume (kg. per sq.cm.)	6019.65	4816.9

Testing Gallery

Gas and dust gallery No. 1 consists essentially of a large steel cylinder horizontally placed; so made that gas may be introduced and retained for a short time; an exhauster and connections for stirring the gas and air mixture; suitable means for observing the action of flame along the length of the gallery; a cannon set at one end of the gallery and backstop barricades and other means of protecting property from the violence of explosions.

The gallery is 100 ft. long, 6 ft. 4 in. internal diameter, consisting of 15 sections of boiler-plate steel riveted together in in-and-out courses, centers on rivet lines being 6 ft. 8 in. The first three sections nearest the cannon are of ½ in. boiler plate.

The end of the gallery heads into a large reinforced concrete block in which is set the cannon. The axial line of the borehole of the cannon is coincident with the center line of the gallery and the face of the cannon is flush with the inner wall of the concrete head. The cannon used is of identical construction with the one used on the ballistic pendulum.

Along the top of the gallery at the center of each section is a circular release pressure door. In use these may be closed and fastened, closed and unfastened or left open. On the outer side of each section is a window made of ¾-in. plate glass, 6x6 in., used for observing flame at points along the gallery. At each rivet line on the inside of the gallery is a flange provided with studs. On these may be fastened semi-circular washers by wedges, thus providing a means of hanging paper diaphragms at different sections in the gallery. Diaphragms may also be placed on the doorways on top and held in place with heavy rings.

The gas feed is made from a 2-in line connected with the mains of Pittsburg, thus offering a natural gas of similar

analysis is that found in the mines. A valve is placed in the line at every third section of the gallery providing a means for running the gas into the gallery at any or all of these divisions. The gas is run into the gallery over a very accurate test meter reading 1/20 cu.ft. and is fed into the gallery through a pipe extending 14 ft. along the bottom of the gallery and perforated as well, so that an equal flow of gas is maintained per unit length of the pipe.

The circulating system for mixing the gas with the air consists of a small exhauster connected in a 6-in. pipe line along the back of the gallery. The exhauster is cut off from the gallery by valves when not in use in order to prevent its destruction from an explosion. A second exhauster with connections is set on a truck and may be connected at any point in the gallery.

A series of four shelves on each side of the gallery running its entire length provides a means of distributing dust and is an approximation to mine conditions where dust is deposited along the ribs of the entries. Another means of introducing dust is made by placing a stout wooden "horse" in front of the cannon. This "horse" is 20 ft. long, the top is 12 in. wide and about 2 in. below the bottom of the barricade when set. In use, dust is spread along this board.

The lower end of the gallery is guarded by a barricade and backstop. The shot is fired electrically from a protected position about 50 ft. from the gallery.

Tests in Presence of Gas or Dust or Both

The tests made were according to certain standard tests as adopted by the Government testing station in determining the safety of explosives. The conditions of these tests are described as follows:

"The charge of explosive to be fired in test Nos. 1 and 2 shall be equal in disruptive power to [illegible] lb. of nitroglycerin dynamite in its original wrapper of the following formula:

Nitroglycerin	10 per cent
Nitrate of sodium	44 per cent
Wood pulp	15 per cent
Calcium carbonate	1 per cent
	100 per cent

"Each shot shall be fired with an electric fuse of sufficient power to completely detonate or explode the charge as recommended by the manufacturer. The explosive must be in such condition that the chemical and physical tests do not show any unfavorable results. The explosives in which the charge used is less than 100 grams, will be weighed in tinfoil without the original wrapper.

"The dust used in tests Nos. 2, 3, 4 and 5, will be of the same degree of fineness and taken from one mine.

"*Test No.* 1—Ten shots with the charge as described above, in the original wrapper, shall be fired, each with 1 lb. of fire-clay tamping, at a gallery temperature of 77 deg. F. into a mixture of gas and air containing 8 per cent. of methane and ethane. An explosive will pass this test if all 10 shots fail to ignite the mixture.

"*Test No.* 2—Ten shots with charge as previously noted in its original wrapper, shall be fired each with 1 lb. of fire-clay tamping at a gallery temperature of 77 deg. F. into a mixture of gas and air containing 4 per cent. of methane and ethane and 20 lb. of coal dust, 18 lb. of which is to be placed on shelves laterally arranged along the first 20 ft. of the gallery and 2 lb. to be placed near the inlet of the mixing system in such a manner that all or part of it will become suspended in the first division of the gallery. An explosive will pass this test if all 10 shots fail to ignite the mixture.

"*Test No.* 3—Ten shots with charge as previously noted, in its original wrapper, shall be fired, each with 1 lb. of clay tamping at a gallery temperature of 77 deg. F. into 40 lb. of coal dust, 20 lb. of which is to be distributed uniformly on a "horse" placed in front of the cannon and 20 lb. placed on side shelves in sections 4, 5 and 6. An explosive will pass this test if all ten shots fail to ignite the mixture.

"*Test No.* 4—A limit charge will be determined within 25 grams by firing charges in their original wrappers unstemmed at a gallery temperature of 77 deg. F. into a mixture of gas and air containing 4 per cent. of methane and ethane and 20 lb. of bituminous coal dust, to be arranged in the same manner as in test No. 2. The limit charge is to be repeated 5 times under the same conditions before being established.

"*Test No.* 5—A limit charge will be determined under the same conditions as in test No. 4, except that 2 per cent. of methane and ethane will be used instead of 4 per cent." The two explosives under examination were subjected to the above tests and all confirmatory tests made. Following is a brief summary of results:

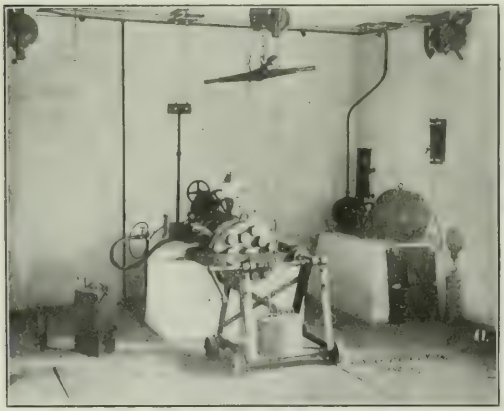

FIG. 3. SHOWING TESTING APPARATUS IN THE GOVERNMENT STATION AT PITTSBURG

FIG. 4. ANOTHER CORNER OF THE PITTSBURG TESTING LABORATORY

Tests with the Safety Explosive

Test No. 1—"Safety" explosive failed to ignite gas mixture on any of the 10 shots fired. Black powder ignited gas mixture. Flame came from doorways 1 to 7 inclusive and was visible in windows 1 to 9.

Test No. 2—"Safety" explosive failed to ignite gas and dust mixture on any of the 10 shots fired. Black powder ignited gas and dust mixture. Flame came from doorways 1 to 9 inclusive and was visible in windows 1 to 13.

Test No. 3—"Safety" explosive failed to ignite dust on any of the 10 shots fired. Black powder ignited dust. Flame

came out of all doorways and was visible in all windows extending 10 ft. out from the end of the gallery. Charred dust was found along the floor of the gallery.

Tests Nos. 4 and 5—Because of the failure to pass the first three tests it was deemed useless to subject the black powder to further tests where it would be fired unstemmed. The "safety" explosive passed tests Nos. 4 and 5 with a charge of 1000 grams (2.2 lb.) this being the largest charge used for these tests.

Heat Developed on Detonation

Two tests were made with each powder by the calorimeter to determine the amount of heat disengaged by the explosion.

The *explosives calorimeter* consists essentially of the following parts; the calorimeter bomb, the inner receiver or immersion vessel with tub, a thermometer reading to small fractions of a degree, and a hooking frame.

The bomb is bottle shaped of ¼-in. wrought steel and has a capacity of 30 liters. The charge is hung by the detonator wires from the connection through an insulated plug to an exhaust valve. The top of the bomb is covered by two caps which may be made tight by a screw plug and heavy lead washers. The bomb is 30 in. high, weighs 158 lb. and is handled to and from the immersion vessel by a small crane.

The inner receiver is a cylindrical sheet copper, nickel-plated tub, 30⅞ in. deep and 17⅞ in. inner diameter. In this is placed the water in which the bomb is immersed during a test.

The other tub provides an enclosure for the working parts of the apparatus. The stirring device consists of a series of rings with a horizontal bearing surface. It is operated by a ¼-horsepower motor. The thermometer used extends through a one-holed rubber stopper set in the cover. It registers to thousandths of a degree.

The customary methods for calorimetric determinations were employed. A series of thermometer readings before and after firing of the charge made it possible to make any corrections necessary for the influence of the air on the rise in temperature. Previous calibrations gave the water equivalent of immersed parts and the calorimetric value of the detonator. These corrections being applied, the averages of the results of two tests on each explosive were as follows:

Average large calories developed by one kg. of "safety" explosive	722.13
Average large calories developed by one kg. of black powder	788.53

A charge of 100 grams of the "safety" explosive and 200 grams of black powder was used for the tests.

Rate of Detonation and Rate of Burning

Tests were made to determine the speed with which the explosive wave travels through the charge. For this purpose a device known as Mettagang's recorder is considered the most accurate of all test methods known. The principle of the device is electrical throughout. Two circuits, obtaining their current from 12 dry cells connected in series, are connected through induction coils to two very delicate needle points set about ¼ mm. from the surface of a soot-covered drum. One pole of the secondary coil is connected to the bearings of the drum. The circuits are passed through separate ends of a cartridge file containing the explosive to be tested, the connections being made just 1 m. apart. A separate set of wires connect the detonator, which is placed in one end of the cartridge, to the firing battery. When the explosive wave breaks the circuits, sparking is caused at the needle point, which makes a small dot on the periphery of the drum. When the drum is revolving rapidly the difference of time between the sparking of the two points is determined by measuring the distance between the dots. A very accurate vibration tachometer is direct connected to the shaft of the drum and indicates the number of revolutions per second of the drum from 50 to 150.

Measurements are made of the distance between specks by means of an eye piece equipped with cross hairs, and a sealed disk with pointer connected to a worm gear which may be meshed with teeth on one side of the drum provided for the purpose. These are so made that one revolution of the pointer will advance the periphery of the drum one milimeter.

A reading may be obtained with accuracy to 0.01 mm. The drum may be driven 100 revolutions per second. The periphery of the drum is ½ m., so that a peripheral speed of 50 m. per second may be obtained. This gives the possibility of obtaining a reading of one-five millionth of a second. The highest speed which the device has been called upon to record at the United States testing station is 22 one hundred thousandths of a second, which is equivalent, approximately, to a velocity of the explosive wave of three miles per second.

The charge of the "safety" explosive used was prepared by cutting off the ends of six cartridges and placing them end to end in a tube, thus making a continuous cartridge about 42 in. long. This cartridge was hung in a covered pit which had been equipped for the purpose in a protected location.

In the case of the black-powder test a steel tube was used open at one end only. Connections were made similarly to those of the "safety" explosive. In this case the fuse was inserted in the open end of the tube and in order to retain it in position it was held in place by a seal of plaster of paris.

The average of two tests on the "safety" explosive showed the rate of detonation to be 3470 m. per sec. One test on the black powder indicated its rate of burning to be 312 m. per second.

Quickness of Explosives

In order to determine the quickness of explosives, that is, the relative time intervals in which the gases are completely formed, it was found convenient to fire the charges unconfined. To obtain a measure of the pressure developed in one direction, a small lead block was used. These blocks are 2½ in. long and 1½ in. in diameter.

One hundred grams of the explosive are placed on top of the block in a paper cartridge which has been previously pasted to the block, care being taken that the density of the explosive is the same as in the original cartridge. In order to prevent a shattering of the lead upon firing, a small steel disk ¼ in. thick and of like diameter with the block is placed in the tube before the charge.

The block when thus tested suffers a deformation due to the pressure developed by the charge, the amount of which depends upon the quickness with which the gaseous products of combustion are developed. In slower explosives the gases have time to escape in other directions of less resistance than that offered by the block while in the case of explosives of rapid detonation, these gases are formed so quickly that the effect is more or less felt by the block.

Three tests were made with the "safety" explosive but only one with the black powder. This was sufficient to show that the gases would never gain enough force to compress the block under these conditions. The powder merely burned slowly.

The average compression caused by the "safety" explosive was 13.08 mm. After the black-powder test no difference in the hight of the block could be detected.

Length and Duration of Flame

Tests were made of the explosives under examination to determine the length of flame and the interval of time during which it was in existence with the charge confined and unconfined.

A cannon, like the one described in the ballistic-pendulum test, is placed on end at the base of a steel cylinder 43 in. in diameter and 20 ft. high. A slit is cut in one side of the cylinder, the bottom of the slit being a trifle lower than the top of the cannon. Connecting the cylinder with an adjacent building is a light-tight steel conduit which also incloses the slit. This conduit is horizontal on the bottom and sloping on the top from 8 ft. 3 in. at the cylinder to 21 in. at the building. The slit is 2 in. wide and 8 ft. long.

At the point where the conduit intersects the building, is located a photographic dark room. The line of sight is arranged to pass through the conduit and slit and center line of the bore of the cannon. The film is fastened to a drum which, when set in position in the box, is geared to a motor and may be driven at a peripheral speed of 20 m. per second and controlled by a tachometer. In front

of the drum and but a fraction of a centimeter from it is a stenopaic slit 3 in. long and 1/16 in. wide, thus allowing only the smallest fraction in width of light to penetrate to the film.

The charge is placed in the cannon, the top of the cylinder is covered with black paper, the drum, with the film tightly fastened on, is started and when the proper speed is indicated by the tachometer, the shutter is opened and the shot fired.

When developed, the negative shows in the case of detonating explosives unstemmed, a light streak at an angle with the vertical. The angle is caused by the speed with which the drum is being driven at the time the picture is taken and is a measure of the time during which the flame was in existence. The hight of the light streak is a measurement of the hight of the flame.

It has been determined by calibration that 19 mm. on the negative is equivalent to a hight of flame of one foot. Knowing the peripheral speed of the drum it is necessary only to apply it to the lateral displacement of the flame image to determine the duration of the flame.

Three shots were made with the "safety" powder stemmed with 1 lb. of dry fire clay and three were made unstemmed. One shot only was made with the black powder unstemmed and one stemmed. The result of the unstemmed black powder was so marked that it was thought unnecessary for the purposes of this article to confirm it. The stemmed shot of black powder gave indications of flame but the picture was not sharply enough defined to obtain a measurement of it. However, by referring to the picture it can be seen that there is nearly as much flame as with the "safety" powder shots unstemmed. No flame was shown by the stemmed shots of the "safety" powder.

The following are the calculated results of the flame tests:

SAFETY POWDER

	Stemmed.	Unstemmed
Calculated hight of flame (inches) . . .	No record	10¾
Calculated duration of flame (seconds) . .		0.0003

BLACK POWDER

	Stemmed	Unstemmed
Calculated hight of flame (inches)	See text	30
Calculated duration of flame (seconds)	See text.	0.93

SUMMARY AND CONCLUSIONS

As explained at the beginning, the two explosives under examination are employed for the same purposes in coal mines and can, therefore, be placed in comparison judging them from the same standpoint.

The element of cost may be mentioned briefly and in a general way. The many features of the type of "safety" explosive used at the preceding tests claim that if used properly and not wastefully, the cost of shooting down coal ton for ton will not exceed that incurred by the use of black powder and in some cases has been known to cost less. The latter is probably the exception rather than the rule and it is generally considered that in ordinary use, the coal operator will pay a little extra for the "safety" explosive for the benefit of the element of protection it affords to his employees and property.

Such conclusions as are here drawn, however, will be based entirely upon a comparison of the explosives according to their physical properties, without consideration to the element of cost.

The ballistic pendulum combines the conditions necessary for determining the coal-getting qualities in better proportion than any other of the tests made. The coal-getting qualities of a powder depend upon two things, viz: its disruptive power and rate of detonation. For example, an explosive such as pure nitroglycerin has the property of developing high pressures, as can be shown by detonating it in a vacuum as in the Bichel pressure gages but if a charge of nitroglycerin were used in a borehole to shoot coal, a large proportion of the energy would be wasted in shattering the coal in the immediate surroundings of the charge and very little used in throwing the body of the coal down. On the contrary, should a charge of an explosive with a minimum rate of detonation be used, even though it might show high pressures on the Bichel gage, the tendency when charged in a borehole in a coal mine would be too strongly toward developing its pressure along the line of least resistance, which might be the borehole, depending upon the angle with the horizontal which the borehole made, the amount of tamping used or other conditions of boring or tamping. Such a condition would both destroy the value of the shot and introduce a large element of danger.

It is necessary, then, to have an explosive combine the elements of disruptive power and rate of detonation in the proper proportions in order to obtain the best coal-getting qualities. The ballistic pendulum has been found by practice to determine this better than any other known testing apparatus.

Referring to these tests it will be noted that a charge of 302 grams of the "safety" explosive will do work equivalent to 375 grams of the black powder. This identifies it as a "stronger" powder; that is, a unit weight will accomplish more work. In shooting coal it would probably shatter more than the black powder because its strength is confined to a smaller volume, the gravity of the two explosives being almost identical. (See gravities given under records of Bichel gage tests).

FIG. 5. THE BALLISTIC PENDULUM FOR TESTING EXPLOSIVES AT THE PITTSBURG ARSENAL

The results on the Trauzl lead blocks are of value only in showing the marked difference in rate of detonation of the two explosives. Whereas the gases were formed quickly enough to cause an enlargement of 169 c.c. in the case of the "safety" explosive, scarcely any perceptible effect was shown by the black powder, the gases escaping through the line of least resistance, viz: the borehole.

The Bichel gages give results which are due wholly to the pressures developed. This is the most accurate means for determining the disruptive power of explosives which was used in the foregoing tests and in fact is considered the best

known method for obtaining the pressure developed by explosives in their own volume.

Up to this point the relative merits of the powders have been confined to considerations of their ability to do work. The tests in gas and dust gallery No. 1 show their respective merits of safety. The weights used in the charges on these tests are well within the limits of the average amount used per shot in coal mines. It will also be observed that the black powder was confined with 2 lb. of dry fire-clay tamping instead of 1 lb. as in the case of the "safety" powder. This afforded a safer condition for the black powder to be fired under. The conditions under which the charges were ignited were as nearly as possible an approach to actual mine conditions as could be obtained above ground.

Test No. 1 used 8 per cent. gas which is near to the most explosive mixture of gas and air that can be obtained. The pressures developed by the ignition of this mixture by the black powder were very high. Such a condition in a mine is made possible by a rapid feeder or even a slow feeder where there is insuffiient ventilation to remove the gas as it is formed.

Test No. 2 used 4 per cent. gas with 20 lb. of dust. Two pounds are partially in suspension at the time the shot is fired. The actual weight of dust suspended in the gallery at the time of the shot is a very small fraction of the 2 lb., but is sufficient to cause a dense cloud similar to that caused by the current of air created at the rear of a rapidly moving trip of cars along an insufficiently sprinkled entry.

Coal Dust Will Explode without the Presence of Gas

Test No. 3 used coal dust without gas. Ignitions under these conditions controvert the belief that existed among mine men up to a recent date that coal dust unaccompanied by gas would not ignite. Such results as have been obtained at the United States testing station at Pittsburg, however, have conclusively shown that the dust itself when acted upon by flame of sufficient intensity or duration will either become ignited with explosive rapidity or will distil gases which will, as soon as formed, create an explosive mixture.

Tests 4 and 5 impose very strenuous conditions upon the powder used. Unstemmed as the charge is, there is nothing in the way to prevent any flame that may be formed from acting upon the gas and dust present in the gallery.

The results of these tests are apparent. The "safety" explosive passed all conditions imposed upon it while the black powder failed in every particular. Although no results were obtained with the black powder without tamping, it is safe to assume that a very low weight would ignite the gas, for, as was observed in the flame test, a large amount of flame is emitted from a very small charge.

The results of the calorimetric determinations are very interesting and favorable to the "safety" powder. To avoid heat and flame are the two main objects in obtaining safety in explosives. Black powder develops a comparatively small amount of heat when fired but a great deal of flame. The contrary is true of a well balanced nitroglycerin dynamite. The nitroglycerin "safety" powder used develops not much more than half the heat produced by the same weight of a 40 per cent. dynamite. This is caused by changing the formula in such a manner as to form CO instead of CO_2 when the powder is detonated and also by the mechanical introduction of moisture. In this way, the heat developed by the "safety" powder is less than that caused by the ignition of an equal amount of the black powder.

The results of the rate of detonation test show one reason for the popularity of the black powder among mine operators who find a market for lump coal. The explosive wave travels over 11 times as fast in the "safety" powder as in the black powder. By reason of this property, black powder "heaves" the coal and produces a minimum of slack. The "safety" powder, on the contrary, owing to its property of more rapid detonation might tend to produce a higher percentage of slack than black powder.

The results of the rate of detonation test are confirmed by the results of the small lead blocks in determining the relative quickness of the explosives.

Photographs of the flame test largely explain the results of the gallery tests. No flame could be detected by the camera when the tamped charge of "safety" powder was fired, and when untamped it was apparently quick enough to prevent an ignition of the gas or dust when tested in the gallery. On the contrary, the black powder shows flame whether tamped or untamped and in the latter case it was of long duration.

Safety Explosives Approved

Briefly, then, the "safety" powder is in a measure, properly so-called. It meets the requirements of mine conditions and gives protection to the miners even though they may be obliged to work under dangerous conditions. On the contrary it meets the objections of the operators because of the lowering in value of their product, and the objections of many of the old school of miners because of the ease of handling the black powder, necessity of thawing the nitroglycerin explosive and kindred arguments brought about by long familiarity with the black-powder type of explosive.

It is claimed by the promoters of "safety" explosives in general that an intelligent use of their product will cause no more slack than with the black powder and this has been demonstrated by use in anthracite and harder grades of bituminous coal. It is still open to question what can be done in the softer bituminous coals. Probably if the proper charge could be used to prevent increasing the slack, it would cause a larger amount of pick work to be done by the miner. An attempt has been made to overcome this difficulty by making an explosive lower in percentage of nitroglycerin.

It is safe to assume, however, that the day of the "safety" explosive is here. There are many opportunities for improvement of the present form and these improvements are gradually being brought about by persistent research work. When these minor objections to the present-day "safety" explosive are met, minor because the money that is lost by destruction of a small per cent. of coal is nothing when compared to the enormous loss of life and property in the colliery disasters, when these objections are met and a full realization of just how large a share the use of black powder has had in causing these disasters, the "safety" explosive will take the lead and black powder for use in coal mines will be a thing of the past.

The Free Entry of Miners Rescue Appliances

In a letter to the collector of customs, at Chicago, Ill., the Secretary of the Treasury says: "Sir: Paragraph 628 of the tariff act of August 5, 1909, provides for the free entry of 'miners' rescue appliances, designed for emergency use in mines where artificial breathing is necessary in the presence of poisonous gases, to aid in the saving of human life, and miners' safety lamps.'

"As the obvious purpose of this paragraph is to aid in the saving of human life, the same should be given the most liberal interpretation. You are, therefore, instructed to admit to free entry all miners' rescue appliances and parts thereof, such as helmets, special tubing of valves, special oxygen cylinders, refilling oxygen pumps, and all other essential parts of the complete outfit, whether imported as entireties or in separate parts.

"Under the provision for miners' safety lamps, you should admit to free entry miners' safety lamps, whether electric, or designed for using oils or other illuminating materials, with or without glass chimneys, and whether imported as an entirety or in separate parts, together with any apparatus for locking or unlocking such safety lamps, for testing or detecting flaws in these lamps, or for cleaning them of dust particles, etc."

Coal Mine Accidents and Their Prevention

By J. A. Holmes*

Our coal industry in its phenomenal growth has nearly doubled during each succeeding decade of the past 60 years. It has had to do more than keep pace with our increasing population, for while it supplied less than 1 ton of coal per capita to the American people in 1880, it has had to supply nearly 6 tons per capita during 1908. Its growth has been too rapid for systematic development, and the industry today represents a great host of scattered, warring, discouraged elements, without organization or coöperation.

In this industry are now employed some 600,000 miners, who work at some 6000 different mines, and produce yearly about 500,000,00 tons of coal.

Not only is the nation increasingly dependent upon this coal for its heat, light and power for its manufacturing industries and transportation facilities, but this coal and other mineral products now contribute in tonnage more than 65 per cent. of the total freight traffic of the country.

The economic conditions upon which coal mining is based in this country are fundamentally bad; and the evil consequences are so far-reaching as to both time and extent, and are so essentially national in character that this subject demands the earnest consideration of our best statesmen, as well as of our best engineers.

1. In spite of this rapid growth in our demand for coal, the normal productive capacity of our coal mines under continuous operation greatly exceeds this demand.

2. Ruinous competition exists not only between the operators in the same field, but between the operators of one field as against those in another field, or in another State, where different mining laws and regulations exist.

3. This competition is first of all driving out of the business the small operators except where they find protection under local freight rates; and is forcing even the larger operator to mine coal under conditions which he cannot approve, but from which he finds no escape. If he and his fellow-operators [illegible] "[illegible]" and place the price of coal at the mine on a reasonable basis, they go to jail under either a Federal or a State statute, and as the only alternative left to them they are compelled to conduct their affairs, which [illegible] wasteful and [illegible] mining methods.

[illegible] Address delivered before the National Conservation Congress at New York, November [illegible]

* Chief of Bureau, Technologic Branch, United States Geological Survey.

4. Even when the demand for coal and the prices are at their best, under existing conditions, the operator can mine only that part of his coal which can be taken out most cheaply and sold at higher prices; and the remainder must be left underground in such shape as may preclude its future recovery. And thus we waste yearly more than 250,000,000 tons of the nation's fuel supply.

5. The American mine owner is as humane as is the mine owner of any other country, and he would like to follow every practice and use every appliance for safety to be found in Britain, or France, or Beglium, or Germany, or elsewhere; but he pays his miners higher wages, and at the same time receives for his coal at the mine less than half the price received for similar mined coal by the operator in these countries; and he must employ miners, an increasingly large percentage of whom come to him unfamiliar either with the practice of the industry or with the language or traditions of the country.

6. And the penalty which *the nation* is paying for this bad system, is this increasing waste of resources and the still more unpardonable increasing waste of human life—the yearly loss of 250,000,000 tons of coal, and the killing or injuring yearly of from 8000 to 10,000 men.

What Are the Remedies for This Bad Situation?

The remedies for the evil are:

(a) Investigations, such as are now being conducted by the Government, as to the causes of mine explosions; and other similar investigations as to the causes of mine accidents of other kinds, and as to methods of prevention.

(b) Educational work among the miners and the lower active mine officials as to these causes and remedies.

(c) The training of men at each mine as to the best methods of using explosives, using electricity, handling of gases and dust, of timbering, of preventing and extinguishing mine fires; as to the methods of rescue work, and as to the methods of first-aid-to-the-injured work.

(d) The development of better and more uniform mining laws, rules and regulations, based upon accurate data and experience.

(e) Active, determined cooperation between the miners and the mine management and the State's inspectors in the enforcement of these laws and regulations with a view to the maintenance of the safest possible conditions in every mine.

The above [illegible] of the program for bettering our industrial conditions are well [illegible] but they do not complete the program. It is an essential part of this program that

(f) The [illegible] competitive system upon which our industry in the United States is based at the present time should be changed, and that the price paid for coal at the mine should be such as will permit and secure safe and efficient mining—mining unaccompanied by either this large loss of life or waste of resources—mining which can have due regard to not only the safety, but also to the health and the comfort of the men who toil underground and whose labor is so essential to the welfare of the nation. All this can be done without adding appreciably to the burden of the average American citizen; without any increase in the price of coal at the poor man's cottage, and without the risk of any unreasonable restraint of trade.

There can be no permanent industry without reasonable profits. It is unjust and irrational that in this great and essential branch of industry, reasonable profits should be dependent upon any unnecessary sacrifice of human life, and unnecessary waste of resources which we can neither replace nor restore and which will be essential to the future development of the country.

This industry needs and deserves fair treatment at the hands of the American people, and upon the receipt of such treatment depends in no small degree not only the welfare of the operators—though nobody cares about them—but also the welfare of the 600,000 miners who risk their lives in supplying the fuel for the nation's industries, and the heat and light for the nation's comfort and convenience.

In the case of Washoe Copper Company against Junilla *et al.*, involving a conflict between placer and quartz locations on the same ground the Montana district court has rendered a decision against the mining company and in favor of the quartz claimants. The ground comprises a large tract in the southern part of Butte, and was located many years ago under the name of the Jones placer. Some years after the placer location, one Colbert made a quartz location of the same ground. The placer claim was then patented, and the Washoe Copper Company in the course of time became the owner. The quartz claimants started to work the ground last year and were enjoined by the Washoe Copper Company. The finding of the court is to the effect that at the time the placer claimants applied for a patent they knew of the existence of a quartz vein within the property, and, applying the law which prevails under such conditions, the court decreed that the quartz claimants were entitled to 25 ft. on either side of the vein, which lies within the placer claim.

The American Iron and Steel Manufacturing Company, Lebanon, Penn., announced that it will install a plant for the production of 30,000 to 50,000 tons of steel billets per annum in an electric furnace. The will be consumed entirely in the rolling mills of the company.

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The "Guggenheim" Coppers

According to the last annual report of the Guggenheim Exploration Company its investment in Utah Copper Company was $4,788,468; in Nevada Consolidated, $1,671,589; in Nevada Northern bonds, $1,650,000; in Cumberland-Ely, $912,808. The Nevada Northern bonds were convertible into Nevada Consolidated stock at $5 and have lately been so converted. We may estimate roughly that the Exploration company owned 240,000 out of the 733,000 shares (issued) of Utah Copper and 320,000 out of the 1,600,000 shares of Nevada Consolidated (previous to the recent increase). The Guggenheim interests are commonly credited with a larger ownership in Nevada Consolidated than is indicated above and doubtless have important holdings individually or through other companies. For its Cumberland-Ely holdings, as to which it is difficult to guess, the Exploration Company probably received a considerable part of the 400,000 shares of new stock. These companies are commonly known as the "Guggenheim" coppers. The Guggenheims have possessed the undivided management of Nevada Consolidated and Cumberland-Ely. Utah has been in the hands of the McNeill-Jackling-Penrose interests, but the Guggenheims have been influential.

It is now proposed to consolidate these companies, absorb Boston Consolidated, and later buy the Garfield smeltery and Baltimore refinery of the American Smelters Securities Company, so as to make a powerful copper producing combination, of which the capital is to be $150,000,000. Evidently this is a result of the check to the larger plan. Its purposes may be surmised. The introduction of sufficient water at this time may make it easier to combine with the Cole & Ryan and Amalgamated interests later on, when a further dilution will not attract so much attention, distribution may be inaugurated, and in the meanwhile curtailment of production may be effected by tacit understanding. Why else should there be a Guggenheim consolidation? Boston Consolidated is useful to Utah Copper Company, but why should Nevada Consolidated go into any combination, unless it be to sell out to a handsome profit? The real interest in this project will develop when the matter of valuation is published.

It is gossiped that 2½ or 2¾ shares of Boston and 2 or 2½ shares of Nevada will be rated as equal to one share of Utah. This corresponds roughly to present quotations in the market, wherein at least two of these stocks are being over valued. Such a basis would appear to be a good exchange for Boston, which seems to be badly needed by Utah and is taking advantage of its opportunity, but it looks as if Nevada Consolidated, which has the best physical conditions and equipment of the three, and to many minds the best mines also, would come out of the small end of the horn. The valuation of these properties is an extremely difficult job and we should not lightly criticize what has doubtless involved many engineering conferences unless it be known that expert opinion has been put aside because of trading necessities. Outside stockholders of Nevada Consolidated will doubtless resist any absorption that is not upon an absolutely fair basis. Anyway it is a pity to see such a successful, substantial and self-contained company lose its identity in a consolidation.

Tularosa Copper Company

The Tularosa Copper Company is capitalized for 1,000,000 shares, of which 500,000 are pooled until sufficient funds have been raised to build a mill of 300 tons daily capacity, and 500,000 shares are in the treasury. Sale of 50,000 shares of the latter stock at $1.25 is now being promoted by Irving K. Farrington & Co. Although we cannot agree to some of the statements of this firm respecting Tularosa, we are bound to say that the enterprise is presented with commendable frankness in so far as the company itself is concerned, there being among other things a report by H. Vincent Wallace, a reputable engineer, of Nogales, which appears to be correct as to facts, but to the ignorant this frankness requires some interpretation.

According to Mr. Wallace's development work [illegible] 18×6×5×45 ft., and [illegible] proving [illegible]

per, or 1.49 per cent. per ton of ore milled. Loss in tailings was 1 per cent., indicating a copper tenor of 2.49 per cent. in the original ore. When, however, Mr. Wallace proceeds to estimate that with a plant treating 100 tons of ore daily there is going to be an extraction of 86 per cent. of the copper in the ore at a cost of $1 per ton for mining and milling and a cost per pound of refined copper of 8.4c., which may be reduced to 7.4c., we fear that he is rather too optimistic. The Ray Consolidated engineers estimate that in milling 4000 tons per day of about the same grade of ore the copper cost will be 9c. per lb., but few outside engineers expect that to be realized, although in the case of Miami, milling 2000 tons daily of a higher grade of ore, that figure will probably be attained. The Tularosa orebody appears to lie near the surface and may be able to yield copper at 7.4@8.4c., if big enough to be mined by steam shovel, which is not yet known.

The plan for Tularosa contemplates erection of a 100-ton mill as the first unit of a 300-ton plant. For a 300-ton mill there is at present less than one year's ore supply developed. Anyway, it is scarcely wise to undertake to exploit commercially an ore deposit of 2½ per cent. grade on so small a scale as 300 tons daily, and hopes for speedy dividends on the basis at present outlined are likely to be disappointed. The Tularosa, according to the report of Mr. Wallace, appears to be a prospect that is not yet ripe for extraction of ore. Instead of proceeding to erect a mill the company should become acquainted with its orebody, first by drilling, then by underground developments. We are informed by the company that drilling is now being done. The enterprise should be presented to the public as a prospect, not as a mine, and distinctly it should not be made a subject of inflation on the Curb market. Nor should the promoters interested in selling the treasury stock say that "the net value of the present ore reserves represent an amount equivalent to over $3 per share on its entire issued capitalization," and indicate that with the mill in operation the stock will advance to at least $[illegible] per share. Insofar as the company itself is concerned its plans and operations appear to be straightforward in the prosecution of a [illegible] [illegible] [illegible] [illegible] [illegible].

The Copper Statistics for November

The figures for November were about what was expected. Deliveries under the large sales of that month were not to get into full swing until December. As recorded for November, the deliveries, both domestic and foreign, were about the same as in October. Production mensually decreased, but November had only 30 days, and really there was a repetition of the same old story—an increasing production—the daily rate having been 4,053,846 lb. against 4,021,216 in the previous month. That there has not yet been any amelioration of the unfavorable statistical position is shown by the total of 389,861,127 lb. as the visible supply in Europe and America on Dec. 1, compared to 376,076,026 at the beginning of November. The great increase in American consumption dates from May or June, but since mid-year the world's accumulation has increased 85,000,000 pounds.

Those who anticipate a rosy improvement in the showing for Jan. 1 are likely to be disappointed. The visible supply in America will probably be less, but that of Europe will be more. Such diminution as there may be will be chiefly the conversion of visible into invisible supply. The shutdown of Montana smelters will not affect the refinery output for December.

It seems now to be recognized that no great improvement in the statistical position of copper is to be expected right away unless there be a curtailment of production. The projected consolidation having been deferred there is talk of a curtailment by tacit agreement among some of the large producers. So we live in hope. But the chief question of interest is: Who is going to curtail?

Safety Chambers in Coal Mines

The disastrous fire at the St. Paul mine in Illinois has caused coal-mine operators to realize that the dangers from mine fires are as great as those from explosions of gas and dust. The latter accidents are likely to occur more frequently, but certainly are not more serious.

This latest fatality has shown how necessary, as a matter of safety, are fire-proof shafts and bottoms. We have also been brought to realize that a complete equipment of fire-fighting apparatus is essential at every well organized coal mine. The most important incident that directed attention to the Cherry disaster, however, was the dramatic rescue of 20 miners after seven days' entombment. This, combined with the knowledge gained from pitiful messages found on the bodies of other miners, who after days of imprisonment perished in the St. Paul mine, are strong arguments favoring the installation of safety chambers underground.

Outlines of plans for building such stations have been published in the JOURNAL from time to time. One large Illinois coal company has prepared plans for an underground safety chamber, which station is to be supplied with oxygen tanks, food supplies, medicine, etc., besides being connected to the surface by a bore hole, permitting the extension of a telephone line to the chamber.

In our issue of March 6, 1909, page 507, we published a paper on "The Isolation of Certain Mine Areas from Contact with the After-Gases of an Explosion." The idea as advanced by Mr. Robinson, the author of the paper in question, was to install a series of boiler-plate doors in the main entry, the intakes and the return roadways. Mr. Robinson in his article conceded that the inner doors in the explosion panel would be blown from their fastenings, but asserted that the outer doors would remain intact, and the men behind them might be saved.

Notwithstanding the skepticism of chronic doubters, intelligent mine managers will lend ear to every new plan that is a sensible endeavor to safeguard our mines. Money cannot be employed more wisely than in providing precautions to insure lives and property.

The threat of a strike by the labor organizations against the United States Steel Corporation to force the latter to abandon its open shop policy will probably fail to attract much attention. The unions have already done about all they can to bring the Steel Corporation to terms and have failed. On the other hand the Steel Corporation is recognized to have been eminently fair in the treatment of its employees, wherefore a strike to force it to abandon the open-shop principle would command but little sympathy.

Stamp Mills as Coarse Crushers

In commenting on the work of the Mines Trials Committee, the *South African Min. Journ.*, Oct. 9, 1909, points out the fact that novel ideas in mill construction are being carried out practically in the connection with new plants. Those ideas are, in brief: The use of stamps as coarse crushers, employment of tube mills for secondary grinding, and the removal of amalgamating tables to another department of the works.

Experimental work in the field of crushing capacity and efficiency which has been carried out by the Mines Trials Committee has shown that crushing to a mesh of nine to the square inch in the mortar boxes, with final reduction to the necessary grade in tube mills, is a working arrangement which represents the limit of economy with machines in use. Upon this basis a result of 15 tons per day has been obtained by means of stamps weighing not more than 1400 pounds.

The importance of this achievement lies first of all in the great reduction of the capital expenditure necessary to obtain an equivalent daily product as compared with present methods, and it is this matter of capital expenditure which has constantly stood in the way of an attack upon the enormous quantity of low-grade ore, which represents so large a percentage of Rand banket reefs. The design of the stamps themselves, and the mortar box, has naturally been under investigation in the various tests, and the arrangement of long heads and short stems, as adopted at the new City Deep mill, has met with unqualified approval.

The open-front mortar box, also, a mortar box with that section of the casting removed which extends from side to side above the screen, has secured favorable opinion. In conjunction with heavy stamps especially are its merits apparent, for it renders access to them much more easy. In some which have been tried the top of the box has been lowered quite successfully to the level of the water-feed opening. Whether any diminution of strength in the box results from this design is perhaps an unsettled point, but it is worthy of remark that in one instance the cutting out of the front has been followed by a springing together of the sides to the extent of about 1/16 in.; a fact which indicates a relief of strain in some portion of the castings.

The new scheme of reduction which relegates the stamp mill to the somewhat inferior position of a coarse crusher opens the way to a consideration of the merits of other machines which have heretofore been handicapped in competition with it, and it seems not unlikely that attempts will now be made by the makers of other types of crushing machines, such as rolls and the like, to reassert themselves. In various directions, then, the experiments of the Mines Trials Committee in the matter of crushing efficiency alone appears destined to have a far-reaching effect, not only upon the Rand but elsewhere.

The McArthur-Forrest Cyanide Patents in Mexico

The latest rulings on the McArthur-Forrest patents in Mexico were recently made the subject of a paper by Leopold Salazar and published in the *Informes y Memorias* of the Instituto Mexicana de Minas y Metalurgia. The following extracts show how the government stands on the subject of the expiration of these patents:

The first term of the principal patent No. 399, had already expired, and that for the extension had commenced, when the government, on October 1, 1903, promulgated a new patent law which is still in force. The term for the duration of a patent is thereby fixed at 20 years without regard to the date of its granting or the term for which it was granted in other countries, it being optional for the inventors to take advantage of this change, which the Mexican Gold and Silver Company naturally did, thereby securing an unexpected extension of another year, inasmuch as the 20 years would end October 19, 1907. The company, however, claimed that in addition to this they had a right to the special extension of 5 years, asking in effect a patent for 25 years.

The company made valiant efforts to obtain official recognition of this view, and failed. The decision of the President of the Republic was communicated to the company October 17, 1906, in the following concise terms: "The caducity of the patent will be declared Oct. 19, 1907."

The company made persistent efforts to obtain a reversal of this decision by means of legal proceedings, but before the courts could come to a conclusion Oct. 19, 1907, arrived, and the patent office, in the absence of any orders to the contrary, published in the *Diario Official* the following notice: "In accordance with the administrative declaration of Oct. 17, 1906, and Art. 40, Sec. 3, of the law on the subject, the termination is hereby declared of Pat. No. 399 for a process to extract gold and silver from their ores or compounds, granted to McArthur and Forrest."

Relief was now sought by the company in the district courts, which demanded a report from the secretary of Fomento, which was delivered in the following terms: "That to admit the suspension of process would mean that at the expiration of the 20 years of a patent, and the 5 years' extension, a lawsuit of 2, 3 or 4 years' duration might be instituted, the company enjoying in the meantime a practical monopoly. The Department of Fomento, in virtue of its mission to protect the liberty of industry, cannot countenance such proceedings."

In consequence of the firm stand taken by the department, the supreme court, on June 4, 1908, gave the following verdict: "The court does not protect the company against the official acts of the patent and trademark office, which declared Pat No. 399 to have expired, ordering the publication of this declaration." It will be conceded by all who have studied the matter, that the government acted in accordance with high ideals of progress and the legitimate interest of the industry.

Mining in the Murchison Range, Transvaal

SPECIAL CORRESPONDENCE

The report of the H. E. Proprietary, in the Murchison range, Transvaal, states that owing to the absence of railway communication the cost of prospecting and opening up claims in the Murchison range has continued to be an almost insuperable obstacle to any activity on a large scale. Since the close of the financial year a change has taken place in the railway position. Two lines to the northern district have been approved by Parliament. Both will be to the advantage of the company. The proposed extension of the abandoned Selati line to Leydsdorp, which lies at the southwestern end of the Murchison range, will connect that area with Delagoa bay, while the line from Pietersburg to Bandolier Kop will open up the far northern districts of the Transvaal.

ANTIMONY IN THE FREE STATE MINE

The Murchison range is situated between the Selati and Groot-Letaba rivers. Geologically it consists of a narrow belt of schists bounded on either side by granite. These schists contain numerous auriferous quartz veins, fahlbands and general impregnations of a lenticular nature which conform both in strike and dip with the adjacent beds.

There are two main auriferous horizons. On the one is situated the Blue Jacket mine, and on the other the Free-State mine of the H. E. Proprietary. The latter appears to be the most highly mineralized portion of the range, and is noted for its extensive deposit of antimony. The antimony-gold deposits occur in the string of kopjes which extend in a northeasterly direction from a point north of Leydsdorp to a distance of about 30 miles. The antimony is present as stib-

nite, but near the surface is represented by its yellow decomposition products.

The H. E. Proprietary's holding in the Free State mine is unchanged. No work has been done during the year. The mine is opened up to a depth of 600 ft., and it will be advisable to allow work to remain in abeyance until the railway has brought about a change in general working conditions.

Blue Jacket Mine

A small portable mill has been installed upon the Blue Jacket property, and a total of 1200 tons has been crushed for a recovery of £2852. A considerable amount of gold is stated to have remained in the tailings, and a small cyanide plant is in course of erection to treat the residues. The experiment has shown that work can be carried on profitably on the small but rich reefs of this district, but the cost of development and supervision will of course be high until ores can be treated on a large scale.

In regard to this experiment the chairman of the Johannesburg Committee reports as follows: "In general the results obtained by this experiment are promising and go to show that it will be possible to work at a profit the claims containing rich leaders. A number of these are known to exist, and it is probable that small mines will be started in the low country in the near future. It has been further ascertained that one or two reefs in the Blue Jacket contain fair ore, but not sufficient development has been carried out to determine the approximate payable tonnage contained in these low-grade orebodies. They go to show, however, that after further development and careful exploitation of these small rich reefs the Blue Jacket will prove payable when lower working costs are possible in the district."

With regard to the company's interest in the Magato concession, the directors report satisfactory progress in the negotiations. The Transvaal government has recognized the new grant in favor of the men who had expended money on the old Magato grant, and a clause to that effect has been inserted in the new gold law which came into force last January.

Large Diamond Found in Orangia

Two portions, weighing 174 carats, of a large diamond, have been found in the [illegible]

The Chief Consolidated, Eureka, Utah

The Chief Consolidated Mining Company is an organization originating in the copper country of upper Michigan and the principal stockholders are identified with the mining business there. The company's property consists of 10 mining claims, of which it possesses full ownership with the exception of three claims in which the company owns one-half. In addition to these, it owns, through its control of the Eureka City Mining Company, nearly the whole of the underground rights of the townsite of Eureka, thus giving it the total ownership of nearly 400 acres of mineral ground in the Tintic district of Utah.

By acquiring the stock of the Little Chief Mining and Milling Company it has secured for itself the shaft and mining equipment of that company. The shaft has reached a depth of nearly 1700 ft. and it is intended to continue sinking to 1800 ft., which depth will represent for the time being the bottom working level.

The plan of the company and the scheme of its organization, as outlined by Walter Fitch, the president and general manager, was the development of an ore channel, which was presumed to run through the length of its territory and parallel to the ore channel on which the Centennial-Eureka mine is located, and from which also the Bullion-Beck, Eureka Hill, Gemini and Ridge & Valley mines have taken out many millions of dollars in metals. That a parallel channel does exist has already been demonstrated, says Mr. Fitch, by the work done by this company, and though the company was only organized in the middle of February, it has already forwarded to the smeltery, within the last 30 days, a little over 1000 tons of ore, which has netted, after payment of all transportation and smelting charges, slightly over $24 per ton. The ore zone was developed and the ore discovered in the northern part of the territory and shipments are being made continuously from this deposit.

As it is estimated that the mines above mentioned have paid in dividends an amount exceeding $18,000,000, and the [illegible]

[illegible]

future, of a new hoisting plant of the first-motion type with the capacity of handling two 2-ton skips in balance, and in connection with this it will have a new boiler equipment with mechanical stoking attachment.

The outstanding capital of the company consists of 810,000 shares, par value $1. It has in its treasury 190,000 shares and approximately $150,000 cash. All of its property is fully paid for and it has no outstanding indebtedness with the exception of that for the current month's business.

Smelting in Bond

Special Correspondence

Treasury officials who had been expecting to issue the regulations governing the smelting of lead ores in bond under the terms of the new tariff have again deferred their action. It is expected that instead of taking final action within a short time, as had been intended, the department will now defer all action until the latter part of January or the beginning of February, if not longer. The special agents of the department who have been at work investigating the questions of wastage, the conditions of transportation of the ores, the giving of bonds, etc., are reported to have found their work unexpectedly complicated and difficult. Pressure had been experienced from the smelting interests for early action, but this has now been partially withdrawn, those interests having somewhat changed their demands. This change of front is responsible for the renewed delay in the matter.

The Bureau of Mines Bill in Congress

Special Correspondence

At a preliminary meeting of the Senate Committee on Mines and Mining, on Dec. 9, the question of legislation creating a bureau of mines was discussed and its importance urged by Chairman Dick. The meeting served to develop the existence of some unsuspected opposition due to conditions the precise character of which is still somewhat uncertain. The friends of the bureau of mines bill have not lost courage and still maintain that there is a better chance for the success of this measure at the present session than at any time in the past.

Several concessions for plants for smelting [illegible] have been granted recently by the Mexican government. A project [illegible] plant at Torreon or [illegible] in the state of Coahuila is being [illegible] by Albert F. R[illegible], who has [illegible] in the northern part of Mexico.

Hydraulic Landing Chair *

By M. Clapier

Until 1902 the output from the Marseille shaft of the Montrambert collieries was handled by two double-decked cages, carrying two mine cars on each deck. The guides, which were placed against the short sides of the cages, were of oak, 18x15 cm. in section. The landing chairs at the bottom were of the ordinary sliding-bolt pattern, and the manipulation of the cages was done from the surface. From a depth of 456 m. the above arrangement permitted an output of 150 to 160 mine cars per hour. In 1902, the double-decked cages were replaced by cages having three decks, but the same guides and landing chairs were retained; the maximum possible output then rose to 180 cars per hour. In 1904, the principal working was done on the 516-m. level, and it became advisable to invent a system of landing chairs for the bottom of the shaft which should obviate the necessity of manipulating the cage from the top.

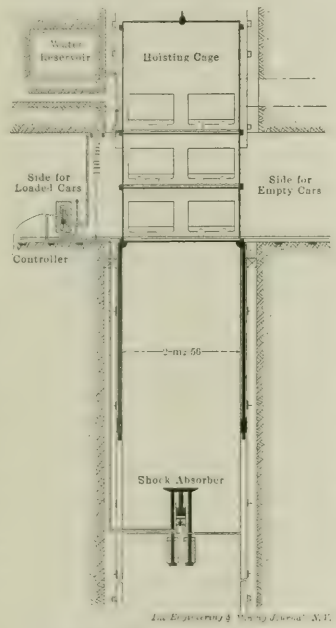
The device consisted essentially of a piston sliding in a cylinder into which water under pressure could be admitted, the flow of water in and out being regulated by a valve. In this way it would be possible to lower the cage step by step, removing the empty and putting on the loaded cars at each step. The pressure of the water was to be such that it would force the unloaded piston upward to its limit, but would not support the weight of the cage, even if unloaded. The downward motion could, of course, be arrested at any position by simply closing the valve. The three following conditions, likewise, had to be met: The new chairs must not obstruct the shaft and must leave the guides clear for future hoisting from a greater depth; the shock of the descending cage must be cushioned to prevent rupture of the piping system; the old chairs must not be interfered with, but must be left serviceable for use if anything should happen to the hydraulic chairs.

To satisfy the first requirement, two cylinders were provided for each cage, and the cylinders and piston rods were imbedded in the guides themselves. The cylinders were made rectangular, 15x18 cm. in section, and replaced the wooden guide for a distance below the landing. The head of the piston, on which the cage rested, was made so that it could be turned through 180 deg., so as to allow the cage to pass unobstructed if desired. The four cylinders were then united, by pairs, to the pressure main so that each cage could be manipulated by a single valve.

The second requirement was fulfilled by connecting to the pressure main a cylinder in which worked a piston having a bearing against two sets of springs. A sudden shock would compress the water and the compression would be taken up by the springs. A throttle valve prevented the too rapid recovery of the springs, so that the cages would be restored to their proper position automatically and quietly. The third requirement was met very simply by putting an behind the wooden guides oak timbers carrying the sliding parts of the old chairs.

Capacity Increased

The pipe connecting the several cylinders had a diameter of 49 mm., while



HYDRAULIC LANDING CHAIRS

the pipe from the shock equalizer to the storage reservoir was of 20-mm. diameter. The admission and escape of water from the cylinders were governed by a special valve mounted in a box like a controller. The valve was of the spindle variety, having a bronze seat. The upper side of the valve communicated with the chair-cylinders, while the lower side was connected to the reservoir at a distance of 110 m. above the landing. The valve was operated by a lever which lifted it from its seat and thus made communication from the pressure main to the cylinders.

When the cage was not on the chairs, the pressure of the water main lifted the governing valve, admitting water to the cylinders and raising the chairs to their highest limit; when they had reached that point, the valve closed by itself. When the cage struck the chairs, the shock was absorbed by the equalizer, and the added pressure forced the controlling valve more firmly upon its seat. When the cage had recovered its initial position, under the action of the cushioning springs in the equalizer, the cars were changed on the lower deck. The controller was then opened, allowing water to escape back into the mains, and the cage descended to the second deck, at which instant the valve was allowed to shut. When the cars had been transferred here, the valve was again opened, allowing the cage to sink to the level of its upper deck, but was stopped this time by some permanent blocks underneath. As soon as the cage lifted, the chairs returned automatically to their upper limiting position.

By the use of these chairs, the possible output was raised at once from 180 to 250 and 280 cars per hour. Repairs to cages likewise diminished from an average of 10.75 to 5.75 cages in the repair shop per year. The cost of maintaining cages in good condition thus showed a remarkable diminution, due to the more gentle handling that they received. Repairs to the hydraulic apparatus amounted to almost nothing.

*Abstract from *Compt. Rend.*, March, 1909.

Iron Ore Deposits along the Ottawa and Gatineau Rivers

The iron ores of the valleys of the Ottawa and Gatineau rivers have been the subject of an investigation by Fritz Cirkel for the Mines Branch of the Canadian Department of Mines, and his report has just been published. The publication of this report comes at an opportune time, owing to the recent developments in the smelting of iron ores by electricity, the region in question possessing much available water power.

The various iron-ore deposits in the townships of Hull, Templeton, Wakefield, Bristol, Grenville and others are described in detail and the conclusion reached that many of these would yield ores which in all probability could be treated profitably in the electric furnace. It is claimed that this method of reducing the iron ores can compete with the blast furnace for the production of pig iron, when electrical energy can be developed at a low cost. An appendix to the report gives a synopsis of the water-power resources, both developed and undeveloped, in the region under consideration. The following falls can all be developed to produce large quantities of power: Pougan falls; Cascades; Chelsea rapids; Great falls; Coulonge river; Riche Fendue; Calumet falls; Chats falls.

At the smeltery of the Tennessee Copper Company at Copper Hill, Tenn., ore from El Cobre, Cuba, containing 9 per cent sulphur, is being used to line converters.

Questions and Answers

Inquiries for information are answered in this department as promptly as possible but since a less delay is often unavoidable. Many inquiries involve a good deal of investigation and these can be answered only when the general interest in the subject is considered to justify the expenditure of the time required. Correspondents should refrain from asking for advice that ought to be obtained in professional consultation with an engineer. We will not answer questions pertaining to the value of specific mining enterprises. Inquiries should be framed concisely.

Aluminum

What is the tensile strength of aluminum. A-G. M. M. Co.

About 25,000 lb. per sq.in. Modulus of elasticity, about 12,000,000. Allowable tensile strength for pure aluminum is about 6000 lb. per sq.in. and the compressive strength somewhat greater. Some alloys of aluminum are stronger.

Value of Tungsten Ore

What is the present value of tungsten ore and the recent range of the market? X. Y. Z.

Early in 1907 wolframite concentrates containing upward of 60 per cent. of tungsten trioxide fetched in the neighborhood of $6.50 per unit. By the middle of 1907 the price had advanced to $11. In December there was a recession and sales were made at prices ranging from $5.50 to $7. By a unit is meant 20 lb., or 0.01 of a ton; for a 60-per cent. concentrate the value is, therefore (taking $7.50 per unit for example), $7.50 × 60, or $450 per ton. In 1908 the value ranged from $5 to $6 per unit. At present the quotation is $6 per unit.

Conversion of Copper Sulphide into Sulphate

Is there any method employed other than heap roasting for converting copper sulphide into sulphate, and leaching with water? If so, what is it and where is it used?

C. L.

Copper sulphide can be converted into sulphate in almost any kind of roasting furnace if the temperature, air supply, etc., be properly controlled. However, we are unaware that copper sulphate (bluestone) is commercially prepared in America, either in this way or by heap roasting. If it be done by the latter, it must be on a comparatively small scale. The bluestone of commerce is obtained either as a by-product in the refining of lead and copper, or as a direct product by the treatment of scrap copper or granulated copper with sulphuric acid. In Germany, we believe, some copper sulphate is prepared by the oxidation of copper matte. An American method for the manufacture of bluestone from copper matte was recently used at Tacoma, Wash. It is described in "The Mineral Industry," Vol. VIII.

Excessive Wear of Plates

Can you refer me to any publication or articles, dealing with the subject of grinding ore in cyanide solution, followed by plate amalgamation? Briefly, our practice is to grind in Bryan mills, through 30-mesh screen, using about a 0.125 per cent. KCN solution, and amalgamating on plates in front of the mills, adding no mercury inside the mills. The sands and slimes are then cyanided separately.

The amalgam on the copper plates is dry and hard, and is only removed by using a steel scraper. Little mercury is held by the plate, a considerable portion running at once to the bottom. After six months' use with cyanide solution the plates show considerable wear from the solvent action of the cyanide and at the lower end are especially thin. Do you think that any combination metal, as Muntz metal for example, would prove more satisfactory than copper and give longer wear?

G. W.

The practice at the Goldfield Consolidated mill, Nevada, includes milling in cyanide solution with amalgamation after stamps and again after tube mills. No description of practice or developments in that mill has been published except such as were prepared from mill designs and flow sheets before the completion of the plant. At the mill of the Bodie Consolidated Company, Mono county, Cal., crushing is done in cyanide solution of 2 lb. per ton, the pulp flowing from the stamps over ordinary copper tables. The copper dissolves in time, leaving rough holes and sharp edges and, until they are entirely beyond repair, it is the custom to patch the holes with pieces of old plate. We believe that Muntz metal has been tried at that plant. The manager of either of the above plants would no doubt give the desired information.

The trouble due to hard amalgam might be attributed to unusual fineness of gold, rather than to lime or cyanide. At Gold Cross, with 100 stamps working with water in the battery on $3 ore, it was a constant struggle to keep the plates soft. The method there was to go over the plates twice a day, first rubbing vigorously with pumice stone of fist size, working up every dry spot of amalgam, using a moderate quantity of quicksilver and finishing with a whisk broom. If the plates in question have been allowed to accumulate a thick coat of hard amalgam it were better to begin with pumice after the next clean-up rather than attempt to work it all up at once. Much pressure and hard rubbing with pumice is an essential.

At one mill under construction the copper plates had not arrived when the mill was ready to run. The lines on the beam were laid in such a manner that the ends of the plates were [illegible] the corners of the latter. Part of the mill floor was old [illegible] and a [illegible] was [illegible] to allow the plates to be [illegible]. These spots were carefully nursed and the entire surface was ultimately coated. So long as the linoleum was not scraped clean of amalgam, it served exactly as well as copper. This scheme might be tried at little expense if the destruction of copper plates is a serious item.

Combined Conveyer and Slime Filter

Can you tell us the inventor or manufacturer of a slimes filter described as follows: The construction is like a belt conveyer; the first carrying pulleys on it revolve in a horizontal position, the other pulleys up to the center being so placed as to work at graduated angles. These pulleys come closer together until in the middle they are perpendicular. The pulp is thus pressed close together, the solution being gradually squeezed out, after which the belt opens out again.

N. G., Ltd.

A somewhat similar scheme was tried in Guanjuato by E. J. White, of the Guanajuato Development Company, in squeezing thickened pulp between belts. The experiments developed the fact that the slime cannot be squeezed between nonporous belts, it merely flowing, while with one porous and one not porous the capacity is very low and no wash is possible.

Flexible Joint Pipe

I am desirous of obtaining information regarding the feasibility of laying large diameter water pipe across the bed of a swift-flowing river. The line contemplated is to be of 30-in. pipe, to carry water under a pressure of 133 lb. per sq. in.; the river bed is shingle and irregular. In this region only pipe bridges have heretofore been used, so except for the information given in Trautwine's 1907 edition, page 661, we have nothing to guide us.

F. R.

In general, such an installation is feasible, the J. G. White Engineering Company of New York, having recently laid two lines of this type, one across the Hudson river, and the other across New York harbor. In any case, however, the engineer in charge must determine on the adaptability for the conditions at hand. After the work has been properly planned, it is largely a question of construction. Such lines are usually designed for a maximum deflection from the horizontal of 10 deg., but for special cases, this angle may be increased to 30 deg., and in any case, an ample allowance for sag should be made. In laying the pipe line, more than two or three lengths of pipe should not be allowed to hang free from the barges, etc., as too great a stress is put on the compression side of the line. Flexible pipe with ball joints is used for this work. The John F. Ward flexible joint is in general use. Cast-iron pipe is adopted for the work and the United States Cast Iron Pipe Company of New York deals in this material.

Details of Practical Mining

Notes of Interest to Prospectors and Operators of Small as Well as Large Mines. Things That Have to Be Done in Everyday Mining

REPORTS FROM EXPERIENCE

Readers of the JOURNAL are invited to contribute to this department. Articles should be brief, thoroughly practical, and preferably illustrated by drawings or sketches. Our draftsmen will prepare properly any kind of a pencil sketch that is intelligible. Something that is an old story in one district may be quite unknown in another. Articles accepted and published are suitably paid for.

The Florida Stadia Rod

The Florida stadia rod is described by William MacDonald in *Eng. News,* Oct. 28, 1909, as follows: The Florida rod is only 0.22 ft. wide and is usually made 10 ft. long. The only figures are the foot

The Engineering & Mining Journal, N.Y.

FLORIDA STADIA ROD

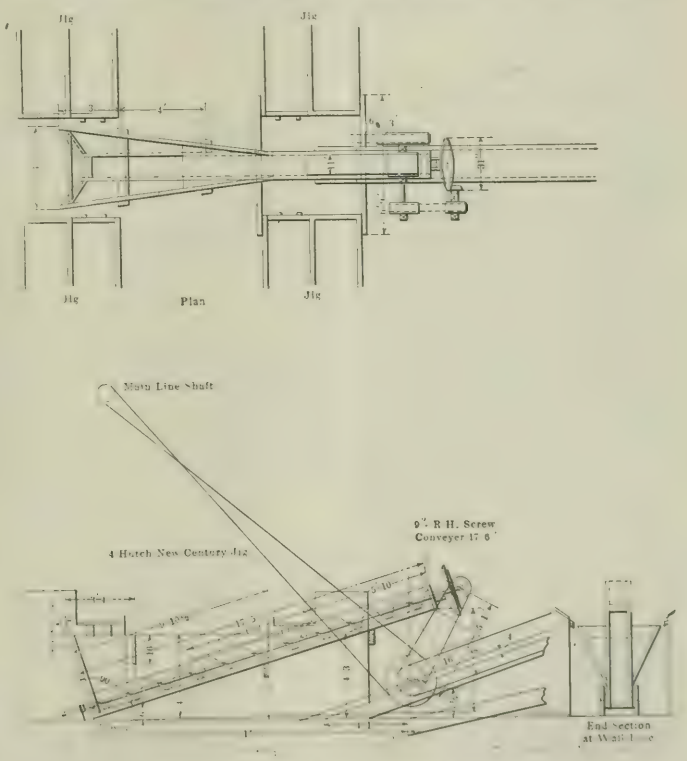
marks. Tenths are indicated by alternate white and red blocks on a black ground; they are stepped for the first ½ ft. one way and for the upper ½ ft. in the opposite direction. The hundredths are shown by serrated edges as per the accompanying illustration.

It will be noted that from point to point of the teeth is 0.02 ft., and each 0.01 ft. is indicated from point to bottom of teeth. If in close reading, say, for instance, in measuring a stadia circuit, even closer readings are desired, they can be obtained as the diagonal side of the tooth can be subdivided by the eye. If only approximate readings are looked for, the white and black spaces can be subdivided by the eye.

Mr. MacDonald has also designed a target with a horizontal slit for laying off instrument hight, which makes this the all-round best rod for topographic surveys.

Dewaterer for Jig Tailings

The screw conveyer shown in the accompanying illustration has given satisfactory results as a dewaterer for jig



METHOD OF SETTING UP SCREW CONVEYER AS DEWATERER

tailings at the hard-rock mill of the Bertha Mineral Company at Austinville, Va. At this mill various screening and other dewatering devices were tried and either proved unsatisfactory or had to be abandoned on account of excessive wear. The screw conveyer, however, has been found to deliver jig tails containing practically no free water, and the water from these tails contains only slimes. Satisfactory results were obtained on material as fine as 30 mesh operating the conveyer at speeds varying from 10 to 50 r.p.m. The conveyer handles the tailings from four Harz jigs, and with coarse material the power consumption is quite small.

In the same mill screw-conveyer dewaterers set vertically have been tried to handle various products. Using a smooth-bore cylindrical shell about the screw, difficulty was experienced from fine material slipping through and clogging the space between the screw blade and its inclosing tube.

This difficulty has been overcome by opposing the screw blade by a narrow metal strip riveted to the inside of the tube so as to form a sort of rifling. Using a tube 8 ft. high and 9 in. in diameter and rifled in this manner, material of jig-

[illegible] slightly elevated 4 ft. above the water level without excessive power consumption. An ample opportunity for water to drain off is thus afforded and the material delivered is so dry and compact that no water can be squeezed from it by the hand.

Mining Methods in New York Tunnels

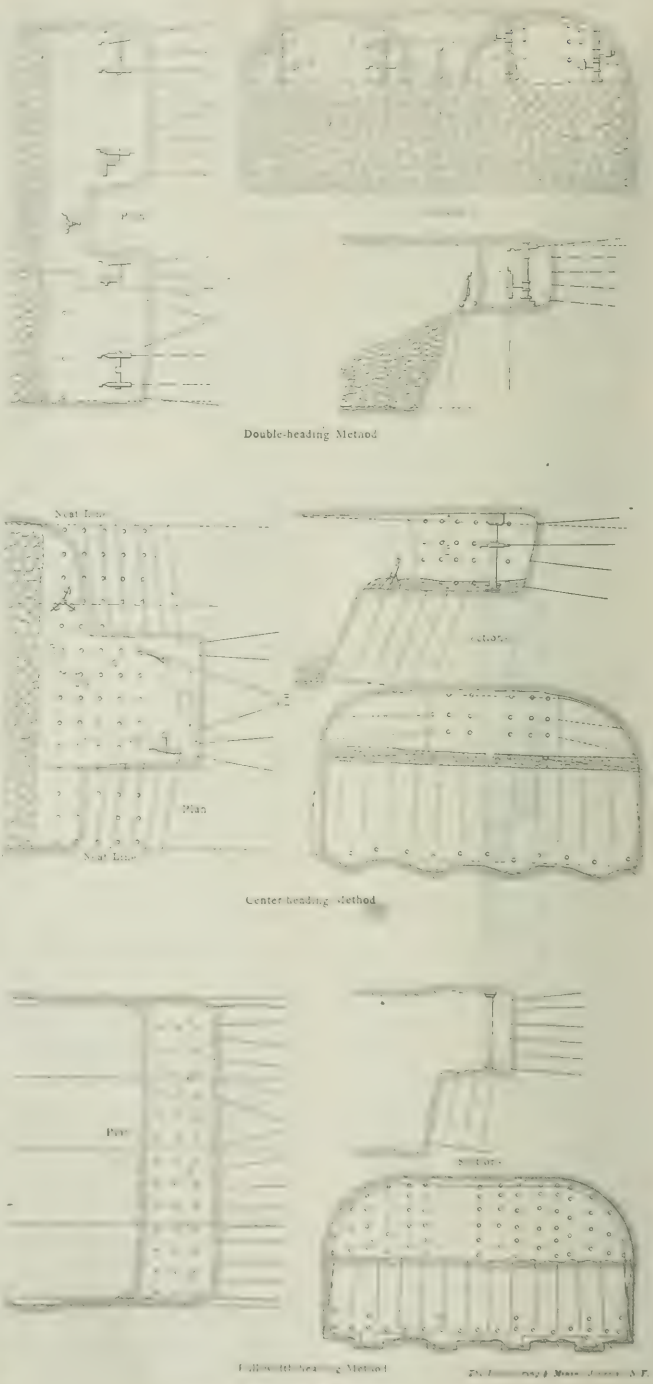
In driving the twin cross-town tunnels in New York City for the Pennsylvania Railroad, three methods were employed by the contractors in solid rock; double heading, single heading and full-sized heading. These methods are described by James H. Brace and Francis Mason in *Proc.* A. S. C. E., October, 1909. They differed only in the manner of drilling and blasting. The bench was usually within 10 to 20 ft. of the face of the heading.

The bench was about 13 ft. high and was drilled by tripod drills, but owing to the lack of head room, steels long enough to reach the bottom of the bench could not be used. Tripod drills were set as low as possible at the foot of the bench and drilled lifting holes, inclined 10 to 15 deg. to the horizontal, and spaced to converge at the location of the drainage ditches. The accompanying drawings show the placing of machines and holes.

In the double-heading method the top headings for each tunnel of the pair were driven separately, leaving a short rock core-wall between them. The headings were drilled from columns and the dividing wall by a tripod drill. The core-wall was fired with the bench.

In the center-heading method only one heading was driven. It was rectangular in shape, about 8 ft. high and 14 ft. wide, and situated on the center line between the tunnels. In general, the face was 6 to 12 ft., or the length of one or two rounds, in advance of the remainder of the face at the top. The center heading was drilled by four drills on two columns. By turning these drills to the side they were used for holes at right angles to the face of the tunnels, by which the remainder of the face of the heading was blasted. By turning the drills downward, two lifting holes under the center heading were also drilled.

For the full width heading method ten drills were mounted on five columns set abreast across the face. Holes were drilled to form a cut near the center line between the tunnels. The remainder of the holes were placed so they would close into the cut. The bench was frequently drilled from the same set up of columns by turning the drills downward. In small rock this method proved to be the most rapid.



MINING METHODS IN NEW YORK TUNNELS

Self Acting Mine Doors

A device, used in a German mine, by which a door across an airway can be opened automatically by an approaching car or trip is illustrated in the accompanying Fig. 1. The rail *G* is supported horizontally, at about 2½ ft. above the ground, by two stulls on one side of the track, in such a way that the end of the rail toward the approach of a car is closer to the track than the other end. A slotted shoe *B* slides on this rail. Fastened to it is one end of a rope which passes around suitable pulleys, the other end being fastened to the outer edge of the door. A counterweight *g* is also connected to the sliding shoe to assist its return movement, if the usual pressure is insufficient.

A car coming in the direction of the arrows strikes the shoe *B*, and by pushing it ahead opens the door; by the time the door is open wide the shoe has traveled sideways far enough to allow the car body to pass it, but the door is prevented from closing by the springs *s*, which rub along the side of the car. When the car has passed, the natural weight of the door, which is purposely hung out of plumb, assisted by the wind pressure and the counterweight, causes it to close.

Another method of accomplishing the same result, in the case of a heavy haulage road traversed by electric locomotive, is shown in Fig. 2. The doors are made of sheet iron, and the joint between them is made more air-tight by wooden and leather strips. The pulleys on the inner ends of the levers *b* and *c* are connected by wire rope. The lever *c* presses against the roller *f*, while the spring *g* presses in the opposite direction so as to insure the closing of the door after the trip has passed. The locomotive or car, coming against the levers *b* transmits its pressure to the levers *c*, and the door opens.

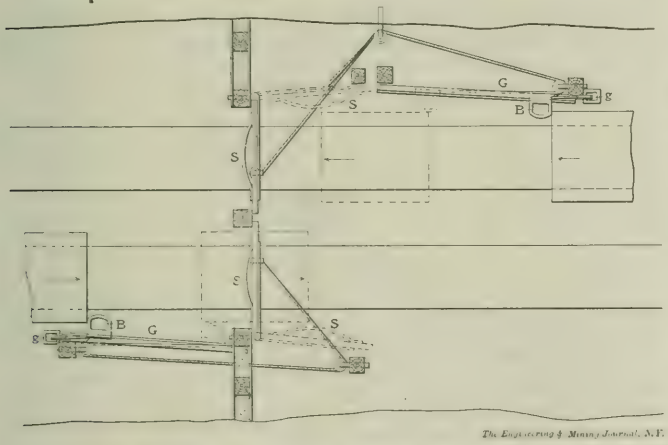


FIG. 1. SELF-ACTING MINE DOORS FOR DOUBLE TRACK DRIFT OR TUNNEL

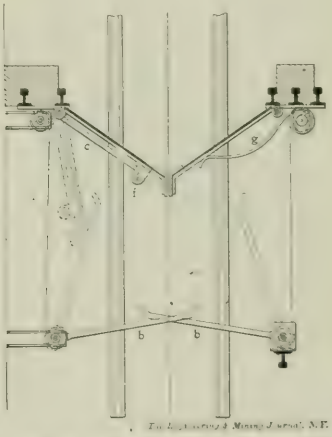


FIG. 2. SELF-ACTING MINE DOORS

Disposal of Tailings

Formerly, the tails from the old Bertha soft-ore mill containing from 16 to 19 per cent. zinc, and about 35 per cent. solid matter, were settled in small ponds, shoveled out by hand, loaded into barrels (only 50 lb. of solid matter to the barrel), elevated and run in a car to the dump from which they were drawn as required by the oxide furnaces of the Bertha Mineral Company at Austinville, Va. A 3-in. Morris centrifugal pump was installed, and now the tailings from the mill are pumped directly out upon the dump pile. The same amount of material as formerly required six men 20 hours to handle is now disposed of in two hours, and the labor of only one man is required to watch the pump. The mixture as delivered by the pump only contains about 25 per cent. solid matter, but as it is only drawn from the outside of the dump pile where it has had time to drain, just as satisfactory results are obtained as formerly, and with a very great saving in labor and time.

Stamp Heads

There is no question as to the advisability of having stamp heads made of steel instead of cast iron. A few years' use will wear down the lower edge of a cast iron head to the breaking point. The removal of broken stem stubs is usually a difficult and tedious job, where cast-iron heads make the use of a pinch of giant powder inadvisable. Particularly is the job difficult if a stem must be removed without removing the stamp head from the mortar. The difference between the cost of cast iron and cast or chrome steel is a mere $25 in a five-stamp mill, and this difference is seen offset by saving of time and profanity.

A Core Drill Hole of Unusual Size

L. C. Glenn, professor of geology at Vanderbilt University, sends the following brief description of two core-drill holes of unusual diameter that have recently been completed by the Nashville Gas Company, of Nashville, Tenn. These holes are 41½ ft. deep, and are believed to be the largest holes of the kind in existence. Each bore hole is 23½ in. in diameter and a 20⅜-in. core was obtained. The material bored through is Ordovician limestone. A contract was given to the National Elevator Company, of Cincinnati, Ohio, and a special drill was made by the American Well Works, of Aurora, Ill. The core barrel is about 12 ft. long and is geared to rotate 28 to 30 times per minute. The cutting was done with crushed chilled steel.

The rate of cutting averaged about 10 in. per hour, the best record being 14⅜ in. in 55 min. The two holes were put down in two weeks. The limestone core weighs 400 lb. to the foot, and although 12-ft. lengths might have been cut it was deemed best on account of the great weight to break and pull the core in lengths of 3 to 5 ft., though one piece of core was 9 ft. long and looked as if it were a turned stone column to be used for some architectural purpose. The cost of a hole of this size is roughly about $10 per ft. and the driller thought there need be no difficulty in going several hundred feet if such depth were desirable. Two sections of this monster core are preserved in the museum of Economic Geology at Vanderbilt University.

Magnet for Removing Steel from Ore

The accompanying illustration shows the details of a magnet that is used by the Federal Lead Company, Flat River, Mo., to pick pieces of steel and iron out of the ore as it passes by belt conveyer from the crusher to the rolls. The metal to be removed consists of pieces of drill steel, bolts, track spikes and castings from the machine drills. In fact any iron

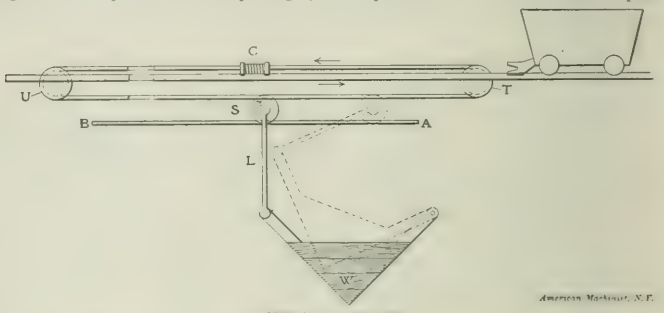
MAGNET FOR PICKING STEEL FROM ORE

that may get in the ore on its way from the stope to the mill.

The magnet used consists of a cast-iron part *a*, 4 in. thick, 20 in. high and 20 in. wide. It is wound with 19 layers of No. 10 double cotton-covered copper wire [illegible] with 2300 turns on each pole. The current used is 5 amp. at 125 volts. The pole faces *b* are 2x6x24 in. and are spaced 6 in. apart. The magnet is suspended from a carriage *e* and supported on a track *d* at right angles to the belt. When a number of pieces of iron are collected on the magnet, the entire apparatus is moved to one side, the current cut off, and all the iron is dropped to the floor. The magnet is suspended 6 to 8 [illegible] the belt and is adjustable by [illegible] This magnet [illegible] weighing [illegible] Run Lead [illegible]

A Novel Car Dumper

A device that is used by the Hudson River Coal Company, at Delanson, N. Y., to transfer coal from its storage and mixing plant to the Delaware & Hudson Company's pockets for use in coaling locomotives, is described by Martin H. Ball in the *American Machinist*, Nov. 18, 1909. The mixing plant is about 300 ft. from the coal pockets and the track upon which the car runs is several feet higher at the mixer than at the coal end. The track is level at the point where the car stands while being loaded at the mixer by a two-ton bucket, which just fills the car. The latter is pushed by hand until it is at a point on the inclined track where it will run alone. Its speed, of course, increases as it runs down the inclined track and it is going at quite a high rate of speed when the picking-up



A NOVEL CAR DUMPER

piece on the forward end of the car strikes the clamp block *C*.

This clamp block has a piece at the left-hand end, as shown in the sketch, which is clamped solidly to the cable, and between this piece and the piece on the right, which is the one against which the car strikes, are springs which absorb a portion of the shock. The car goes on carrying the block before it until it raises the swinging weight *W*, as indicated by the dotted lines. The weight gradually brings the car to a stop at one of the pockets, the car having run against a tripping device just before stopping, which allows the side door of the car, hinged at the top, to open and drop its contents into the pockets.

As soon as the car is empty it is quickly started backward by the swinging weight pulling against it through the cable and clamp block. The clamp block now follows the car back considerably beyond the point where the car first picked it up, and [illegible] stops at the point [illegible] started, with the links [illegible] Meanwhile the [illegible] back up the inclined track [illegible] point [illegible] by the swinging weight [illegible] The swinging weight [illegible] trough filled with [illegible]

One end of the cable is fastened to the end *A* of the track upon which the sheave and wheels *S* run; then passes around the sheave *S*, runs off to the right, around the sheave *T*, thence to the left through the clamp block *C*, around the sheaves *U* and *S* and is finally fastened to the end of the track at *B*. When the car first strikes the clamp block the cable moves quite easily for two reasons: (1) The sheave *S* moves only half as fast as the clamp block, and (2) the links *L* which support the swinging weight are in a vertical position and can be moved by very little force from this central position. It, however, requires a rapidly increasing force to move it as it leaves this central position, so that in spite of the fact that the car strikes the block with a heavy blow, the shock is well taken care of and does not injure the parts. The clamp block is moved to different positions on the cable and the tripping device to different points on the track, to stop and unload the car at the desired pocket.

Treatment of Zinc Sulphide Ores

In British patent No. 6511, of 1908, Woldemar Hommel describes the recovery of zinc, lead, silver, copper and gold from sulphide ores or products, the zinc in a metallic form as spelter, the other metals in a condition suitable for recovery by ordinary smelting methods.

The ore is roasted in a calcining furnace to eliminate the bulk of the sulphur that is in combination with the lead, zinc, iron or copper. The ore is then mixed with carbonaceous material, and zinc, together with some lead and silver products, is blown from it in the form of an oxide fume, which is condensed. The fume is made dense, mixed or briquetted with fuel and treated for reduction to spelter in a distillation furnace. The residue containing lead, silver and carbonaceous material is brought back and mixed with the [illegible] thus saving the metals and [illegible] of the necessary fuel. The [illegible] controlled by the Metals Extraction Corporation, Ltd., of London.

Personal

Mining and metallurgical engineers are invited to keep THE ENGINEERING AND MINING JOURNAL informed of their movements and appointments.

A. H. Wethey left New York Dec. 6 for Butte, Montana.

W. A. Clark went to Arizona Dec. 6 and will visit Montana before returning to New York.

The Merton Metallurgical Company, Ltd., has removed its offices to No. 3 Lombard street, London, E. C., England.

Peter B. Scotland, of the Arizona Copper Company, has returned to Clifton, Ariz., from a visit to the Mesabi and Vermillion ranges in Minnesota.

Victor G. Alderson, president of the State School of Mines at Golden, Colo., has been visiting the San Juan region in the interest of his institution.

B. O. Pickard, formerly superintendent of the Little Coronado mine in the Clifton-Morenci district, Arizona, has taken charge of mines at Gleason belonging to the Shannon Copper Company.

Clifford Wilfley is superintendent of the cyanide mill of the Virginia & Mexico Mine and Smelter Corporation at Hostotipaquillo, Jalisco, Mexico. He succeeds P. R. Whitman, who has resigned.

Thomas Bennet has resigned his position as mining engineer for the Atlantic Copper Mining Company, to take the post of superintendent of the Lake Copper Company in the Lake Superior district.

D. S. Calland, recently with the Pinguico Mining Company at Flores, is to be chief metallurgist of the Real del Monte Company at Pachuca, Mexico. Augustus MacDonald will succeed Mr. Calland at the Pinguico.

Walton Van Winkle, of the United States Geological Survey, is arranging for testing the waters of the Columbia river at various points. The work has been undertaken by the State of Washington in conjunction with the survey.

E. N. Funston, recently manager of El Cubo Mining Company at Guanajuato, is to be general superintendent of the Real del Monte mines at Pachuca, Mexico. His successor at El Cubo is F. G. Fabian, but it is said that this appointment is only temporary.

George S. Rice, mining engineer for the United States Geological Survey, met the operators of the McAlester district, Oklahoma, Dec. 5 and addressed them on the mine accident work. Plans were also inaugurated for a substation for rescue work in that district.

Robert DeLuce, manager of the Castle Dome silver and lead mines at Dome, Arizona, delivered an interesting lecture to the faculty and student body of the University of Arizona at Tucson, Nov. 22. The subject discussed was the "Liquid Assay of Gold."

C. A. Bohn, mining engineer, of Leadville, Colo., for the last eight years in Mexico, has entered the mining department of the American Smelting and Refining Company, and will be with S. W. Eccles, vice-president of the company in New York.

C. B. Lakenan, general manager of the Nevada Consolidated, Cumberland-Ely and Steptoe Valley Mining and Smelting companies, has been in New York for several weeks in consultation with other officials of those companies. He will return to Ely next week.

George W. Woodruff, judge of the United States Court at Honolulu, Hawaii, has just resigned this appointment to accept the secretaryship, in connection with duties of a legal-advisory character, of the Pocahontas Fuel Company and the Pocahontas Consolidated Collieries Company.

Judge E. H. Gary, chairman of the board of directors of the United States Steel Corporation is visiting the Birmingham district in Alabama to look over the properties of the Tennessee Coal, Iron and Railroad Company. The Chamber of Commerce of Birmingham will entertain Mr. Gary during his stay.

S. H. Ball, formerly of the United States Geological Survey and more recently in charge of prospecting for the Société Internationale Forestiere et Miniere du Congo, has opened an office as consulting mining geologist at 71 Broadway, New York. He is at present in New Mexico on professional work.

Dr. Eugene Haanel, Dominion Director of Mines, Ottawa, has been requested to recommend an electro-metallurgist capable of taking charge of the erection and management of an electric-smelting furnace to H. Boholm, of the Cobber Mine and Smelter Company, Trondhjem, Norway, where electric smelters are to be established.

James E. Chapman, who was for several years in Mexico for the American Smelters Securities Company and recently in the New York office, will go to Pachuca, Mexico, about Jan. 1 to join the staff of the Compañia Minera de Real del Monte y Pachuca, one of the subsidiary companies of the United States Smelting, Refining and Mining Company.

Obituary

The cable reports the death on Dec. 10 in England of Dr. Ludwig Mond, the eminent chemist, who is known all over the world. We hope to publish a fuller account of Dr. Mond's life and services at an early date.

George Darsie McGrew died at Pittsburg, Penn., Oct. 8, aged 82 years. After an apprenticeship in boiler[illegible] he entered into the coal business in 1860, operating several mines and shipping coal down the Ohio river. His firm was among the first to use steamboats to tow its coal barges to the Mississippi river towns as far as New Orleans. Later his activities were extended to the oil trade, as a well owner and producer. He retired from active business about 10 years ago.

William N. McGugin died at Olive Furnace, O., Dec. 7, aged 92 years. He was the oldest charcoal-iron maker in the country. He was born in Wooster, O., in 1817, and in 1846 removed to the Hanging Rock district and entered the iron business. After working at the old Marble and Gallia furnaces, he went to Olive furnace over 50 years ago. He gradually acquired a controlling interest, and in 1883 organized the McGugin Iron and Coal Company, of which he remained president until his death.

Societies and Technical Schools

Mexican Institute of Mining and Metallurgy—The excursion of this society to Pachuca in the last week in November was highly successful. There were 44 members in attendance, and two days were spent in visiting the mines and reduction works in and around Pachuca, under charge of a local committee. A business meeting of the institute was held, many important matters were discussed.

Western Association of Technical Chemists and Metallurgists—The board of control has decided to hold the fifth annual meeting of the association at Boulder, Golden and Denver, on Jan. 6, 7 and 8, 1910. It is planned to make this meeting especially interesting and profitable to our members, and it is hoped that many will avail themselves of the opportunities offered by the inspection trips arranged by the committee. These trips include beet-sugar factories, breweries, smelteries and various industrial plants. Opportunity will also be afforded for inspection of the various laboratories of the State University and of the School of Mines. The headquarters during this meeting will be the association rooms, 1510 Court place, Denver, Colorado.

Coal Operators' Secretaries' and Commissioners' Association—A meeting was held in Chicago, Dec. 1, at which general conditions in the various States and districts were discussed at length. It was resolved that hereafter meetings shall be held semi-annually, in June and December. It was resolved that the association indorses the call of President Elliott of the Southwestern Interstate Coal Operators' Association for a meeting of operators to consider a federation of coal operators; that the association believes such a federation quite feasible, in accordance with views expressed in 1905. The following officers were elected: President, Thomas W. Lewis, Michigan; vice-president, Philip H. Penn, Indiana; secretary, C. L. Scruggs, Illinois.

Special Correspondence from Mining Centers

News of the Industry Reported by Special Representatives at Butte, Denver, Salt Lake City, Goldfield, Cobalt and Toronto

REVIEWS OF IMPORTANT EVENTS

San Francisco

[illegible] is expected that the Merced group of quartz mines at Coulterville will shortly be reopened after many years of idleness. This group was at one time extensively worked with all suitable facilities. The mines and machinery have been, however, kept in very good condition, contrary to the usual custom, and it will require little expenditure to put the whole property in order for work again. A number of the other mines near Coulterville have of late been giving good accounts of themselves and this has encouraged the Merced company to undertake work again. Since the mines closed down the conditions have materially changed and operations may now be carried on at much less cost than formerly. What that section needs most is electric power as the fuel question has always been a serious one. It is probable that before many months electric power will be furnished for the district.

Another mine, once famous, but which has been closed down for about 30 years, is the Eureka at Sutter Creek, Amador county, owned by Mrs. Hetty Green, of New York. Her terms for sale have always been prohibitive and she would not hear the property. The mine closed by reason of a fire. Meantime other mines in that vicinity have proved very rich at depth. Engineers have been looking up conditions at the Eureka and it is thought that a sale will result. A Scotch company has a nominal control but Mrs. Green is the principal stockholder.

The Bay State group, owned by the Amador Gold Mining Company near Plymouth, Amador county, near the boundary of Eldorado county, includes the Bay State, Venture and Rhetta claims. Some development work has been done on all these claims and there is a 10 stamp mill on the property. The company owns about 220 acres of mineral lands. The Eastern men interested have recently visited the property and have decided to increase the mill to 30 stamps and to do more development work and to equip the mine with better machinery. H. G. Torrence is the superintendent. The money for the proposed improvements has been made immediately available.

[illegible] of Los Angeles [illegible] on the Northern Gold Bar Gravel Placer and [illegible] other [illegible] placer claims on the [illegible] Placer county. [illegible] Los Angeles. The [illegible] extend from the Kohl diggings up the ridge to within two miles of the Bellevue, or Thistle Shaft property. It is supposed that the Bellevue channel extends down the Mooreville ridge where these bonded claims are situated. Some of the gravel in the Bellevue channel is of high grade. It is expected that those who have taken the options on these gravel claims will shortly begin developing them by the drifting method.

While the advent of the rainy season has driven the prospectors to the valleys from the Magalia ridge in Butte county, many going mines will continue work all winter. Most of the mines are working gravel though there are several quartz mines. The North Star company near Powellton has put in machinery including a small mill. The Steiffer property, lately in litigation, is awaiting the completion of its new power plant on the west branch of the Feather river before starting up again. The Gold Dyke Mining Company is working the old Matheson mine near Coutolenc and has a mill on the ground not yet installed. The Mammoth Channel company near Magalia has recently installed a complete plant of machinery. The Magalia Consolidated Company near Magalia is running a tunnel to tap its channel. The Butte-Magalia Consolidated Company has cleaned out its old workings and put in machinery so the mine is nearly ready for operation. The Cape Horn Mining Company now has plenty of water. The Cobb & Goodday mine near Magalia has its incline down to gravel but it has not reached bedrock yet. Water for power has been brought in and machinery supplied. The ridge has many good mines but until of late many of them have been idle. There is now a general resumption of mining in that section of the county.

There appears to be at present some unusual activity in the mines in the gravel mining fields in Eldorado county. A great gravel channel extends through the county north and south with numerous branches extending laterally. Some mines have been operating on parts of this channel for years and now a number of new mines are being opened and developed.

Butte

[illegible] State Mine Inspector William Wade states that [illegible] in mining in Montana during the last year and that in spite of the general financial depression throughout the country the mines have produced their usual tonnage. [illegible] accidents occurred in the mines during the year, the greater number of which were caused by the carelessness of the miners themselves. The inspector comments upon the fact that at the recent session of the legislature several bills were put forward by the miners looking to the regulation of operations of the larger mines of the State, but that the legislature uniformly refused to consider any of these measures. A serious consideration of such measures is advocated for the purpose of improving the sanitary conditions under which the miners work. Comment is also made upon the fact that at the larger mines a number of accidents are indirectly due to the different points of view with which the shift bosses on the one hand and the foremen and superintendents on the other regard the operations. While the mine foremen and superintendents usually endeavor to use all due precautions with reference to proper timbering and other measures for safety of the men, the shift bosses, under whose personal supervision the men work, are actuated by a spirit of rivalry to see which can mine the greatest amount of ore during his shift and they frequently lose sight of the importance of proper timbering and the safety of the men working under them. While there are at present a number of laws in force in this State for the protection of those working in the mines, yet there is room for much additional legislation on the subject. Two years ago the legislature passed a law with reference to the location and acquisition of mining claims, and this law greatly simplified and improved the former law on the subject, and it would appear advisable that some such measure be taken with reference to the safe regulation of operating mines.

The strike of the railway switchmen shows no signs of ending. Of the roads running into Butte, the Great Northern and the Northern Pacific are seriously affected in their capacity to handle freight, such as coal and ore, but the Oregon Short Line, and the Butte, Anaconda & Pacific are carrying freight as usual. As a result, the Butte mines having ore bins on the Great Northern and Northern Pacific tracks have been forced to close since no ore cars can be obtained. This includes the Boston & Montana company's Mountain View, East Colusa, West Colusa, Leonard and Pennsylvania, and that company's smelters at Great Falls, the Butte & Boston company's East Grey Rock, Silver Bow, and Berkeley, the Washoe company's Moonlight, the Parrott company's Parrott, the [illegible] company's Tramway and the Anaconda company's Right Bower and

Belmont mines. The principal supply of coal for the Butte mines comes from the Diamondville mines in Wyoming, and since the Oregon Short Line is operating as usual, this supply is not interfered with. The uninterrupted operation of the Butte, Anaconda & Pacific road connecting Butte with the Washoe smeltery at Anaconda, enables that smeltery to treat the Butte ores as usual.

The United States assay office at Helena reports receipts for November at $175,304, as against $112,618 for the same month last year. Fergus county leads with $58,229.

A total of 106,570 shares of stock was traded in during the month of November on the Butte stock exchange, at a total price of $138,746. Alameda leads with 29,220 shares traded in and Butte & Superior was second with 21,375 shares.

The recent purchase of the Rochester ranch at Bearmouth, Mont., by W. A. Clark has led to the report that the senator intends to erect a smeltery at that point to treat ores from the mines in the adjoining Phillipsburg district. These ores are now shipped to smelteries at Butte and Anaconda at a considerable cost and a smeltery erected at Bearmouth would doubtless secure a considerable supply of custom ores. The range carries with it the right to 357 in. of water, sufficient for the purposes.

Denver

Dec. 12—Sir Moreton Frewen, the British silver champion, has been expounding his views to Denverites at the Chamber of Commerce dinner. The chief points he made were that within 18 months the British empire will put into effect the Goshen plan of the issuance of nonlegal-tender notes for 10 and 20s., secured by silver deposited in the government treasury, and that this will cause an immediate rise in the price of silver, to the great advantage of Colorado and other silver-producing States of the West. That gold' prices have advanced at an unprecedented rate for the past 10 or 15 years, but as they are not accompanied by a corresponding rise in silver prices in Asia and the Orient, our industries are being swept off their feet one after the other, as proved by the fact that whereas when the price of silver was up, ships from our Pacific coast for the Orient were going out loaded with lumber, steel, leather and other bulky commodities, they now go out empty, and return loaded with goods that enter into competition with American wage earners. Asking the opinion of a Denver banker and financier for an expression on Sir Moreton Frewen's work here, his reply was: "The bankers of the West, and for that matter of the civilized world, have decided on gold as a stable and conservative medium of exchange, and that, therefore, it is pretty certain that the cause of silver is a forlorn hope." This was answered by a silver-mine owner, to whom I repeated it, with a laugh, and the words: "Why, of course; gold is the money of the rich, and silver of the poor, and as the bankers make more money out of the former, they naturally are all in favor of gold, but they can't stop silver coming back." These two opinions from leading men in what has been known as a silver-producing State, may in a concise manner give an idea of the present feeling here on this important subject.

The third annual banquet of the Golden Cycle Company, of Cripple Creek, occurred Dec. 1, and many speeches were made, the keynote of which was a desire for a railroad commission that would be a medium of protection between the shippers of ore and the railroads, which latter, it was maintained, are charging exorbitant rates of freight, and as they apparently owned the State legislature, could not be reached in that way. About 300 mining men from the district attended, and it was a great success.

Salt Lake City

Dec. 10—The Utah Ore Sampling Company has filed articles of incorporation in Salt Lake with a capital stock of $200,000, in $1 shares. The officials are Ernest R. Wooley, president and general manager, Jesse Knight, vice-president, J. William Knight, secretary and treasurer. These with W. Lester Mangum and F. R. Wooley comprise the directors. The new company has acquired all the sampling works in Utah except the McIntosh sampler at Park City which was already controlled by Wooley and associates. The Taylor & Brunton plants at Murray and at Tintic and the Pioneer sampler at Sandy which was controlled also by Wooley went into the consolidation. The cash consideration amounted to $200,000. Practically all the custom ores of Utah, Idaho, western Colorado, eastern Nevada and parts of Montana, California and Arizona pass through the Salt Lake samplers to the ore market. The combined plants have an annual capacity of about 500,000 tons and have regular contracts for about 300,000 tons. The original plant of the Pioneer sampler was built at Sandy, 13 miles south of Salt Lake City 40 years ago. During the last few years it has been completely remodeled. The Taylor & Brunton company entered the field in 1893 by building the Murray plant, a few miles south of Salt Lake City. Business increased to such proportions that last year a new sampler was built at Silver City in the Tintic district.

Hornblower & Weeks of Boston and New York have purchased a seat on the Salt Lake Mining and Stock Exchange.

Joplin

Dec. 12—November has shown an increase in activity all over the Joplin district. All the mines are running, and the total production for the month was 40,334,040 lb. of zinc ore and 5,026,530 lb. of lead, having a value of $1,116,595. While it was exceptionally rainy during the month, the total production, together with the base price, kept up with remarkable consistency. More activity among the buyers has been noticed and a great many mines and leases have changed hands. The greatest number of sales has been in the West Joplin sheet ground district, and this camp is rapidly coming to the front. Six large modern mills are running, and as many more are to be built in the near future.

The Kansas camps produced for November 3,487,650 lb. of zinc and 302,470 lb. of lead, having a value of $95,467. Mining is showing great gains in the Galena and Empire camps, but no new prospects are being brought in from the Badger-Peacock camps. Galena is coming into an era of deep mining that will radically change the old methods there. The camp has been in the hands of the custom mills, and now more mills are being built all over the camp than for years. The operators are awaking to the fact that where shallow ore exists deeper ore is almost sure to be found. In both ends of the camp large deposits of disseminated ore have been found below the Grand Falls chert or sheet-ground horizon.

The total production for November in the Oklahoma camps amounted to 2,300,030 lb. of zinc and 431,560 lb. of lead, having a value of $64,414. The mines in the Miami camp do not show the activity that they should as the extension of the limits of the camp is slower than was anticipated. The two tailing mills are making good records, showing that the loss in the tailings has been great. The Okmulgee has the best prospect of the new mines. The development of the deeper runs progresses slowly, but is anxiously awaited as it means a great deal to this camp. The high royalty is retarding development to a great extent. In the Baxter-Quapaw camp more life is shown than for two years. With the present high prices the low-grade mines of this camp can be worked with profit, and all the mills are running or preparing to run and the production has increased rapidly.

Scranton

Dec. 11—Over 500 miners working in the collieries of Lackawanna county had their certificates cancelled immediately after the investigation conducted by the county authorities after the exposure of the traffic in miners' certificates. Undoubtedly this was a great hardship to a number of miners who, although their certificates were illegally issued, yet obtained them in good faith. Of course the number of those who were absolutely unaware that they had become possessed of illegal certificates was comparatively small. According to the laws of Pennsylvania, the mine examining boards can sit only upon three days each month, and for a limited number of hours each day. The consequence is that there are about 400 miners idle because they cannot secure

certificates which they are fully competent to hold.

The Scranton Board of Trade forwarded a communication to the presidents of the companies owning coal properties in the neighborhood of this city asking them to send representatives of their companies to a conference with that body in order to adopt some plan to prevent subsidences in excavated coal areas. President Underwood of the Erie, replied that he saw no good in such a conference. President Fowler of the Ontario & Western sent a communication to the same effect. President Loree, of the Delaware & Hudson, answered that if such a conference were held, that he would have his company represented; while President Truesdale, of the Lackawanna, requested the board to outline for him the scope that the deliberations of such a conference would take, in order to be in a position to consider the proposal as it might affect his company and the people immediately interested. The Board of Trade has sent a reply to President Truesdale's request outlining the heads of a discussion, which they believe would lead to some practical results.

The Lackawanna Coal Company is sinking two shafts at Dundee, near Wilkes-Barre. When the shafts are sunk, the company will erect a breaker at the place with a capacity of 2500 tons, which it is expected will give employment to 1200 men when in full operation. The new workings will be driven 920 ft., to reach the Hillman vein. Later on several other veins will be opened.

Indianapolis

Dec. 12—President Lewis, of the United Mine Workers of America, has issued a formal statement in which he commits the organization in favor of a national bureau of mines.

The ballots for the election of president and other officers of the United Mine Workers of America have been sent out to the local organizations from headquarters in Indianapolis. The race for the presidency is being made by T. L. Lewis, present incumbent, and William Green, of Ohio. Each candidate is making a personal canvass of the districts. John H Walker, of Illinois, who was a candidate against Lewis last year, is managing Green's canvass, and considerable bitterness is being injected into the campaign.

Cobalt

Dec. 12—Little is being heard of the Gillies Limit claims, and many of those who bought late at the last sale are beginning to regret the extravagant prices paid. Their value, however, cannot be estimated until more work has been done and the delay in getting air and electricity from the power [illegible] is responsible to a large extent for the small amount of work. The owners feel that it would be unwise to go to the expense of installing plants until the cheap power is available. The Hydraulic Compressed Air Company has promised air for the middle of January; it is very doubtful if it will be ready for delivery before a month or more from that time. This power will have a beneficial effect on the camp and many properties now lying idle will start work as soon as cheap power can be procured. Several of the mills are also awaiting the electric power and their capacity will be much increased when it is available.

Considering the revival of interest in gold mining in northern Ontario, it is interesting to note that for the year 1908 only 3465 oz. of gold were produced. When the gold mines in this section of the province are firmly established the output should be largely augmented. The first place in which gold was discovered in this district was at Larder lake, and although uptodate, the results have not been very encouraging, work is going ahead, and if the properties are properly developed and conservatively managed, they stand a chance of eventually making good. Gold was next discovered in Munroe township, and subsequent to that at Painkiller lake. Several companies are operating in the latter section and good results are being obtained. It is probable that this winter a small mill will be erected by the Painkiller Lake Gold Mining Company. This company started its shaft on an 8-in. vein and at a depth of 50 ft. the vein had widened to over 4 ft. The latest district to claim attention is around Porcupine lake, where gold was discovered this fall. A large number of prospectors have already gone into the district, but the real rush will not take place until the winter roads are in shape and extensive preparations have been made to handle it. At the present time a large number of dog teams and horses are waiting at Matheson, and their numbers are being increased daily, while large quantities of supplies are being obtained in readiness for the time when the roads will be fit to travel over. A large amount of work will be done this season, and until such time as that is accomplished it will be impossible to give any estimate of the value of the discoveries.

During the past week seven new mining companies with a total capitalization of over $7,000,000 were incorporated.

Toronto

Dec. 11—A statement has been issued by the Ontario Bureau of Mines, showing the output of the metalliferous mines and works of the province for the nine months ended Sept. 30, as follows:

	Quantity	Value
Gold, oz.	1,125	$18,926
Silver, oz.	18,751,519	9,185,600
Cobalt, tons	127	79,450
Arsenic, tons	780	39,221
Copper, tons	5,588	740,677
Nickel, tons	8,912	1,921,365
Iron ore, tons	205,262	473,770
Pig iron, tons	204,698	1,095,733
Zinc ore, tons	785	8,000

The gross production amounted in value to $16,762,742, against $12,185,511 for the first nine months of 1908. Cobalt ore shipments amounted to 22,218 tons, of which 1878 tons were concentrates, the total silver content exceeding that of the same period last year by 6,170,039 oz. The output of nickel showed an increase of 1162 tons, iron ore 39,174 tons, and pig iron 105,411 tons, while copper showed a decrease of 309 tons.

Count Alfred Von Hammerstein, on Dec. 3, testified before the committee of the Canadian senate on mineral resources at Ottawa, concerning the richness of the Athabasca oilfields. He stated that for eight years he had been engaged in the exploration of a field between 320 and 350 miles north of Edmonton. He and those associated with him in the work had spent about $85,000 and drilled 14 wells scattered over an area of 60 miles. The wells varied in depth from 250 to 1200 ft., and some of these had revealed the presence of oil and gas in large quantities. He produced samples of sand impregnated with oil which he ignited before the committee, and stated that there were inexhaustible supplies of this material in the region. It was found in a hardened state near the surface but at the depth of 60 ft. it occurred, he stated, in a semi-liquid condition. He was satisfied that deep drilling would result in a large production of oil.

Mexico

Dec. 12—The mining operators in Mexico generally believe that the mining interests were made to suffer by reason of the adoption of the gold standard, at the expense of the railroads and other interests in the country, chiefly those in which foreign capital was largely invested. In this connection the following report from the Mexican Exchange and Currency Commission, recently made to Señor Limantour, minister of finance, is of interest: "The silver-mining interest still complains of the abolition of its time-honored right of free coinage, which was nothing but a privilege by virtue of which all the inhabitants of the nation had to buy the product at a fixed price and at the cost of an actual decline in salaries and wages, though in appearance they might seem to rise, and of a depreciation as unjust as it was general in every branch of public and private wealth. The mining interest in thus complaining forgets that under the new regime it alone profited, as indeed was only fair, when the price of silver rose, selling it, not at the old coinage value of the metal, which was $40.91 per kilogram, but at $43 and even more; it also forgets the permanent reduction in taxes decreed in its favor when the monetary reform came into force and that it also derives advantages from the fixity of exchange when it makes purchases abroad of machinery, tools, apparatus, and many other articles which it needs in the development of its industry."

Mining News from All Parts of the World

New Enterprises, Installations of New Machinery, Development of Mines and Transfers of Property Reported by Special Correspondents

THE CURRENT HISTORY OF MINING

Arizona

COCHISE COUNTY

Calumet & Arizona—The smeltery output for November was 4,500,000 lb. from four furnaces and five converters.

GILA COUNTY

National Mining Exploration Company—This Boston company is developing adjoining the Arizona Commercial property at Globe. The Williams shaft is down 350 ft. and it is expected will cut the vein, opened at 500 ft. in the Eureka shaft of the Commercial company. About 800 ft. of work has been done on the Black Hawk vein of the Iron Cap claim. F. A. Woodward is in charge.

Old Dominion—The November production was 2,296,000 lb. of blister copper.

GRAHAM COUNTY

Arizona Copper—The November output was 1,614,000 lb. of copper.

PIMA COUNTY

Twin Buttes—The company has about 60 claims 27 miles southwest of Tucson. The mine is connected with Tucson by the Twin Buttes railroad, which the company built and which has recently been taken over by the Southern Pacific company. This road is now being extended to Nogales and may be made the main line into Mexico from the west. The Twin Buttes company has been shipping for about two years, and during that time has taken up and paid a bonded indebtedness of about $90,000 and has $20,000 in the treasury. The surface equipment from the Morgan shaft has been removed to the new working shaft, which has been upraised from the 400-ft. level, and the company has resumed shipment. A contest is on for the control of the board of directors to be elected at the meeting Jan. 18. There are five other properties developing in the Twin Buttes district.

Helvetia—This company is carrying on extensive developments during the suspension of shipments. During the last year, ended June 30, 1909, 5327 ft. of development work was accomplished at an average cost of $20.46 per ft. including all general expenses and depreciations. C. C. Prindle is president.

Wayne Development—The company has made the first payment on the properties in the Comababi mountains to Edward Rochester and is planning to develop actively. A new gold strike was recently made adjoining the property and is now being explored.

MOHAVE

Wallapai Mining and Development—This company, owning the Tennessee mine at Chloride, is planning to resume. The company has not decided whether it will treat the zinc-lead ore at the mine or sell it crude. James H. Hurin, of Los Angeles, is president.

YAVAPAI COUNTY

Vulture—The company has added a compressor and five drills and is carrying on development work to increase the ore reserves. Twenty stamps are now running and a new mill is being built—using 1500-lb. stamps. A cyanide plant is planned. The property was taken over by the present company in September, 1908, and since that time has carried on an active development campaign.

Golden Ridge—This property, seven miles east of Congress Junction, has reported a gold strike. The Southern Yavapai company, T. J. Morrison, in charge, is developing another gold property near the Golden Ridge.

Black Hills Copper Company—The property is 12 miles south of Jerome on the eastern slope of the Black Hills range. The main shaft is 400 ft. deep, with 1500 ft. of workings. Some copper ore has been encountered, but not in commercial quantities. The company is controlled in Pittsburg.

California

AMADOR COUNTY

Kennedy—In this mine at Jackson a new level is being opened at the 3300 station where the vein was met recently. The 100-stamp mill continues to crush 400 tons of ore daily. The company is planning to increase its mill by 50 stamps.

BUTTE COUNTY

St. Francis—Joseph A. Dowling has been elected president of this company. The 10-stamp mill will be running next month. The mine has been equipped with compressor and auxiliary gasolene engine. The Mooretown ditch has been purchased and will furnish water for power. John McCarthy is superintendent.

CALAVERAS COUNTY

Tulloch—Thomas Ewing is sinking a two-compartment shaft on this mine near Angels and the old mill on the property will be repaired.

Dolling—Work of sinking a shaft on this property at Angels has commenced. This was formerly the North Star mine and adjoins the Gold Cliff on the west. A 40-stamp mill will be built.

ELDORADO COUNTY

Clark—At this mine, four miles from Shingle springs, a 10-stamp mill and gasolene engines are being installed. Randall & Blake, of Sacramento, have the bond.

SONOMA COUNTY

Culver-Baer—The furnace at the Sonoma mine will be purchased and placed on this quicksilver mine.

Eagle-Shawmut—The new shaft has been started at this mine at Chinese and the hoisting machinery will be moved from the old shaft.

Colorado

CLEAR CREEK AND GILPIN COUNTIES

Ophir-Burroughs—A. Watters & Co., of Bald Mountain, have taken a lease on this property and commenced shipments.

Gladstone—This property in the Lake and Illinois-Central districts, has been leased and bonded to W. H. MacFarland, Toledo, O., for three years in the sum of $25,000, and active developments have been started.

Sea Bird Mining Company—This company has purchased the group in Moon gulch for $7500, and will install a compressor. H. Everest, Rollinsville, is superintendent.

TELLER COUNTY—CRIPPLE CREEK

Jerry Johnson—The November output from the properties of this company, on Ironclad hill, was 52 cars of shipping ore, and 1000 tons of low-grade, treated at the mill on the property, having approximately a gross bullion value of $46,000. A dividend will be paid Dec. 15 of 1c. per share, amounting to $25,000.

Doctor-Jack Pot—The quarterly report from July 1 to Oct. 1, mailed to the stockholders, along with a dividend of ½c. per share, amounting to $14,500, shows royalties received from lessees $4300, and a cash balance in the treasury of $40,800.

Gold Dollar Consolidated—The royalties for August were $2075; September, $2068; October, $2000, with a cash balance in the treasury of $13,244.

Prince Albert—The production during November is given at 600 tons, of a gross value of $9000.

El Paso Consolidated—The November production from this property on Beacon hill, by leasers, was 101 cars, approximately 2500 tons of ore, the value being given at an average of 1 oz. gold per ton.

Western Investment—This company, which is operating the Mary McKinney mine under lease, is said to have made a production during November of nearly 800 tons, yielding $30 per ton.

Last Dollar—This mine, credited with a production of $2,000,000, but which has been idle since 1904, has been leased for 18 months to responsible parties, and will be put in active operation at once. The main shaft is 1278 ft. deep, with 12,000 ft. of drifts and crosscuts. It is fully equipped with powerful machinery.

Granite—This property on Battle mountain is stated to be making a production of 2100 tons per month.

United Gold—During November, under the leasing system, this company shipped 2500 tons from dump and mine, the average value being given at $30 per ton. Twenty sets of leasers are employed on the various mines of the company, viz.: Wild Horse, Damon, Deadwood, Trail, W. P. H., Montrose, Midway and Trachyte. A dividend amounting to $40,000 will be paid Dec. 20.

School Section—This company, leasing on block 8, School Section No. 16, at the base of Bull hill, has opened a new orebody at the third level. The ore is about 6 ft. wide, and can be hand-sorted to run about $20 in gold, with shipments of about 75 tons per week.

Michigan

Copper

The output of copper for November by the Calumet & Hecla Mining Company amounted to 6,470,473 lb., compared with 6,670,899 lb. for October. The subsidiary companies report the production for November: Ahmeek 1,112,695 lb.; Osceola, 2,050,110; Tamarack, 1,232,715; Isle Royale, 629,210; Centennial, 214,219; Allouez, 345,956 lb. The Superior Copper Company purchased 212,710 lb. in November.

Hancock—No. 2 shaft has reached the footwall of No. 3 lode in one corner. The lode at this point is 15 ft. wide. No. 2 shaft will continue on its way to cut the Pewabic lode, estimated to be about 1500 ft. further down.

Gratiot—No. 1 shaft is sinking below the 11th level, with drifting under way at all the levels above. No. 2 shaft is down to the 12th level and is drifting from the 9th, 10th, 11th and 12th, the ground down to the 9th level being somewhat disappointing. This company has a stock pile of 15,000 tons.

Montana

Butte District

Butte & Superior—A contract has been entered into whereby the mining company will send all its ore to the concentrator at Basin for treatment until the Butte & Superior zinc mill is completed. A spur is being constructed from the mine to the Great Northern track, and shipments will start by Jan. 1. The crosscut south on the 1600-ft. level is being cut through the second vein.

Amalgamated—The raise from the 1100-ft. level of the East Grey Rock mine to connect with the 700-ft. shaft of the West Grey Rock, has been completed making the shaft of the latter mine 1100 ft. deep. Stations have also been cut on the 850-, 1000- and 1100-ft. levels. The West Grey Rock is now hoisting about 125 tons daily while the East Grey Rock was hoisting 600 tons before it shut down on account of the switchmen's strike. Previous to the shut-down the Silver Bow was hoisting about 350 tons daily.

Jefferson County

Boston & Alta—The shaft has reached 300 ft. where a station is being cut from which a crosscut will be run to the Alta lead. Sinking will continue uninterrupted.

Corbin Copper—The Dewey tunnel is in 600 ft. and has encountered ore. The Dow tunnel is in 636 ft. Development work is being carried on at five different points. General Manager Richards has gone east for the purpose of making arrangements for the erection of a concentrator.

Wickes-Corbin—The crosscut tunnel is now in 900 ft. and has cut seven different veins.

Copperfield—A tunnel has been run on the vein 500 ft. and is in ore carrying copper and silver.

Montana-Corbin—Drifting on the 235-ft. level will be begun at once.

Peacock and Turkey—James Madden and A. C. Ray have secured a lease and bond for $20,000 on these claims in the Elkhorn district.

Nevada

Douglas County

Willard McDonald—This mine, near the Mountain House, has been bonded to Sheridan parties.

Esmeralda County

Ideal—This new company purchased the Knight-Condlon mill at Rawhide, and will add 10 stamps and do custom work.

Combination-Fraction—The company has secured a renewal of the lease of the mill of the Nevada Goldfield Reduction Works and within a few days the stamps will again be dropping on company ore.

Goldfield-Florence Extension—An application for an order to make an underground survey of the workings, has been made by the Florence Goldfield Mining Company.

Humboldt County

Nevada Sales Smelting Company—This company is incorporated to acquire the Arizona and Henning groups at Union ville and is considering the installation of a small smelting plant. J. K. Malkey is secretary of the company.

Lander County

Austin Manhattan—This company is erecting a mill at Austin. It has developed milling ore in the Frost shaft on the Panamint vein and in the Jack Pot mine.

Lincoln County

Dinosaurus—The properties of this company, in Eldorado cañon, have been leased to a Denver company.

Nye County

The estimated value of the production from Tonopah for the week ended Dec. 4 is $125,700, the tonnage being divided among the various properties as follows: Tonopah, 3500; Montana-Tonopah, 968; McNamara, 300; West End Consolidated, 160; Midway, 100; total, 5028 tons.

Tonopah—This company is maintaining production of from 3000 to 3500 tons per week, most of the ore coming from the Mizpah and Valley View veins. The ore continues to be of an even grade and runs about $19 per ton. The company has been doing prospecting of late, and the last few weeks have shown 500 to 600 ft. of new ground broken, several new oreshoots having been disclosed.

Tonopah Extension—Practically all the machinery for the new mill has been received, and it is the intention of the management to start within the next 30 days. Underground work in the mine has begun and the cleaning up after a shut-down of several months is in progress. Several raises are to be run from the 35-ft. level to a point under the ore dump, and the ore will be dropped to that level and then hoisted through the main shaft and run through the crusher close to the collar.

Tonopah-Belmont—After a shut-down of one month the Belmont has again resumed. The main shaft has been repaired, and a number of surface improvements have been made. Underground work has been resumed and a full force of men is employed. Among the improvements is a Crane washer and ore picker and by the use of this device the manager expects to raise the grade of the ore. S. H. Brady is superintendent.

Storey County

C & C—Progress is being made in unwatering the shaft, the water now standing at 148 ft. below the 2350 station.

Ward—This shaft is holding the water and making necessary repairs to the shaft. A set of hearers was completed at the 2250 mark. Work is being pushed on the 2100 pump station.

Savage—This mine is shipping ore to the Franklin Leonard mill at the mouth of the Sutro tunnel.

Yellow Jacket—Work will be confined to the opening of the incline shaft to water level, stoping operations having been suspended.

Coleman and Chart—These claims on Cedar hill have been leased.

Baker—This mine is drifting west on a 5-ft. foot vein carrying good ore. The electric hoist on the tunnel level is in operation.

WHITE PINE COUNTY

Boston Ely—An assessment of 50c. per share has been called, payable Dec. 23. The Emma shaft is now 1065 ft. deep. During October the advance was 71 ft. and in November 35 ft. The November work was in particularly hard rock. The new compressor is in operation and increased speed in sinking is expected. It is figured that the water level will be reached at 1160 ft. The superintendent reports that carbonate ore was struck in the shaft Dec. 9.

Ohio

Sunday Creek Company—A suit brought in Perry county is pending to annul the charter of this company on the grounds (1) that the Sunday Creek Company, by permitting its stock to be held unlawfully by the Hocking Valley Railway Company has abdicated the powers conferred upon it by the State of Ohio, and is, therefore, divested of its authority, and (2) that by holding the stocks of kindred and competing corporations it is violating the law of Ohio. The company is a holding company, organized to hold and operate the coal mines formerly owned by the Hocking Valley Railway Company. It is the largest coal company in Ohio, practically controlling the Hocking Valley district.

Oregon

JACKSON COUNTY

Murray—S. H. Murray, of Central Point, has bonded the mine to M. O. Womack, who will erect a 10-stamp mill.

JOSEPHINE COUNTY

Oregon-California—This property has installed hydraulic equipment at the former Biggs property, and plans are being made to erect a mill. George W. Soranson, Grants Pass, has charge.

Pennsylvania

ANTHRACITE COAL

Knickerbocker—A mile of track has been built to carry coal from this colliery, near Shenandoah, to the Ellengowan breaker. Work which was stopped by the burning of the breaker on Nov. 20, was resumed Dec. 10 in the colliery.

Nay Aug Coal Company—The breaker at Dunmore was burned Dec. 3, the loss being a total one. It is to be rebuilt at once.

Vulcan—This colliery and the Buck Mountain, both on Broad mountain, east of Frackville, will be taken over and operated by the Lehigh Valley Coal Company on Jan. 1 next.

BITUMINOUS COAL

J. V. Thompson, of Uniontown, has closed a sale of a field of 3000 acres of the Pittsburg vein of coking coal in Greene county, to William G. Mather, of Cleveland, O., for $1,750,000. Mr. Mather is president of the Cleveland-Cliffs Iron Company.

Sackett Coke Company—This company has bought the Madison plant of the United-Connellsville Coke Company, in Westmoreland county, for $125,000. The plant is on the Hempfield branch, nine miles southwest of Greensburg, and comprises 45 acres of coal. The plant consists of 50 ovens constructed about three years ago.

Utah

BEAVER COUNTY

Beaver Carbonate—On the 700-ft. level, an orebody has been developed 30x100 ft. and a second orebody of milling grade has been developed, 75x100 ft. These orebodies are said to warrant the building of a mill. M. M. Johnson is consulting engineer; Grant Snyder, manager.

Leonora—A contract for another 100 ft. has been let on the tunnel already 400 ft. long. More active development has been stimulated by the finding of the shipping ore on the Red Warrior adjoining.

Horn Silver—Plans are being worked out for a concentrating mill for the separation and saving of the various minerals in the complex ores. The present price of zinc justifies the shipping of the zinc but these ores carry also 10 per cent. lead and 5 oz. silver for which the zinc smelters do not pay. A mill to accomplish the separation and saving is to be built. The mine was maintaining an average shipment of 1500 tons per month to the Knight smeltery when it closed down. Efforts are being made to secure another smelting contract. At present the company is delivering 1000 tons of zinc ore to Colorado, on contract. The mine has a dividend record of $6,000,000.

Red Warrior—A streak of rich galena has been encountered on the 400-ft. level underneath the sand carbonates which have been furnishing the shipping ore from the mine.

CARBON COUNTY

Utah Fuel—Contracts are being let for a tunnel 8000 ft. long to convey water from Ranch creek to the mines at Sunnyside. The estimated cost is from $8 to $10 per foot.

JUAB COUNTY—TINTIC DISTRICT

Lower Mammoth—The station on the 200-ft. level has been completed and drifting has begun for the ore which occurs in the upper levels. It is expected that two months will be required to drive this drift to the ore.

Mammoth—The judgment in favor of the Grand Central has been paid to the amount of about $150,000; the final payment will be made Jan. 12, bringing the total to $176,385.

Sioux Consolidated—The ore on the 450-ft. level is showing up well and although it is not so good as on the 400 is nevertheless of shipping grade.

Grand Central—A dividend will be paid during December 15 yet is not stated whether this will be the inauguration of regular dividends. The treasury has been put in exceptionally strong position by the heavy payments from the Mammoth company.

Golden Chain—The company has taken complete charge of the workings of the Ajex recently acquired. Drifting for the Golden Chain oreshoot is under way on the 300- and 1100-ft. levels.

Uncle Sam Consolidated—An entirely new strike has been made which is farther west than any ore previously encountered. The oreshoot is 7 ft. wide.

SALT LAKE COUNTY

Ohio—In the Elvina vein a second seam of rich ore, first encountered on the 100-ft. level has been cut on the 500 where it is 4½ ft. wide and averages 4 per cent. copper, $1.80 in gold and is high in iron. The porphyry ores which are going to the mill, average only 1.75 per cent. copper. The first unit of the new mill, just started, is running satisfactorily, treating nearly 700 tons per day.

Columbus Consolidated—The new orebody encountered on the 100-ft. level and for which a drift is being run on the 400, averages 10 per cent. copper, 15 per cent. lead and 18 oz. silver.

UTAH COUNTY—AMERICAN FORK DISTRICT

Mineral Flat—Work has been stopped and the property closed down indefinitely. The recent assessment will pay the indebtedness. Good ore was encountered in the upper levels and an expensive power plant was built and a long tunnel driven with the expectation of getting the ore in quantity with depth. The tunnel has not thus far encountered the ore and the company being without funds, the mine was forced to close. This is one of the Jesse Knight properties.

West Virginia

MARION COUNTY

Pittsburg-Buffalo Coal Company—This company has bought a tract of 2450 acres of coal land in the Brackenville section of the Fairmont district. The price is said to have been $290 per acre. Mines will be opened on the tract at once. The operations will be supplementary to those of the company in the Pittsburg district; and it is understood that the coal will go chiefly to the northwestern trade.

Wyoming

The Federal Circuit Court of Appeals has given an opinion setting aside the verdict and ordering a new trial in the case of the United States against the Union Pacific Coal Company, the Union Pacific railway, the Oregon Short Line railway, James M. Moore and Everett Buckingham, in which they are charged with having violated the Sherman anti-trust law, by forming an unlawful com-

bination. Proceedings were started by a Salt Lake City coal dealer named Sharp, who charged the coal company and the defendant railways with having refused to sell and haul coal for him. The Court of Appeals holds that the evidence of a combination was insufficient and orders a new trial.

Canada

British Columbia

Granby—A week's run at the smeltery at Boundary, gave an average of 560 tons of ore per diem smelted in seven blast furnaces. The eighth enlarged furnace had not yet been blown in. Operations have proved that the capacity has been increased to about 4500 tons each 24 hours, with eight furnaces running.

Consolidated—The orebody on the ninth level of the War Eagle mine, Center Star group, Rossland, continues to show up well. Ore is being mined on the sixth level of the Iron Mask mine.

Silver Cup—A larger hoist has been installed in the lower tunnel to facilitate sinking the winze below that level another 100 ft., to 1000 ft. F. Charles Merry, Ferguson, is superintendent.

Winslow—A 5-stamp experimental mill is being installed. D. E. Wert, Trout Lake, is superintendent.

Ontario—Cobalt

The shipments for the week ended Dec. 3 are as follows: Nipissing, 197,344; La Rose, 124,021; Trethewey, 127,500; Right-of-Way, 127,265; Hudson Bay, 120,735; Drummond, 100,000; Kerr Lake, 126,740; Crown Reserve, 123,900; O'Brien, 64,500; Buffalo, 53,300; Coniagas, 62,958; City of Cobalt, 63,480; Townsite, 54,369; Cobalt Central, 40,820; total, 1,386,932 pounds.

Crown Reserve—A rich oreshoot has been struck in No. 14 vein.

Nova Scotia—At the annual meeting held in Montreal, Dec. 6, the financial statement submitted showed $121,000 as having been expended on underground development and over $50,000 on surface work. The engineer's report showed 1,600,000 oz. of silver blocked out which was expected to return the first year some $60,000. A cyanide and amalgamating mill is under construction, which is expected to be ready early in the spring. The shareholders ratified the proposal to increase the capital stock by $500,000. The new stock will be offered to shareholders at 50c. per share *pro rata* to their holdings at one to every four held.

Orphir—At the annual meeting held at Cobalt, Dec. 6, a statement was presented showing over $110,000 in hand. Since the installation of the plant in June, 1000 ft. of stoping has been done, resulting in the discovery of four well mineralized veins. Shaft No. 1 is down 216 ft., and about 40 ft. of drifting has been done on the 100- and 200-ft. levels.

La Rose—Development on the No. 5 vein of the Lawson at the 88-ft. level has shown high-grade ore.

Ontario

Lake Superior Corporation—Contracts have been closed for the erection at the Sault Ste. Marie of 110 Koppers by-product coke ovens, to be completed by the close of 1910. The work will be under charge of Louis Wilputte, engineer for the H. Koppers Company.

Mexico

Baja California

Boleo—The November output was 1132 long tons of copper. The average ore yield was 3.89 per cent.

Chihuahua

Batopilas—The bullion shipment for November was 90,000 oz. of silver; for October, 49,600 ounces.

El Rayo—This mine at Santa Barbara has declared its first dividend of 3 per cent., payable Dec. 24.

Jalisco

Tecalitlan—A 20-ton Bryan amalgamating plant is nearing completion at mines owned by A. J. Stewart and G. S. Johnson in the Tecalitlan district. The mines have been under development for several years. The ore is free milling gold.

Amparo—It is hoped to secure water for milling as a result of sinking the 3-compartment shaft 300 ft. The present water supply is inadequate. Work on the shaft extension, which will give a depth of 1050 ft., has commenced.

Solomon and Hundido—The option on these Hostotipaquillo district mines, secured to allow an examination by the Bradbury interests of Los Angeles, has expired. No deal was made.

Mexico

El Oro—In November, mill No. 1 ran 20 days and mill No. 2 29 days. Crushed 25,456 tons; yielding bullion, $219,480. Working expenses were $115,190; expenditure on development, $28,000; profit, $76,290; profit on railway, $6000; total profit, $82,290; expenditure on permanent improvements, $5000.

Mexico Mines—Mill ran 29 days; crushed 11,050 tons; yielding bullion, $106,730; working expenses, $40,600; expenditure on development, $12,300; profit, $53,830. Net value of 50 tons shipped during month not included in the above profit, $12,000; expenditure on permanent improvements, $1000

Oaxaca

Ulaxe—The Boston company owning this property near Parian is installing a 10-ton mill to treat the gold ore from the property. Samuel Webster is manager.

Sonora

Montezuma-Arispe—Shareholders have subscribed 50,000 shares at $5 per share among themselves. A resumption of development work on the lost of the year has been announced.

Lampazos—Eastern men are negotiating for this property. The Banco de Sonora is the present owner through indebtedness.

Amargoso—This mine, located 30 miles east of Calabazas station on the Nacozari railroad, is arranging to export ore. George J. Cole is superintendent.

Transvaal—Diamond drilling is being extensively carried on. A resumption of ore extraction will not be accomplished until the railroad reaches the property.

Tepic

The Southern Pacific line is being inspected preparatory to its opening as far as Rosamorada. An extensive mining section is tributary to that point.

Zapopan—Power and pumping equipment has been purchased, and some of the old workings will be unwatered preparatory to important development work. Later the cyanide plant will be modernized and enlarged. The mines are in the La Yesca district.

Independencia—The old Independencia mine 16 miles from the Pacific coast has been acquired by R. N. Leggett and E. C. Good.

Africa

Transvaal

The cable reports the gold production in November at 597,765 oz. fine, or slightly less than in October. For the 11 months ended Nov. 30 the total gold production was $132,163,443 in 1908, and $137,983,722 in 1909; an increase of $5,820,279 this year.

Central America

Salvador

Gigante Mining Company—Douglas Waterman and M. Milner are developing this property six miles from the Butter's Salvador and are installing a cyanide plant. The ore is partially free milling and averages $11 per ton. William Hollister is engineer.

South America

British Guiana

Arowa Mining Company—This company is developing a gold quartz property in British Guiana. A mill is under construction, and it is announced that it will be in operation by March 1. The same interests also have the South American Gold Company, operating a placer property in the same region. Gaylord Wilshire is president of both companies.

Peru

A concession has been granted to Julio Federico Galves, granting permission to explore the River Tumbes, in the northern part of Peru for auriferous deposits. The area extends between Rica-Playa and Punsango, 60 kilometers.

Metal, Mineral, Coal and Stock Markets

Current Prices, Market Conditions and Commercial Statistics of the Metals, Minerals and Mining Stocks

QUOTATIONS FROM IMPORTANT CENTERS

Coal Trade Review

New York, Dec. 15—Coal trade in the West has been livened up by very cold and stormy weather, which has brought about extensive buying of domestic coals. Mines are fully occupied in filling orders and there has been an advance in prices at some of the principal distributing centers. Steam-coal trade continues steady. There is some complaint of shortage of cars, but conditions in this respect are much better than in the East.

The Seaboard bituminous trade shows little change. Business continues on a fair scale, but prices do not advance on account of the large supplies ready to be put on the market. Car shortage is still an element in the trade.

The anthracite trade has been suffering a good deal from the results of the long drought. Last week several large collieries were compelled to close down on account of lack of water. This week, however, there have been very heavy rains throughout eastern Pennsylvania, which will probably furnish a supply.

Southern Coal Rates—A number of coal operators in the southwestern section of Virginia met at Bristol, Tenn., and appointed a committee to contest the application made by Tennessee coal producers to the Interstate Commerce Commission for lower rates over the Southern railway. The Virginia operators claim that such rates would be differential and unfair to Virginia coal.

Coal Traffic Notes

Coal tonnage originating on the Southern Railway for the nine months ended Sept. 30 was: Tennessee district, 948,476; Alabama district, 1,754,507; total, 2,702,983 short tons. The total in 1908 was 1,992,168 tons, showing an increase of 710,815 tons, or 35.7 per cent., this year.

Coal and coke tonnage of the Chesapeake & Ohio railway, four months of fiscal year from July 1 to Oct. 31, short tons:

	Coal.	Coke.	Total.
New River	2,736,735	118,802	2,855,537
Kanawha	2,053,377	11,956	2,065,283
Kentucky	133,071	93	133,164
Connecting lines	25,155	16,220	41,375
Total	4,948,288	147,071	5,095,359
Total, 1908	4,141,892	79,570	4,221,462

Deliveries this year to points west of mines, 2,587,208 tons coal and 62,682 coke; points east, 577,047 tons coal and 84,389 coke; tidewater, 1,781,706 tons coal; anthracite to line points, 2317 tons. Total increase in shipments this year, 873,897 tons.

Coal tonnage passing through Sault Ste. Marie canals, season to Dec. 1, short tons:

	1908.	1909.	Changes.
Anthracite	1,260,753	1,362,037	I. 101,284
Bituminous	8,254,306	8,235,454	D. 18,852
Total	9,515,059	9,597,491	I. 82,432

Only a few cargoes passed in December, so that the above figures represent nearly the season's business.

Coal receipts at Boston, 11 months ended Nov. 30, reported by Chamber of Commerce:

	1908.	1909.	Changes.
Anthracite	1,619,800	1,606,294	D. 13,506
Bituminous	2,971,968	3,215,663	I. 243,695
Total domestic	4,591,768	4,821,957	I. 230,189
Foreign	338,808	214,106	D. 124,702
Total	4,930,576	5,036,063	I. 105,487

The foreign coal is almost all from Nova Scotia.

New York

Anthracite

Dec. 15—The anthracite trade has been started into greater activity by the cold weather which has prevailed during the past week. Dealers are hustling to get in supplies, and trade is good.

Schedule prices for large sizes are $4.75 for lump and $5 for egg, stove and chestnut, f.o.b., New York harbor. For steam sizes quotations are, f.o.b., New York harbor points: Pea, $3.10@3.25; buckwheat, $2.35@2.50; No. 2 buckwheat or rice, $1.75@2; barley, $1.35@1.50. Some washery pea and buckwheat have been offered at 10 or 15c. less.

Bituminous

The local bituminous trade is more active and there has been considerable buying, both in New York harbor and at points along the Sound. All-rail trade continues steady, as it has been for some time past. The Far East, owing to the season, is getting to be less and less a factor in the market.

Prices are advancing, but are still irregular. A fair grade of steam coal can be had at a seaboard price which realizes about $1 per ton at mine, while better grades run up to $1.40 at mine and in some cases $1.50 at mine is paid for special coals. A peculiar situation has developed in gas coal. The shipments of lump and ¾-in. have been so light that comparatively little slack has been made, the result being a scarcity of that grade. During the past week prices have been paid for slack which are on a parity with those for lump and run-of mine.

Car shortage is still with us, and is holding back deliveries. The situation is still particularly bad on the Baltimore & Ohio, but the Pennsylvania is also suffering. Transportation is better, coal coming through about on schedule time.

In the coastwise vessel markets there is talk of higher rates, but no positive advance has been made, although some boats are holding back on account of stormy weather. The current rate from Philadelphia to Boston, Salem and Portland is $1; while from New York it is 70@75c. to points around Cape Cod.

Birmingham

Dec. 13—Coal production in the South is back to the condition that prevailed before the panic came on in 1907 and there is need for every ton. There is a considerable amount of coal going into coke but still the cry is for more coke. There have been some coal-land deals consummated recently which mean development in the near future while some smaller mines have changed hands and are soon to be under better operation than heretofore. The railroad interests have been recently in the market.

Chicago

Dec. 14—With the coldest weather of the season over Chicago territory in the last week, the market for domestic coals has been brisk and sales have been widely distributed. Country and city dealers have bought freely of bituminous and anthracite and it is the opinion of some in the trade that the buying movement, now that it has begun, will continue actively, for both retailers and consumers are believed to have short stocks generally. Others adhere to the idea that the coal market is strictly a weather proposition. As a result of the cold wave, domestic grades of Illinois and Indiana coals strengthened and a better tone has become manifest in the steam trade. Eastern coals have found some betterment in the situation. Transportation has been bad on account of storms and the switchmen's strike, but this affects about all kinds of coal alike.

Illinois and Indiana coals continue to bring $2@3 for lump and egg, $1.75@1.85 for run-of-mine and $0.95@1.15 for screenings. For steam uses lump and run-of-mine are in large and increasing demand, and the amount of coal sold to escape demurrage charges is small.

Of coals from east of Indiana, Hocking is very strong and brings its full circular

price; smokeless is again weak through oversupplies and brings 10@25c less than circular prices; other eastern coals find a fair sale at good prices. Anthracite sells very well in both city and country.

Cleveland

Dec. 13—A cold snap and snowstorm have started up the domestic demand at a lively rate. The steam coal trade is steady and good. Prices remain unchanged, as the closing of the Lake trade has thrown plenty of coal on the local market.

Indianapolis

Dec. 13—Cold weather throughout the West has stirred up domestic trade. Local dealers are making large requisitions on the coal companies and there is much activity at mines in consequence. There is also a good demand from the Northwest and shipments are being made as fast as cars can be had. Some complaints are heard of delay in supplying cars, and if there is no cessation in orders car shortage will become a feature in the trade. Local prices of domestic coal have advanced.

Pittsburg

Dec. 14—Local demand for coal is better on account of the cold weather. The car supply is barely sufficient, with occasional shortages, promising serious interruptions when the weather really becomes bad. Prices are a trifle firmer, while slack is clearly quotable 10c. higher. Regular prices, which are adhered to by practically all interests, are: $1.15 for mine-run and nut, $1.25 for ¾-in. and $1.40 for domestic coal, with slack at 75@85c. per ton.

Connellsville Coke—The market has continued quiet as to actual transactions in both prompt and contract, but negotiations on several contracts for furnace coke are believed to be coming to a head. Buyers have been holding off and have been since it became pretty clear a few weeks ago that the prospective position as to supply and demand would not justify the high prices of $2.90 and $3 which were done on a few contracts for 1910 closed in September and early October. The lowest quoted price of late has been $2.80 on contract furnace coke, but it is possible this may be shaded 5 or 10c. when good contracts are offered. Sales of prompt coke have been light, covering only 2000 tons in the week, all at $2.80 so far as reported. Foundry coke has been quiet, except for odd sales of prompt at $1.60@1.75 at oven.

We quote the market at $2.80@2.90 for furnace or contract furnace coke, and $3@3.25 for prompt and $4.25@4.50 for contract foundry coke.

The *Courier* reports production in the Connellsville and lower Connellsville region in the week ended Dec. 4 at 444,610 tons, a drop of about 1000 tons, and shipments at 7842 cars to Pittsburg, 8090 cars to points west of Pittsburg and 812 cars to points east of Connellsville, a total of 16,744 cars.

Foreign Coal Trade

German Coal Trade—Exports and imports of fuel in Germany, 10 months ended Oct. 31, metric tons:

	Exports.	Imports.	Exports.
Coal	19,004,296	9,891,418	Exp. 9,172,878
Brown coal	28,594	6,804,261	Imp. 6,775,467
Coke	2,818,294	556,364	Exp. 2,267,930
Briquets	1,308,969	147,060	Exp. 1,161,909
Total	23,220,323	17,393,073	Exp. 5,827,250
Total, 1908	21,735,259	17,545,549	Exp. 4,189,710

Coke exports this year included 30,461 tons to the United States.

German Coal Production—Coal production of the German Empire, 10 months ended Oct. 31, metric tons:

	1908.	1909.	Changes.
Coal	124,560,567	123,611,118	D. 1,949,449
Brown coal	55,086,244	55,762,053	I. 675,809
Total mineral	179,646,811	179,373,171	D. 273,640
Coke made	17,650,854	17,637,527	D. 13,327
Briquets made	15,277,072	15,526,980	I. 249,908

Of the briquets reported this year 12,321,073 tons were made from brown coal or lignite.

Welsh Coal Market—Messrs. Hull, Blyth & Co., London and Cardiff, Wales, report prices of coal as follows on Dec. 4: Best Welsh steam, $4.02; seconds, $3.84; thirds, $3.66; dry coals, $3.84; best Monmouthshire, $3.48; seconds, $3.36; best small steam, $2.28; seconds, $1.92. All prices are per long ton, f.o.b. shipping port, for cash in 30 days, less 2½ per cent. discount.

Iron Trade Review

The iron and steel markets show the end-of-the-year dullness which is usually expected at this season. Comparatively little will be done before Jan. 1 but most people expect that after that date buying for the third and fourth quarters will set in actively.

Pig-iron sales have been confined chiefly to comparatively small lots of foundry iron which are needed to make up deficiencies. Practically nothing has been done for next year, beyond the first quarter. The December report from the furnaces shows an increased production, the most noticeable point in which is that the gain over last month is entirely from the merchant furnaces, the steel works stacks showing a slight decrease.

In finished material the market has likewise been quiet, with little new except some sales of structural steel which is needed to fill contracts of considerable size.

At a conference held in Pittsburg the American Federation of Labor has decided to concentrate its forces on an attack on the open shop policy of the United States Steel Corporation. No immediate action is to be taken, but funds will be raised, and opportunity taken to bring on a conflict as soon as possible. This may be accepted as a forerunner of serious labor troubles in the future.

Pig Iron Production—The statements of the blast furnaces, as collected by the *Iron Age*, show that on Dec. 1 there were 314 coke and anthracite stacks in blast, having a total weekly capacity of 599,200 tons of pig iron; an increase of 5600 tons over Nov. 1 and of 197,200 tons over Jan. 1 last. In the past three years the highest weekly active capacity reported was 528,200 tons on July 1, 1907; the lowest, 235,150 tons on Jan. 1, 1908. Making allowance for the charcoal furnaces, the estimated production of pig iron in the United States in November was 2,582,500 long tons; for the 11 months ended Nov. 30 it was 23,041,000 tons.

Lake Superior Iron Ore—Shipments of iron ore from the Lake Superior region by water for November were 4,899,220 long tons, notwithstanding the delay caused by the accident to the Poe lock at the Sault. For the season to Dec. 1 the total shipments were, in long tons:

	1908.	1909.	Changes.
Escanaba	3,351,502	5,748,042	I. 2,396,540
Marquette	1,487,487	2,909,578	I. 1,422,091
Ashland	2,513,670	3,834,285	I. 1,320,615
Two Harbors	5,702,237	9,181,132	I. 3,478,895
Superior	3,564,030	6,540,505	I. 2,976,475
Duluth	8,808,168	13,470,503	I. 4,662,335
Total	25,427,094	41,684,045	I. 16,256,951

The total this year shows an increase of 305,200 tons over 1907. A few cargoes came out in December, but the quantity was small.

Baltimore

Dec. 13—Exports for the week included 62,065 lb. wire and 211,866 lb. galvanized sheets to Liverpool. Imports included 104 tons manganese ore from Germany; 11,900 tons iron ore from Cuba.

Birmingham

Dec. 13—The Southern pig-iron market continues quiet though a few sales are being made. Inquiries are being received indicating that before long there is going to be a buying movement. The production in Alabama in December will not quite reach the high figure of November, one of the Sloss-Sheffield company's city furnaces having been blown out for repairs with another soon to go out for relining. Reports are current that No. 2 foundry iron is being sold in this section at $14 per ton. Inquiry elicts the information that only resale iron is selling at from $14@14.50, while furnace companies are endeavoring to maintain $15 per ton. The make is not much greater than the needs, old orders considered. There is some inquiry being received from the cast-iron pipe makers.

The consumption of pig iron in the South continues to show improvement. There is steady operation at the steel works.

Chicago

Dec. 14—The iron market continues quiet, with every indication that it will not change materially before the passing of the year. Signs of weakness continue to characterize the market for Southern, but furnace agents profess faith in the maintenance of present prices. No. 2 Southern sells at $14@14.50. Birmingham ($18.35@18.85 Chicago) on the small contracts that are being made for first-half deliveries, considerable resale iron being in the market at the lower figure. Northern iron is firm at $18.50@19, the furnaces being well sold up. There is apparent a feeling that it will do no harm to wait a while until the consumption of iron products has increased and the season for stock taking is over. Buying now is mainly in carload lots to 1000 tons, a larger order appearing but rarely. In iron and steel products there is a continuance of fair sales but no heavy buying, with a firm tone. Coke continues at $5.50 and is in somewhat irregular supply owing to transportation delays.

Cleveland

Dec. 14—The season has finally closed, with stormy weather and an unusually large number of wrecks and casualties. Several ore boats are reported tied up in the ice on Lake Huron, at the head of the St. Clair river. It is now reported that no final action on ore prices will be taken before January.

Philadelphia

Dec. 15—The tone of the pig-iron market is strong, notwithstanding the small amount of business closed during the past few days. Quite a number of large buyers have their inquiries in hand though there is no disposition to bring dealings to a close. Very little business will be done until after the holidays. Northern No. 2 foundry is quoted at $19.50; Southern, $18.50; Northern gray forge, $18; Southern, $17.50; basic, $19.

Steel Billets—Business at present is confined to forging billets on which prices have been again advanced 50 cents.

Bars—Mills are holding prices at the highest point. A further advance is spoken of as probable. The month so far has been rather quiet. The bulk of retailers are now supplied with refined iron for from 30 to 60 days.

Plates—Some interests are endeavoring to arrange for supplies of material for next spring. Prices are creeping up and there is no standard figure. Each contract fixes its own price

Structural Material—No transactions in structural material have been reported outside of a few small orders for city delivery.

Scrap—The scrap market has been quiet and no sales have been made to the mills

Pittsburg

Dec. 14—Effective at the close of business Saturday, Dec. 11, wire products were advanced $1 a ton, to 1.65c. base for plain wire, $1.85 base for wire nails, 1.85c. for painted barb wire and 2.15c. for galvanized barb wire. The great reduction occurred May 1, being $8 per net ton on plain wire, $7 on nails and $10 on barb wire. Since then there have been two $2 advances, May 15 and July 24, which with the $1 advance Dec. 11 make a total of $5, leaving plain wire $3, nails $2 and barb wire $5 below the prices ruling, at least nominally, from the $2 reduction on June 9, 1908, to May 1 last. The general expectation in the trade had been that there would be a $2 advance Jan. 1 next, and with the $1 advance just made the expectation is there will be another $1 advance about Jan. 15. These prices refer to the jobbing trade, with which contracts are customarily made covering specifications to be filed within 60 days. Manufacturers who buy plain wire are covered farther ahead, and a couple of months ago producers started covering them for the first half of the new year at 1.70c., or at an advance of $2 a ton over prices then ruling for early delivery. The wire advance will stimulate specifications from jobbers on contracts already placed. Specifications had been rather light, as all contracts taken prior to the previous advance had been worked off. The wire mills have been running fairly full, but have been accumulating stocks.

Pig Iron—The market has been very quiet as to actual transactions. Most of the large steel works which bought bessemer iron heavily in the past few months are asking for January iron to be delivered at once, and bessemer iron is scarce. One merchant producer has been bidding for bessemer iron in the market, to apply on contracts, and has made one purchase, of 3500 tons, at $19, Valley, for prompt shipment. Basic is relatively weak, with no demand. It is quoted at $17, Valley, but some heavy buying will probably have to be done after the first of the year. Foundry and forge irons are dull and neglected, the market being quotable at $17@17.25 on foundry and $16.25@16.50 on forge, depending on delivery. The weakness in Southern iron has not affected this market, since even at $14, Birmingham, which it is believed can be done on prompt iron, the delivered price Pittsburg would be $18.90, while Valley iron at $17 at furnace makes $17.90, Pittsburg. Some Southern producers are understood to be willing to do $14.50, Birmingham, the $14 iron being offered by speculative interests, and the $14.50 price could probably be done for the fore part of 1910.

Steel—The supply of unfinished steel has eased up a trifle, but offerings are still limited and prices high. Billets are quotable at $27.50@28 for bessemer and $28@28.50 for open-hearth, with sheet-bars at $28.50@29.50, all f.o.b. maker's mill, Pittsburg. Only odd lots of sheet-bars are available at the lower price.

Ferromanganese—The market has been quiet, with a strong tone, but with no evidence of the extreme advance which some interests professed to expect. Prompt material is quotable at $45@45.50, and first quarter or half at $45.50@46, f.o.b. Baltimore, the freight to Pittsburg being $1.95 per ton.

Sheets—Prices are firm, with mills sold pretty well through the first quarter. The market stands at 2.40c. for black, 3.50c. for galvanized, $1.70 for painted corrugated and $3 for galvanized corrugated.

Metal Markets

New York, Dec. 15—The metal markets generally show little change from recent reports. There is, in most metals, a good business, but no important changes in quotations. Lead has risen while spelter has fallen.

Gold, Silver and Platinum

UNITED STATES GOLD AND SILVER MOVEMENT

Metal.	Exports.	Imports.	Excess.
Gold:			
Oct. 1909..	$ 9,379,402	$ 7,034,164	Exp. $ 2,245,438
" 1908..	1,952,574	3,785,705	Imp. 1,833,131
Year 1909..	106,652,236	38,139,557	Exp. 68,512,679
" 1908..	70,889,954	42,213,678	" 28,676,276
Silver:			
Oct. 1909..	4,053,745	4,017,884	Exp. 35,861
" 1908..	4,378,015	3,746,863	" 631,652
Year 1909..	47,342,861	37,258,414	" 10,084,447
" 1908..	43,159,395	34,539,067	" 8,620,328

Exports from the port of New York, week ended Dec. 11: Gold, $1,978,000, chiefly to Argentina; silver, $538,432, principally to London. Imports: Gold, $77,576; silver, $340,186, chiefly from Mexico and South America.

Gold—Supplies of gold on the open market in London were divided between the Bank of England and Continental banks. The price was 77s. 9d. per oz. for bars and 76s. 11d. per oz. for coin. Some more gold for South America was taken in New York.

Platinum—Business continues very good and dealers are holding prices steady at $29.50 per oz. for refined platinum and $33.50 per oz. for hard metal. There has been some increase lately in imports from Colombia.

Our special correspondent writes from St. Petersburg, under date of Nov. 25, that demand is good, especially from Paris, and there has been a further advance in prices. At Ekaterinburg small dealers and producers sell crude metal, 82 per cent platinum, at 6.25 rubles per zolotnik—equal to $23.50 per oz. At St. Petersburg quotations for the same grade are 24,000@24,500 rubles per pood—equal to an average of $23.77 per oz. Still higher prices are expected and dealers are not pressing sales.

Silver—The silver market has shown considerable firmness and activity this week. It has been a rising market. Continental orders are supposed to be responsible for the advance. The market closes easier today.

SILVER AND STERLING EXCHANGE

Dec.	9	10	11	13	14	15
New York....	51⅞	52	52	52⅛	52⅞	52⅞
London.... ..	23⅞	24	23 15/16	24 1/16	24	24⅛
Sterling Ex..	4.8755	4.8755	4.8755	4.8755	4.8780	4.8790

New York quotations, cents per ounce troy, fine silver; London, pence per ounce sterling silver, 0.925 fine.

Exports of silver from London to the East, Jan. 1 to Dec. 2, as reported by Messrs. Pixley & Abell:

	1908.	1909.	Changes.
India.....	£ 8,369,640	£5,955,500	D. £2,414,140
China.....	571,400	1,829,300	I. 1,257,900
Straits.....	164,885	114,614	D. 50,271
Total.. ...	£ 9,105,925	£7,899,414	D. £1,206,511

Indian exchange in London, 16.125d. per rupee, average for the week.

Copper, Tin, Lead and Zinc

Dec.	Copper. Lake, Cts. per lb.	Copper. Electrolytic, Cts. per lb.	Copper. London, £ per ton.	Tin. Cts. per lb.	Lead. New York, Cts. per lb.	Lead. St. Louis, Cts. per lb.	Zinc. St. Louis, Cts. per lb.
	13¼	13⅛		32	4.40	4.35	6.10
9	a13¾	a13¾	59½	a32½	a4.50	a4.35	a6.12½
	13½	13⅜		32⅛	4.47½	4.37½	6.10
10	a13¾	a13¾	59¾	a32½	a4.50	a4.40	a6.12½
	13½	13⅜		32⅛			6.10
11	a13¾	a13¾	....	a32¼	4.50	4.40	a6.12½
	13	13⅜		32⅛			6.07½
13	a13¾	a13¾	60¼	a32	4.50	4.40	a6.10
	13	13		32½			6.07½
14	a13¾	a13¾	60	a32½	4.50	4.40	a6.10
	13¼	13⅜		32½	4.55	4.40	6.07½
15	a13¾	a13¾	59½	a32¼	a4.60	a4.45	a6.10

London quotations are per long ton (2240 lb.). Standard copper. The New York quotations for electrolytic copper are for cakes, ingots and wirebars, and represent the bulk of the transactions made with consumers, basis New York, cash. The prices of casting copper and of electrolytic cathodes are usually 0.125c. below that of electrolytic. The quotations for tin represent wholesale transactions in the open market. The quotations on spelter are for ordinary Western brands; special brands command a premium.

Copper—While a good business has been reported for some special brands of lake copper, the general character of the market has not changed. Business has been in relatively small volume and the demand is peculiar insofar as the current quotations. Special brands of lake have sold at high prices. Some sales of electrolytic for immediate delivery have been made at 13¾c. delivered, and some at 13½c. delivered, but for the most part the current quotations, 13¾c. for lake and 13½c. for electrolytic, New York, are the basis for business. Sales have been made at 13¾c. delivered, and some at 13½c. delivered, at the close, and some of copper is offered at that price for the next month or two. In Europe there was a fair business at higher prices, the last quotation being 60¼ pounds sterling, equivalent to 13¾c. delivered. The London market closed at 60 pounds sterling, equivalent to 13¾c. delivered. The Lake Superior Smelting and Refining Company on Dec. 13 announced an advance in its price for lake copper to 13¾c. delivered. The Lake Superior Company and the domestic producers quote the domestic. The close is steady at 13⅝@13¾c. for Lake copper, and 13⅛@13⅜c. for electrolytic copper in cakes, wirebars and ingots. Casting copper is quoted nominally at 13@13¼c. for the week.

Copper sheets are 18@19c. base for large lots. Full extras are charged, and higher prices for small quantities. Copper wire is 15¼c. base, carload lots at mill. Business is fair.

The standard market in London developed a great deal of strength upon the report that an agreement had been reached among the American producers to curtail their production. On Monday prices stood about £1 higher than the closing quotation reported in this issue last week, but since then realizing has taken place which wiped out more than one-half of the improvement, the close being cabled weak at £59 10s. for spot and £60 10s. for three months.

Refined and manufactured sorts we quote: English tough, £62 10s.; best selected, £62 10s.@£63 10s.; strong sheets, £73 10s.@£74 10s. per ton.

Exports of copper from New York and Philadelphia for the week were 7511 long tons. Our special correspondent gives exports from Baltimore at 480 tons copper.

Copper Producers' Association—The reports give the following figures for November and the 11 months ended Nov. 31, in pounds of fine copper:

	November.	Eleven Mos.
Stocks, Nov. 1 and Jan. 1.....	153,500,626	122,357,266
U. S. production	121,618,369	1,287,574,401
Total supplies.	275,127,995	1,409,931,667
Deliveries, domestic..	66,857,873	636,647,395
Deliveries, export....	55,266,595	620,280,745
Total deliveries .	122,124,468	1,256,928,140
Stocks, Dec. 1.....	153,003,527	153,003,527
Inc. or dec. in stocks	D. 506,099	I. 30,646,261

United States production includes all copper refined in the United States, whether from domestic or foreign material. Production for the 11 months exceeded deliveries by 30,646,261 lb., with a corresponding increase in stocks.

Tin—Operations for the bull account have been on a very large scale in the London market. The operators appear to be very confident of their position, predicating their predictions of a further improvement upon the excellent statistical position of the metal and the favorable outlook for a continued large consumption in this country. Consumers have not participated in the movement, but as they are not covered ahead there has been a steady inflow of orders for early delivery. The London market closes firm at £148 10s. for cash and £149 15s. for three months, while business in the New York market has taken place at 32½@32¾c. this week.

The American Smelting and Refining Company on Dec. 13 announced an advance in its price for tin to 32½c. The trade and the domestic trade quote the market for common brands of lead followed suit. On Dec. 15 the smelting company announced a further advance to 4.60c. The close is firm at 4.55@4.60c., New York, and 4.40@4.45c. St. Louis.

The London market has been somewhat firmer and the close is cabled at £13 1s. 3d. for Spanish lead, and £13 3s. 9d. for English.

Spelter—As a result of a lull in the demand, some little spelter is accumulating at the smelting centers, and it is reported that occasional lots have been sold at below current quotations. Business is so light that it is difficult to fix quotations, the close being reported nominal at 6.07½@6.10c. St. Louis, and 6.22½@6.25c. New York.

New York quotations for spelter Dec. 9-11, inclusive, were 6.25@6.27½c.; Dec. 13-15, inclusive, 6.22½@6.25 cents.

The London market is slightly higher at £23 2s. 6d. for good ordinaries and £23 7s. 6d. for specials.

Base price of sheet zinc is now 8c. per lb., f.o.b. La Salle-Peru, Ill., less 8 per cent. discount.

Other Metals

Antimony—Business is extremely dull, and no change is looked for until the new year opens. In the absence of sales, prices are nominally unchanged. Cookson's is quoted at 8⅜@8½c. per lb.; Hallett's, 8@8⅛c.; U. S., 7⅞@8c.; with 7⅝@7¾c. named for outside brands.

Aluminum—The price of aluminum is unchanged at 20@23c. per lb. for ingots. The higher price is that asked by the American producer.

Quicksilver—The market is quieter, but strong and steady. The New York quotation is $52.50 per flask of 75 lb. for large lots; for small lots 72@75c. per lb. is asked by jobbers. The San Francisco quotation is $50.50@51.50 per flask for domestic orders, and $2 less for export. The London price is £9 15s. per flask, with £9 17s. 6d. asked by jobbers.

German Metal Imports and Exports

Imports and exports of metals—other than iron—in Germany, nine months ended Sept. 30, in metric tons:

	Imports	Exports	Excess
Copper.....	140,942	48,790	Imp. 92,152
Copper, 1908...	134,147	52,648	Imp. 81,489
Tin	10,912	5,569	Imp. 4,483
Tin, 1908	10,687	4,439	Imp. 6,248
Lead	54,411	26,597	Imp. 28,814
Lead, 1908..	35,493	4,587	Imp. 30,906
Zinc	77,020	35,087	Imp. 42,267
Zinc, 1908	1,728	46,607	Exp. 44,864
Nickel	2,773	1,870	Imp. 1,083
Nickel, 1908	2,454	1,390	Imp. 1,064
Aluminum	7,918	1,255	Imp. 4,663
Aluminum, 1908	2,564	855	Imp. 1,707
Mercury	881	7,763	Exp. 6,882
Mercury, 1908	766	7,242	Exp. 6,557

The figures include alloys and manu-

factures of the several metals. Imports and exports of ores—other than iron—for the nine months, were, in metric tons:

	Imports.	Exports.	Excess.
Gold ore	122	.....	Imp. 122
Gold ore, 1908	139	.....	Imp. 139
Silver ore	1,118	.....	Imp. 1,118
Silver ore, '08	1,529	5	Imp. 1,524
Copper ore	16,299	16,838	Exp. 539
Copp'rore,'08	13,484	17,524	Exp. 4,040
Tin ore	11,127	23	Imp. 11,104
Tin ore, 1908	8,078	27	Imp. 8,051
Lead ore	87,961	1,577	Imp. 86,384
Lead ore, '08	95,823	898	Imp. 94,925
Zinc ore	153,044	35,285	Imp. 117,759
Zinc ore, 1908	137,873	26,045	Imp. 111,828
Nickel ore	10,100	.....	Imp. 10,100
Nickel ore,'08	7,780	.....	Imp. 7,780
Chrome ore	19,037	5,021	Imp. 14,016
Ch'me ore '08	11,451	115	Imp. 11,336
Pyrites	506,261	9,505	Imp. 496,756
Pyrites, 1908	510,348	13,118	Imp. 497,230
Miscellaneous	4,989	501	Imp. 3,888
Mis., 1908	3,625	533	Imp. 3,092

Miscellaneous ores include uranium, molybdenum, tungsten and other minor metals, with some mixed or complex ores.

Imports of slag and slag products were 428,792 tons in 1908, and 360,370 tons in 1909; exports, 56,736 tons in 1908, and 47,605 tons this year.

Zinc and Lead Ore Markets

Platteville, Wis., Dec. 11—The highest price paid this week for zinc ore was $52.50; the base price, 60 per cent. zinc, was $49@51 per ton. The base price paid for lead ore was $54 per ton.

SHIPMENTS, WEEK ENDED DEC. 11.

Camps.	Zinc ore, lb.	Lead ore, lb.	Sulphur ore, lb.
Platteville	624,035	62,500	218,600
Mineral Point	470,000	.....	.....
Days Siding	314,000	.....	.....
Highland	254,000	.....	.....
Benton	251,420	.....	.....
Cuba City	234,370	86,725	141,040
Galena	176,000	.....	95,000
Linden	66,890	.....	.....
Total	2,390,715	149,225	454,640
Year to Dec. 11	130,707,375	8,917,655	14,890,755

In addition to the above there was shipped to the separating plants, Platteville, Galena and Mineral Point, 1,985,162 lb. zinc concentrates.

Joplin, Mo., Dec. 11—The highest price paid for zinc ore was $54.50, the assay base for zinc-sulphide ore being $50@52 per ton of 60-per cent. zinc. Zinc silicate sold on a base of $28@30 per ton of 40-per cent. zinc. The average price, all grades, was $48.04. The highest price paid for lead ore was $54, and very little ore sold at a less price. The average price, all grades, was $53.98 per ton.

The severe cold weather proved disastrous to mining everywhere except in the sheet-ore area. The shipment was decreased 3200 tons of zinc ore compared with the previous week. It was necessary to blast the ore from the bins, where loading was done. The weather moderated Friday, but there is evidence tonight of another cold wave coming. Despite the unfavorable weather the price of zinc ore was lowered a little here and there, in preparation for a general decline expected next week.

SHIPMENTS, WEEK ENDED DEC. 11.

	Zinc, lb.	Lead, lb.	Value.
Webb City-Carterville	3,392,150	556,940	$101,536
Joplin	1,301,560	162,460	38,877
Miami	645,210	.....	14,194
Duenweg	397,920	90,210	12,170
Galena	440,670	36,040	11,989
Alba-Neck	432,220	.....	11,237
Prosperity	157,660	235,530	10,379
Granby	498,300	.....	8,715
Aurora	345,820	.....	7,115
Quapaw	218,880	.....	5,253
Oronogo	130,840	54,930	4,754
Spurgeon	226,090	7,250	4,278
Peoria	279,730	.....	3,816
Carthage	130,390	.....	3,398
Sarcoxie	117,671	.....	2,824
Carl Junction	55,040	.....	1,486
Seneca	47,050	.....	658
Totals	8,817,200	1,143,360	$242,671
50 weeks	569,818,650	84,123,930	$13,950,529

Zinc value, the week, $211,807; 50 weeks, $11,657,526
Lead value, the week, 30,864; 50 weeks, 2,293,003

MONTHLY AVERAGE PRICES.

Month.	Zinc Ore. Base Price. 1908.	Zinc Ore. Base Price. 1909.	Zinc Ore. All Ores. 1908.	Zinc Ore. All Ores. 1909.	Lead Ore. All Ores. 1908.	Lead Ore. All Ores. 1909.
January	$37.60	$41.25	$35.56	$38.46	$46.88	$52.17
February	36.63	36.94	34.92	34.37	49.72	50.60
March	36.19	37.40	34.19	34.71	49.90	50.82
April	35.40	38.63	34.08	37.01	52.47	55.63
May	34.19	40.06	33.39	37.42	56.08	56.59
June	33.06	44.16	32.07	40.35	60.48	57.52
July	34.55	43.06	31.67	41.11	59.90	53.74
August	36.63	48.25	33.42	44.54	60.34	57.60
September	37.63	47.70	34.44	44.87	54.59	56.11
October	35.96	49.50	33.28	45.75	52.63	55.02
November	39.13	51.31	35.02	48.29	54.53	53.94
December	42.76	.....	39.63	.....	49.68	...
Year	$36.63	.....	$34.31	.....	$53.93	.....

NOTE—Under zince ore the first two columns give base prices for 60 per cent. zinc ore; the second two the average for all ores sold. Lead ore prices are the average for all ores sold.

Petroleum

Production and shipments of petroleum for the month of November are reported by the *Oil Investor's Journal* as below, in barrels of 42 gal. each:

	Production.	Shipments.
Oklahoma	3,716,353	3,682,489
Southeast Texas	675,866	1,114,774
Louisiana	252,472	201,751

New wells completed in November were: Oklahoma, 141 oil and 9 gas; Southeast Texas, 31 oil; Louisiana, 6 oil and 3 gas. Stocks of Oklahoma oil were 56,809,815 bbl. at the end of the month.

Chemicals

New York, Dec. 15—The general market is reported firm as to prices, with a fair business in most lines, and deliveries on contracts well taken.

Copper Sulphate—Business is quiet and quotations unchanged at $4 per 100 lb. for carload lots and $4.25 per lb. for smaller consignments.

Arsenic—Consumers seem to be pretty well stocked, at the same time sellers are not urgent, apparently looking for better prices. Quotations are unchanged at 2¾@2⅞c. per lb. for white arsenic.

Nitrate of Soda—There is nothing new in this article, which is still held at 2.07½c. per lb. for spot and 2.10c. per lb. for futures.

Sulphate of Ammonia—The removal of duty has resulted in an increase of imports. For the 10 months ended Oct. 31 these were 45,558,062 lb. in 1908, and 62,583,604 lb. in 1909. Of this year's imports 16,484,311 lb. have come in since the new tariff took effect.

Mining Stocks

New York, Dec. 15—The general stock market has shown signs of improvement during the past week and quotations have been at a little higher range. It is still largely a traders' market, but many brokers insist that the public is more in evidence than it has been for some weeks past. United States Steel common is strong again and in good demand, while Amalgamated Copper also advanced. The anthracite-coal stocks were noticeably strong.

On the Curb the copper stocks followed the lead of the Exchange and there were several advances. The reported consolidation of the Guggenheim coppers was variously received. At the close there was some irregularity, with declines in a few stocks. The Nevada gold stocks are still rather neglected. Cobalt shares were a little stronger but were inclined to be heavy at the close.

Boston, Dec. 14—The local market has been one of specialties the past week. Prices have maintained a strong front, with but few exceptions. Business has been of fair volume and temperament is optimistic, although nothing great is looked for in the market until the turn of the year. North Butte had a $5.12½ break to $54.87½ on profit-taking although considerable manipulation entered into the trading. A recovery to $57.25 followed this, although the closing today was near the lowest. It is believed that inside selling caused the decline.

Hancock mining is attracting attention and has risen $8.62½ during the week to $20.37½. As a matter of fact the price has more than doubled within the past few weeks and it is spoken of in some circles as a second Lake or Superior mine.

The expected merger of the Boston Consolidated and the Nevada Consolidated with Utah Copper has given a good market to these specialties, especially to the first named, which rose $2.25 to $23.50. Report has it that Boston Consolidated stockholders will be called upon to contribute $2 per share for the privilege of exchanging their shares into Utah Copper on the basis of 2½ Boston for one Utah.

Amalgamated has shown only slight changes during the week, although it holds firm. Activity developed in American Zinc, which rose $4 to $39; and in U. S.

Sterling, which rose $3.12½ to $50.12½. The former is approaching dividend payments and the latter is making big earnings.

On the Curb, prices have been firm. Davis-Daly had a weak period and Ohio Copper has strengthened. Cactus rose to $5 and Chino has been an active and strong feature.

STATISTICS OF COPPER.

Month.	United States Product'n.	Deliveries, Domestic.	Deliveries for Export.
I	112,135,200	51,862,624	38,499,797
II	103,700,817	43,578,118	30,968,496
III	117,058,661	48,871,964	59,191,043
IV	113,574,292	47,546,010	65,110,111
V	118,356,146	61,163,325	70,542,753
VI	116,567,493	60,591,116	70,966,457
VII	118,277,603	75,520,083	75,018,974
VIII	120,597,234	59,614,207	48,382,704
IX	118,023,139	52,105,955	50,077,777
X	124,657,709	66,359,617	56,261,238
XI	121,618,369	66,857,873	55,266,595
XII	....	....	....

VISIBLE STOCKS.

	United States.	Europe.	Total.
I	122,357,266	124,716,480	247,073,746
II	144,130,045	118,574,400	262,704,445
III	173,284,248	117,140,800	290,425,048
IV	182,279,902	115,024,000	297,303,902
V	183,198,073	114,050,320	297,248,393
VI	169,848,141	127,352,960	297,201,101
VII	154,858,061	150,928,960	305,787,021
VIII	122,596,607	171,492,160	294,088,767
IX	135,196,930	197,993,600	333,190,530
X	151,472,772	210,224,000	361,696,772
XI	153,509,626	222,566,400	376,076,026
XII	153,003,527	236,857,600	389,861,127

Figures are in pounds of fine copper. U. S. production includes all copper refined in this country, both from domestic and imported material. Visible stocks are those reported on the first day of each month, as brought over from the preceding month.

Monthly Average Prices of Metals

SILVER

Month.	New York. 1908.	New York. 1909.	London. 1908.	London. 1909.
January	55.678	51.750	25.738	23.834
February	56.000	51.472	25.855	23.706
March	55.365	50.468	25.570	23.227
April	55.505	51.428	25.133	23.708
May	52.795	52.905	24.377	24.343
June	53.663	52.538	24.760	24.166
July	53.115	51.043	24.514	23.519
August	51.683	51.125	23.858	23.588
September	51.720	51.449	23.877	23.743
October	51.431	50.923	23.725	23.502
November	49.647	50.703	22.933	23.351
December	48.766	.....	22.493	..
Total	52.864	.....	24.402	

New York, cents per fine ounce; London, pence per standard ounce.

COPPER

	New York. Electrolytic 1908.	New York. Electrolytic 1909.	New York. Lake 1908.	New York. Lake 1909.	London. 1908.	London. 1909.
January	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]
February	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]
March	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]
April	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]
May	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]
June	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]
July	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]
August	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]
September	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]
October	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]
November	[illegible]	[illegible]	[illegible]	[illegible]	63.417	58.917
December	[illegible]		[illegible]		62.943	...
Year	13.208		[illegible]		59.902	...

[illegible]

TIN AT NEW YORK

Month.	1908.	1909.	Month.	1908.	1909.
January	27.380	28.060	July	29.207	29.125
February	28.978	28.290	August	29.942	29.966
March	30.577	28.727	September	28.815	30.293
April	31.702	29.445	October	29.444	30.475
May	30.015	29.225	November	30.348	30.859
June	28.024	29.322	December	29.154	
			Av. year	29.465	

Prices are in cents per pound.

LEAD

Month.	New York. 1908	New York. 1909.	St. Louis 1909.	London. 1908.	London. 1909.
January	3.691	4.175	4.025	14.469	13.113
February	3.725	4.018	3.868	14.250	13.313
March	3.838	3.986	3.835	13.975	13.438
April	3.993	4.168	4.051	13.469	13.297
May	4.253	4.287	4.214	12.938	13.225
June	4.466	4.350	4.291	12.600	13.031
July	4.744	4.321	4.188	13.000	12.563
August	4.580	4.363	4.227	13.375	12.475
September	4.515	4.342	4.215	13.125	12.781
October	4.351	4.341	4.215	13.375	13.175
November	4.330	4.370	4.252	13.538	13.047
December	4.213	......	......	13.166	......
Year	4.200	......	......	13.439	......

New York and St. Louis, cents per pound. London, pounds sterling per long ton.

SPELTER

Month.	New York. 1908.	New York. 1909.	St. Louis. 1908.	St. Louis. 1909.	London. 1908.	London. 1909.
January	4.518	5.141	4.363	4.991	20.563	21.225
February	4.788	4.889	4.638	4.739	20.875	21.563
March	4.665	4.757	4.527	4.607	21.075	21.438
April	4.645	4.965	4.495	4.815	21.344	21.531
May	4.608	5.124	4.458	4.974	19.906	21.975
June	4.543	5.402	4.393	5.252	19.000	22.000
July	4.485	5.402	4.338	5.252	19.031	21.969
August	4.702	5.729	4.556	5.579	19.350	22.125
September	4.769	5.796	4.619	5.646	19.563	22.906
October	4.801	6.199	4.651	6.043	19.750	23.200
November	5.059	6.381	4.909	6.231	20.875	23.188
December	5.137	......	4.987	......	20.625	......
Year	4.726	......	4.578	......	20.163	......

New York and St. Louis, cents per pound. London, pounds sterling per long ton.

STOCK QUOTATIONS

NEW YORK Dec. 15

Name of Comp.	Clg.
Amalgamated	87¼
Anaconda	.49¾
Balaklala	‡2 1/16
Braden	4⅞
British Col. Cop.	7⅞
Buffalo Mines	3½
Butte Coalition	29
Colonial Silver	¼½
Combination Fra.	.46
Con. Ariz. Sm.	2
Cum. Ely Mining	9
Davis-Daly	5
Dominion Cop.	7
El Rayo	2⅞
Florence	2⅞
Furnace Creek	‡ 05
Giroux	11
Gold Hill	2
Goldfield Con.	8
Granby	103
Guanajuato	2
Guggen. Exp.	242
Hampah	‡15
Kerr Lake	8
McKinley-Dar.	.90
Miami Copper	20
Mines Co. of Am.	55
Montezu. of C. R.	4
Mont. Sho. C.	1
Nev. Utah M. & S.	1
Newhouse M. & S.	[illegible]
Nipissing Mines	10
Ohio Copper	6
Old Hundred	[illegible]
Pacific Sm. & M.	1
Silver Queen	[illegible]
Stewart	[illegible]
Tennessee Copper	[illegible]
Tri-Bullion	1
United Copper	8
Utah Apex	[illegible]
Utah Copper	[illegible]
Yukon Gold	[illegible]

‡Last quotation.

BOSTON Dec. 15

Name of Comp.	Clg.
Adventure	6
Allouez	‡55
Am. Zinc	38¼
Arcadian	7¼
Arizona Com.	44
Atlantic	11½
Boston Con.	21½
Calumet & Ariz.	101
Calumet & Hecla	650
Centennial	48
Con. Meteur	.12
Copper Range	82
Daly West	8
East Butte	11¼
Franklin	15½
Greene-Can.	12
Hancock	28⅝
Isle Royal	26
Keweenaw	4
La Salle	16
Mass.	6¾
Michigan	7
Mohawk	63
Nevada	27
North Butte	55
Ojibway	[illegible]
Old Dominion	51
Osceola	155
Parrot	29
Quincy	85
Rhode Island	10
Shannon	15
Superior	61
Superior & Bost.	16
Superior & Pitts.	16
Tamarack	64
Trinity	10
U. S. Smg. & Ref.	55
U. S. Sm. & R. pd.	53
[illegible]	44
[illegible]	4
[illegible]	10
[illegible]	145
[illegible]	2

‡Last quotation.

N. Y. INDUSTRIAL

Am. Agri. Chem.	46
Am. Smelt. & Ref.	100⅝
Am.Sm. & Ref., pf.	112
Colo. Fuel & Iron.	52
Federal M. & S., pf.	88
National Lead	87¼
National Lead, pf.	110¾
Pittsburg Coal	27
Republic I. & S.	46⅜
Republic I. & S., pf.	107
Sloss-Sheffield	87½
Standard Oil	667
U. S. Steel	91⅛
U. S. Steel, pf.	125⅝
Va. Car. Chem.	50⅛

BOSTON CURB

	Low.
Ahmeek	‡220
Chemung	‡15½
Chino	10¼
Gila	7
Indiana	7¼
Mason Valley	1 1/16
Ray Central	2 1/16
Ray Con.	23¼
San Antonio	‡9¾
Yuma	1¾

Furnished by Hornblower & Weeks, N. Y.

ST. LOUIS Dec. 11

N. of Com.	High.	Low.
Adams	.40	.30
Am. Nettie	.09	.07
Center Cr'k	2.00	1.75
Cent.C.& C.	86.00	85.00
C.C. & C. pf.	85.00	84.00
Cent. Oil	115.00	100.00
Columbia	8.00	7.00
Con. Coal	19.00	17.00
Doe Run	110.00	100.00
Gra. Bimet.	.35	.30
St. Joe	12.50	11.00

LONDON Dec. 15

Name of Com.	Clg.
Dolores	£1 10s 0d
Stratton's Ind.	0 3 3
Camp Bird	1 7 6
Esperanza	2 14 6
Tomboy	0 19 3
El Oro	1 5 10
Oroville	0 10 9

Cabled through Wm. P. Bonbright & Co., N. Y.

NEVADA STOCKS. Dec. 8.

Furnished by Weir Bros. & Co., New York.

Name of Comp.	Bid.
COMSTOCK STOCKS	
Belcher	1 00
Best & Belcher	66
Caledonia	.47
Chollar	.26
Comstock	.30
Con. Cal. & Va.	95
Crown Point	95
Exchequer	‡ 43
Gould & Curry	29
Hale & Norcross	48
Mexican	1 55
Ophir	1.75
Overman	.60
Potosi	.60
Savage	47
Sierra Nevada	50
Union	.63
Utah	09
Yellow Jacket	1 15
TONOPAH STOCKS	
Belmont	.65
Extension	.47
Golden Anchor	...
Jim Butler	10
MacNamara	29
Midway	.18
Montana	.85
North Star	02
Tonoh Mine of N.	7.37
West End Con.	24
GOLDFI'D STOCKS	
Adams	.01
Atlanta	10
Blue Bell	02
Booth	.09
C.O.D. Con.	.06
Columbia Mt.	05
Comb. Frac.	45
Cracker Jack	01
Dia'dfield B. B. C.	.01
Florence	2.62
Goldfield Belmont	04
Goldfield Daisy	.08
Great Bend	03
Jumbo Extension	11
Kendall	02
Lone Star	.02
May Queen	04
Oro	02
Red Hill	.08
Sandstorm	05

Name of Comp.	Bid.
Silver Pick	.08
St. Ives	.05
Triangle	01
BULLFROG STOCKS	
Gibraltar	02
Homestake King.	01
Mont. Shoshone C.	1 00
Tramp Cons.	.04
MISCELLANEOUS	
Cumberland Ely	8.00
Giroux	11.00
Greenwa'r Copper	.08
Nevada Con.	26.87
Nevada Hills	.70
Nevada Smelting	1.00
Nevada Wonder	.60
Nevada-Utah	1.31
Penn-Wyoming	.
Pittsburgh S. Pk.	.78
Ray Central	2.75
Ray Con.	23.00
Round Mt. Sphinx	05

COLO. SPRINGS Dec. 10

Name of Comp.	Clg.
Acacia	.07⅞
C. C. Con.	.03¼
Dante	.07½
Doctor Jack Pot.	.07¼
Elkton	72
El Paso	60¼
Findlay	09½
Gold Dollar	.12
Gold Sovereign	.05
Isabella	19¾
Jennie Sample	.08
Jerry Johnson	.08
Lexington	‡.48½
Mary McKinney	.48
Old Gold	‡.04
Pharmacist	.03⅛
Portland	.83
U. G. M.	.09
Vindicator	72¼
Work	06½

Assessments

Company.	Delinq.	Sale.	Amt.
Arcadian Copper, Mich.		Mar. 1	$0.50
Boston Ely, Nev.	Dec. 23		0.50
Camp Bird Min. Co., Colo.	Dec. 13		0.002
Chemung Copper, N. M.	Jan. 1	Jan. 2	1.00
Con. Virginia, Nev.	Dec. 20	Jan. 10	0.25
Crown Point, Nev.	Nov. 30	Dec. 20	0.10
Exchequer, Nev.	Dec. 15	Jan. 5	0.05
Gold ... M. & M., Utah	Jan. 15	Feb. 4	0.002
Hancock Min., Mich.		Feb. 1	1.00
Mexican, Nev.	Dec. 6	Dec. 29	0.10
Mineral Flat, Colo.	Dec. 11	Jan. 6	0.01
Mountain Dell Con., Utah	Dec. 21	Jan. 10	0.01
Palmyra G. & C., Utah	Dec. 29	Jan. 19	0.002
Reindeer G. & C., Ida.	Dec. 31	Jan. 19	0.003
Seven Bros. Pioche, Nev.	Jan. 15	Feb. 4	0.002
Sheridan M. & M., Ida.	Nov. 20	Dec. 20	0.002
Silver Hill, Nev.	Dec. 23	Jan. 14	0.05
Union Con., Nev.	Dec. 22	Jan. 13	0.10
Utah Ideal, Utah	Feb. 1	Feb. 20	0.001
Winona, Mich.	Dec. 1	Jan. 1	1.00
Yellow Jacket, Nev.	Nov. 18	Dec. 22	0.10

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Fatal Accidents in Coal Mines of North America

About 2800 Killed During 1908 and 20,000 in Last Decade; Fatality Rate Increasing; Accidents Are More Numerous under Liability Act

BY FREDERICK L. HOFFMAN*

Accidents to workmen are no longer a neglected subject in law or economics, but in every civilized country of the world workmen's compensation and accident prevention are in the front of public discussions as problems which demand a more successful solution than has heretofore been the case. The passage in 1906 of the English Workmen's Compensation Act has crystallized American opinion more, perhaps, than any other measure, and in some of the most important States the whole question of employers' liability is under serious consideration. The English act has the advantage of precision in terms, and under it a definite money value is assigned to human life, with the certainty of compensation to dependent survivors in the following terms:

"(1) If the workman leaves any dependants wholly dependent upon his earnings, a sum equal to his earnings in the employment of the same employer during the three years next preceding the injury, or the sum of one hundred and fifty pounds, whichever of those sums is the larger, but not exceeding in any case three hundred pounds, provided that the amount of any weekly payments made under this act, and any lump sum paid in redemption thereof, shall be deducted from such sum, and if the period of the workman's employment by the said employer has been less than the said three years, then the amount of his earnings during the said three years shall be deemed to be one hundred and fifty-six times his average weekly earnings during the period of his actual employment under the said employer.

"(2) If the workman does not leave any such dependants, but leaves any dependants in part dependent upon his earnings, such sum, not exceeding in any case the amount payable under the foregoing provisions, as may be agreed upon, or, in default of agreement, may be determined, on arbitration under this act, to be reasonable and proportionate to the injury to the said dependants."

In practice the amounts actually secured as compensation in the event of death vary, but the degree of variation is of small importance. Where the cases have been settled in the county courts the average amount recovered in 1907 has been £174 9s. ($847.80), while the settlements under agreement and informal arbitrations return an average amount of £173 6s. 5d. ($842.32). There are exceptions to be taken under the common law, but such cases are rare and not of practical importance.

It is apparent from the experience which has been had since the act of 1906 went into effect that the average compensation paid in the event of the death of a workman due to an accident in the course of his employment is about £175 ($850.50). If allowance is made for the higher average rate of wages prevailing in this country a corresponding act would probably call for an average payment of $1500, or three years' payment at $500 each.

Since during 1908 there occurred in the coalfields of North America 2686 officially recorded fatal accidents, the compensation which would have had to be paid on the basis of $1500, payable in the case of each death, would have been in the aggregate not less than $4,029,000. Actually, however, the amount would probably have been much more since a number of deaths resulting from coal-mining operations are not officially recorded because of defective methods in some of the States, while deaths directly due to mining operations, but not immediately resulting therefrom, are not included in the lists, excluded from the official reports as fatal occurrences at the time when the reports are made. Under any rational system of workmen's compensation, however, all such cases would have to be compensated for, and the total amounts, therefore, would be quite considerably in excess of the estimated amount on the number of deaths officially returned as resulting from coal-mining casualties in the different States.

There is the further probability that the minimum of $1500 would not be considered a sufficient equivalent for the loss incurred, and it would be more likely that the average amount of compensation to be paid would be fixed as five years' average earnings, which would probably not be less than $500, making allowance for time lost, or in the aggregate not less than $2000, instead of the first estimate of $1500. So that under any general system of workmen's compensation throughout the coal-mining States, based on the principles of the English act of 1906, the average amount of compensation in the event of death would probably be not less than $1500 and more than $2000, and the average total amount to be paid for such mining casualties on this account alone, and without allowance for compensation for the injuries which would probably result from the [illegible]

TABLE 1. NUMBER OF PERSONS KILLED BY ACCIDENTS IN COAL MINES OF NORTH AMERICA 1899–1908.

States, Territories and Provinces.	1899.	1900.	1901.	1902.	1903.	1904.	1905.	1906.	1907.	1908.	1899-1908.
Alabama	40	37	41	50	57	84	185	96	154	110	854
Colorado	41	29	55	73	40	89	59	88	99	61	634
Illinois *c*	81	94	99	99	156	157	199	155	165	175	1,383
Indiana	16	18	24	24	55	34	47	41	55	47	347
Indian Territory	25	40	44	60	33	30	44	39	32	44	391
Iowa *c*	20	29	26	55	21	31	24	37	35	38	316
Kansas	16	22	26	27	36	16*b*	36	30	32	[illegible]	241
Kentucky	7	17	21	19	25	19	31	39	32	40	250
Maryland	5	7	12	11	13	12	13	7	9	12	92
Michigan	4*b*	10	6	8	8	7	8	6	7	6	68
Missouri	14	10	15	10	17	11	11	16	18	10	122
New Mexico *c*	15	15	9	17	17	15	5	9	31	34	167
Ohio	57	68	72	81	114	118	131	127	153	112	1,033
Pennsylvania (Anth.)	461	411	513	300	518	595	644	557	708	678	5,886
Pennsylvania (Bit.)	258	265	301	456	402	536	479	477	806	572	4,552
Tennessee	20	10	53	226	26	28	29	33	41	34	480
Utah	0	209	10	8	7	9	7	7	8	8	273
Washington	45	33	27	34	25	31	13	13	36	25	282
West Virginia *c*	89	141	134	120	159	110	194	268	356	625	2,226
British Columbia	11	17	102	139	12	37	12	15	31	18	424
Nova Scotia	19	21	14	19	31	19	20	28	35	59	245
Total deaths	1,247	1,503	1,604	1,834	1,802	2,018	2,191	2,078	2,812	2,686	19,775

a Returns not available. *b* Six months only. *c* Year ended June 30, 1908.

*Statistician, Prudential Insurance Company of America, Newark, N. J.

basis of 3000 fatal injuries per annum, than $4,500,000, and not more than $6,000,000.

Insurance Increases Accidents

It is more difficult to estimate what would be the cost of compensation for injuries since the term injury itself is difficult of exact definition. Under the English law no compensation is paid if the injury results in the loss of less than two weeks' earning capacity, but since the law has been in operation the number of injuries of more than two weeks' duration has been considerably increased. In fact, the tendency of all workmen's compensation laws is to increase the number of minor injuries which, under ordinary circumstances, would not be the cause of incapacity to work or require financial relief.

The most trustworthy of our coal-mining statistics do not show a rate in cases of nonfatal accidents in excess of 10 per cent., but under the earlier operations of the Illinois inspection laws the recorded rate has been as high as 16 per 1000 in 1892. The rate has, however, fallen continuously until in 1906 it was only 7.7 per 1000 employed.

The average recorded nonfatal accident rate for the anthracite coalfields of Pennsylvania is 6.93 per 1000 for the five years ending with 1906, while for the bituminous fields for the same period the rate was 6.48 per 1000. In England the recorded rate of nonfatal accidents for 1907 was only 0.40 per 1000, but it is officially stated that "the number reported is only a small fraction of the number of nonfatal accidents that actually occur," and this statement is supported by the statistics for the Northumberland district, which in 1907 gave a rate (14.08) per 1000 of two weeks' duration or more, which is the Doncaster coalfield, the rate was 88.5 per 1000. The rate would be materially increased, we think, if it were so as to cover the cost of medical attendance, which is not included in the Doncaster rate.

According to English statistics for 1908 the rate of disablement cases in proportion to the number employed in mines was 1.34 per 1000, while the fatal-accident rate in mining during the same year was 1.24 per 1000. The corresponding fatal-accident rate for American coal mines for the same year was 3.96 per 1000, so that without reference to nonfatal accidents the number of fatal cases which would require compensation under a similar law in this country would be about three times, would unquestionably be materially increased under a similar law in the United States, and probably amount to not less than $30 per case. Since the proportionate number of disablement cases is also much larger in this country, and certainly not less than 150 per 1000 employees, the actual number of such cases per annum which would be required to be compensated for would be approximately 105,000. At an average cost of $30 for every case of disablement this would require annually not less than $3,150,000 to be paid in compensation on this account. If this sum is added to the minimum of $4,500,000 payable in compensation on account of fatal cases, the approximate total workmen's compensation in coal-mining operations in North America would be not less than $7,650,000 for both classes of applicants.

In English experience the average amount paid in compensation has been equivalent to about ½d. per ton of coal raised. This would be approximately one cent in American money, but since the unit cost of compensation in this country would probably not be less than one per cent. greater, the approximate cost would be about 1½c. per ton of the annual production of the coalfields of North America. In round numbers the annual production is about 500,000,000 tons which, on a basis of 1½c. per ton for the purpose of workmen's compensation, would require the disbursement of about $7,500,000 annually.

The foregoing considerations are pertinent to the various proposals which have been made for accident insurance of coal miners, particularly in the report of the State mine inspector of Indiana, who, according to the Journal of Dec. 5, 1908, had proposed a bill providing for a compulsory fund for the benefit of disabled miners, the sum being to be based on a certain number of mills on each ton of

TABLE 2. FATAL ACCIDENTS IN COAL MINES OF NORTH AMERICA, 1899-1908.
RATIO OF PERSONS KILLED PER 1000 EMPLOYED.

States, Territories and Provinces.	1899.	1900.	1901.	1902.	1903.	1904.	1905.	1906.	1907.	1908.	1899-1908.
Alabama	3.10	2.59	2.90	2.79	2.94	4.71	10.74	5.23	7.61	5.86	4.99
Colorado	5.60	3.99	6.88	8.11	3.89	8.26	4.96	7.32	7.67	4.25	6.11
Illinois	2.27	2.39	2.24	2.15	3.13	2.87	3.36	2.49	2.47	3.39	2.72
Indiana	2.07	1.82	1.98	1.83	3.64	2.70	2.56	1.61	2.79	2.37	2.35
Indian Territory	6.24	7.59	8.35	9.62	5.42	5.68	5.76	4.81	4.15	3.02	5.35
Iowa	2.49	2.22	1.97	4.23	1.59	1.90	1.36	2.20	2.05	2.20	2.17
Kansas	1.57	2.06	2.28	2.70	3.61	3.09b	2.97	2.95	2.67	a	2.60
Kentucky	0.83	2.06	2.14	1.58	1.85	1.37	2.06	2.33	1.82	2.15	1.87
Maryland	1.08	1.32	2.23	1.99	2.29	2.11	2.09	1.13	a	2.00	1.82
Michigan	4.88b	6.11	5.26	4.24	2.54	2.58	2.93	2.83	2.43	1.94	2.91
Missouri	1.80	1.31	1.63	1.09	1.85	1.47	1.06	1.65	0.73	1.06	1.39
New Mexico	4.98	5.44	8.41	10.12	5.26	7.61	2.37	3.82	10.13	9.26	7.27
Ohio	2.03	2.14	2.15	2.16	2.75	2.57	2.96	2.73	3.20	2.33	2.54
Pennsylvania (Anth.)	3.28	2.86	3.47	2.03	3.41	3.69	3.83	3.35	4.19	3.89	3.43
Pennsylvania (Bit.)	2.82	2.43	2.56	3.37	2.65	3.44	2.90	2.76	4.40	3.15	3.11
Tennessee	2.60	1.15	6.10	25.80	2.69	2.81	2.38	3.07	2.79	3.06	4.97
Utah		138.96	5.81	3.24	3.51	4.06	5.14	3.69	3.07	2.99	13.82
Washington	13.60	7.79	5.59	7.83	5.13	6.60	2.7	2.52	6.04	4.08	5.93
West Virginia	3.55	5.63	4.14	3.78	3.03	3.08	4.24	4.98	6.92	10.55	5.38
British Columbia	2.91	4.22	25.67	34.65	9.85	8.31	2.72	3.12	5.12	2.95	9.24
Nova Scotia	3.39	3.17	1.83	2.36	2.79	1.63	1.86	2.31	2.89	3.02	2.48
Average	2.98	3.25	3.24	3.49	3.14	3.37	3.44	3.16	4.17	3.96	3.46

a Returns not available. b Six months only. c Year ended June 30, 1908.

TABLE 3. FATAL ACCIDENTS IN COAL MINES OF NORTH AMERICA.
COMPARISON OF 1908 WITH THE FIVE PREVIOUS YEARS

States, Territories and Provinces.	Number Persons Killed, Yearly Average. 1903-07.	Number Persons Killed, Yearly Average. 1908.	Rate per 1,000 Employed. 1903-07.	Rate per 1,000 Employed. 1908.	Rate of Increase or Decrease per 1000 Employed.
Alabama	115	110	6.19	5.86	−0.33
Colorado	75	61	6.48	4.25	−2.23
Illinois	167	175	2.84	3.59	+0.75
Indiana	44	45	2.60	2.36	−0.24
Indian Territory	36	44	4.71	3.02	−1.69
Iowa	30	38	1.83	2.20	+0.37
Kansas	330	d	2.97a	d	
Kentucky	29	40	1.90	2.15	+0.25
Maryland	11b	12	1.89b	2.00	+0.11
Michigan	7	6	2.47	1.94	−0.53
Missouri	12a	10	1.40a	1.06	−0.34
New Mexico c	15	31	6.10	9.26	+2.16
Ohio	127	112	2.55	2.33	−0.22
Pennsylvania (Anth.)	664	675	3.70	3.89	+0.19
Pennsylvania (Bit.)	540	572	3.26	3.15	−0.11
Tennessee	29	34	2.74	3.06	+0.32
Utah	8	8	3.70	2.99	−0.71
Washington	24	25	4.67	4.68	+0.01
West Virginia	222	625	3.74	10.55	+6.81
British Columbia	27	18	5.71	2.95	−2.76
Nova Scotia	27	30	2.90	3.02	+0.12
Average	2,180	2,686	3.47	3.96	+0.49

a 12 years only. b 5 years only. c Statistics for year ended June 30, 1908. d Not available.

coal produced, plus a small percentage tax on wages earned by employees. The money, according to this plan, is to be paid into the State treasury and distributed to those entitled to a benefit in sums proportionate to the extent of injury. The proposed law provides that in each case the benefits shall be paid without question as to contributory negligence of the employee killed or injured.

A similar law went into effect in Montana, as Chapter 67 of the Session Laws of 1909, creating an accident-insurance fund to cover workmen employed in coal mining. Under this law employers are required to deduct 1 per cent. of the wages paid monthly, and pay the sum so deducted to the State auditor. They are also required to pay to the auditor monthly one cent for each ton of coal mined and shipped or sold locally. The insurance is thus compulsory upon both workmen and employers. How far the law has been successful in actual operation is at this time not known. A somewhat similar act passed by the legislature of the State of Maryland some years ago was declared unconstitutional.

TABLE 4. TWENTY-YEAR RECORD OF FATAL ACCIDENTS IN COAL MINES OF NORTH AMERICA, 1889-1908.

Year.	Number of Employees.	Fatal Accidents.	Rate per 1000 Employed.
1889	262,223	660	2.52
1890	288,205	701	2.43
1891	325,840	1,076	3.30
1892	342,744	859	2.51
1893	382,133	965	2.53
1894	385,579	957	2.48
1895	395,549	1,057	2.67
1896	401,874	1,120	2.79
1897	405,433	947	2.34
1898	405,600	1,049	2.59
1899	417,415	1,247	2.98
1900	462,308	1,503	3.25
1901	494,367	1,604	3.24
1902	525,443	1,834	3.49
1903	574,210	1,802	3.14
1904	598,856	2,018	3.37
1905	637,522	2,191	3.44
1906	658,189	2,078	3.16
1907	673,657	2,812	4.17
1908	678,785	2,686	3.96
1889-1893	1,601,145	4,261	2.66
1894-1898	1,994,035	5,130	2.57
1899-1903	2,473,743	7,990	3.23
1904-1908	3,247,009	11,785	3.63
1889-1908	9,315,932	29,166	3.13

Cost of Insurance Nearly Doubled in England

In English experience under the new act the cost of employers' liability insurance to protect employers against the risk to the industry resulting from the law has nearly doubled. Incapacity, under the present act, has a money value, which encourages malingering and imposition on the fund. Even under the present act from 20 to 25 per cent. of the injuries are trivial and do not come within the scope of the law. In the opinion of Sir Thomas Oliver, there is under the present act a doubled inducement for many workmen to exaggerate slight injuries and to profess disablement for a fortnight.

This same authority, whose home is in the heart of the English coal-mining district, states that in the case of one large coal owners' association the cost of the act is equivalent to 0.568d. per ton of coal raised, and as the number of tons raised in 1907 by this association was 38,721,790, the act cost the association £91,707 ($445,696), or roughly, 19s. per £100 of wages. This is compared with 0.243d. per ton, or 9s. 3d. per £100 of wages paid in 1900, when the total output of coal was 33,206,246 tons, and the total cost of compensation £33,620 ($163,393).

These illustrations clearly emphasize the importance of the whole subject of workmen's compensation to the coal-mine owners of North America, and the corresponding importance of the degree of accident frequency in the different coal-fields, the tendency of the rate from year to year, and the correspondingly important question of successful accident prevention.

During 1908, out of an average of 678,785 persons employed in the coal mines of North America, 2686 were killed by accident, or at the rate of 3.96 per 1000. This is the highest rate on record for any single year during the last two decades except the previous year, when the rate was 4.17. The statistical tabulation for 1908 is unfortunately not quite complete, and does not include the State of Kansas, for which information could not be secured. It also does not include the State of Arkansas, nor Alaska, but the coal-fields of both are of very limited extent.

It is difficult to understand why information of this kind should not be made public at the earliest possible date, and why mine inspectors should withhold the data from publication for practically more than a year after the date of occurrence. Where so small a number of items requires consideration it would seem that a complete return should be available within less than 30 days after the close of the calendar year, and it is to be hoped that a mandatory provision to this effect will be included in the mining laws of all the States which are now derelict in publishing mining accidents in the proper manner and at the proper time.

Table 1 exhibits in detail for States, Territories and Provinces, the number of persons killed by accident in the coal mines of North America during the ten-year period ending with 1908, except as otherwise stated on account of the impossibility of securing the necessary information. The table is complete for all of the States included in the tabulation except Kansas. For Illinois, Iowa, New Mexico and West Virginia the returns are for the year ended June 30. If allowance is made for the States for which information is not at present available, and for the imperfect returns of some of the States, it is quite probable that during 1908 the number of persons killed in American coal mines was not less than 2800. During the 11 year period ending with 1908 the total number of recorded deaths in American coal mines was 19,775, while the actual number was over twenty thousand.

Upward Tendency of Fatality Rate

Table 2 shows the fatality rate in coal mining in the United States and Canada, calculated upon the usual basis of the number employed. The fatal accident rate for 1908 for the entire coalfields of North America was 3.96 per 1000, against an average of 3.46 for the whole decade. While there has been a slight decline in the rate during 1908, the tendency of the rate itself is decidedly upward, and the most recent experience, in the great calamity at Cherry Hill, Ill., emphasizes the accuracy of this conclusion. During 1908 the fatality rate was above the average for the 10-year period in Alabama, Colorado, Illinois, New Mexico, Pennsylvania (anthracite), Washington, and West Virginia. The highest rate during the year prevailed in West Virginia, where it attained to 10.35 per 1000, a rate which, with the exception of one disastrous year in Utah, and two equally disastrous years in British Columbia, never has been equaled during the history of American coal mining in the last decade.

Table 3 exhibits the fatal accidents in coal mining in 1908, compared with the average for the preceding five years, both upon the basis of actual numbers and the rate per 1000 employed. The States showing an increase in the rate during the preceding five years are Illinois, Iowa, Kentucky, Maryland, New Mexico, Pennsylvania (anthracite), Tennessee, Washington, West Virginia and Nova Scotia. The increase in the average rate was 0.49 per 1000. As measured by this comparison the most favorable rate was experienced in the State of Missouri where the fatality rate was only 1.06 per 1000 during 1908, and 1.40 during the five years ending with 1907. The next lowest rate was experienced in the State of Michigan, followed by Maryland. All the other States have experienced average rates during 1908 of more than 2 per 1000 per annum.

Table 4 affords a means of convenient comparison of the fatality rate in coal mining during 1908 with those of previous years, showing the number of employees, the number of persons killed and the rate per thousand employed for each of the 20 years, 1889-1908. The table has also been arranged in four equal periods of five years each, and it is shown that the fatality rate has increased from 2.66 per 1000 during the first five years to 3.50 during the last, or, in other words, the actual excess in the rate at the present time is about 1 per 1000 employed over the normal rate of former years.

As emphasized in former summaries, the data confirm the conclusion that the tendency in the fatality rate of American coal mining is in the wrong direction.

When the accident rate is compared with the rates of European countries, our coalfields are decidedly more dangerous and the loss of life is considerably higher. The subject itself demands more qualified attention than has heretofore been given to it, and much remains undone which could be done, and ought to be done, to mitigate the loss of life and the frequency of serious injury resulting from coal-mining operations. Especially should attention be directed to the resulting economic consequences to the vast population made more or less dependent upon the disasters which now occur with increasing frequency.

There is need in this country for an expert investigation into the whole subject in conformity to the thorough inquiry which has been made by the British Royal Commission of Mines, and which has been published in a series of practical reports. These reports, in six large volumes, constitute an extremely valuable source of information which, however, requires to be interpreted in the light of American coal-mining experience.

Of particular value is the appendix to the first report, prepared by A. L. Boyd, M.D., of the Lister Institute of Preventive Medicine, on breathing apparatus [illegible] The reports cover every subject [illegible] the average condition of the mines in [illegible] and safety lamps. Of [illegible] the [illegible] and [illegible] for the [illegible] in America [illegible] and interesting features.

[illegible]

[illegible] sible drastic compensation laws as applied to coal-mining operation, the prevention of every possible accident becomes not only a matter of imperative duty, but also of financial importance to every coal-mining company of North America.

The Cowanee Club, Copperhill, Tennessee

Throughout the country, mining companies are realizing the importance of keeping their employees satisfied with their conditions. This is evident in the provision of modern dry houses at many mines, the improvement in the living quarters provided working men, and finally in the interest taken by some companies in the social welfare of their employees. There can be no doubt but that this is an important consideration in the success of any company, and especially of one operating in such a place as the average mining camp.

At Copperhill, Tenn., the home of the Tennessee Copper Company, a club house modern and comfortable in every particular has recently been completed and occupied. Details of the architectural features of the new club house, photographs and plan of which accompany the article, the history and description of the Cowanee Club house [illegible] and interesting features.

History and Work of the Club

[illegible] six years ago among the members of the engineering staff of the Tennessee Copper Company for the purpose of taking care of the social functions of the camp. For a while a room was kept in the Blue Goose, the company's boarding house; club quarters were also maintained in the basement of the company office building. A piano and pool tables were bought by the club, and through its efforts two tennis courts were graded and equipped, trap-shooting grounds fixed up, and a canoe club organized and maintained as an adjunct to the club.

The sentiment in favor of having a home for the club gradually took root and finally culminated in the securing of financial aid from the Tennessee Copper Company for the erection of the present club house. It was largely through the efforts of B. B. Gottsberger, formerly general manager at Copperhill, N. H. Emmons, acting general manager; P. H. Hubbard, mechanical engineer, and other prominent members of the staff of the Tennessee Copper Company, that the contribution of $10,000 was secured. This sum, together with about $2000 raised by the club members, was used for building and equipping the club house. The plans for the club house were drawn, with a little outside assistance, in the office of the Tennessee company at Copperhill, under the direction of Mr. Hubbard, from which the accompanying plan and data were obtained.

The Club Site

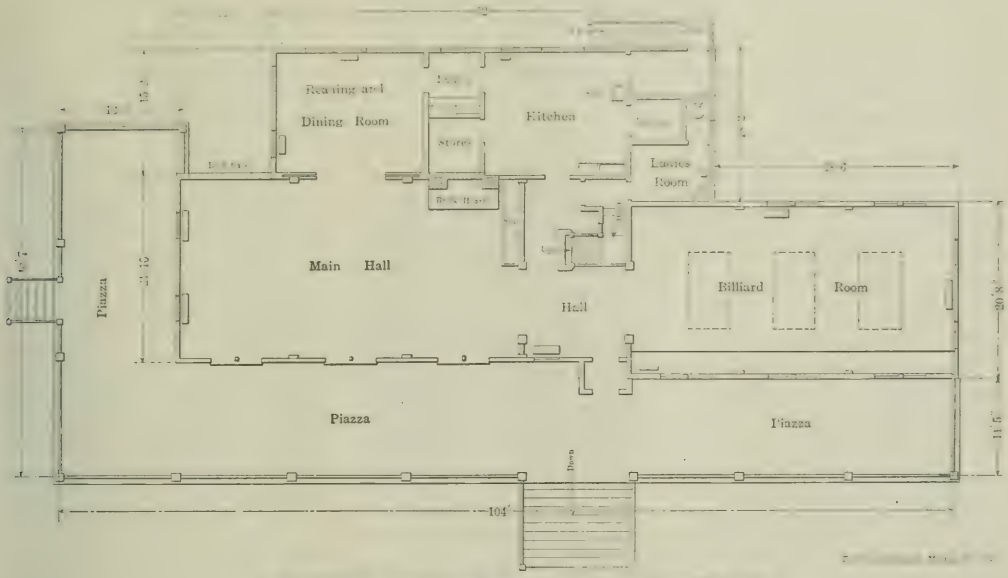
The club house is situated near the foot of the hill, upon which are the homes of

THE COWANEE CLUB AT COPPERHILL, TENN. SMELTING AND ACID PLANT IN BACKGROUND

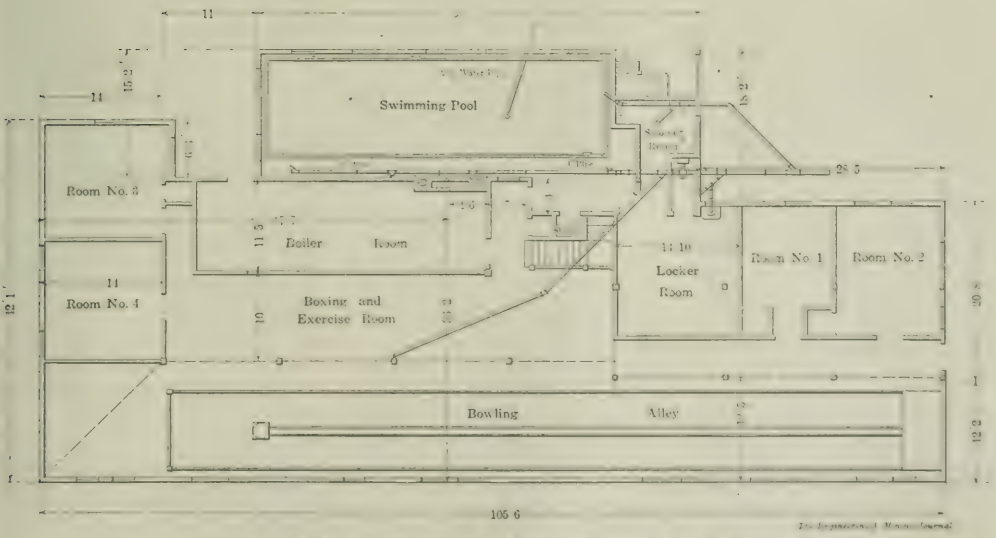
the members of the engineering force. It faces away from the smeltery, toward the company houses, and at the foot of the hill below the house are the tennis courts belonging to the club. The club building is a two-story and basement structure, with shingle exterior, and with a wide veranda around three sides. Upon entering the main floor from the front, there is a large billiard room at the right. The main hall opens to the left and is used for dances and receptions. Both the main hall and dining room are provided with a maple floor. The dining room is entered from the main hall and from it the kitchen, pantry, etc., are reached. Opposite the entrance is a stairway leading to the second floor, where are four bedrooms, arranged in pairs, with a connecting passage leading to a bathroom. Ample closets, shelves and a linen closet have been provided.

In the basement, which is finished in cement throughout, are the bowling alley, swimming pool and gymnasium. Here too are locker rooms, shower baths and toilets. Four rooms are also finished and floored.

As mentioned, bedrooms and kitchen are included in the design of the club



PLAN SHOWING ARRANGEMENT OF MAIN FLOOR OF COWANEE CLUB



PLAN SHOWING ARRANGEMENT OF BASEMENT OF COWANEE CLUB

house. These, however, are used only on occasions, such as the visits of the officers or directors of the company. The bedrooms are well furnished and comfortable in every particular. The culinary department, too, is well equipped and ready for immediate use at any time.

Heating System

A complete heating system is provided for the club house. There is a boiler room in the basement but ordinarily steam for the heating system is taken from the power plant at the smeltery and is also used to heat water for showers, etc., being run through coils in the two 300-gal. tanks provided to store water for such purposes. The exhaust steam and condensed water from the heating plant are run into the swimming pool and are sufficient to heat the water to a comfortable degree for swimming during the winter.

Management of the Club

The club is still run as a private organization, membership not even being restricted to company employees. As in city clubs, provision is made for out-of-town members as well as for resident ones. Already from the popularity of the club there can be no doubt as to its success. It is considered a common rendezvous and each evening there is sure to be a crowd at the pool tables and bowling alleys. The club is open to members and their wives at all times, and at frequent intervals dances are held in the club house.

It is interesting to know that J. V. Bohn, superintendent of mines for the Tennessee Copper Company, is urging the building of a club house at Ducktown, which is the headquarters for the company's mines, and about five miles from Copperhill. It is planned to have this club run by the Young Men's Christian Association and to have its membership open to all company employees. It will be supported and run as other Y. M. C. A. organizations. A tennis court has already been completed at the Burra Burra mine for the use of members of the engineer corps and a staff house is being erected.

A movement is on foot to establish a register for youths by which vacancies for junior clerks in the mine offices of the Witwatersrand can be offered to lads with a secondary education of recognized standard. The subcommittee of the Transvaal Chamber of Mines has reported that it is desirable to open such register of youths of good character who have given promise in their scholastic careers of ability in commercial subjects, and has recommended that the Association of Mine Managers be requested to keep the register, which it has consented to do.

Iron Ore Deposits of Brazil*

By Orville A. Derby

The existence of iron-ore deposits in Brazil has been known for over two centuries, and these deposits have been worked in a limited way. It is reasonably probable that the first iron produced on the American continents came from Brazil. Unfavorable conditions exist, but for the present it is sufficient to say that a deficiency of ore of excellent quality, and in good working conditions as regards mining, is not one of them.

Iron ores are known in every state of Brazil and specimens figure in every national exposition. Definite information regarding most of the deposits is lacking. The greater part of the specimens exhibited in expositions and museums are magnetites, and of these the majority have proved to be quite highly titaniferous. A good number of specimens of excellent hematites representing numerous widely separated localities, have also appeared.

The districts regarding which definite information is at hand are those belonging to the states of Mines Geraes, São Paulo, Bahia, Goyaz, Paraná, Santa Catharina, Rio Grande do Sul and Matto Grosso. The ores known in the first three and the last of these states are predominantly hematites; in the others, magnetites.

With a single exception none of these districts have been studied in a way to give definite information on the subject of iron-ore supply. The district that has been investigated is situated in the eastern central part of Mines Geraes, in the section of the Espinhaço range that forms the divide between the Rio Doco and the São Francisco drainage systems extending over about two degrees of latitude with a width of about one degree of longitude. This is also the most productive of the goldfields of Brazil, and in consequence is one of the oldest and most densely populated of the interior regions of the country. Notwithstanding this fact, however, it has only been very imperfectly mapped and there is a singular lack of reliable and accurate information regarding its geological and economic features. This lack is now being supplied by a small party of the Serviço Geologico e Mineralogico do Brazil, under the direction of Dr. Luiz Felippe Gonzaga de Campos, that for the last two years has been occupied in mapping the district, both topographically and geologically. Thus far only about one-half of the known ironfields of Brazil has been covered by this work which is of a reconnoissance, rather than of a definite character.

Communication with Seaboard

At present the only all-rail means of access is by the Central Railroad of Brazil, which, starting from the port of Rio de Janeiro, enters the district at its southern border at km. 493, traverses it in a north and south direction for a distance of 90 km. to Sabará and extends a branch transversely across it which, when completed to Santa Barbara, will have an extension of 60 km. This is government road with a gage of 160 cm. for 498 km. to the station of Miguel Burnier and 1 m. from that point onward. The Leopoldina Railway, a narrow (1 m.) gage road belonging to an English company, starting from the same port, with a present extension of 630 km. will eventually tap the district at its northeast corner at Itabira do Matto Dentro with an extension of about 87 km. The Victoria and Diamantina Railroad, also of meter gage and belonging to a French company, is now under construction from the port of Victoria, in the State of Espirito Santo, toward the same point (Itabirá), which it can reach with an extension of about 630 km. It is understood that the company proposes to complete this line as soon as possible and to equip it especially as an ore-carrying road. If this is done and if the port of Victoria, which is an excellent one, is properly equipped with handling facilities, one of the most important parts of the district will have a satisfactory outlet in the near future.

Geology

The part of the region that has been mapped with approximate accuracy containing the iron-bearing formation, covers an area of about 5700 sq.km. The ore field is known to extend to the northward, northeastward and southwestward beyond the limits of the map which thus embraces only from a half to two-thirds of its total area.

In its essential geological features the region is constituted by a basement complex of crystalline schists (igneiss, mica, amphibole, chlorite and talcose schists), much injected with granite, and overlaid by a heavy series of partially metamorphosed sedimentary beds, profoundly folded and faulted. In this series, which consists principally of quartzites and clay slates with subordinate beds of limestone, a prominent member is the peculiar iron-bearing quartzite to which the name of "itabirite" has been applied. This name was originally proposed by Eschwege, in 1822, for the massive, pure iron ore of which the peak of Itabira do Campo, among others, is composed, and which is associated with a schistose rock composed of granular quartz and scaly hematite, which he discriminated as iron mica schist. This shows all possible gradations from an almost pure quartz rock with scattered flanks of hematite to a massive hematite free from quartz. The latter presents itself as intercalated layers, or lenses, varying from a few millimeters up to scores of meters in thickness, alternating with leaner quartzose portions. When lime-

*Abstract of report prepared for the International Geological Congress, which is to meet in Stockholm in 1910.

†Chief of the Geological Survey of Brazil.

stones are associated with the series, they also are more or less heavily charged with flakes of hematite and are frequently associated with commercially valuable ores of both iron and manganese.

Three Classes of Ore from the Same Beds

Taken as a whole, the itabirite beds, which are often of great thickness, become, when exposed to the weather, extremely friable, and as the region is one of heavy rainfall (60 to 80 in.) they have been extensively denuded. In consequence of this, the massive portions, when they occur, stand out as topographical features; the rain- and wind-swept slopes become covered with a rubble of iron ore due to the breaking up of the thinner intercalated layers, more or less completely freed from the associated silicious elements by rain and wind action, and the bottom lands of the valleys become charged with deposits of iron sand separated by the natural sluicing of the streams. There are thus produced from the same series of beds three classes of ore, namely: (1) Quarry ore, in the peaks and other natural exposures *in situ* of the massive portions of the rock; (2) rubble ore, on the denuded surfaces; and (3) sandy ore, in the valleys where sluicing action has taken place. To these must be added a fourth class, the so-called "canga" (contraction of Tapanhoacanga, i.e., "Negro's Head"), due to the cementation by limonite of the rubble ore into a hard-stone conglomerate. It is probable also that still a fifth class might be recognized in the outcrops of quartz-hematite rock sufficiently friable to permit the separation of the metallic mineral by sluicing.

Estimated Deposits

The cubic contents of a limited number of the orebodies have been estimated by competent observers on the basis of actual approximate measurements of their outcrops, but for the most part this has been done by private parties, and the information is not available. The estimates made by Dr. Gonzaga de Campos, of the Servico Geologico, are believed to be as reliable as can at present be made, and will serve to give an approximate idea of what the figures may amount to when the district becomes better known.

ESTIMATES OF BRAZILIAN IRON ORE DEPOSITS.

	Cubic meters.
Gava	72,000,000
Conceicao	80,000,000
Esmeril	19,000,000
Caue (Itabira peak)	33,000,000
Pitanguy	14,000,000
Sao Luiz	8,000,000
Peak of Itabira do Campo	8,000,000
Rio de Peixe	10,000,000
Cocaes	3,000,000
Total	247,000,000

Taking the specific gravity of these ores as four, this volume represents 988,000,000 tons. The above list includes several of the largest-known deposits, so that the contents of the others cannot be estimated on a proportional basis; but it seems quite safe to assume for them at least an equal volume, which would double the above figures. In these estimates no account is taken of the presumed underground extension of the visible orebodies.

No attempt has been made to estimate the volume of the rubble-ore deposits, which are both numerous and extensive throughout the district. As regards the "canga," Dr. Gonzaga do Campos estimates that it covers about 10 per cent. of the area occupied by the iron-bearing formation, which is about 5700 square kilometers.

Quality of the Ores

As regards the quality of these ores, the analyses at hand are naturally of hand specimens only, but mineralogists and metallurgists who have examined the outcrops agree that on immense rock faces, such as represented in the peak of Itabira do Campo, no differentiation of richer and poorer portions is perceptible to the eye.

Most of these analyses are deficient from an industrial point of view, as in the majority of them the phosphorus contents is given vaguely as "traces," without accurate determination, and no reference is made to titanium, leaving it doubtful whether this element had been especially looked for or not. The iron oxide content is generally given as from 97 to 99.5 per cent., the remainder being almost exclusively silica. In two cases in which special tests were made for titanium none was found, and from this and other considerations it seems safe to assume that as a class these ores are practically free from it. The most reliable phosphorus determinations at hand are from samples from two different localities submitted to the Krupp works and to those of the United States Steel Corporation, both of which give the same result—namely, 0.0024 per cent.

Conditions in the Silver Mountain District, Arizona

Special Correspondence

The Silver Mountain mining district is situated in the south-central part of Yavapai county, Arizona, about 40 miles south of Prescott, and reached from the north by the Santa Fe, Prescott & Phœnix railway from Prescott. At the present time there is considerable prospecting being carried on. The more important properties now in operation are scattered over a large area and there seems to be no central point to which mineral is confined.

In general the district lies in what is known as Yavapai schist, a broad belt of silicious schist running from north to south and cut by immense iron, porphyry, diorite and silicious dikes, usually lying conformably with the bedding planes of the schist. The principal veins are either highly silicious, carrying a high-grade white iron pyrite, or great basic iron dikes on which deeper mining is required to uncover the heavier sulphides.

Among the more important mines is the old Crown King mine, about three miles northwest of Crown King. This property, on which several thousand feet of work has been done, was recently purchased by the Yavapai Consolidated Mines Company, owners of the Old Tiger and Wildflower mines in the vicinity.

The Crown King mine, with a credited production of over $2,000,000, has been closed for some time due to friction among the stockholders. The new company is preparing to work the property on a large scale and at present is cleaning out the levels, retimbering, and unwatering the 600-ft. shaft. The owners have been actively engaged in mining both in this district and in Tombstone where they are developing low-grade copper properties.

The Wildflower and Old Tiger mines have been gradually developed during the last five years and have several hundred thousand dollars worth of ore blocked out. It is expected that the owners, as soon as they get their various properties in good shape, will build reduction works at Crown King. The same men control the railroad and own an uptodate copper smeltery in the southern part of the territory.

The Ora Belle property, a steady producer for the last four years, is about two miles south of Crown King. At the present time it is sinking the 3-compartment shaft from the 400-ft. to the 600-ft. level. The Mascot and Savoy properties lie between Crown King and the Ora Belle. Both companies have good bodies of ore and are developing rapidly. At the present time the Savoy is figuring on constructing a dry-concentrating plant to treat the low-grade silver ores.

The Pacific copper mine is about six miles south of Crown King in the same belt of Yavapai schist before mentioned. The property consists of 30 claims. No ore has been shipped as yet although the owners have spent nearly $100,000 in development. The ledge is an immense iron gossan varying in width from 50 to 500 ft. On the surface it is leached and honeycombed, with considerable copper stain and some gold and silver.

The main shaft is now at a depth of 320 ft., at which point crosscuts are being driven to cut the ledge. As soon as these crosscuts reach the objective point sinking will be continued to the 500-ft. level. The shaft is equipped with a 25-h.p. gasolene engine. Several small shafts have been sunk on the property and one or two long crosscut tunnels driven; the present work will open the ledge at a greater depth.

Bad roads and expensive transportation have hindered operations in this district but the new Territorial automobile road, the survey for which was recently commenced, will pass within one mile of the Pacific mine and will undoubtedly be a great help to this section.

Mines of the Granby Consolidated, Phoenix, B.C.

Over Eight Tons of Ore Produced Daily per Man Underground; Electric Haulage Superseding Steam; Glory Hole Mining System

BY ROY HUTCHINS ALLEN*

[illegible] Phoenix camp was first discovered by Matthew Hunter in the summer of 1891 on the Knob Hill claim, now owned by the Granby company. The fact that the ore was of low grade and far removed from smelting facilities prevented the rapid development of the mines, but since the Granby company obtained possession, progress has been rapid until they have become the largest and most important in British Columbia.

Geology

The country rock, insofar as the ore deposits are concerned, is chiefly the old greenish volcanic breccia with bands of tuffs and ash, locally known as diorite. The breccia includes fragments of chert, argillite, porphyrite and limestone, with some of granite. The only body of limestone is a small mass near the north end of the intermediate level on the Old Ironsides claim. The country rock is cut by a large number of dikes of pink alkali-syenite porphyry, but only one dike has been found in close conjunction with the ore. There are also several volcanic plugs of basalt with lava flows, now more or less eroded. A number of the orebodies of the district have been found directly underneath the lava capping.

The country rock has been much fractured, probably during the period of volcanic activity or immediately following. The principal lines of fracture have a north and south trend, while between these the ground is intersected by a host of minor fractures. The former probably represent the main channels, the latter the distributaries, of the mineralizing solutions.

The ore occurs in vast irregular bodies as a metasomatic replacement of part of the limestones and tuffs by the ore minerals. These bodies have in general a north and south strike with a low dip to the east, up to about 30 deg. Some of the bodies, however, have their longer axes nearly at right angles to the above. They belong to what the Canadian Geological Survey has termed the "magnetite" type. The principal ore minerals are magnetite, chalcopyrite, pyrite, specularite, pyrrhotite, calcite, quartz, garnet, epidote and hematite. Copper and iron have been almost the only metals in commercial quantities. In addition to the copper the ore averages from $1.25 to $1.50 in gold and silver, these occurring chiefly in the chalcopyrite and pyrite. The ore is self-fluxing. The work of the Granby company is confined largely to the Knob Hill-Ironsides deposit, and to the Gold Drop claim a half mile farther to the east, but prospecting is being carried on in the intervening territory.

Mining and Transport of Ore

The Knob Hill-Ironsides deposit has been opened up by levels at 100-ft. intervals and the ore is extracted from both a shaft and tunnels. Near the top of the hill is a great "glory hole" over 1000 ft. in length and from 90 to 200 ft. in width. The ore here was formerly removed by steam shovels, but now all is drawn down through raises put up from the main haulage tunnels below. There are three of these tunnels, but tunnel No. 1 has been abandoned for some time and the bottom of the glory hole is now in places considerably below its level.

The No. 2 tunnel, 100 ft. below the No. 1, has nearly a mile of 36-in. gage track, using 30-lb. rails. The ore is handled in 10-ton steel hopper-bottom cars drawn in trains of 6 to 10 cars each by a 14-ton steam locomotive, using coke for fuel. In two 8-hour shifts 1000 tons of ore can be brought out. The engine produces an objectionable amount of steam and gas, and is to be supplanted by an electric locomotive similar to those in use on the other levels of the mine. The cars are dumped into ore pockets from which a 12x36-in. Blake crusher is fed. There is one of these crushers at each tunnel and one at the Victoria shaft. Each is driven by a 150-h.p. Westinghouse induction motor receiving current at 2000 volts.

The crushers have a rated capacity of 150 tons per hour, but on occasions this has been greatly exceeded. The two hips from which the crusher is fed, one on either side, are each provided with a finger gate, operated by compressed air. These gates have four double fingers made of heavy bar iron bent at nearly right angles. One end is pivoted at the chute opening. The fingers are raised simultaneously by a bar which passes under them, but when the air pressure is released each finger falls back by its own weight. The action of the gate is rapid and satisfactory.

The crushed ore, 7 to 8 in. in size, falls from the crusher on a belt conveyer discharging directly into Canadian Pacific railway cars in which the ore is taken to the smelters at Grand Forks, 24 miles distant. If no railway cars are at hand the ore is diverted into a pocket reached by a crosscut from the No. 3 tunnel.

Electric Haulage on Lower Levels

The No. 3 tunnel, 100 ft. below the No. 2, is of about the same length as the latter, and its equipment is essentially the same. The 10-ton cars are, however, drawn by a Baldwin-Westinghouse electric locomotive of 70 h.p. This locomotive has two motors, one on each axle, which take direct current at 500 volts supplied by a motor-generator set placed in the compressor house. The gates of the ore pockets which supply the crusher at this tunnel are made of six steel bars, 4 in. square, sliding in vertical guides. These bars are attached by chains to a cross-bar which is raised by compressed air. The bars fall by their own weight. This style of gate is very satisfactory, but no more so than the somewhat lighter and less expensive finger gate.

The broken ore from the crusher goes by belt conveyer up an incline of about 20 deg. directly to Great Northern railway cars. The crusher is run only when a car is under the discharge of the conveyer. Two thousand tons of ore have been hauled out of this tunnel, crushed and loaded in 24 hours. The crusher crew consists of one crusherman, one man to look after the conveyer and one carloader.

All ore below the No. 3 tunnel is discharged through chutes to the 400-ft. level, 300 ft. below the tunnel, and hauled by electric locomotive to the Victoria shaft, where it is hoisted to the surface. This shaft was sunk on an incline of 60 deg., and is about 500 ft. deep. It has three compartments, two for hoisting, each 5x6 ft. in the clear, and a ladder and pipe way, 3x6 ft. in the clear. The shaft is well timbered with 12x12-in. timbers. Seven-ton skips are used, hung in balance. These skips are provided with a hood, and guide shoes with safety clutches. The hoist, built by the Jenkes Machine Company, of Sherbrooke, Que., has a double conical drum, 7 ft. in diameter, and is driven by a 250-h.p. variable-speed induction motor taking current at 2000 volts. This motor reaches 583 r.p.m. at full load, giving a hoisting speed of about 700 ft. per min. The time required for the trip averages about 1 minute and 10 seconds from the 400-ft. level to the dump. The output of the shaft is about 900 tons per eight-hour shift.

The headframe is 90 ft. from the collar of the shaft to the center of the sheave wheels. The skips dump about 60 ft.

Note.—This article was written after a visit to the Granby mines and some of the data here been contained were furnished by R. W. Hodgson and V. M. Cragg[illegible] in the 7 issue of the Canadian Mining Journal.

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above the ground and the ore can be run into either one of two coarse-ore bins, each holding 500 tons. These bins are provided with finger gates through which the ore is fed to the 36x42-in. Blake crusher. The product of the crusher drops to a belt conveyer on which it is carried up an incline of 12 deg. to the crushed-ore bins from which both Canadian Pacific and Great Northern railway cars can be loaded. The belt conveyer discharges into a hopper and chute which may be revolved about a vertical axis, and by turning the chute any one of the four bins may be loaded.

Side-dump Cars in the Mine

The levels tributary to the shaft are served by five-ton cars drawn by electric locomotives. The cars used on the 400-ft. level are built of steel, 5 ft. in hight, and have flat bottoms. They are hinged on the side of the running gear next the ore pockets, and have an automatic side-dumping arrangement. This consists of a side wheel, attached to the box of the car, which runs up an inclined plane placed opposite the shaft ore pocket, thus tipping the box and dumping the contents. As the wheel descends the incline the box returns to its original position. A small wheel attached to the side of the car truck and bearing against the underside of a guard rail attached to the frame of the inclined plane prevents a chance overturning of the truck. The gate is held in a constant position, independent of the position of the box of the car, by means of a scissors lever having one arm attached to the car truck. By this means the gate is automatically opened by the tipping of the car and is again closed when the box returns to its normal position. The speed of the train is slackened very slightly as it approaches the pockets, and the cars are dumped in rapid succession and with no delays.

The ore pockets hold about 400 tons and extend 40 ft. below the level. They are also connected with the two upper levels by raises, thus greatly increasing their capacity. The loading gates are of the finger type, similar to those in use at the crusher bins, but a sheet-iron gate rigidly attached to the arm operated by the air lift is placed below the fingers to prevent fine ore from running into the shaft.

Development Done by Contract

The tunnels and main haulage ways are all 9x11 ft. in the clear, though in actual measurement they average about 12x12 ft. These headings are driven by contract, as is all development work done in the mine, and cost approximately $7.50 per foot for labor alone. Four miners, two on a shift, with one machine drill will run from 110 to 130 ft. of 9x11-ft. drift per month. A twenty-hole round is used, made up of four lifters, four cut holes, eight breast holes in two rows, and four back holes. An 8x9-ft. drift was advanced 50 ft. in one week. The contractors furnish the two shovelers for loading the cars. In the breasts of the tunnels the ore is shoveled into special wooden, gable-bottom cars, 5 ft. in hight and holding seven tons. In the lower levels the 5-ton steel cars are used.

The orebodies are opened up on each level by a number of parallel drifts, approximately 75 ft. apart, driven along the strike of the orebodies. These drifts are 9x11 ft. in the clear where the big cars are used, and 8x9 ft. for the smaller cars. From the levels raises are driven at intervals of 25 to 60 ft., usually 45 ft. These are 7x9 ft. in the clear, and are put up by contract at a cost of about $5 per foot for the labor. Eighteen-hole rounds are drilled. In starting the raise two rounds are drilled and blasted and also the cut holes of the third round before the broken rock is removed. All of the rock is then shoveled up and the chute is built, after which the remaining holes of the third round are blasted and drilling continued.

From this point the methods employed differ slightly in various parts of the mine. The method most used is to carry the raises ahead at an angle of 45 deg. At a hight of about 30 ft. above the sill floor stoping is commenced and the raise widened out until it connects with those on either side of it. The ground between the raises is taken out for a hight of 10 to 15 ft., above which the raise is carried up 20 to 25 ft. wide until at a hight of about 60 ft. above the level another connection is made with the raises on both sides. In this way pillars about 20 ft. in diameter are left. Up to this point all drilling has been done with the machine mounted on a column. When the sill floor of the level above is reached the stope is widened out and a glory hole started. From this point tripods are used and the ore is broken down in benches.

Underhand Glory Holes

It is frequently planned to bring the raise up behind the chutes on the level above. The timbers are then taken out and the glory hole started. At the same time the raise is continued upward 10 to 15 ft. underneath the old stope, and the intervening ore is broken down by long upper holes drilled from the raise. In this way the back is always within reach and there is little danger to the miners from falling rock.

A 3 or 3½-in. Rand drill (No. 43, 4 B. or 4B½) is used for both raising and stoping. The holes drilled in raising are from 6 to 10 ft. deep, while in bench work holes up to 20 ft. in depth are drilled. Air for the drills is furnished at 90 lb. pressure by two 30-drill Canadian Rand duplex two-stage compressors, each driven through a rope drive by a 700-h.p. slow-speed, alternating-current motor receiving current at 2000 volts.

Where the orebody is flat or very wide the raises are frequently put up as nearly vertical as possible, and when the hanging wall, or the sill floor of the next level, is reached, glory holes are started and the ore broken down in benches. In this case vertical pillars are left to support the roof. There is no timbering in the stopes, and aside from a few tunnel sets in portions of the haulage levels the only timbering used is that sufficient to carry the electric wires. All drifts, crosscuts and manways are electric lighted. Both trolley and lighting

GLORY HOLE ON KNOB HILL-IRONSIDES CLAIM OF THE GRANBY GROUP

wires are carried eight feet above the floor of the level in order to be out of reach of the men.

The ore chutes are made of round timber and are heavily constructed to withstand the effects of the frequent bulldozing. The posts are 18 to 20 in. in diameter and are set firmly in hitches in the floor and wedged securely against the roof. The space behind these posts is tightly lagged with 8-in. poles, an opening being left for the chute proper. At the sides of this opening and behind the lagging, posts are placed, surmounted by a cap 18 to 20 in. in diameter. The bottom of the chute is made of a double thickness of 4-in. planks.

The mouth of the chute is closed by an arc gate made of a single piece of heavy sheet iron operated by a lever. At a hight of 8 ft. above the bottom of the level a platform is built for the convenience of the car-men, both for loading the cars and for bulldozing the pieces of ore which are too large to pass the 36x36-in. chute opening. The platform has movable planks which may be shoved against the mouth of the chute to catch any fine ore should the gate be held up by coarse material. All blocks of ore too large to pass the chute opening are bulldozed, it being considered cheaper to use more powder in this way than to bother with drilling. Sixty per cent. dynamite is used for this purpose.

The methods employed at the Gold Drop property are essentially the same as those that have been described. All ore is dropped down to the level of the Curlew tunnel, which is several hundred feet below the upper workings, and there taken to the ore bins in flat-bottom wooden cars of three tons capacity, drawn by an electric motor. The cars have a side discharge and are dumped by an air lift.

The Granby company at the time of my visit was shipping 3300 tons of ore daily. There were about 500 men on the pay roll, approximately four-fifths of whom were engaged underground. This means a production of 6½ tons per day per man employed, or 8¼ tons for each man underground, a record surpassed by few mines. For each miner employed, there were about 20 tons of ore broken daily. Extensive improvements to the smeltery were practically completed and the output of the mine is to be increased to 4000 tons per day.

Iodide Assay for Copper

R. T. D. Williams (*Aust. Min. and Eng. Rev.*, April 5, 1909) contributes some notes on the iodide method for the determination of copper. The details described were used in connection with "Low's Modification of the Iodide Method." Highly ferruginous ores prevented the complete expulsion of nitric acid even after evaporating to the densest fumes. This difficulty was overcome by taking a smaller quantity for analysis. It was also found that iron and silica interfered with the precipitation of the copper by aluminum. The unprecipitated copper was then precipitated by the addition of a little hydrogen sulphide water to the decanted liquor from the copper precipitated by aluminum. Bromine water was used to dissolve the copper sulphide and also served to oxidize arsenious compounds and assist in expelling nitrogen dioxide later.

The copper nitrate was evaporated to a syrup before neutralizing, which was done with a concentrated solution of sodium carbonate. The titrating was done in flasks and the bulk was from 75 to 100 cc. The reagents used should be tested for copper as the author often found it present in acetic acid.

Consolidated Goldfields of South Africa—A Criticism

SPECIAL CORRESPONDENCE

The general meeting of the Consolidated Goldfields of South Africa has been held and the report and accounts have been passed without opposition and with only a short discussion. The chairman's speech, which always attracts attention from the general public interested in South African affairs, was on the whole optimistic as regards the prospects of the company and the Transvaal gold-mining industry in general, and was well received by the shareholders. Outside, however, the speech has not been allowed to pass without unfavorable criticism. It is felt that the business of a company of the importance and reputation of the Consolidated Goldfields ought to be analyzed and explained in more detail than is done either in the directors' report or the chairman's speech.

The accounts of the company, for example, are presented only in lump sums. The shareholdings are given only periodically, and this year the list is omitted. The working results of the principal mines in which the company is interested are certainly given with considerable detail, but important information about the lives of these mines is either not given or referred to only in a casual manner. This is all the more surprising as the directors call special attention this year—and very properly—to the fact that the mines have limited lives and that therefore a portion of the dividends must be regarded as return of capital. If it is important for the Consolidated Goldfields to make provision by a sinking fund for redemption of capital, it is equally so for the individual shareholder, who has a right to all the information that the Consolidated Goldfields possess about the prospective lives of the subsidiary mines.

Then again, both in the report and the chairman's speech, new investments are dealt with only in the most general manner. Especially is this noticeable as regards the company's investments in West Africa. An important departure like this ought surely to be supported by a report from the company's engineer. When predictions are made that West Africa is some day going to be the biggest gold producer in the world, and the statement is put forward that four separate lines of banket formation have been found, the name of the authority should be given, for without that information the statements cannot be expected to make much inpression. Statements such as these put forward in such a loose and unbusiness-like fashion suggest that the directors do not realize their importance.

In discussing the policy of going outside the Rand for mining investments the chairman gave reasons which are to be deplored. He said that mining on the Rand had become prosaic and was an absolute certainty, and that he thought the shareholders wanted a bit of a gamble which he would find for them somewhere else in the world. Language of this sort is out of place at a company meeting and is not likely to impress shareholders.

Mining on the Rand, though exceptionally reliable as regards results, is not an absolute certainty and shareholders in such mines as the Robinson Deep or the Nigel Deep, two of the Goldfield's subsidiaries, will not agree that their operations have been prosaic. Neither will mining engineers agree that mining, when honestly conducted, and gambling have anything in common. Through their institutions and societies they have been doing their best for some time to make the public understand that mining is as respectable as any other business, and that while no doubt all mining enterprises carry some risk it is a risk that can be estimated and valued. Therefore when the chairman of the Consolidated Goldfields of South Africa, the trustee of millions of money invested by the public, couples mining and gambling together—although perhaps the remark was not meant to be taken too seriously—it is time for engineers to protest.

Gambling in mines means speculation in mines or mining property without good professional advice; it is a practice which in 99 cases out of 100 ends in disaster. Legitimate mining, on the other hand, is mining undertaken on the advice of competent engineers or geologists, and when conducted in this way the risk of failure should be small. It is on such lines that the shareholders of the Consolidated Goldfields or of any respectable mining company expect their business to be conducted; and when an opposite course is suggested to them by their chairman and the word gambling is introduced, whether playfully or not, they have good cause for taking alarm.

San Ygnacio Mine and Mill, Chihuahua, Mex.

Ore Deposits of the Small Sierras on Mexican Plateau Little Known; Success of This Mine Will Stimulate the Development of Others

BY ORESTE PERAGALLO

There is no question that much has yet to be done to develop the mineral resources of the small isolated sierras on the Mexican plateau and especially in the eastern part of the state of Chihuahua. New camps spring up here and there the ephemeral life of which is due, not to their lack of intrinsic merit, but to the absence of experience and want of capital on the part of those who try to promote the enterprises. One among these is the Sierra de la Magdalena, in the Bravos district, state of Chihuahua. In the north-central part of this range is a prominent landmark known as the Bufa de la Magdalena (Magdalena butte), east of Ahumada station on the Mexican Central Railroad, 85 miles south of El Paso, Texas, and reached by a good wagon road 18 miles long. Very few mountains offer such clear evidence of strong mineralization as this one, but no record exists of any property upon it which deserves the name of mine.

The monuments of the claims scattered through the country and the prospect holes found here and there show that some mineral ground has been taken up and several outcrops scratched, but apparently by people who are waiting for better times in which to work their claims. About 10 years ago rich silver and lead pockets were dug out, but only when Lewis Vidal, of El Paso, took hold of a group of claims did the San Ygnacio camp begin to be of some importance. To the seven properties Mr. Vidal bought he added several others acquired from the Mexican government; among these last ones I will take into consideration only three, called the San Ygnacio Anexas 1, 2 and 3, because they help to form a regular polygon of 155 acres with 10 titles, called the San Ygnacio group.

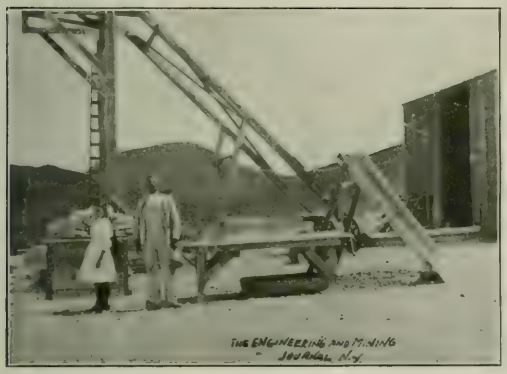
Geology

This group is formed by a basin about 3000 ft. long from east to west, and about 2000 ft. wide, limited by masses of igneous rocks, and the base formed by a thick deposit of sandstone which appears in all the arroyos. The ore deposits have two well defined characteristics; they occur as veins in sandstone along fissures perpendicular to the sedimentary planes, and as veins associated with intrusive dikes. In both cases the most remarkable features are: (1) The constancy of the strike (nearly east and west); (2) the great iron cap that forms the outcrops, and (3) the nearly constant vertical dip of the veins. Outcrops are formed by quartzose hematite of different colors and hardness, also limonite.

The sandstone strata, nearly horizontal, and from 1 in. to 3 ft. thick, are completely free from fossils, and in some places (especially near the surface) are found silicious knots of organic origin disseminated through them. Toward the south where they adjoin the eruptive material that forms San Ygnacio hill, they are slightly tilted over, but the place has not yet been found where they show plainly any of the metamorphism which they ought to have undergone when penetrated by the great mass of fluid eruptive rock shown in the hill. The sandstone exists only in this basin.

Magdalena butte rises due west of the camp, about two miles distant; it is surrounded by several other buttes, evidently chimneys of volcanic eruptions. All along the road to the railroad station there is no outcrop of sedimentary rock, although I remember that several years ago very close to the main butte on the south side, I found white crystalline limestone associated with fossiliferous strata, probably of the Cretaceous period.

The most important mine of the group is the San Ygnacio, near the east end of the property. The vein is a fissure in sandstone with about 5 to 10 deg. hade to the south. A study of this mine and others of the group shows the absence of folds and faults, and that after the formation of the ore deposits the topography of the country did not change save through erosion. This property, with the others, was opened as a lead-silver mine, and only when the percentage of zinc in the ore became so high as to prohibit the shipment to a lead smeltery was the attention of the owner attracted to the possibility of getting rid of the detrimental mineral by some mechanical process.



SAN YGNACIO MINE

SAN YGNACIO MILL

Contact Veins Most Productive

The width of the vein is variable, averaging from 2 to 4 ft.; it never pinches out entirely, and in some places the pay streak occupies the entire width. The gangue is formed by regular zones of calcareous crystalline deposit and by silicious matter and remains of the sandstone derived from the walls, but no foreign or brecciated

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material is found. On both walls the slickensides are well marked, [illegible] slips and probable shear zones. To reach accurate conclusions concerning the genesis of the ore would entail more detailed [illegible], but data could be obtained from the examination of the several prospect holes scattered over the hills and from the study of the numerous basalt and porphyry dikes. My impression is that the veins that lie along the shear zones of the volcanic dikes posterior to the dacite of the buttes (because they cut it in some places), and along the contacts of eruptives and sedimentaries, have the same source as those intrusions, and have been filled with mineral deposits after the removal of the crushed material from the zone of least resistance. This was accomplished immediately after the period of most intense volcanic activity which brought up the dacite.

The veins in sandstone are the first that have been formed, and their origin is related to the big dacite eruption (probably Tertiary) that formed the buttes. The fissures have been opened, or rather widened, by the vapors and waters expelled from the solidifying igneous body; the hot ascending waters which succeeded the vapors in the cooling of the volcanic magna deposited the metals they carried in solution, and formed the ore. It seems to me that it is strictly a primary deposit, although the fact that the zinc sulphides increase in depth may show secondary enrichment. The most productive spots are in this class of veins, while the other veins above referred to, have been proved entirely barren or low in grade. The organic matter of the sandstone has acted as precipitant for the lead and zinc sulphides. To explain the rich pockets of silver and lead found on the opening of the vein (and of another called the Carolina) it seems to me that as the solutions cooled and thinned near the surface the salts of silver were deposited and afterward (in the oxidized zone) precipitated as chlorides by water containing chlorine, the lead remaining as insoluble sulphate.

The other vein, the Carolina, has this same character, but it is not so rich. This vein is about 1500 ft. west of the San Ygnacio, within the main property, but no efforts have been made to find out whether there exists any connection between the two veins or not. South of it, farther up the hill, a vein in dacite crops out and has been prospected with fairly good success. The talus that covers the slope conceals the sandstone at the point where it joins the dacite, and one may expect that some new mineral deposit will be found at this point of contact. This zone of contact is to the south and less than 1000 ft. distant from the actual workings, and is about to be proved by a tunnel from one of the arroyos in the center of the basin toward the butte that forms San Ygnacio hill. All the indications show that the vein is continuous and it would not surprise me should some large replacement be found in the contact zone, or in the probable zone of kaolinization. No analysis has as yet been made of the dacite and sandstone. Very little water has been encountered, except some seepage from the vein or joints of the sandstone (which sandstone becomes harder with depth), but the level of permanent water has not yet been found.

SECTION THROUGH SHAFT, SAN YGNACIO MINE

Economics

Water for the use of the camp is found in an old shaft in the vicinity, and rain is collected in tanks; also 150 gal. per day is bailed from the workings. The ore has been estimated at 20,000 tons in sight, blocked out from a single and nearly vertical shaft 500 ft. deep. This shaft, sunk on the vein, is explored through working levels. The levels are 10 in number and 50 ft. apart. After the removal of the iron cap from the upper levels, rich silver-lead ore was extracted to the amount of $200,000 as per smeltery returns. The main supply of zinc ore is obtained from level No. 7, where workings extend 225 ft. west and 150 ft. east, with a raise to the upper levels. The proportion of zinc increases at a uniform rate. The typical ore is blende and silver galena, spotted with iron pyrites. Assays of 3 per cent. copper and $1 per ton in gold have often been obtained. From the Carolina mine about $40,000 has been produced by shipping ore sorted by hand. During exploration of the San Ygnacio levels, 10 carloads of lead and two of zinc ore were shipped, mostly sorted and jigged by hand, and the returns from these shipments were $10,000. No complete sampling of the ores of the San Ygnacio mine has ever been made, but the average is about as follows: Ag, 15 oz.; Pb, 20 per cent.; Zn, 20; Fe, 3 per cent.

Treatment

The mill was designed to treat from 30 to 40 tons per day. Tests were made by Henry E. Wood & Co., Denver, Colo., but those made in Dallas, Tex., with the dry concentrator actually in use gave better results. At the time of my visit (June, 1909) the mill was nearly completed. Figures given below explain the results obtained after a few changes had been introduced, but no systematic tests or assays have been made as yet and no working records kept. The mill consists of a small building 26x60 ft. on floor plan, and the difference of level from dumping wagon to the discharge of product is 30 ft. The mill was designed and erected by James W. Searle, and cost about $15,000, but a new mill might be built cheaper.

The ore is crushed through a 7x10 Dodge crusher, goes to a set of 14x27-in. rolls of the Cananea type (built by the El Paso Foundry and Machine Company), then passes along a spiral conveyer where it is dried, then elevated and screened to 12 mesh. The fines are classified by a Sutton, Steele & Steele vibromotor, size 4, and oversizes, same as those from the screen, go to a set of finishing rolls, also 14x27-in., which discharge again into the spiral conveyer. The classified product from the vibromotor (from 18 to 200 mesh) goes to eight ore bins above two S. S. S. dry-concentrator tables, and the fines above 200 mesh go to tailings. The vibromotor, tables and the impact screen (from the Colorado Iron Works Company) are the only patented machines used. A 25 h.p. gasolene engine is used to run the blowers and tables, an independent source of power being necessary to give them a constant and uniform speed. A 32 h.p. gasolene engine is required to operate the other equipment.

The daily output of every table is about two tons of concentrates, which average 70 per cent. lead and 45 oz. silver. The zinc content is under smeltery penalty. The amount of ore run over the tables depends entirely upon the work of the rolls. The ore treated at present is first-class

ore, but they have on hand several old dumps of low-grade. The middlings are stored and will be treated later on by some magnetic process to get the zinc content out as soon as market conditions are favorable. In spite of the little troubles peculiar to every new mill of this kind, everything seems to be right and several carloads have already been shipped. To my knowledge the owner has no connection whatever with any large metal-selling company, and the successful outcome of his efforts with the present-day mechanical appliances that the mining industry has developed, will be watched with interest by every small producer.

Leasing Public Oil Lands

In connection with the recent action of the Administration in withdrawing from entry over 3,000,000 acres of public petroleum lands in California, Wyoming, Utah and Oregon, the following statement is given out by C. W. Hayes, chief geologist of the United States Geological Survey:

To remedy the present unsatisfactory conditions by which public oil lands have to be entered under a law framed primarily to provide for placer-gold mining entries, it is generally admitted by those interested in the development of oil lands that a radical revision of the American mining law is necessary. Anticipating that Congress will recognize and meet this evident need, the Secretary of the Interior has withdrawn from all forms of entry all vacant public lands designated by the Geological Survey as probably containing oil and gas. This executive action, is, however, only temporary, and is intended to preserve the *status quo* until Congress acts.

When the present placer-mining law was enacted probably no one in Congress or out had any idea that it would ever be made to cover mineral deposits so far removed in every essential characteristic from gold-bearing gravels as are oil and gas. Yet when oil was found on the public lands no other law was on the statute books except the placer law under which title to it could be acquired, and this anomalous and wholly unsatisfactory condition still holds to the great detriment both of the Government and of the oil industry.

The fundamental basis of a location under the placer law is discovery, and the courts have held uniformly that there can be no legal location until there has been a discovery. But in the nature of the case there can be no discovery of oil until a well has been drilled at great expense, since ordinarily there are no surface indications of the oil and the well must be drilled upon purely geological inference. It follows, therefore, that the driller will be wholly unprotected against rival claimants to the land until he has completed his first well or he will be forced to make a false claim to discovery on which to base his location.

Fraudulently Entered as Gypsum and Agricultural Land

One very common method of evading the law is to locate oil under the guise of a gypsum claim. In many of the California oilfields the surface soil contains a small amount of gypsum, although rarely in sufficient quantity or purity to be profitably mined, even if favorably situated for transportation and market. It affords a pretext, however, for a location under the placer law, and large numbers of claims have been patented where it is a matter of common knowledge that the real object is to acquire title to the oil. In this way land worth thousands of dollars an acre has been acquired from the Government for $2.50 per acre, and this without oil development. Moreover, it is not generally the man of small means, but rather the wealthy corporation that resorts to this subterfuge to secure title.

Although many of the oilfields in the public-land States, and particularly those in California, are in regions wholly devoid of agricultural possibilities, no sooner is a successful well drilled than the entire district is covered by homestead and scrip entries, the purpose of which is to secure title to the oil under cover of the agricultural-land laws. It is to meet these conditions that a thorough revision of the law is needed.

Oil-leasing System in General Practice

Any law which will adequately meet the requirements of the case must recognize the fundamental difference between oil and gas and other minerals, namely, mobility. These elusive products can be drawn from a distance underground across boundary lines, and exclusive title to the product is acquired only after it reaches the surface. It follows, therefore, that oil can be disposed of by the Government or other owner of the land in which it occurs only as a commodity and not in terms of acres like coal or other minerals occupying fixed locations. This difference is so well recognized that it has determined the leasing system which is practically universal in all the oilfields where the land is in private ownership. The Government cannot do better than to adopt the plan which has been worked out through long experience, and, where the holdings are sufficiently large, found thoroughly satisfactory, both to the oil operator and to the private land owner. Why should not the Government as a land owner deal directly with the producer rather than through the intervention of a middleman to whom title to the land has passed?

Any ideal or practical law must further recognize the fact that actual discovery involves heavy expenditure and considerable time, and that the prospector must be adequately protected in his investment before as well as after the discovery is made. The area to which he is given a preferred right must therefore be sufficiently large to justify his initial heavy investment and in such compact shape as to protect his discovery from encroachment by drilling on subsequent entries.

A well considered leasing law will give certain incidental advantages of great importance both to the Government and to the oil operator. It will constitute the most effective means for the conservation of the oil and gas resources of the country by enabling the Government to regulate developments so as to prevent much of the criminal waste now prevalent.

Present Law a Hardship

Under the present system the owner of a 20-acre placer claim is compelled to drill and pump the oil from his land with all possible speed, regardless of transportation facilities or market, for otherwise his competitors on adjoining claims will take a large share of it away from him. In the resulting feverish exploitation half a dozen or more wells may be drilled when one would have secured the same amount of oil—a serious economic waste to the nation and a heavy tax on the ultimate consumer. Also, unrestricted drilling by careless or ignorant operators may ruin a valuable field by admitting water to the oil sand from a higher or lower water-bearing stratum. Many examples of criminal waste resulting from the unrestricted exploitation of oilfields might be cited.

Oil for American Naval Vessels

The Government is not only the largest owner of oil lands, but it is likely to be the largest consumer. The six largest battle ships in commission or under construction in the American navy are equipped for the use of either oil or coal, and the fourteen largest destroyers use oil exclusively. The question of fuel supply for these vessels is certain to become an exceedingly important one in the near future, and the law should provide a means of perpetuating a supply for this certain future need.

The fact is gaining recognition that the natural resources remaining in the possession of the Government are the heritage of the whole people, and the idea that they should be utilized for the general good rather than exploited for the enrichment of a few individuals is rapidly crystallizing into public opinion. The enactment by Congress of a law providing for the leasing of oil lands will be a logical and much needed action in the Government's management of its great [illegible] property.

Trial Runs with the Garretson Furnace

By Clarence C. Semple*

There appeared in the Journal of April 16, 1908, an article by the late Oliver S. Garretson relating to the furnace of his invention, in which he proposed reducing sulphide copper ores to metallic copper in one operation. This article was published after Mr. Garretson's death and dealt principally with the chemical and heat reactions involved. So far as I am aware, nothing has been published giving the details of the actual operation, wherefore the following notes on the results obtained in some experiments made with this furnace at Ore Knob, N. C., in the summer of 1905 may be of interest.

The principle of the furnace was based on the assumption that if an ordinary copper-matting furnace were provided with a crucible somewhat deeper than usual, and a suitable blast of air were blown into the bath of matte in the crucible, the iron and sulphur would be oxidized, as the grade of the matte raised, and the heat evolved would be available for the melting of more ore with attendant production of more matte to keep the crucible filled. The sulphur would escape upward through the charge and be carried off through the furnace stack, the oxidized iron would enter the slag and the matte in the crucible would be raised in copper content until metallic copper could be tapped.

Description of the Furnace

In the Ore Knob furnace, a cast-iron base plate, 2 in. thick, 42 in. wide by 108 in. long, was supported upon 10 cast-iron columns, 18 in. high. The sides and ends of the furnace consisted of two rows of water jackets. These jackets were of cast copper ¾ in. thick with a 4-in. water space. There were 18 jackets on each side of the furnace, 8 in the lower row and 10 in the upper. Each of these jackets were 12 in. wide by 4 ft. 6 in. high. The ends of the furnace were built up of water jackets similar to those used in the sides except the middle lower jacket at each end of the furnace was 18 in. wide. One of the wide end jackets was provided with a tap notch for drawing the matte from the crucible of the furnace and the wide jacket at the other end was fitted with slag notch and spout. There were seven jackets at each end of the furnace, four 12-in. jackets in the upper row, two 18-in. and one 18-in. in the lower row.

The upper row of the lower jackets overhung the inside the lower row of the upper jackets. The overlapping arrangement of the jackets was placed first and through each passed two 2-in. holes. The cooling water entered at the bottom of the lower jackets, rose in them, passed through the two holes into the upper jackets and from the upper part of the upper jackets entered a 5-in. pipe leading to a steel tank outside the furnace building, the bottom of which was a little higher than the top of the upper jackets. The excess of water overflowed from the steel tank. The tank was provided so as to insure the jackets always being filled with water.

The lower side jackets of the furnace were each provided with two tuyere openings of 2-in. diameter, the centers being 18 in. above the base plate of the furnace. These tuyeres were called the "smelting tuyeres." Twelve inches below the smelting tuyeres, each jacket was provided with three other tuyeres, 11/16 in. in diameter, which were known as the "converting tuyeres."

The discharge lip of the slag spout was 14 in. above the base plate of the furnace, and arranged to trap the blast in the usual manner. The tap notch in the wide center jacket at the other end of the furnace was 6 in. above the base plate.

The hood of the furnace was built of brick and supported on three sets of 16-lb. rails. There were two stacks in the hood, each 30 ft. high and 37 in. in diameter. A steel feed plate 12 in. deep held the upper jackets in place and added a foot to the depth of the furnace. The furnace had the form of two rectangular prisms, the larger above the smaller. The overlapping of the jackets resulted in there being a 6-in. shelf-like projection all around the inside of the furnace. There was no bosh whatever. The lower prism measured inside the furnace, 29 in. wide, 108 in. long and 54 in. deep, the upper, 41 in. wide by 120 in. long by 48 in. deep so that including the depth of the feed plate the distance from feed floor to base plate was 9 ft. 6 in. There were 16 smelting tuyeres and 24 converting tuyeres on each side of the furnace. The bottom of the furnace was made by tamping in a 6-in. layer of brasque.

The forehearth was water jacketed and lined and bottomed with fire brick, the dimensions inside the brick being 52 in. in diameter by 36 in. deep. The forehearth was provided with a slag overflow, and a tap notch 6 in. above the bottom.

Operation of the Furnace

Blast was supplied to the smelting tuyeres by a No. 3 Roots blower. The converting tuyeres were supplied with air by a Ladlaw Dunn Gardner compressor capable of supplying 400 cu. ft. of free air per minute up to a pressure of 18 lb. The smelting and converting tuyeres were supplied through independent blast pipes.

The ore used was taken from the old waste dumps of the Ore Knob mine, carefully picked over and broken to 3-inch size. All fines were carefully screened out. A typical analysis of the ore showed: copper, 1.4 per cent.; alumina, 3.93; silica, 12.5; iron, 41.7; lime, 6.8; sulphur, 26. The ore was a heavy pyrite ore composed of the minerals pyrite, pyrrhotite, chalcopyrite, quartz and a small amount of calcite. Connellsville coke was used for fuel and the only flux was an almost pure white quartz taken from the creek bottoms.

After thoroughly drying the brasque bottom, a wood fire was kindled and a bed of burning coke built up to about 12 in. above the tops of the smelting tuyeres. The converting tuyeres, slag and matte taps were plugged and the blowing-in charges fed. These blowing-in charges were made up of first 6000 lb. of slag, followed by 400 lb. of coke, and 2000 lb. of slag until three such charges had been fed, then the regular ore charges of 2000 lb. of ore, 200 lb. of quartz and 7 per cent. coke were fed until the furnace was three-quarters filled. Blast was then supplied at 10-oz. pressure through the smelting tuyeres and gradually raised to a maximum of 30 oz., two hours after the first blast had been turned on.

As soon as the forehearth had half filled with matte and the regular ore charges had reached the zone of fusion, the amount of quartz on the charge would be raised to 400 lb. per ton of ore and the coke cut to 4 or 5 per cent. of the charge. It would take about 40 min. for this charge to reach the fusion zone, then the converting tuyeres would be opened at a pressure of about 10 or 8 lb. Before opening the converting tuyeres the furnace would smelt at the rate of about 125 tons of charge per 24 hours; after putting on the converting blast the smelting would run slower for about 40 min. then increase to the rate of 175 to 200 tons of charge.

Bridging of Charge

In the first experiments, we had great trouble usually about six hours after turning on the converting blast. An arch of chilled material would form across the furnace about 2 ft. above the level of the smelting tuyeres, eventually stopping the blast entirely and freezing the furnace completely.

By taking down the end jackets we could have a good view of this arch and generally found it hung with stalactites of material which upon analysis proved to have the composition of Fe_3O_4. We were rarely troubled with an actual chill in the crucible of the furnace, the chills being generally confined to the formation of the arch above the smelting tuyeres. We did have much trouble in keeping the converting tuyeres open; before turning on the converting blast, slag and matte would chill around the lower tuyeres and form masses that were hard to break off

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when we wished to open the converting tuyeres. These noses would also form nuclei of chills around the lower tuyeres which would not spread so as to fill the crucible but upon being broken off would soon build up again.

Apparently the trouble was caused by the lack of silica to combine with the iron oxide formed by the conversion of the matte at the moment of opening the lower tuyeres, and also due in part to the chilling effect of the jackets on that part of the matte immediately surrounding the converting tuyeres. Lining the crucible was then tried. A mixture of broken quartz, with just enough clay to bind the particles together, was rammed between the jackets and a wooden mold in the crucible of the furnace. This lining was made 6 in. thick and carried up to within 3 in. of the smelting tuyeres. Holes were punched for the entrance of the converting blast and opposite the slag notch. After drying this lining the furnace was blown in as before and from that time on we began getting encouraging results.

Operating with Quartz-Lined Crucible

After putting in the clay lining a typical run of the furnace would be about as follows: The blowing-in charges as before mentioned were fed, followed by a regular ore charge of 2000 lb. of ore, 200 lb. of quartz, with 7 per cent. coke until the furnace was filled. The blast was turned on through the smelting tuyeres at a pressure of about 10 oz., this being raised to 24 or 30 oz. two hours later. The charge would melt down quickly, the furnace producing about one-half as much matte as slag. The slag, while basic, ran hot and limpid, a typical analysis of which would show: Silica, 34.4 per cent.; iron, 37.5; lime, 7.6; alumina, 6.3; sulphur, 0.8; copper, 0.35. The corresponding matte carried 3.2 per cent. copper, 60 per cent. iron and 30.4 per cent. sulphur. Approximately 60 per cent. of the sulphur in the ore went out the stack.

After the regular charge had reached the fusion zone the coke would be reduced gradually to about 3 per cent. of the weight of charge. The amount of quartz raised to 400 lb. per ton of ore and as soon as the slag began to show acid the converting tuyeres would be opened at a pressure of 8 lb., gradually raising it to 10. The immediate effect of opening the lower tuyeres would be to cause slower running for about an hour, then the furnace would begin to run faster until it took about 50 per cent. more charge than when running with the smelting tuyeres alone. The clay lining would be gradually eaten away and completely disappear in 40 minutes, but by that time conditions in the crucible would be such that no chills would form in front of the tuyeres and we could shut them off and open them again at will.

Dark Tuyeres

Soon after the lower tuyeres had been opened the smelting tuyeres would darken and in spite of constant punching could not be kept open nor could any blast be driven into the furnace through them. A bar could be driven from a smelting tuyere on one side out through the tuyere opposite and be withdrawn with the bare hand. The smelting blast was cut off altogether after the tuyeres had darkened, but the furnace ran exactly as well with only the lower tuyeres in commission.

About an hour after the lower tuyeres were put in blast no matte at all could be observed overflowing with the slag. In 24 hours we would hardly tap a pot of matte from the forehearth. With 400 lb. of quartz to a ton of ore and with the converting blast on, a slag would be obtained showing the following analysis: Silica, 37.4 per cent.; iron, 38.7; lime, 5.4; alumina, 3.2; sulphur, 0.5; copper, 0.15. The corresponding matte ran 9.8 per cent. copper.

Shortly after opening the lower tuyeres, the quartz on the charge would be again raised to 600 lb. per 2000 lb. of ore and the slag obtained showed: silica, 39 per cent.; iron, 38.5; lime, 3.9; alumina, 2.5; sulphur, 0.4; copper, 0.2. The coke was oftentimes reduced to 0.95 per cent., and one time we ran for five hours with no coke at all.

The slags ran from the furnace white hot and smoking. They were very limpid, cooled exceedingly slowly in the pots and usually showed a glassy surface or fracture when cold, and although rather high in iron, the little matte that came over in the slag seemed to settle rapidly and cleanly. Both the slags and mattes were magnetic, and could be entirely lifted with a magnet when ground to powder.

Furnace Conditions

The furnace always ran with a cold top showing no signs of fire, the charge was kept level with the feed floor and great volumes of bluish- and yellowish-white smoke rose to tax the carrying capacity of the stacks. This sulphur smoke would often settle about the smelter yard to the great annoyance of the slag wheelers who oftentimes could not work more than half the shift. It was often possible to account for only 2 per cent. of the sulphur charged with the ore in the slag and matte obtained, 98 per cent. of the sulphur being burned off.

The converting capacity of the furnace often exceeded the rate of matte production so that the line of matte in the crucible would sink below the lower tuyeres, allowing slag to come in front of those tuyeres which would immediately chill and cause trouble. The number of converting tuyeres in blast would then be decreased and charges of old low-grade matte with sufficient quartz to flux the iron be charged until the lower tuyeres were again submerged. We had no trouble with the lower tuyeres as long as they were submerged in matte. The amount of air supplied the furnace was about enough to oxidize all the iron to FeO and three-quarters of the sulphur to SO_2.

Copper Content of Products

Samples of the matte and slag taken from time to time after the converting tuyeres were put in blast were analyzed and the copper content is shown in the accompanying table.

COPPER CONTENT OF MATTE AND SLAG.

	Matte, Per Cent.	Slag, Per Cent.
Before converting began.	4.57	0.35
5 hours after converting tuyeres had been in blast.....	8.08	0.15
17 hours afterward.....	32.12	0.18
18½ hours.....	41.75	0.40
20 hours.....	45.64	0.40
25 hours.....	56.83	0.42
30 hours.....	62.29	0.45
In crucible after blowing out.	69.25	....

After using the clay lining in the crucible the results obtained were most encouraging and in not a single instance did we have trouble with the furnace. A series of accidents to the pumping machinery obliged us to cut short the experiments when they had reached such a satisfactory state and Mr. Garretson decided that he would discontinue the trials as he wanted to redesign the furnace so a deeper bath of matte could be carried in the crucible to do away with the annoyance of having the matte line drop below the lower tuyeres.

The high copper in some of the slags made while converting is probably due to the insufficient size of the forehearth. The stream of slag from the furnace was so large that the little forehearth gave practically no chance for any entrained matte to settle out.

No attempt was made in the experiments to eliminate sulphur in the shaft of the furnace; the charge was melted down to produce the maximum matte fall possible without regard to its copper content, all the concentration being left to be accomplished in the crucible. I am not aware that the furnace has ever produced metallic copper, but even if such a degree of concentration should be impossible or not economical there would seem to be a field for a furnace capable of producing such a high degree of concentration as 40 to 45 into 1 with the use of so small a percentage of carbonaceous fuel. An ore with considerable sulphur and high in unoxidized iron that upon melting down would result in the production of a heavy matte fall, with sufficient silica to meet the requirements of the oxidized iron to form a liquid slag would, from the results of our experiments, seem to be the class of ore the furnace could work upon to give most favorable results.

Separate Leaf System for Recording Survey Notes

Enables the Office to Keep Pace with Field Work; Only Notes of Work in Hand Are Carried; the Installation Cost Is Quite Nominal

BY LEE FRASER*

The system herein described for the taking and recording of survey notes, suggested by a system in use at the Tamarack mine and inagurated by John T. Been, has been devised with the intention of facilitating the labor of this work, insuring its accuracy and guaranteeing the ability at all times to instantly refer to any notes or records.

Field Notes

The field notes are taken upon cards, as shown on Fig. 1 and 2, which the crew passed on (shown in Fig. 3). A blackboard of the pattern of [illegible] was mounted and carried [illegible] during the field round.

The field party passed on a card ruled [illegible] the [illegible] card.

[illegible] Accounts [illegible] Fig. 1.

[illegible] Mining Co. _____ Computation Book _____ Ledger Number _____

Station	Horizontal Angle	Bearing	Magnetic Bearing	Vertical Angle	Distance	a	b	c	Remarks

FIG. 1

[illegible] Mining Co. _____ Computation Book _____ Ledger Number _____

							Remarks

FIG. 2

FIG. 3

FIG. 1 TRANSIT CARD FIG. 2 LEVEL CARD FIG. 3 SKETCH CARD

together with a cross-section card for sketching. The size of these cards is approximately 5x8 in., a stock size. The weight of the board may be chosen with a view to its probable use, thus a card for mine notes may be heavier than one for notes to be taken under more advantageous circumstances.

When in the field the cards may be bound in [illegible] Binder. It has been found that [illegible] covers of heavy [illegible] to which the binder is soldered, give satisfactory service, especially underground. The covers should be made of sufficient width to afford ample protection to the edges of the cards, and, if necessary, a clamp provided, but this is not recommended. The cover [illegible] should be [illegible].

The field notes may be filed in the main [illegible] in the [illegible] bound in a ledger or filed under an alphabetical index, as in a card system. The scheme as portrayed in Fig. 4 was adopted to minimize the labor and drudgery, but more especially to give a direction or definition to the work. The *modus operandi* will depend in any case upon the one calculating but in general [illegible] as follows: (1) Record field notes. (2) Find corresponding logarithms. (3) Add logarithms and find corresponding numbers, recording results under Latitude and Departure, a; (4) Compute [illegible] and departures by [illegible] (5) [illegible] latitudes

Office Record

The office record is in loose-leaf form, size of sheet about 14x30 in., and may be

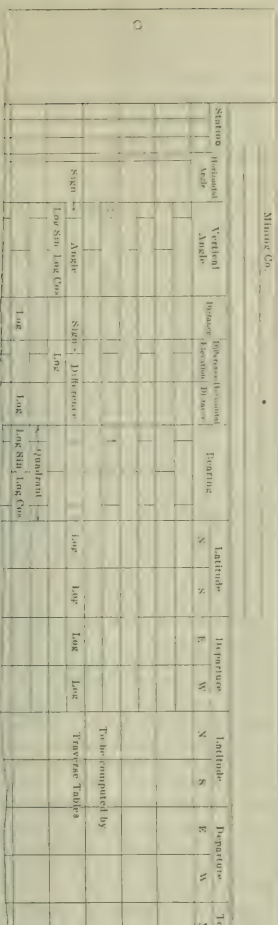


FIG. 4. LEDGER SHEET OF SEPARATE LEAF SYSTEM FOR SURVEY NOTES

and departures by both methods and record average; (6) Compute total latitude, departure and elevation of the point; (7) Record under Remarks the number and page of the computation book in which any calculations were made.

From the above description of the routine to be performed it is evident that in this system figures are handled twice, there is a definite program to be followed, thus avoiding confusion, and the operations progress in a logical order. A complete record of all operations up to and including the final results is thus maintained and the work is always readily accessible for future reference.

Cost of Installation

The cost of installing such a system is not great, and certainly warranted by the results obtained. A zinc etching made from drawings representing the form to be used, gives satisfactory results, and the cost of such an etching varies from 6 to 8c. per sq.in. A notebook cover, as described, costs about $1.50. The sum of $50, including the cost for etchings estimated at $35, should cover the entire expense of installing such a system.

General Advantages of the Separate Leaf System

For the work about a mine, which often includes a little of almost every sort of surveying, cards have been found superior to regular field books on many points. To begin with, by their use a complete and continuous record of the work is maintained, regardless of the date the notes were taken. Then too all notes are readily accessible, and in the case of the sketch cards, they may be laid out to represent a continuous and connected sketch of a road, railroad line or profile stope, drift, tunnel, etc. Another great advantage is that all data, information, and notes, except those actually in use in the field, are always available in the office. This feature is to be particularly commended. Another great advantage is that the engineer in the field does not carry the notes of other surveys with him, which might easily be the case if he carried a half-filled field book, especially when there is a volume of disjointed survey work to be kept up, faces to be measured, etc.

As a usual thing, the notes, in either case, may be taken clean, and, with the cards, they may be filed at once in the office. When a survey party is in the field it is an easy matter, if separate cards are used, to send the notes of the day's work to the office, there to be plotted by the office man; this might be awkward if books were used, and the distance to the office great. This plan has also worked out well in some railroad surveys for preliminary location. Special forms for sketches in constant use, for example of the rooms off an entry in a coal mine, may be printed and will facilitate the work.

Determination of Iron in Brass and Bronze

I. M. Bregowsky and L. W. Spring (*Journ. Ind. and Eng. Chem.*, I, pp. 187-188) find appreciable amounts of iron present in brasses and bronzes where other chemists report traces or small amounts. Check results are usually obtained on the main constituents as tin, lead, copper and zinc. This difference on the iron content they believe to be due to the methods used, as they have found that their method in the hands of other chemists gives check results. Their method is based on the fact that appreciable amounts of iron are retained in the ignited stannic oxide. The procedure is as follows:

One gram of the borings is dissolved and run down in nitric acid (1.42) and the metastannic acid filtered out as usual and ignited to stannic oxide in a clean weighed porcelain crucible. One gram of c.p. sodium carbonate and 0.25 gram of sublimed flowers of sulphur are added to the stannic oxide after weighing, the crucible covered and the mixture fused at a very low heat until the excess of sulphur is burned off. When cold the crucible and cover are immersed in 50 c.c. of distilled water in a No. 1 beaker and warmed to disintegrate the melt. The crucible and cover are then rinsed and removed. A blue or green solution indicates soluble iron which can be precipitated by the addition of a little ammonium chloride, leaving the solution a light yellow. The ferrous sulphide is filtered out, washed with hydrogen sulphide water, dissolved from the filter, and the iron determined volumetrically or gravimetrically. Correction for the iron as oxide in the stannic oxide should of course be made.

The lead and copper are removed from the original filtrate, the filtrate brought to a boil and the iron oxidized with a few drops of nitric acid and then precipitated with an excess of ammonia. The precipitated hydroxide is best settled out if the solution is kept at just the boiling point with not more than a bubble ascending now and then. Then hydroxide is filtered off, washed well and the iron determined by any of the usual methods. Blank determinations should be run on all the chemicals.

The authors have seldom found brasses with less than 0.1 per cent. iron and often as high as 0.5 per cent. and over. As a rule, approximately half of the iron content is retained in the stannic oxide.

Iron Ore Deposits of Eastern Texas

SPECIAL CORRESPONDENCE

The daily papers have published a number of accounts of proposed developments in the eastern Texas iron-ore region. The facts appear to be about as follows: The Bethlehem Steel Company has become interested in these ores with a view to shipping them coastwise through Port Bolivar or Texas City. The ore is limonite (brown ore), and carries from 54 to 57 per cent. iron, with phosphorus above the bessemer limit. About two years ago several thousand tons of this ore were shipped to Birmingham, Ala., on an all-rail rate of $2.20 per ton. The analyses of these shipments showed that the ore carried above 57 per cent. iron and from 0.12 to 0.15 per cent. phosphorus, with low sulphur. It is almost an ideal ore for basic iron, especially for malleable consumption.

There are but few of the deposits that require washing, most of the ore occurring in masses free from sand and clay. The expense attending the installation of washers and a large water supply for the same, as is required with the brown ore of Tennessee, Alabama and Georgia, will not be necessary in Texas, except at a few places. The ore occurs as a capping on the sand hills of nearly all of the eastern counties of Texas. It is probable that it can be mined and put on cars for $1 per ton and this cost should not at any place exceed $1.25 per ton. The rate to Gulf ports has not yet been established by the Texas railroad commission, but the facts in the case are now before this body and an early decision is expected.

While it is perhaps too early to venture an opinion, yet it is thought that some business will result from the present negotiations. Some metallurgists advocate an increased proportion of brown ore in furnaces making basic iron, whether for the steel furnace or for malleable purposes. There is a marked decrease in the consumption of coke per ton of iron and the grade of the iron is better and more uniform. There is enough ore of this kind in Texas to supply a large demand and it now looks as though the deposits would be developed.

Quartette Mining Company, Nevada

The annual report of the Quartette Mining Company, Searchlight, Nev., for the fiscal year ended Sept. 30, 1909, shows a production of 38,316 tons of milling ore of an average grade of $8.72 per ton. In addition to this, 38 tons of a gross value of $[illegible] per ton were shipped to a smelter. The [illegible] were given at $[illegible] per [illegible] and a total of 3,[illegible] ft. of development [illegible] were made during the year.

The ore was milled in a 20-stamp mill and the tailings cyanided. The stamp-milling charges are given at $1.01 per ton, and a saving of 70 per cent. was effected on the plates. In the cyanide plant, 35,740 tons of tailings averaging $4.78 per ton were treated with an extraction of 77 per cent., at a cost of $1.02 per ton.

Crucibles of Nickel Instead of Platinum

The use of a nickel crucible instead of a platinum one for the determination of carbon in steel is described by H. E. K. Ruppel in the *Journ. Ind. and Eng. Chem.*, I, pp. 184-187. The substitution of the cheaper nickel for the more expensive platinum-ware recommends itself especially to those laboratories where the number of carbon determinations performed is limited. Nickel, besides being inexpensive, has a high melting point and resists oxidation well. A conservative estimate of the life of these crucibles when the solution method is used, is from 30 to 50 determinations. The crucibles are made as simply as possible, with a separate water jacket not directly attached to the crucible, to allow for the shorter life.

The nickel crucible is 1⅞ inches deep, 1 9/16 in. in diameter at the mouth and is provided with a flange about 9/16 in. wide. A brass rim soldered with silver solder may be used if the crucible is not supplied with one. The area of the bottom is comparatively large so that all the carbon might be in contact with the bottom, even though the asbestos pad is large. Unburnt carbon is sometimes found in platinum crucibles in which the bottom area is small and the asbestos pad and wipings extend up the sides of the crucible. A deep crucible also aids in overcoming this difficulty.

The crucible rests upon an annular water jacket of machined bronze casting, 2¾ in. outside diameter, 1 9/16 in. inside diameter and ⅝ in. high with walls about ⅛ in. thick. Two brass tubes, ¼ in. outside diameter and ⅛ inside, are soldered into holes bored in opposite sides of the ring. Three brass stud bolts, 3/16 in. in diameter, project upward from ears spaced 120 deg. apart on the ring. The cover has corresponding ears with holes bored in them through which the stud bolts pass and by means of winged nuts the cover is clamped to the ring.

The cover is also of cast bronze, 2¾ in in diameter, ⅞ in high with walls about ⅛ in. thick. A brass tube ⅛ in. inside diameter is inserted and soldered into one side and a similar tube fastened into the top. The flow of cooling water is through the cooling ring and then through the side tube of the cover and out the top. The air enters the crucible through a tube which passes through the cover and extends 1¼ in. below and leaves through another tube which just passes through the cover. An ordinary rubber gasket is used to make the joint tight between the crucible and cover. The cost of the crucible is $1.10 and the cover and jacket about $7 exclusive of patterns.

The crucible is supported through a hole in a piece of asbestos board ¼ in. in thickness and is heated to a bright redness for ⅜ to ½ in. from the bottom by means of a small upright blast lamp. The time of heating is ½ hour for steel and ¾ hour for cast iron. A modified form of a Gooch crucible funnel is used in filtering in which the hight of the funnel above the stem is about 1 in. A copper wire with a close spiral at one end passes through the stem, loose asbestos is placed on it and then asbestos suspended in water. Suction is applied and the asbestos gently tamped into place with the flattened end of a glass stirring rod. This makes a pad of ¾ to 1 in. in diameter and about ¼ in. thick. The bottom of the crucible is protected by a false bottom of sheet platinum which fits snugly and extends about ¼ in. up the sides. The pad is placed in the crucible with the carbon down and the crucible loosely filled with ignited asbestos.

The combustion train consists of a small pre-heating furnace holding a 12-in. porcelain tube filled with copper oxide, followed by a Liebig bulb with potassium hydroxide and then a small guard tube. Following the crucible is another furnace with tube of copper oxide, a tube of beads moistened with water, a Marchand drying tube and the Geissler bulb and guard tube.

When the crucible is used for direct combustion, the bottom is filled to a depth of about 1/16 to ⅛ in. with ignited aluminum oxide, which is tamped down in the middle. Three grams of steel are carefully placed on the aluminum oxide so as not to touch the sides of the platinum. The crucible is then filled with loose asbestos and the steel burned for 30 min. in a current of oxygen, followed by a current of air for 30 min. to remove the oxygen. The steel samples used for direct combustion consisted of pieces about 1/16 in. square and 0.006 in. thick. The iron oxide is removed from the crucible by withdrawing the platinum shell. The platinum shell should occasionally be removed to prevent its adhering to the crucible.

A comparison of results using the double potassium copper chloride solution method with both nickel and platinum crucibles indicates that the nickel crucible can be safely substituted for platinum. Results by direct combustion and by the solution method with the nickel crucible were equally satisfactory

Instantaneous Outbursts of Gas in Shaft Sinking

There has been much discussion as to the nature of gases occluded in coal seams, and some question as to the pressure under which this gas has existed. Sudden outbursts of gas in American mines are not common, and as a consequence, the following description of an occurrence at a mine in the Gard coalfield in France is interesting:

At the Rochebelle mines, June 7, 1905, when more than half a mile of drifts had been opened, the first outburst of gas took place in a rise heading, blowing out 280 tons of material, and filling the mine with carbonic acid. This gas rose through the shafts and spread over the surface to some depth above the pit top. This outburst was followed by 50 others, in 10 of which the material displaced exceeded 500 tons.

The first seam having been found to dip steeply eastward, the sinking of the new pit was resumed during 1906, and on the twenty-fifth of October, after a round of 13 shots were fired in a sandstone bed at 235 m., a violent outburst of carbonic acid ensued, which rising to the surface made the ground about the fan outlet inaccessible for nearly an hour, while the coal dust projected invaded the engine house and other surface buildings and filled the pit to a hight of 26 m. above the bottom. In cleaning up, 560 tons of coal and 280 tons of shale and sandstone débris were removed.

The blower of gas was traced to a coal seam about 2 ft. below the bottom of the pit at the time the shots were fired. This was the first time that this gas has been encountered in pit sinking, but a few months later it was followed by a more violent outburst, unfortunately attended by loss of life. On July 5, 1907, at a depth of 322 m. the pit bottom was in a coal seam, and the shots fired in the afternoon broke out a depth of about 1 m., the pit being 5 m. in diameter, without any gas being observed. When, however, the next round was fired at 4 a.m. on the following day, the shot firer at the surface felt a sudden rush of air accompanied by a loud noise and called to the men about the surface to get away at once, while at the same moment a column of black dust and carbonic acid rose through the pit to about 120 ft. above the surface, covering the surrounding buildings and rendering the air irrespirable for about 200 yards in every direction. The rush of gas lasted for about 1½ hours through both pits and the fan outlet. At the pit bank the deposit of coal dust was nearly 10 ft. thick, and 25 yd. away it reached nearly 3½ ft. on the roof and floor of the engine house, the ground and trees over an area of 50 acres to 60 acres being thickly covered. Three men who neglected the fireman's warning were suffocated by the gas and were found buried under the coal dust, one in the open air and the others on the engine-house floor. Many cases of incipient suffocation were found among the inhabitants of the houses near the shaft top, and a considerable area remained inaccessible for about 2 hours, while poultry, birds and pigs were killed by the gas up to more than half a mile away. The efflux of carbonic acid continued for about 12 hours.

In cleaning up, 523 tons of coal in fine dust were collected at the surface and about 500 tons more were estimated to have been distributed by the wind over the surrounding country. The bottom of the pit was filled up to a hight of 49 m., and from the lower filling place at 208 m., it was projected into the workings to a distance of 140 m. from the pit eye. The coal so distributed through the workings amounted to 1774 tons, and it is estimated that the total quantity blown out exceeded 4000 tons. The seam from which the gas proceeded has since been found to be of the unusual thickness of 18 m., and nearly flat. It contains 6½ to 9½ per cent. of volatile constituents and in the sinking showed irregular alternations of hard and very fragile coal, apparently due to a fault passing through at that point. The discovery has been a surprise, as none of the coals of the district had hitherto been known to be more than 10 m. thick.

The Coalfields of Canada*

By Phillips Thompson

The great influx of population during recent years into the prairie provinces of Canada, large areas of which are entirely destitute of timber, renders the fuel question one of grave importance to the future of that region. It is natural, therefore, that considerable attention should be directed toward ascertaining how far the coal resources of the middle portion of Canada are capable of supplying the steadily increasing demands of a growing population. This report aims at presenting a concise statement of the area and probable contents of the coalfields of the provinces named, together with other information showing the condition and prospects of the coal-mining industry, with analyses showing the quality and value of the different coals, as compared with American and other fuels. The problem of forming an estimate of the coal content of the various areas is admittedly a difficult one, and the writer intimates that the maximum value deduced from data at present available has been given. The minimum can be arrived at only after years of prospecting. Considerably closer estimates can be made in the case of the small rich areas exposed in the mountains, than in the flat-lying measures where the exposures are at great distances apart, with few drill holes to prove the intervening portions. A low estimate of the general content is, therefore, to be placed on the areas outside of the mountains.

Coal Deposits of Alberta

The province of Alberta is liberally supplied with coal areas. The western border of the southern part consists of several ranges of mountains formed generally of rocks which were originally the floor on which the coal formations were laid down. The elevation of the coal formations subjected them to greater denudations than the harder rocks beneath, consequently little of this material is left, but in the wider valleys remnants are found which from their superior quality and amount of coal form valuable coalfields. The structure of the eastern British Columbia areas is intimately related to that of the Alberta mountain area. Exposures are to be found in the Elk river valley, that generally known as the Crows Nest area containing 230 square miles of coal lands, estimated to contain 22,000,000,000 tons of bituminous coal. North of this on the upper waters of Elk river an additional area of 140 square miles has an estimated content of 14,000,000,000 tons. These, like the coals of the adjoining areas in Alberta, belong to the Kootanie formation. In the latter province they are generally exposed in narrow lands in the mountains, the principal of these areas being the Coleman, 45 square miles, estimated to contain 2,000,000,000 tons; Blairmore-Frank, 50 square miles, estimated content, 1,500,000,000 tons; Livingstone, 60 square miles, estimated content, 1,500,000,000 tons; and Cascade 40 square miles, estimated content, 1,600,000,000 tons. These coals are mainly bituminous with some anthracite. The coals of the foothills belonging to the Edmonton formation are partly lignites, but grade up to bituminous.

These areas, though but narrow bands, have a length of about 400 miles, and may have an exposed area of possibly about 2000 square miles with a total content of 11,000,000,000 tons. Further east a large area produces lignites, that in places are almost lignitic coals. The estimate for that portion of the formation between Bow river and Edmonton gives 10,800 square miles with 6 ft. of coal below it at workable depth, or a possible content of 60,000,000,000 tons.

Coals of the Belly River and Laramie Formations

The coals belonging to the Belly river formation grade generally between lignite and bituminous and are found over an enormous area lying east and south of the Edmonton formation and extending into the province of Saskatchewan. Of this area, portions of which are known to be unproductive or to contain only small

*This article is an abstract of report on "Coalfields of Western Canada," by D. B. Dowling, of the Canadian Geological Survey.

seams of inferior coal, 5000 miles are assumed as being valuable, which with coal of an estimated thickness of 4 ft. would furnish 13,000,000,000 tons, 10,000,000,000 tons being in Alberta and the remainder in Saskatchewan.

The coals of the Laramie formation are lignites. The Souris area in Saskatchewan, now being worked, is estimated to contain 2,000,000,000 tons and the remaining portion lying to the west, consisting of 4000 square miles, has possibilities up to about 13,000,000,000 tons.

Manitoba's coal resources are limited to the Turtle mountain area in the southern portion of the province, belonging to the Laramie formation and embracing 48 square miles which represents a possible total of 160,000,000 tons.

The total estimate for the three provinces and eastern British Columbia approximates 22,506 square miles and 143,400,000,000 tons of coal classified as follows: Anthracite, 400,000,000 tons; anthracitic and semi-anthracite, 860,000,000 tons; bituminous and some semi-anthracite, 43,070,000,000 tons; coal and lignitic coal, 21,000,000,000 tons; lignite, 78,160,000,000 tons. The report adduces figures to show that the coal consumption is increasing at a much more rapid rate than the population, so that it is evident that unless new mines are opened, the present plants will in a few years be taxed to their full capacity. Much of the need for domestic fuel is now being supplied from the lignite belt, but industrial and transportation requirements will demand coal in largely augmented quantities for power production, resulting in a great increase of the per capita consumption with additional population.

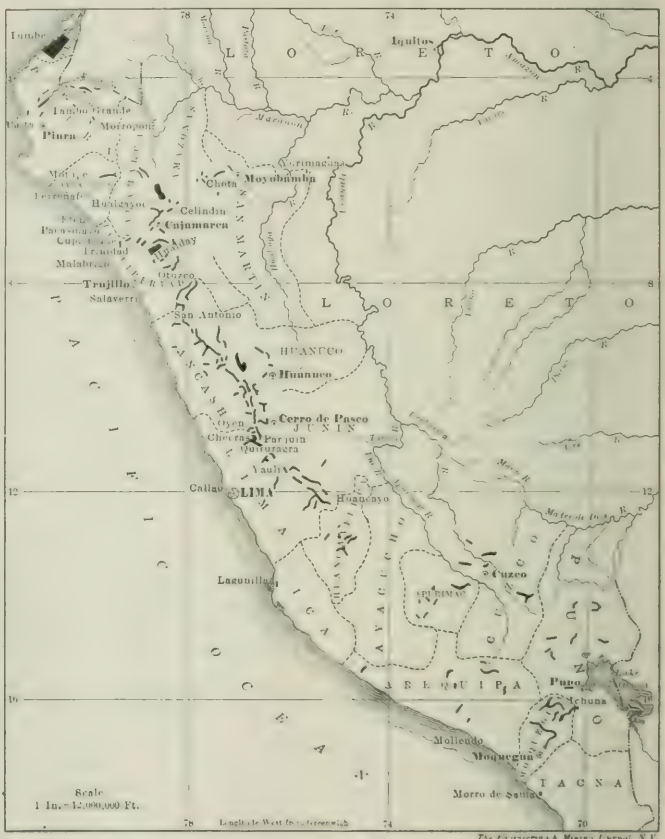
The Winter Meeting of the West Virginia Coal Mining Institute

The winter meeting of the West Virginia Coal Mining Institute was held at Huntington, W. Va., Dec. 7, 8 and 9, and was largely attended by coal-mining men from all parts of the State. A number of papers were read and discussed according to the program recently published, and a day was spent in visiting the mines of the United States Coal and Coke Company on the Green Valley road.

The following officers were elected: President, J. B. [illegible]; vice-president, [illegible]; Virgin, Frank [illegible]; [illegible] and treasurer, [illegible]; executive committee, [illegible]; J. W. [illegible] and P. A. [illegible]. The papers that were read at the meeting will be published in [illegible] part in a [illegible] of the [illegible].

Geographical Distribution of Coal in Peru

The map published herewith, supplementing the article on the coal deposits of Peru in the JOURNAL of Nov. 13, shows a wide distribution of the coal-bearing strata in this Andean region and suggests that the real extent of these coal deposits is not yet demonstrated. The map shows an interesting geological condition and justifies the claim of commercial importance which has been made for these Peruvian coal measures.



MAP SHOWING PRINCIPAL COALFIELDS OF PERU

The Lewistown Coalfield, Montana*

A survey of the coal lands around Lewistown, Fergus county, Mont., was made in 1907 by W. R. Calvert, geologist of the United States Geological Survey, whose report has just been issued as Survey Bulletin 390.

The Lewistown coalfield covers about 1500 square miles, the greater part of which lies in the Judith basin, a name applied to the principal drainage basin of Judith river. The boundaries fixed for the field are land lines, the western boundary adjoining directly the eastern limit of the Great Falls coalfield, which has already been made the subject of a report issued by the Survey.

Mr. Calvert describes the geography and geology of the field, the coal beds and their present commercial development, and the character of the coals, giving chemical analyses.

Prospects of Further Development

Under the heading "Future Development," after stating certain conditions that are unfavorable to an early development of the coal resources of the field, Mr. Calvert writes:

"In spite of the foregoing considerations, however, there is every probability that there will be a constant and increasing [illegible] demand for the coal of the Lewistown field. Judith basin has developed

*Report by the United States Geological Survey.

remarkably within the last few years and now contains a considerable agricultural population. Lewistown is a thriving business center, and other towns within the field are growing rapidly. Another factor which will add to the local demand for coal is the depletion of timber in the field. The Little Belt, Judith and Moccasin mountains are now almost bare, and the only remaining sources of timber are the Big Snowy mountains and the district in the vicinity of Rock creek.

"In regard to the possibility of future demands from outside the field for coal, there is a rather important factor which should be taken into consideration. The Great Falls and the Lewistown fields are the only large areas in the central part of the State which contain a bituminous coal. The coal in the eastern part of the State is a lignite, and that of the Bull mountain and other fields to the south is probably subbituminous. This latter class of coal, while it is a fair grade of fuel for stationary engines, is not so well adapted for locomotives, and in addition it does not stock well. On the contrary, the coal of the Lewistown field both stocks fairly well and is an excellent locomotive fuel. Because of these qualities it seems probable that if in the future an outlet is furnished for the coal it will be used to a greater degree by the railroads of the State in preference to fuel of a lower grade."

Lessons Taught by the Cherry Mine Disaster

SPECIAL CORRESPONDENCE

A number of changes in the Illinois mining statutes, shown to be necessary from the Cherry mine disaster, were suggested by George S. Rice, head of the mine accident division of the United States Geological Survey, in a lecture before the Western Society of Engineers, Chicago, Dec. 1.

Mr. Rice represented the Government in the rescue work at Cherry and was one of those who donned helmets and helped explore the St. Paul mine.

"What lessons are we to draw from this and other like disasters?" said Mr. Rice at the close of his lecture.

"First, the danger of having combustible material taken down wood-lined shafts and into timbered passageways.

"Second, the menace of having the approaches and the exits themselves of combustible material."

"Third, the danger of reversing a fan when those above do not know all the conditions underground at the moment of reversal. This may not have been a matter of consequence in the present instance, but the dangers are brought to notice.

"Fourth, the importance of having ample fire-fighting equipment and systematic drilling.

UNDERGROUND RESCUE CHAMBERS

"Fifth, that escape facilities suitable for a mine with 100 underground workers may not be suitable for 500 or 600 workers. The depth of the working should also be taken into account. Stairway exits which are required by the present Illinois law, while suitable for shallow seams, may not be so for deeper seams, except as an auxiliary means.

"Sixth, that fireproof underground rescue chambers, supplied with food, water, and means of communication to the surface, preferably with an open drill hole, would be of inestimable value. Such chambers are used in some of the German mines, equipped also with oxygen breathing apparatus.

"Safety provisions cost money. With the prevailing drastic competition in the mining industry, such expenditures would force many operators out of business. But the public, I believe, would be willing to pay for them.

"The maintenance of the widows and orphans should be as much a part of the cost of production of coal as the payment of wages and the means of living. A part of the cost should be compulsory accident insurance made compulsory by the laws of the State."

During the lecture Mr. Rice made a general and sharp criticism of coal mining and the laws pertaining thereto in the United States, comparing them with those of European countries. "The death records for the United States during the last 15 years for the mining industry are remarkable," he declared. "No other industry shows such an increasing death rate. The death rate in 1895 was 2.67 to every 1000 men engaged. In 1908 the death rate was about 3.50 per thousand. This is different abroad. The death rate for Belgium last year was 0.91 per thousand, and our figures show the United States to be where Belgium was eighty years ago."

A Primer on Explosives

The U. S. Geological Survey is about to issue a "Primer on Explosives" as an aid to the coal miner in particular and also to all who handle explosives. The misuse of black powder and other explosives is sometimes considered the least important of the causes of mine accidents; but its importance is much greater than the statistics indicate, for the reason that this misuse of explosives may itself be the cause of many of the mine fires, gas or dust explosions or falls of roof, and thus be responsible for a death roll often credited to other causes.

The use of explosives is increasing both in quantity and in the variety of purposes to which they are applied. There is no such thing as a safe or safety explosive when in the hands of a careless or ignorant person. This statement is true whether considered in connection with the transportation or use of these explosives in mining. The aim of this book has been to tell what explosives are and how they should be handled with a view toward greater safety, and to do this in language free from unnecessary technicalities. It has been prepared by Charles E. Munroe, explosives expert, and Clarence Hall, explosives engineer, of the technologic branch of the U. S. Geological Survey. It has been revised in the light of suggestions made by the mining engineers associated with the survey, by several mine managers, by the experts associated with the manufacture of explosives and by B. W. Dunn, chief of the Bureau for the Safe Transportation of Explosives.

Much of the information has been obtained from experiments conducted at the mine accidents station of the survey at Pittsburg, authorized by Congress, May, 1908, for investigations as to the "causes of mine explosions." These investigations have shown the recent development of a new type of quick-flame explosives designated as permissible explosives, which can be used with greater safety than black powder in mines, where gas or inflammable dust exists under conditions indicative of danger, for the reason that the flame from the explosion of black powder lasts from 1000 to 4000 times as long as the flame from those newer explosives and is, therefore, more likely to ignite the gas or dust in these mines.

Lists of permissible explosives were issued by the survey on May 15 and Oct. 1, 1909—the latter list containing the names of 31 explosives—and with these lists is to be found a statement of the conditions under which these explosives have been selected from a larger number presented for examination. There are also in course of publication and soon to be issued, bulletins dealing with other phases of the subject, such as methods and results of using permissible explosives in coal-mining operations, the results of tests of explosives and concerning the dust problem in coal mining.

It may never be possible under conditions such as exist today to prevent mine accidents. Little may be accomplished in that direction by either the operators or miners working alone, but experience in all countries shows that through the co-operation of the two these accidents may be greatly reduced. This will require wise laws and regulations based on fact and experience and the strictest possible discipline.

The special purpose of the primer is to prevent the improper use of explosives in mining, and thus lessen the number of accidents. This purpose is to be most certainly accomplished through the use of the safest and safest explosives, handling and firing these explosives in the safest manner by carefully selected and trained men and the strict and [illegible] only to those men.

Mining Coal in Spitzbergen

By Tony Cattot

Coal is found in Spitzbergen in the largest fjord of the western coast, called ice fjord. This fjord is located at over 78 deg. N. and includes several bays or smaller fjords such as Green harbor, Advent bay, Sassen bay, North fjord and Dickson bay. Coal is extracted at Green harbor and at Advent bay. At the former place it is used only for a whale-fishing station, where whales are mechanically cut up by special steam-driven appliances. The mine is therefore worked on a very small scale for the local need.

At Advent bay two mines were opened, one by the Spitzbergen Coal Trading Company, Ltd., and the other by the Arctic Coal Company, an American-Norwegian enterprise. The first is now closed and the so-called Advent City was transported on the other side of the bay where the mine of the Arctic Coal Company is now at full work.

Advent City is in a narrow valley and consists of some 12 dwellings built after the Norwegian fashion. Water is brought to the city through a 1-in. pipe which crosses the valley and branches by places to a number of casks for the convenience of the inhabitants, some of whom winter there. The climate is rude, reaching often as low as 35 deg. C. below the freezing point in winter. In August, at the time of my visit there, I noted 11 deg. C. of heat in sunshine.

Description of the Mine

[illegible]

The main gallery is 50 m. long and is lined with nicely crystallized ice, which by its white and bright appearance gives an uncommon impression in entering a coal seam.

A double narrow track 24 in. wide is laid in the main gallery and branches extend into the drifts where single track is used. Haulage is done by horses. Eighty workmen are at work there, using picks and hand drills. Additional machinery is to be installed when it is expected to produce from 500 to 600 tons of coal daily. The men are paid 6 kroners a day (about $1.48).

Shipping Coal

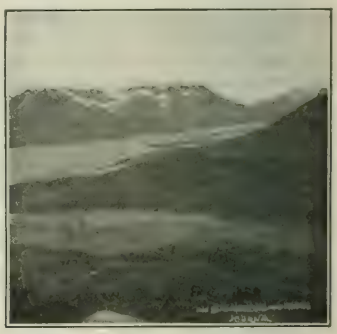
Near the mouth of the mine, cars are tipped into an inclined chute which feeds a bin about 12m. long, fitted with 10 doors. From here the coal is delivered into the cars of a Bleichert aërial cableway, which descends by gravity to the pier. A powerful brake prevents the cars reaching too great a velocity. The empty cars are elevated by the loaded ones. Coal is either stored or delivered at once to the cargo-boats. The store is on the ground in front of the pier whence it is reclaimed by hand and cars which run down an incline to the pier.

Some Spitzbergen coal was supplied last year to the Norwegian State Railway; 2000 tons were shipped to Trondhiem and 1000 to Narvick, which is the terminus in Norway of the most northerly railway in the world. This line connects the iron mine of Gelivara, Sweden, with the Glacial ocean. Forty men wintered in Advent City last year and mined 2000 tons of coal during that time.

In conclusion, I would mention that Spitzbergen, being crown ballast, is open to any prospector who desires to become a mine owner. He will not have to buy any ground or pay any tax. Everything is free. The only living things are the reindeers, birds and fish which [illegible]

COAL-SHIPPING STATION AT ADVENT BAY

SHOWING CHUTE TO THE BINS OF THE AERIAL ROPEWAY



ADVENT CITY LIES IN THE VALLEY BELOW

Mining by the Tunnel and Heading System

The large pyrites orebody at the Arminius mine at Mineral, Va., is mined by a modification of the underhand stoping method known as the tunnel and heading system. The orebody varies in width from 8 to 60 ft. and dips at an angle of about 60 deg. The walls are slate which holds well so that practically no timber is used in the stopes.

Levels are run at intervals varying from 50 to 100 ft. and the ore drifted on with tunnels carrying a 10-ft. face. From these drifts the procedure is to drive a raise inclined at about 45 deg. to the level above. Leaving a pillar of about 12 ft. below the upper level, a heading is driven below the drift of the upper level. From this heading the ore is then worked back and down the raise in benches varying from 4 to 6 ft. in hight. A pillar of about 12 ft. is also left above the lower level.

At convenient intervals, usually about 25 ft. auxiliary raises are put up from the main haulage way to connect with the stope above and aid in drawing out the ore. These raises are usually driven on the footwall, i.e., on the dip, but this is not necessarily the case. Pillars and legs of ore are left where necessary.

By this system only from ½ to ⅔ of the ore is recovered; the pillars are, however, to be drawn later and to this end a new shaft is being sunk in the footwall country about 50 ft. from the orebody. From this shaft drifting will be done and crosscuts run to tap the ore.

This method of mining is generally practised in the Louisa County pyrites mines. Its disadvantages are that all ore must be shoveled from the floor into the tram cars and a large percentage of the ore must be left to protect the levels and hold the stopes open. In the Arminius mine 250 lb. Ingersoll-Sergeant drills are used on tripods in all work, driving and stoping. A drill crew consists of a machine runner, [illegible] and a tipper.

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*Illustrated

The "Guggenheim" Coppers

It was announced, Dec. 17, that the Utah Copper Company would call a shareholders' meeting on Jan. 6 to authorize increase in capital stock from 750,000 to 2,500,000 shares, a portion of the increase to be used to acquire Boston Consolidated at ratio of 2½ : 1 and Nevada Consolidated at 2¼ : 1 (providing that a majority of Nevada stock is thus exchanged), and a portion to provide funds to increase the Utah milling capacity to 12,000 tons per day and the Boston milling capacity to 5000. This plan is bitterly resisted by important interests in Nevada Consolidated, and an inquiry as to why such a plan should be contemplated is in order.

It has been evident for a long time that there is something wrong in the Utah Copper Company. Without doubt it possesses a great and valuable mine, but as we have previously remarked it has failed to come up to the expectations, particularly as to cost of production. The erratic manner in which the cost as reported quarterly by the company itself has been fluctuating is indicative of something askew that the explanations of the officers do not satisfactorily account for. It is to be noted, moreover, that while the company has been making elaborate quarterly reports, with apparent frankness, it has avoided stating an essential part of the fundamental data, viz., the tonnage of ore milled.

Recently our Salt Lake contemporary, *Mines and Methods,* has specifically charged that the officers of the Utah Copper Company conduct their bookkeeping in such a way as to conceal the real cost of mining, particularly as to the accounting of stripping overburden; that in order to maintain production of copper at the promised rate they have had to overcrowd the mills; and that it is doubtful if the estimated great ore reserves can be actually extracted by the present method of mining at anything like the profit heretofore reckoned. There is a strong suspicion that there is a great deal of truth in the main part of the charges of *Mines and Methods.* If there be not the company can easily disprove them by publishing the data that should have been given in its reports to enable a careful and impartial analysis. The stockholders of the company should demand the publication of that data.

The Boston Consolidated awoke to the realization of disappointed hopes about a year ago and manfully recognized its mistakes, which involved a complete change in its method of mining. It was found that the ore that was thought to average 36 lb. copper per ton in reality had only 30 lb. and that the probable cost of production would be about 10½c. per lb. of copper, which is materially higher than was previously reckoned. However, the work of the mill came up to expectations, in so far as extraction is concerned, wherefore a yield of about 20 lb. per ton is realized.

The Utah Copper Company was absolutely confident that the bulk of its ore averaged 40 lb. copper per ton. We believe that it is actually extracting about 20 lb. It is well known that the mill has fallen below expectations in point of extraction. We imagine that the ore as mined is less good than was figured, just as in the case of Boston, and probably averages about 35 lb. per ton. The process of milling evidently has defects that it has not yet been possible to correct and to compensate for this and the inferiority in grade of the ore it has been necessary to rush through an increased quantity of ore. In order to produce at the rate of 60,000,000 lb. copper per annum, the company has apparently been compelled to mill nearly 3,000,000 tons of ore per annum, at which rate the estimated reserve of 65,000,000 tons of the better grade of ore will last but little more than 20 years. We doubt if it be safe to reckon more than 20 years' life, in spite of the marvelously superior estimates, and on that basis the value of the stock should be computed upon a 10-per cent. return. If we accept the estimate of 8.5c. as cost of production and 13.5 as a probable average realization, the average annual profit would be $3,000,000, or about $4 per share, which would indicate a value of $40 (? ?). The queries indicate grave doubt as to ability to produce at 8.5c. That figure may be attained by increasing the milling capacity, as now proposed, and raising the mill extraction to 70 per cent. This increase is the proper thing to do, but in undertaking to reckon what may be its economic result we are confronted always by doubt, inspired by the past record, as to the data offered for estimates

As to the proposed absorption of Boston Consolidated it is clearly evident

that Utah must take it in, else a large part of the ore in the steam-shovel section of its mine will be unavailable; also the acquisition of Boston is desirable to ameliorate dumping difficulties. With respect to Boston Consolidated the glamor was largely removed by Mr. Jennings' report. It may be reckoned as possessing 28,000,000 tons of ore yielding 20 lb. per ton at a cost of about 10.5c., and as at present equipped can produce approximately 20,000,000 lb. per annum at a profit of about $600,000, or 77.4c. per share, indicating an actual value of about $9 per share on 30 years of life. As in the case of Utah, the value of Boston will be increased by enlargement of capacity, the plan being to raise this to 5000 tons per day from the present 2750, and in view of the frankness that has always characterized the Boston management we feel that the data for reckoning the benefit of increased capacity are reasonably reliable. We are inclined to think that the relative value of Boston and Utah shares is probably somewhere between 4 : 1 and $2\frac{1}{2}$: 1 and that in agreeing upon the latter ratio the Utah is conceding something out of its necessities.

The combination of these two companies is quite logical, but when we come to the project of taking in Nevada Consolidated, the scheme becomes wide open to criticism and the feeling is inevitable that one more trick is being played upon that distinguished enterprise. Nevada Consolidated is the one of the porphyry mines, come to the productive stage, about which there have been no disappointments. In almost all particulars have the preliminary engineering estimates been equaled or bettered. Consequently it is an enterprise in which the profession takes a special pride. Of the three operating porphyry mines it has the best grade of ore, the easiest mining and milling, and a producing cost far below the others. In milling about 2,100,000 tons per annum and obtaining a yield of 30 lb. per ton at a cost that may be conservatively put at 7... per lb. [illegible] materially [illegible]

to dispute a claim of $25 as the probable intrinsic value in view of the possibilities that the company has in additional ore reserves, in its possession of the Steptoe smeltery, its chances for development of custom smelting business, and its great asset in the Nevada Northern railroad, which claims tribute from the whole Ely district and will shortly become a link in a transcontinental line. Obviously any such ratio as $2\frac{1}{4}$ Nevada shares for one of Utah is ridiculously unfair, as important interests in the Nevada company claim. They will doubtless contest this part of the combination project as they promise to do.

But why should Nevada Consolidated go into any such combination on any terms? It is an absolutely self-contained enterprise and has nothing to gain in economy of management or any other respect. If the union of Utah and Boston will result in increased economy, as doubtless it will, and appears to be an attractive investment, the Nevada stockholders can subscribe for the new stock along with the general public and without any fear that they are being flim-flammed in the exchange of their own valuable property. It looks as if under the present project Nevada is to be put in as a "sweetener." Why the Guggenheims should want to perpetrate this deal may remain a mystery for a while, but even if they can carry it through we advise minority stockholders to reflect if they will not best keep their present property and at the worst let Nevada Consolidated stand in the same position as Anaconda does in Amalgamated.

E. S. Mendels, agent for the New York Curb market, has inaugurated a new reform, effective Jan. 1, by announcing that he will refuse to accept incorporated brokerage houses as subscribers. Such concerns as continue to do business will be obliged to operate through some representative, who will be held personally responsible for all liabilities. This is in line with the practice of the New York Stock Exchange, wherein no corporations are allowed to do business. Mr. Mendels, [illegible] evil!

We do not take much stock in the talk of a general curtailment of copper production by common consent. Some concerns may have made up their minds to refrain from further increase until conditions become more propitious, but there are too many that cannot restrict without increasing their cost of production too much to make the plan agreeable. Where for example would the porphyry mines stand, which are fundamentally dependant upon a large tonnage? The present scheme to increase the capacity of the two mills at Garfield does not look much like any idea of restricting output in that quarter.

Some good old-fashioned mining companies used to set aside their profits until the principal was reimbursed before they began to pay dividends. Perhaps there are some that still do this. When a smeltery or any new construction is required they discontinue dividends until it is paid for. Under this system there is never any doubt that what may appear as profit on paper may not be real profit. Of course this would not suit the requirements of modern financiers. However, these old-fashioned companies were working their mines as mines and had no eye to the stock market.

We are inclined to think that the much discussed copper consolidation—meaning the combination of Cole & Ryan, Amalgamated, and Guggenheim interests—will fail of consummation, although the project has not yet been abandoned. It might have been effected if it had been sprung when contemplated but the Standard Oil decision checked that. The psychologic moment has been missed, and the deferred plans are likely to sink under the weight of criticism and ridicule, the temper of the public being unfavorable to combinations that aim to boost prices.

Congress is once more wrestling with the bureau of mines bill. A strong attempt is to be made to consummate this at the present session, but there appears to be strong opposition. We think we are correct in saying that the mining engineers of the country do not see the [illegible] of such a bureau and consequently are rather opposed to having it.

The annual statistical [illegible] of the [illegible] covering the [illegible] will be [illegible] Jan. 8, [illegible]

Discussion

Coal-mine Safeguards

Apropos of the recent disaster at the St. Paul mine, Cherry, Ill., it has frequently occurred to me that someone is very lax in providing safeguards to protect the lives of the miners in the various districts. These provisions should reduce the fatalities to the minimum, if not wholly prevent the loss of life.

It has been the record of every disaster of this character that a large number of miners have been entombed and, while they were not killed outright from the force of the explosion or fire, they died of starvation or from the deadly black-damp. Had these survivors been furnished with a pure-air supply, food and water, there is no question but what hundreds of lives might have been saved in the last few years.

At the Harwick mine explosion in Pennsylvania, a large number of miners literally starved to death, and the same was true at Monongah, W. Va., where between 350 and 450 miners lost their lives—and now the Cherry disaster, to say nothing of the dozens of instances where anywhere from one to twelve men have been killed! In view of the inexpensive method which might be employed in safeguarding the various mines it would seem that our law makers should pass such measures as would compel the mine operators to adopt such a precaution.

I noted an article in one of the mining papers recently where the editor advances the theory of installing telephones in mines so that the emtombed miners might get into communication with the outside world and be able to give them their exact condition, the condition of the mine, etc. This would be some safeguard and guide for the rescuers, providing the telephones were installed in such shape as to prevent the explosion from destroying the wires, but the ideal plan would be to sink bore holes from the surface at stated intervals, running along the main entries and tapping the main stations in the mine. These bore holes should be cased with iron pipe from top to bottom, and be of sufficient size so that in case of accident they could be used for supplying various sections of the mine with pure-air supply, food, water and communication with the entombed miners.

It would hardly be possible for an explosion to destroy a bore hole as these explosions do not usually occur in the main entries of the mines. They are usually in some part of the mine that has been abandoned and with no outlet for the gas which accumulates. This is largely responsible for the explosions that take place. If bore holes were sunk into the old workings they would provide an outlet for the dangerous gases and black damp.

Had this provision been installed in the Cherry mine as well as the others, and fresh air furnished to the miners, a large number of lives could have been saved. These disasters fall on a class of people who are dependent on their daily labor for the livelihood of their families, and the loss of the bread winner under these circumstances produces deplorable conditions which cannot be imagined by the class of people who are in better circumstances financially.

I believe that the men who will advocate and push to a conclusion a measure of this kind will have done something that will cause their names to be remembered for all time. The idea is not original with me, as I have seen this plan used in ventilating mines. In mines where they could not get a pure-air supply to the face of the entries which they are driving by the ordinary means of a fan, they drilled holes ahead of the entry and when these holes were tapped they caused a great current of air to flow through the entries which carried out the smoke, gas, etc., back and up through the hoisting shafts.

W. T. Kershner.

Washington C. H., Ohio, Dec. 2, 1909.

[The Journal has repeatedly emphasized the usefulness and desirability of holes from the surface as recommended by our correspondent.—Editor.]

Questions and Answers

Value of Pumice

Please inform me as to the commercial value of punice. D. P. L.

The current New York quotations on pumice are given in the table published monthly in the Journal. Quotations as given in the Dec. 4 issue are: American powdered, 100 lb., $1.60@2; Italian powdered, 1⅜@1¾c per lb.; lump 5@30c. per lb. T. Van Amringe, 241 Water street, New York City, is a dealer in this material.

Talc

Is there a market in America for finely powdered steatite of the best quality, such as is valued in England at £5 per ton? What firms buy this material?

B. & Co.

There is a market in the United States for limited quantities of high-grade ground talc or steatite, of which about 10,000 tons are annually imported, mainly from France and Italy. Considerable crude talc is now imported and ground in the United States; the crude talc is admitted free of duty, the ground product being subject to an import tariff of 20 per cent. ad valorem. Of ordinary grades there is an abundant domestic supply and only ground talc of superior quality can be imported. The market for talc is exceedingly varied, depending upon the physical qualities demanded by the various trades; see The Mineral Industry, Vol. XVII. The leading jobbers are Hammill & Gillespie, 240 Front street, New York, and L. A. Salomon & Bro., 216 Pearl street, New York. Colgate & Co., 55 John street, New York, and the Gerhard Mennen Chemical Company, 42 Orange street, Newark, N. J., are large users of ground talc in toilet powders.

New Publications

Summary of the Surface Geology of Michigan. By Alfred C. Lane. Published by the Board of Geological Survey as a part of the Report for 1907.

Tables and Diagrams of the Thermal Properties of Saturated and Superheated Steam. By Lionel S. Marks and Harvey N. Davis. Longmans, Green & Co.

Die Brennofen fuer Tonwaren, Kalk, Magnesit, Zement und Dergl. mit Besonderer Berucksichtigung der Gasbrennofen. By Ernst Schmatolla. Dr. Max Janecke.

Report on the Examination of Some Iron Ore Deposits in the Districts of Thunder Bay and Rainy River, Province of Ontario. By F. Hille. Government Printing Bureau.

The Rise and Progress of the British Explosives Industry. Published under the auspices of the Seventh International Congress of Applied Chemistry by its Explosive Section. $5.25. Whittaker & Co.

The Mining and Quarry Industry of New York State: Report of Operations and Production During 1908. New York State Museum, Bull. No. 132. By D. H. Newland. University of the State of New York.

A Geological Reconnaissance in Northern Idaho and Northwestern Montana, by F. C. Calkins; with Notes on the Economic Geology, by D. F. Donald. U. S. Geological Survey. Bulletin No. 384. Government Printing Office.

The report of the Select Standing Committee of the Canadian House of Commons on mines and minerals has been issued. The proceedings were principally concerned with the granting of mineral rights, the evidence of a number of delegates of the Canadian Mining Institute being taken. The following recommendations were made by the committee: (1) That there should be assigned to the Department of Mines the administration of mines, including the issue of title thereto, and of all mining laws. (2) [illegible] mines [illegible] granted [illegible]

Rapid Method for Determining Copper in Slags

By F. D. Aller*

Many methods for the determination of small amounts of copper in slags have been published. Practically all of these provide for the dehydration and separation of the silica by filtration. If, however, the chilled sample is dissolved in rather dilute acid, preferably sulphuric, and maintained at the boiling point in a high state of dilution, the silicates remain soluble while the dissolved copper may be precipitated by any of the common methods, preferably on aluminum, and the precipitated copper, together with the undissolved copper, may be separated by decantation and determined by the iodide, cyanide or electrolytic method. I introduced the following rapid method in the Establecimiento de Playa Blanca, Antofagasta, Chile, in 1900, and it has since been used at various copper smelteries in Chile.

Place 5 grams of the thoroughly chilled and finely powdered sample in a large beaker of at least 600 c.c. capacity and cover with 200 to 400 c.c. of water; bring to boiling and treat while stirring with 10 to 15 c.c. of sulphuric acid previously diluted in cold water. The entire slag goes into immediate solution with the exception of matte, lead sulphate and carbon; the latter forms a slight scum on the surface of the solution, but in no manner interferes with the accuracy of the determination. Five or six large strips of sheet aluminum are now placed in the solution, which is then diluted up to a bulk of about 500 c.c. and gently boiled for about twenty minutes, when all copper should be precipitated. The solution and precipitate are now poured into another beaker, leaving behind the aluminum which is washed with a jet of water in order to free it from adhering particles of copper. The washings are added to the solution, and it is allowed to settle for about five minutes and then decanted; about 200 c.c. of hot water are added to the precipitate, which is again allowed to settle and the clear solution decanted.

The precipitated copper (with undecomposed matte and any shot copper) is now dissolved in a little nitric acid and the copper determined by titration with a solution of potassium in the usual manner, or, if the nitric acid is neutralized with ammonia, an excess of sulphuric acid added and the copper deposited on a platinum cylinder by electricity. A proper determination should require not more than thirty-five minutes and fifteen to twenty minutes to boil the slag and solution. If the filtration of the solution and precipitate is difficult, a strength of [illegible] per cent. of copper [illegible] to [illegible] per cent., which is delicate enough for practical purposes.

For the rapid determination of lead, the slag is dissolved as before, diluted to a large volume with hot water, allowed to settle ten minutes, decanted once, the settled lead sulphate (carrying also a little calcium sulphate) is dissolved in nitric and sulphuric acid, boiled to copious white fumes, diluted with cold water, boiled and filtered (practically all of the calcium is left in the filtrate, thereby not scoring as lead in the final titration). The filter containing all the lead as sulphate is now dissolved in ammonium acetate and titrated with solution of ammonium molybdate.

System Gone Mad

By David Wallace.

This is an age of short-cuts, abbreviated formulas, concentrated thought and systemized accounts, so much so that life for a modern man of business is becoming one long nightmare of impending doom. Is the "game worth the candle?" Mining companies have not escaped the prevailing craze, for elaborate forms, index cards and tabulated charts appear now to be the rule; indeed, one may well exclaim, "It is system gone mad!"

With many companies and small properties it is simply waste of time, energy and money to install a so-called system of accounts, for, if the mining engineer in charge complies with an auditor's requirements and stays in the office to work up a beautiful set of typewritten monthly statements, it will be at the expense of his more important duties of looking for ore and extracting same. On the other hand, if one of these cleverly devised, automatic-check inhumanizing schemes is turned over to a soulless office staff, the whole business may become a complete failure—killed by red tape.

I have in mind a high-sounding, steel-engraved letter press British Mining Company, Limited, working some properties in Spanish America, with mines, mill, lixiviation and cyanide plant. The general manager, a thorough gentleman and competent engineer, was a stickler for detailed statements (though it was not this company which insisted on the staff dining in evening dress). Printed forms were supplied to foremen, surveyors, contractors, hostlers, mechanics, millmen, [illegible], stoke-holders, etc., from which the clerical force in the office filled out another complicated set of cost sheets, and it seemed to an outsider, that the sole object of the employees, from shift bosses to general manager, was to make out and file reports.

For several months the major portion of the manager's monthly statements of operations to the board of directors was taken up with explanatory remarks for not showing a profit. Eventually the resignation of the general manager was called for and his place taken by a rough-and-ready, though none the less practical, superintendent, whose first procedure was to abolish nearly all the red-tape mining and metallurgical forms, telling the men to attend strictly to their proper work and not take up the company's time with pen and pencil.

The new man promised to obtain profits if allowed a free hand and this, too, while making improvements. His first monthly report was laconic:

Value of ore produced and treated	$.....
Total expenditure	$.....
Net profit	$.....

Further comment is needless.

Minerals Separation, Limited

Special Correspondence

The report of the directors of the Minerals Separation, Ltd., of London, for the period ending Dec. 31, 1908, states that a considerable revenue has been earned in royalties from the plants erected at Broken Hill, N. S. W., and that remunerative results are also being obtained from the plant erected by the company on joint account with others for the treatment of purchased tailings.

The Sulphide Corporation, Ltd., of Broken Hill, treated 251,123 tons under license, of which 162,292 tons were crude-ore tailings direct from the company's wet mill, and 81,831 tons were old dump tailings. The Minerals Separation company's own plant treated 167,371 tons of tailings at a cost of 7.92s. per ton, all expenditure being charged to working account and none to capital account.

During the first nine months of the present year 140,505 tons of tailings were treated on joint account by this process, producing 53,208 tons of concentrates averaging 13.6 oz. silver, 8.8 per cent. lead and 46.4 per cent. zinc, at a cost of 7.383s. per ton. During the same period the Sulphide Corporation treated 143,698 tons of tailings.

In addition to the litigation of the Minerals Separation with the British Ore Concentration Syndicate and A. Stanley Elmore, the decision regarding which was noted in the Journal of Dec. 4, 1909, a third action in which the company was engaged, namely, that brought against the Ore Concentration company (1905), was dropped "for reasons of policy irrespective of any legal consideration involved in the action."

As regards the degree of concentration obtained, it was announced at the general meeting that for the five months ended Sept. 30, 1909, the zinc percentage in the concentrates had gone up to 47 per cent. The lead is not taken from the concentrate at present. In this respect the company appears to be behind some of the other processes at work on Broken Hill silver-lead mine[illegible]

Details of Practical Mining

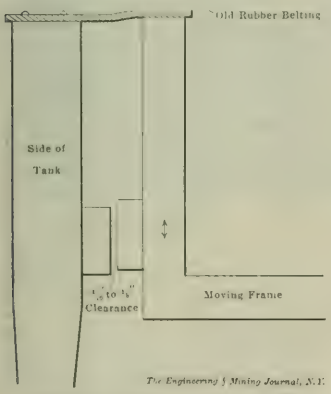
Notes of Interest to Prospectors and Operators of Small as Well as Large Mines. Things That Have to Be Done in Everyday Mining

REPORTS FROM EXPERIENCE

Readers of the JOURNAL are invited to contribute to this department. Articles should be brief, thoroughly practical, and preferably illustrated by drawings or sketches. Our draftsmen will prepare properly any kind of a pencil sketch that is intelligible. Something that is an old story in one district may be quite unknown in another. Articles accepted and published are suitably paid for.

Saving Wear on Hancock Jigs

A great deal of unnecessary wear is caused and trouble experienced by having feed fall into the space between the moving frame and the tank of Hancock jigs. This is easily prevented by attaching old



BELTING ATTACHED TO KEEP OUT FEED

pieces of rubber belting to the top of the tank, as shown in the accompanying sketch. The rubber being pliable causes practically no resistance to the movement of the frame and at the same time the space between the moving frame and tank is closed to any feed material which may splash over.

Abandoned Shafts and Open Cuts

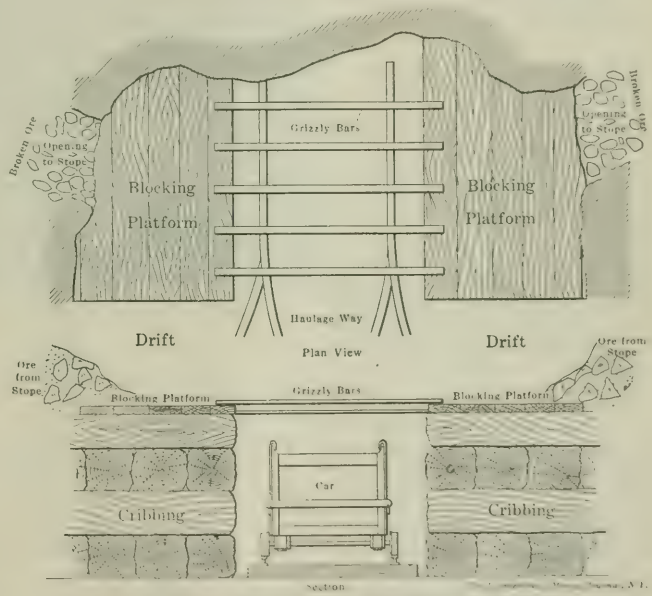
Abandoned shafts and open cuts should be securely covered or fenced to prevent accidents due to persons falling into them. This, however, is not such a simple matter as one would at first suppose. In many cases this has been done, and when the mine inspector makes his rounds, all is in good shape. Perhaps on his next trip these same openings will be unprotected, due to the fact that someone simply steals the material with which the shaft has been covered or the open pit is fenced.

Only recently in South Africa an old shaft was covered with timbers too heavy to move, and they were actually chopped in pieces in order that they might be carried away. In another case a wire netting had been placed around an open pit and some one had deliberately taken the wire down and carried it away.

In practically every mining camp one comes across abandoned shafts that are not covered in any manner. Too much care cannot be taken to make these places safe. In the vicinity of Nome, Alaska, there are dozens of open shafts on the tundra, with nothing to mark their situation save the small pile of dirt that has been taken out. During the winter the snow will drift over these, completely covering them, thus making an excellent trap for the cross-country traveler. Many times it is a case of negligence whereby they are left open, but too often it is due to careless and irresponsible persons who do not realize the seriousness of this class of stealing.

Underground Grizzlies

Much trouble has been experienced in the mines in the Ducktown basin of Tennessee from the ore in the stopes breaking into such large pieces that it could not be handled or would not run in chutes without blocking. In the large underhand stopes, when the ore is milled down to the haulage level in benches from 5 to 7 ft. high, this difficulty, although annoying, is not serious, as the miners with blocking drills can easily drill the large lumps and shoot them into



ARRANGEMENT AND CONSTRUCTION OF UNDERGROUND GRIZZLY

such pieces as can be handily loaded into the tram cars. However, in using a system of mining in which the ore is drawn from the stopes in chutes this difficulty at times becomes so serious as to preclude the possibility of drawing the ore from the stopes through chutes. At the Tennessee company's mines several types of chute have been tried in connection with their shrinkage or back stopes, but none have given any satisfaction, all being liable to choking from the large masses of ore which they have to deliver.

Recently, however, J. V. Bohn, super-

intendent of mines, for the Tennessee Copper Company, has introduced a type of underground grizzly in the Burra Burra mine, which has proven so successful that in the future it will be used in connection with all the shrinkage stopes where large pieces of ore have to be dealt with, i.e., on the hanging-wall side of the orebodies where the larger lumps tend to gravitate. These grizzlies, as shown in the accompanying drawing, are very simple and require practically no repairs for maintenance. An opening is made into the side of the haulage way or drift and a platform cribbed up with 10x 10 timbers on either side, leaving a space into which a car may be run from the drift. Across the top of the opening left for the car, old track iron is laid at 15-in. spacing, the iron being seated in the timbers on either side. At either side of the platform openings are made to the stope above, these being made large enough so that ore of any size liable to be encountered will be readily delivered upon the platform.

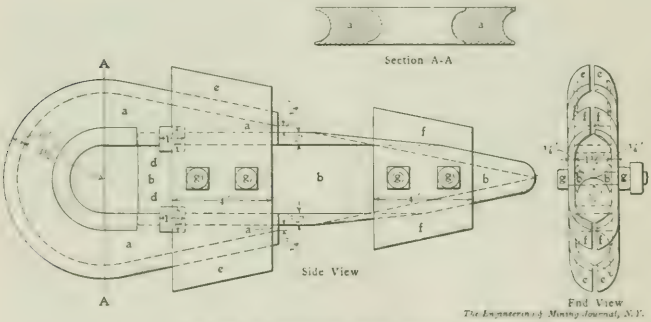
Both arrangements aim to permit delivery of any material broken without blocking in the stopes. The grizzly, however, possesses several marked advantages over the "chinaman." In the first place being at one side of the haulage way, it does not form an obstruction or cut down the head room as does the Australian arrangement. It is also easier to open up the additional space to one side of the drift required for the grizzly than to provide the space above the drift for the "chinaman." Grizzly bars could be provided at either end of the platform to the "chinaman," but "popping" boulders on a light platform over a drift is much more dangerous and liable to cause an obstruction to tramming than doing this upon a cribbed platform at one side of the haulage way.

Thimble for Hoisting Cable

In hoisting the 10-ton skips used in the slopes of the Tennessee Coal, Iron and Railroad Company on Red mountain, Alabama, much difficulty was experienced in fixing the wire rope to the bales of the skips so that they would not pull out. The pull exerted by the hoisting engines is so great that ordinary clamps will not hold at all. This trouble has been overcome by using thimbles of the type shown in the accompanying drawing.

The eye piece *a*, through which the bale of the skip passes, is keyed to the main shank *b* of the thimble by two square lugs *d*. The clamps *e* which are drawn down on the cable by the bolts *g*, hold the keys in place. The clamps *f* are similar to the former ones and are bolted in the same fashion.

The thimble is fitted to the skip bale by removing the larger clamps, thus releasing the eye piece which is closed about the bale, the key then has passing thereunderneath. The bottom side passes along a groove in the eye piece and then back under the opposite side of the eye piece.



DETAILS OF HOISTING-CABLE THIMBLE

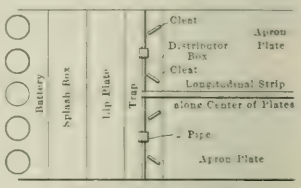
To fill the car the trammer simply runs it under the grizzly and with a pick draws ore from the mouth of the chute over to the grizzly bars, the fines, or materials of such size as can be handled by the crusher, passing through the bars, while large lumps are retained on the platform. These can be readily blocked while still on the platform, with no danger of destroying the grizzly, there being no gates or movable parts to the device.

The underground grizzly serves the same purpose as the "chinaman" used in Australia and fully described in the December 4, 1909, issue of this journal. This [illegible] a platform erected [illegible] the drift [illegible] the hanging-wall side [illegible] and from wall to wall. The platform is constructed with [illegible] of the [illegible] can be [illegible] the platform.

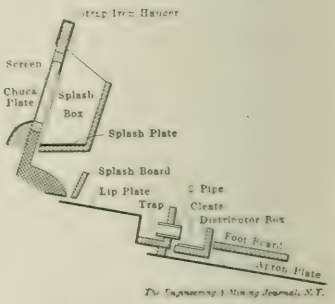
b and *a* are grooved to receive the rope as shown in the sectional views. Finally the clamps are drawn down upon the cable by the bolts upon which lock nuts are used. Usually several ordinary clamps are used to hold the loose end of the rope to the taut end.

Arrangement of Traps and Plates for Stamp Mill

Though all the traps and plates shown in the accompanying illustrations are in use in the stamp mills of this country, yet the combination, as shown, is of interest



Diagrammatic Arrangement of Plates and Boxes



SECTION, LAURENTIAN MILL

as one which gives excellent results. The series of plates, back, chuck block, splash, lip and aprons, together with the drops and the trap above the aprons, almost precludes the possibility of escape of any particles of analgam or amalgamable gold. Another trap is, of course, placed at the bottom of the aprons in the usual manner.

Referring to the drawings, the pulp passes through the screen into the splash box which is suspended in front of the screen by a pair of strap-iron hangers. The pulp flows off the splash plate over the edge nearest the mortar, falls upon the iron of the mortar box and from there upon the lip plate. The splash board shown is to catch any flying particles. From the lip plate the pulp drops into a box or trap extending the full width of the apron, and from this trap it is delivered through two 2-in. pipes to the centers of two distributor boxes. These boxes are connected front of the aprons by strips running on the edges of the table and by the feeder strip at the center of the apron plate. The plates are nailed in as usual.

sary to secure an even distribution of the flow. The pulp leaves the distributor boxes over the edge nearest the battery, falling upon the apron. The pulp thus impinges upon a plate three times after passing the screen, and, in addition, most of the coarser pieces of loose amalgam are held at the upper trap. On an ordinary grade of ore with this arrangement, there will be but little amalgam on the lower apron plates.

The double arrangement of apron plates is well shown on the accompanying halftone. With this cleat or strip extending longitudinally down the aprons, together with the trap and double distributor boxes, the whole flow of pulp may at will be deflected to one or the other side of the plates by merely putting a wooden plug into one of the 2-in. pipes leading from the trap. In this manner the necessity of hanging up the stamps while dressing the plates is avoided.

The arrangement is particularly applicable to the running of low-grade ores, when the inside plates should be entirely dispensed with, and the hight of discharge regulated to give the maximum capacity without regard to any scouring action that might be set up in the battery.

LAURENTIAN MILL, SHOWING TRAPS AND DIVIDED APRON PLATES

Cool Air for Compressors

The necessity of having air brought to the compressor in a cool, dry, pure state, through passages somewhat larger than the piston area, constructed of wood or cement rather than of metal, is not sufficiently appreciated by engineers. As an illustration of the effect of the disregard of this rule, P. A. Babb, in a paper read before the Instituto Mexicano de Minas y Metalurgia, describes the case of a well known Mexican mine at which the heads of departments were earnestly working to reduce the operating cost. In this mine, however, an electrically driven air compressor was erected near the collar of the interior shaft at a considerable distance from the mouth of the tunnel.

The air entering the compressor was, of course, that of the room at the collar of the shaft, heated and vitiated by contact with the workings in heavy sulphide ores below. At about 10 m. from the compressor are well ventilated, dry and cool old workings, having a temperature of about 30 deg. below that of the compressor room. A drive of about 5 m. would have made a connection and the cool air so brought to the intake valve of the compressor would have produced an increase of 5 per cent. in efficiency. The monthly operating costs of this compressor were: Power, $1875; direct labor, $195; oil, repairs, etc., $47; total, $2117. An increase of 5 per cent. in efficiency would mean a reduction of $105 on this amount.

Explosives and Blasting—Some "Dont's"

Robert N. Bell, formerly State Mine Inspector of Idaho, in one of his annual reports suggested the following "Dont's," which, although not new, are worth repeating and bearing in mind. "Some of them will appear superfluous to the lay reader, or to the careful and experienced miner," says Mr. Bell, "but from personal experience I know them to be justified."

Don't start to drill in a new face until you have thoroughly satisfied yourself that there are no missed holes or unexploded pieces of powder left in the old butts of cut-off holes. If such are found, reprime and shoot them before starting in to drill, as a slip may connect with the charge that will transmit a sympathetic concussion from the drill, especially if a machine is being employed that may explode a charge while drilling.

Don't depend entirely upon reports. It often happens that the upper part of a charge will explode and the lower part remain alive and unexploded without going off.

Don't be in too big a hurry to go back to a burnt hole or "stinker," or to reprime a missed hole, for it is safer to reprime within an hour, say, than to work over a hole that has missed fire for a half shift, as missed holes will remain apparently dead for several hours without any sign of life, and then, unexpectedly, go off. Several cases of this kind have occurred recently in Idaho with disastrous results.

Don't use any kind of metal tamping bar or tap a wooden one with a hammer when loading.

Don't carry a lighted candle together with powder or a capped fuse in the same hand.

Don't keep caps and fuse in the same place with powder.

Don't store powder in the same room with oils or other inflammable materials.

Don't thaw or keep powder in a blacksmith shop or a dwelling.

Don't jab too hard with a wooden tamping bar, in case a piece of powder fitchers or sticks half way in a hole, when loading, and you cannot push it home gently. Never mind your reputation as a loader. Let the hole spoil. If it should result in your losing your job you will have yourself left, anyway.

Don't carry powder about your person to soften it, or attempt to thaw it in the flame of a candle, or crimp a cap with your teeth, or "break" a stick in two. Cut it, no matter how dull your knife is, and if you hav'n't a knife, go and get one.

Don't jab a pick into a muck pile in the manner of striking a drill with a double hand hammer. You are likely to hit a stray piece of powder that will explode and blow your eyes out. Three such accidents happened in Idaho in 1905. Use your pick to work the stuff down with more of a raking motion. It is safer, and just as effective.

Don't take a naked light into any warm storage place for powder or sub-magazine, or hang a candle over an open box of powder or scatter particles of powder in making a hole for a primer where they are likely to strike a candle flame.

Don't carry loose powder in your arm. Use a small canvas sack which you can swing over your shoulder with a rope loop.

Old powder is dangerous to handle in many ways and hard to explode. Demand fresh powder and strong caps. By practising the above rules and using ordinary care, you will experience little trouble in handling powder.

The Van Mater Sampler

The sampling machine shown in the accompanying drawing was designed by J. A. Van Mater, head of the mining department of the New Jersey Zinc Company. The sampler as first installed at the hard-rock mill of the Bertha Mineral Company, at Austinville, Va., was intended for use in a space where none of the standard grades of samplers could operate satisfactorily. The ore from the crusher house enters the mill on an 18-in. conveyer belt, which dumps its ore into a hopper for a Richardson automatic scale. Between the conveyer belt and hopper there was only 17 in. clearance. This sampler worked easily in the available space and gave such satisfactory results that several have since been installed by the company, and the designer has applied for a patent on the machine.

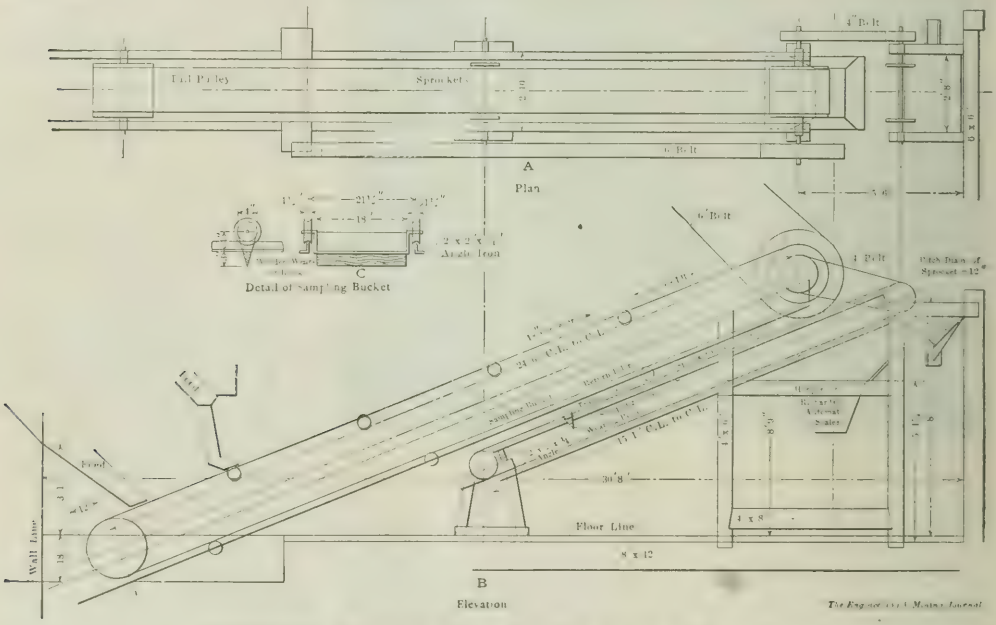
Construction of the Sampler

The idea of the sampler is extremely simple. A second conveyer is arranged to run below and extend beyond the end of a belt conveyer so as to cut the stream of falling ore from the upper belt. On the original apparatus the sampling conveyer was constructed of two parallel No. 25 link 1 in. pitch belts carrying a single bucket. On later samplers No. 45 link belt with about [illegible] in. pitch was substituted. The sprockets in each case were [illegible]. The buckets of sampling troughs [illegible] desired [illegible] ber may be used, must be as wide as the stream of ore delivered from the belt, and also must be deep enough to contain all the ore intercepted, as will be explained. The details of the sampling troughs are shown on the accompanying drawing in plan and section at *C*. The length and number of the buckets is determined by the size of sample desired and by the number of cuts to be made per minute. The bucket is fixed at either side to the chains of the sampling conveyer, and is provided with trolley wheels which runs upon 2x2x¼-in. angle irons used as tracks or guides. These tracks serve to take the impact when the bucket fills. As shown, a wooden bearing block is provided on the bottom of the bucket; this is pointed so as to offer a minimum resistance to the falling stream of ore through which the bucket must pass on its back journey, and protects the bucket from wear.

Theory of the Sampler

As stated, the length and depth of the sample bucket, as well as the number used, depends upon the size of sample desired. Contrary to what might be expected, the percentage cut by the sampler is absolutely independent of the relative speed of the conveyer belt and sampler, or the number of cuts made by the sampler. The only effect of making a greater number of cuts is to give a better average sample, within certain practical limitations. To understand this, assume the sampler a solid belt. Then irrespective of the speed of either conveyer, the entire discharge from the upper belt will be caught upon the lower one, and delivered as a sample. If, however, in place of a solid belt for the sampling conveyer, one is substituted in which half of the total length of the sampler is made up of buckets and half left open, then it is evident that one-half of the discharge from the upper belt will be cut as a sample. Similarly, if any desired proportion of the total length of the sampling conveyer is made up of a bucket, or any number of buckets, that proportion of the total stream delivered by the upper belt will be delivered as a sample. Hence the total length of the bucket or buckets with respect to the length of the sampling conveyer alone determines the proportion of the discharge from the upper belt taken as a sample. The respective speeds of the two belts, the number of cuts made by the sampler, or the number of buckets into which that portion of the sampling conveyer which is to catch the stream from the upper belt is divided, only affect the quality of the sample. The object of making several cuts a minute is to get a more average sample, and this can be accomplished by using several buckets or by running the belt at a greater speed. The buckets, of course, must be the full width of the stream delivered from the upper belt and also must be large enough so that all of the ore, falling into them, will be retained.

In the design shown, the sampling conveyer is about 33 ft. long, and the bucket



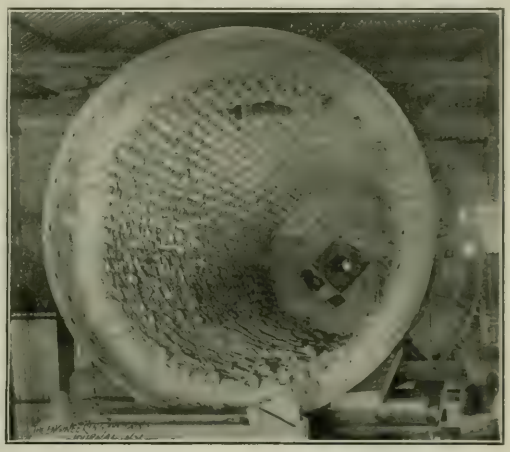
CONSTRUCTIONAL DETAILS AND METHOD OF SETTING UP VAN MATER SAMPLER

4 in. long, a proportion of 100 to 1; therefore, a 1 per cent. sample is delivered. As installed, the sampler is run so as to make 6 cuts per min., this being regarded as giving a fair average sample. Running faster, it was found that too great an amount of the ore was spilled.

New Tube Mill Linings

On account of the ever-growing, prominence of tube mills in connection with stamp-milling operations, especially in the Rand, the two illustrations of new types of linings recently patented by Messrs. Gibson and Schillie are of interest. These liners have been tested, but no data concerning the tests are at hand.

In the one, an arrangement of steel plates, curved on the outer edge, is bolted to angle-iron standards set inside the shell of the tube mill. The lining consists of fragments of any hard rock, such as gold-bearing banket, set in concrete between the plates. The other photograph shows another construction wherein the darker rows are made up of the heads of short pieces of worn-out drill steel set in concrete with rows of pebbles caught between them.



TWO NEW FORMS OF CONSTRUCTION OF TUBE MILL LININGS

Volumetric Method for Determining Alumina

A method, given by W. H. Seamon in *West. Chem. and Met.* V, pp. 62-64, for the volumetric determination of alumina, is based on the perfect separation of all the members of the fourth group, except zinc, from alumina, this being attained by sodium peroxide. The alumina enters solution as sodium aluminate and is precipitated by exact neutralization of the solution. The precipitated hydroxide is redissolved with a standard solution of sulphuric acid.

The precipitated hydroxides of iron and alumina from the usual lime determination are thoroughly washed with a boiling solution of ammonium chloride to insure the removal of zinc. The hydroxides are then dissolved in the least quantity of concentrated hydrochloric acid necessary for complete solution. Two to five grams of pulverized sodium peroxide are added cautiously to avoid spattering to the solution held in a No. 2 casserole. A sufficient excess must be added to make the solution strongly alkaline. The precipitate is filtered off, using a filter pump if desired, and washed twice with boiling water. The alumina is present in the filtrate as sodium aluminate along with any zinc that was not removed by the ammonium chloride washing. The presence of zinc or lead will, however, render the determination worthless.

A drop of phenolpthalein is added to the filtrate and then either dilute hydrochloric or sulphuric acid to the point where a gelatinous precipitate begins to show, care being taken that the pink color of the indicator is not removed. The neutralization is then carefully completed by running in a standard sulphuric-acid solution from a burette. Caustic soda may be used to bring back the solution if the end point is overrun. The liquid is heated to near the boiling point, a drop of methyl orange added and standard sulphuric run into the hot solution until a permanent acid reaction is obtained. The pink color should remain permanent after one or two minutes' standing, and the solution clear. The amount of standard acid for this latter titration is accurately measured.

The standard acid solution contains 8.3 c.c. of 1.84 sp.gr. sulphuric acid per liter and should have a value of 1 c.c. equivalent to 0.005 gram alumina. The solution is standardized against 1 gram of pure potassium alum (10.86 per cent. alumina) dissolved in 100 c.c. water. One gram of sodium peroxide is added to the dissolved alum, then a drop of phenolphthalein and the method as described followed out.

A check on the final titration is possible if the point where the acid begins to react with the sodium aluminate is noted and the amount of acid required from this point to the fading of the pink color of the phenolphthalein observed. The aluminum hydroxide dissolves most rapidly in a boiling solution of sulphuric acid, although not instantaneously, so that constant stirring and time are necessary toward the end of the reaction. Zinc and lead, if present, consume acid and so render the determination valueless. In their absence the decomposition of the sample by acids or fusion may be followed directly by the addition of the peroxide. Sodium peroxide is preferable to sodium or potassium hydroxide on account of its greater freedom from alumina. The largest amount of alumina found in the sodium peroxide was a trifle less than 0.01 per cent. The method is rapid and apparently accurate.

Encinnillas Mines and Smelting Works

The Encinnillas Mines and Smelting Works of Santa Rosalia, Ltd., formerly a British corporation, is now under French control, its main office being at 47 Boulevard Haussmann, Paris. The company operates a lead smeltery at Santa Rosalia Camargo in Chihuahua, the title of the Mexican company being Fundicion de

Santa Rosalia. The company has been negotiating for some time for further capital to enlarge its present plant, which consists of one 40x52-in. rectangular furnace and two 42-in. circular furnaces, with the necessary blowers, steam engines, boilers, pumps, etc. Since Dec. 22, 1908, the plant has smelted about 25,000 metric tons of ore and produced 3300 tons of bullion averaging 98 per cent. lead, 100 oz. silver and 1 oz. gold per ton. The matte produced, amounting to about 1000 tons, is sold in Mexico. The bullion, however, is shipped to England.

Owing to the large portion of pulverulent lead ores in the charge, the capacity of the plant has been greatly reduced and at the same time, through the absence of flues and settling chambers, the lead losses have been high. Extraction of gold and silver is said to be satisfactory. The officials at the plant are of the opinion that a liberal return can be obtained on the capital required for the enlargement and improvement of the plant, and have recommended the installation of two new lead furnaces, 42x180 in., with necessary power equipment and the enlarging of the settling chambers. A briquetting machine may also be installed. The present plant will then be used as a reserve. The company owns the Dolores group of mines situated about 75 miles east of Santa Rosalia. These mines, however, are closed. If the present negotiations for further capital are successful the company will probably acquire other properties in the state of Chihuahua. J. L. Saint-Dizier is general manager of the company's Mexican properties.

Failure of a Cooperative Mining Enterprise in France

A striking example of the failure of socialistic theories when practically applied is given by Edward Vicars, British Consul at Lyons, France, in his latest report to the Foreign Office as reported by the London correspondent of the *Sun*.

The enterprise was known as the Miners' Mine, in the Loire coal basin, and was started in 1891 and heralded as marking the inauguration of a new golden age of industrial [illegible]. A concession, consisting of four pits, covering an area of about 184 [illegible], had been obtained at a low price from a Paris banking firm, and [illegible] from all sides, including Saxony from the French Government and from the town of St. Etienne.

[illegible] working capital the Miners' Mine [illegible] the [illegible] property, the [illegible] of [illegible] all [illegible] were [illegible] of the [illegible] Government and [illegible] of the [illegible]

were not long in making their appearance, and practically never ceased until the final closing down of the mine.

The chief of these disputes arose from the fact that soon after the opening of the mine the regular members of the society began to get in outside men to help. These auxiliaries gradually came to consider themselves just as much shareholders as the original members, and therefore equally entitled to share in the profits. Moreover, it not infrequently happened that when funds were low an all round pro rata reduction had to be made in wages—an arrangement which caused great dissatisfaction among many of the men, who, being unable apparently to grasp the principle of coöperation, demanded their full wage.

Finally a general meeting was called to settle these difficulties, at which it was decided to divide the workers into two separate categories—members of the society in the strict sense of the term, who should take their chance of pay according to the ready-money position of the company from week to week, with a right to participate in profits, and auxiliary men with regular wages, no matter how empty the treasury, but with no right to any dividend. This decision raised an outcry among the ready-money men, who declared that it ran counter to the whole spirit of the enterprise, the principle of which was that all should share alike on a coöperative basis.

This quarrel marked the beginning of the end. As far as can be ascertained no great amount of profits found its way into the pockets of the miners, even in good times, large sums being spent by the directors in developing the existing property of the company and in acquiring fresh mines. Heavy loss was sustained by reason of a successful suit brought against the company by another colliery on whose territory the Miners' Mine had encroached.

Charges of corruption were freely brought, but there is no need of any such explanation to account for the disastrous career of the enterprise. Quarrels followed thick and fast; chairman after chairman was elected, only to be intrigued against and forced to resign. Serious fires in two of the pits contributed to hasten the inevitable crisis, and the hard times in which the whole of the Loire basin suffered found the Miners' Mine least of all able to make head against the storm. Money began to run short, creditors became pressing, and at length a receiver was put in and the pits closed down.

[illegible] unit of [illegible] by the State Attorney [illegible] the [illegible]

Tin Mining in Bolivia

According to recent British consular reports, the total production of tin in Bolivia, during 1908 was as follows: Potosi, 18,139 tons; Oruro, 9620; La Paz 2008; Cochabamba, 170; total, 29,937.

The average value of the boliviano in 1908 was 1s. 5d., as compared with 1s. 8d. in 1906 and 1907.

The principal mines are situated in and around the city of Potosi, in Chorolque, Tupiza, Uncia, Llallagua, and Huanchaca.

An express train now runs weekly from Oruro to the coast, with very comfortable sleeping and dining cars, and the journey can be made in 36 hours. The La Paz-Oruro passenger line has been running for some months. The Oruro-Potosi branch has been definitely abandoned, and the rich mining centers of Huanuni and Uncia will still have to transport their products by llamas, donkeys, or carts.

Tin mining is still almost the only industry of the Oruro district. Several new workings have just been begun in the Huanuni Morocacala, and Negro Pabellon districts, and an increased output is expected in 1909. One mine is now shipping 10 tons per day of 58- to 60-per cent. ore without treatment, save picking at the mine. Several completely new dressing works have been erected, on which about £250,000 have been spent; but, unfortunately, in most cases very little has been expended in developing the mines.

The Bolivian tin production mostly comes from four or five districts—Huanuni, Uncia, Potosi, and Chorolque, La Paz, Berenguela, Avecaya-Antequera. It costs £22 to send a ton of 65-per cent. barrilla to the United Kingdom. Generally only the poorer and less developed parts of the mine are rented to *pirquineros*; £1 8s. 10d may be taken as a fairly high price in this district for metal of 60 per cent in *pirquineros*, and 16s. for 50-per cent ores. For the year 1908 one company showed a cost in the mine of about 20 bols. (say £1 10s.) per quintal for a production of nearly 2000 tons, of which over four fifths gave an assay of over 60 per cent metallic tin. A smaller company is now producing about 800 quintals per month at a monthly cost of £2000, and that from ore that barely averages 3 per cent., which is very low for this district, and still making a profit.

Some of the properties secured by Chilean capital were good, but the prices paid were, almost without exception, far above the face value, and most of the undertakings got into difficulties.

The incorporation of the mining law leaves much to be desired. A civil lawsuit will usually take a fair lifetime to be settled. It is a safe criterion of the value of a mine to count the number of its lawsuits. There is scarcely a mine in the [illegible] that does not defend [illegible] lawsuits.

The Joplin District under the New Tariff

By C. H. Plumb*

Before the passage of the Payne tariff law the United States as a whole and the Joplin district in particular suffered from lack of confidence.

Crops were good, the zinc mines were looking better than ever before and business was inproving all the time, but no one knew just what the tariff bill was to be and everyone was afraid to spend money and go ahead. The Joplin zinc-lead district suffered from the general depression, and in addition was fighting for its life against a trouble all its own—the free importation of Mexican zinc ores.

Long before the panic of 1907-8 struck the United States, the price of zinc ores began to fall. Mexican imports of zinc ores had increased from 22,137 tons in 1905 to 103,117 in 1907, and the price of zinc ore had fallen so that mining had ceased to be profitable except in the richer mines. Jack was bringing only from $30 @ 35 per ton, where formerly it brought from $50 @ 55. Practically all the low-grade sheet ground mines were shut down and mill building was at a standstill. Wages were cut and the miners worked for $1.50 a day rather than have no work at all.

As a result of this condition more prospecting by miners for soft-ground free ores was done from 1907 to 1909 than during a decade before. Some of the mines piled up their ore and ran through the period of low prices, but the majority were unable to do so. When the fight for a tariff was made and a duty seemed assured, prices of ore began to ascend and a few of the mines resumed, but the majority waited till the passage of the Payne bill in August assured good prices for jack for some length of time.

Most of the imports have been silicate ores and the price of silicate has gone up from $17 to $20 per ton since last August, and the price of jack to $52. Every mine in the district with pay dirt is running. One noticeable result of the tariff is the buying of large fees by local and outside capital and the prospecting of outlying camps with drills. If the deposits here were in well defined beds, fissures or veins, large companies would long ago have secured control of the output, but in this district ore is where you find it and a geologist is like a fish out of water. Everybody has an equal chance, and the large company and the small miner must prospect their land to determine its value.

Sarcoxie, Neck City, Spring City and the Baxter-Quapaw camp (which six months ago was practically dead) are coming to the front. The West Joplin sheet-ground district has six mills running and as many more to be built, where six months ago not a wheel was turning.

Investors are coming into the district and properties are changing hands every week. The miners now are getting as good wages as they ever did and labor for the mines is becoming scarce.

While Joplin once had high ore prices with no tariff on zinc, it was before the Mexican mines were developed and the imports were practically nothing; with imports of 10,000 tons per month high prices are impossible.

Joplin at one time could have prosperity on $30 jack, but in these times, with the increased cost of mining supplies, labor and the necessities of life, $50 jack is a necessity. In short, the Joplin district now has prosperity where a year ago the conditions were worst.

*Civil and mining engineer, Keystone building, Joplin, Mo.

Petroleum and Natural Gas in the Philippines*

By Warren D. Smith†

There has been considerable interest aroused within the last year by the tapping of small reservoirs of natural gas in the course of drilling for artesian water. Two of these cases were investigated and it was found that only a small pocket of gas had been penetrated and that the supply was exceedingly small and intermittent.

Petroleum

Petroleum has been found in five places in the Archipelago—three in Tayabas Province, the other two on the island of Cebu; one near the center of the island on the west coast not far from Toledo, the other near the southern extremity, close to the *pueblo* of Alegria. In Tayabas and at the first-named locality in Cebu some prospecting by means of boring has been carried on, but as yet the Alegria field remains practically unknown. The oil in all three of these localities is found in a bluish shale, presumably of Tertiary age.

In Tayabas province on the east coast of the peninsula south of San Narciso Mr. Cook drilled a well 21 m. deep and found some oil. This well is in the Vigo river valley. On the Bayhay river there is another well 40 m. deep, belonging to a different company. In the latter well, which is about 8 km. from the coast, the yield at the beginning was reported to be about 190 liters per day. The well has a 5-in. bore and was made with a light churn drill. The oil appears to be of a very good grade. It has a paraffin base and its composition is very like that of the Sumatran oils.

The Cebu Oilfield

In Cebu, near the town of Toledo, about three miles from the coast and just at the edge of the foothills, are two wells, the first to be sunk in the Philippine archipelago. These are on the sugar estate of Smith, Bell & Co. These wells are sunk in shale strata (in all likelihood similar to the formation in Tayabas) to the depth, respectively, of 244 and 344 m. Very fair shows of oil have been reported from these wells in former years, but at present all operations have been suspended in the district. In fact, nothing has been done in this field since the outbreak of hostilities in 1897, and when the writer visited the field he found the wells choked up with *abacá* stalks and other refuse material, said by the natives to have been placed there by *insurrectos*. The elevation of the surface at these wells is 23 m. above sea level. There was only one derrick standing. It was approximately 18 m. high, the borings were 3 in. and the casing 6 in. The strike of the strata is north 83 deg. west, dip 73 deg. to the south.

About 2 km. from the oil well is an outcrop of coal which in former years was worked to some extent, but is now abandoned. From a hasty reconnaissance of the country it is my opinion that the strata are less disturbed in this portion of the island than on the eastern side of the Cordillera or to the south, in the vicinity of the Alegria oilfield. It is the intention of the Division of Mines to undertake a more detailed survey of this region at an early date, with a view to the rapid delimitation of the coal and the oil-bearing horizons.

The Alegria Oilfield

At Alegria the oil is found at an elevation of 350 m. on the Malbog creek, about 3 km. in a straight line from the coast. At 441 m. a bed of poor brown lignite is found. The strata here dip eastward, or into the island, being quite different from what was found in the Toledo field. The rock capping on the surrounding hills is a coralline limestone of probable Pliocene age. The oil appears to be identical with that from the other two fields and is found oozing out of the same bluish shale. To those intending to explore this field I would recommend that a light drill be taken just over the divide, about 1 km. to the east from the place where the oil at present comes to the surface, to a point where the topography reaches its lowest elevation, where the oil-bearing stratum would be found under better cover.

Prospects

With reference to the likelihood of finding oil on the east coast of Cebu, I might add that although the sedimentary formations are the same, yet a great area

*From "Mineral Resources of the Philippines," issued by the Bureau of Science, Manila.

†Chief of Division of Geology and Mines, Manila.

of igneous rock which occurs there would cause serious interruption to the oil-bearing formation. The apparent connection between coal and oil deposits in Cebu and other islands of the group leads me to think that in time oil may be found in paying quantities in many parts of the archipelago.

The Ontario Mining Report

SPECIAL CORRESPONDENCE

The eighteenth yearly report of the Bureau of Mines of Ontario[1], just issued, presents a comprehensive review of the mining industry of Ontario for the year 1908, with statistical tables showing the quantity and value of the mineral output, besides much other information regarding mining conditions and the work of the bureau. The data as to mineral production published early in the year have undergone careful revision, resulting in some changes in the figures; the value of net metallic production being given as $16,754,986, and of non-metallic production as $8,882,631, making a total of $25,637,617, an amount considerably in excess of that given in the preliminary statement. It is pointed out that owing to the different methods employed in valuing mineral products for statistical purposes by the mining departments of the Dominion government and the several provinces, great discrepancies occur between the figures of the Canadian Geological Survey and those of the Provincial Bureau of Mines. For instance, the value assigned to the nickel output of Canada—which all comes from Ontario—by the survey is $8,231,538, while the bureau's valuation is only $1,866,059. The survey values the nickel contents of the mattes produced at the Sudbury furnaces at the average price of refined nickel in New York, while the bureau's figures represent the value of the nickel in the form of matte, and at the point of production as given by the producers. On this point the report says: "To reckon the charges for transportation to the United States or England, the cost of separating the nickel from the matte, and probably also the profit arising from the whole series of processes to which the ore is subjected from mine to finished product, as part of the value of the nickel when it leaves Canada in the matte, certainly helps to swell the aggregate value of the mineral production, but the propriety of the method is not free from doubt." In dealing with pig iron, on the other hand, the survey credits Canada only with the product of Canadian ore excluding all pig iron made from imported ores, while the bureau includes all pig made at the blast furnaces of the Province, deducting from the aggregate the value of the Canadian ore smelted so as to avoid reckoning its value twice, once as ore and again as pig. The report expresses the wish that a common system might be adopted by the Dominion and Provincial mining authorities. In order to enable the mining production of Ontario to be fairly compared with that of the other provinces a table of the metallic output compiled on the Geological Survey basis is given, making the total $22,330,062, in place of $16,754,986 according to the plan followed by the bureau.

SILVER PRODUCTION

An attempt has been made to ascertain the entire yield of silver in Ontario up to the end of 1908. The statistics of production in the earlier days of the silver-mining industry were not officially collected, and cannot be exactly obtained, but data from several authentic sources show an approximate production of 4,748,541 oz. valued at $5,135,681 previous to the opening of the Cobalt mines. The yield of the subsequent period, ending with last year, was 37,586,970 oz. of the value of $20,468,751; making a total of 42,335,511 oz. of the value of $25,604,432. In dealing with the government revenue from mines the value of the ore shipped from the Provincial mine, while it was operated by the government is for the first time made public. The shipments consisted of two carloads of cobalt ore and one carload of silver ore, the total receipts from which were $12,317. The 48,625 lb. of silver ore assayed 783.17 oz. of silver to the ton.

MINE ACCIDENTS

A somewhat larger section of the report than usual is devoted to mine accidents, which have greatly increased in frequency of recent years. There were 47 fatalities, 14 men seriously and 26 slightly injured during the year. Of the total number of accidents 32 occurred in the Cobalt area, of which 30 resulted fatally. Mining Inspector E. G. Corkill reports that from a close analysis of the fatalities it is found that 44.7 per cent. resulted from danger inherent in the nature of the work; 31.9 per cent. through neglect or carelessness of the management; 8.5 per cent. through the fault of a fellow workman; and 14.9 per cent. through the fault of the injured person. Lack of discipline and supervision are the two chief causes for a number of the accidents at Cobalt. Inspector Corkill also contributes a descriptive account of the mines of Ontario with details as to their condition as regards equipment and development.

ONTARIO IRON RANGES

The series of reports dealing with the iron ranges of northern and northwestern Ontario, commenced in previous issues, is continued in the present volume, including the following papers: "Iron Ranges of Nipigon District" and "Black Sturgeon Iron Region" by Dr A. P. Coleman; "Iron Range North of Round Lake," and "Bog Iron on English River," by E. S. Moore; "Iron Formation of Woman River Area," by R. C. Allen, instructor in geology in Michigan University; and a detailed study of the "Geology of the Onaman Iron Range Area," by E. S. Moore. M. B. Baker furnishes an account of explorations in the region adjacent to Lake Abitibi and Dr. A. P. Coleman gives a description of Lake Ojibway, the last of the great glacial lakes and presents his views on the classification and nomenclature of the drift of Ontario. Part II of this report, dealing with the silver areas of South Lorrain and Gowganda, appeared some time since as a separate volume.

[1] Eighteenth Annual Report of the Bureau of Mines, Ontario, 1909," part I; pp. 311; illustrated. Toronto: L. K. Cameron, King's Printer.

Copper Deposits of Greene County, Virginia

BY MARSHALL HANEY*

The copper deposits in Greene county, are on the eastern slope of the Blue Ridge mountains at an elevation of about 2800 ft. above sea level. The Blue Ridge is composed largely of pre-Cambrian rocks, represented by various igneous types. Copper has been known to exist along the Blue Ridge since the earliest settlement; native copper furnished the Indians with metal from which they made axes and ornaments.

The ores comprise native copper, cuprite, malachite, bornite and chalcopyrite. The ore generally occurs along crevices and joint-planes, in small irregular lenses of quartz and as disseminated grains through the more epidotized portions of the altered rocks. When ore-bearing, the rocks are generally yellowish green, due largely to the formation of epidote and chlorite.

It is believed that the ore has been formed by the concentration of material leached out of the copper bearing portions of the igneous rocks. The shear zones have offered a place for collecting the solutions and deposition of ore. The ore seldom occurs in continuous masses, but can be traced for miles by the copper-bearing débris.

The mine of the High Top Copper Company is the most extensively developed mine in the county. It is on the summit and southern side of the spur of High Top mountain.

The company has a number of good buildings, a power plant, a 100-h.p. air compressor, 20-h.p. hoist, pumps and drills. The workings consist of open cuts along the outcrop, a crosscut tunnel about 150 ft. in length, and a shaft 115 ft. deep. Another tunnel enters the hillside about 400 ft. from the summit of the ridge and has been driven about 200 ft.

The various companies holding prospects are in need of capital to carry on development work. Plenty of cheap labor, good timber and water power are at hand.

*Geer, Virginia

Personal

Mining and metallurgical engineers are invited to keep THE ENGINEERING AND MINING JOURNAL informed of their movements and appointments.

P. K. Horner is now superintendent of construction for the Union Minière Du Haut-Katanga at the Star of Congo mine.

C. B. Wilmott has returned to Sault Ste. Marie, Ont., from British Columbia, where he has been examining some mining claims.

R. B. Lamb, of the C. L. Constant Company, is making a professional visit to northern Mexico, and expects to be absent about two weeks.

Charles Conners has been appointed field and office assistant to Chief Mine Inspector Laing, of West Virginia. He succeeds J. Austin King, resigned.

P. R. Whitman has left the Virginia & Mexico mine at Hostotipaquillo, Jalisco, to accept a position with the Real del Monte, at Pachuca, Mexico.

Leonard Peckitt, president of the Empire Steel and Iron Company, has been elected president of the Eastern Pig Iron Association. W. S. Pilling has been re-elected secretary.

J. A. Mowbray, of London, England, was in New York last week, having just completed an examination of the York Harbor copper mine in Newfoundland for English parties.

Guy C. Stoltz, mining engineer with the Port Henry Iron Ore Company, at Mineville, N. Y., visited Cobalt, Ont., and examined property in the new Gowganda district, recently.

Dr. H. J. Burgin, formerly connected with the Fresno Magnesite Company, of Fresno, Cal., has been appointed superintendent of the Talbot Dyewood and Chemical Company at Lowell, Massachusetts.

W. L. Caulkins has retired from the active superintendence of the Yellow Dog mine in the Joplin district of Missouri and Messrs. Coats & Ortt will have the active charge. Mr. Caulkins will remain general manager.

E. Gmelin, formerly with the Peñoles Mining Company, at Mapimi, Durango, and later manager of the Candelaria Mining Company, at Pinos, Zacatecas, has opened an office as consulting mining engineer at Aguascalientes, Mexico.

T. J. Jones, for seven years superintendent of mines for the Mountain Copper Company, Ltd., in Shasta county, Cal., has removed to San Francisco. While still retaining a connection with the company, he will also engage in general practice.

T. W. Atterbury will leave the service of the Copper Queen Consolidated Mining Company at Douglas, Ariz., Dec. 31. He made the first general layout of the smelter, over eight years ago, and has been in charge of the engineering office at Douglas ever since it was established. He will go East on an extended trip before taking up another position.

Obituary

Capt. Thomas Pidwell, a pioneer of the Turquoise district in Arizona, died at Tucson, Ariz., last week. He was buried at Tombstone.

E. B. Dear, who died at Duluth, Minn., last week, was for many years largely interested in mining. He was one of the promoters and the first president of the Butte-Ballaklava Copper Company operating in Butte ,and was also a director of the Keating Gold Mining Company, operating in Broadwater county, Montana.

William Adams, a mining engineer and promoter well known in Mexico, committed suicide at Chihuahua, Dec. 8. The cause for such action is unknown. He was born in the United States and was about 64 years old. He had been engaged in mining in the United States and in Australia before going to Mexico. He had lived in Chihuahua for nine years and was well known there and elsewhere, largely by his published reports on the Santa Eulalia camp.

Israel Wistar Morris died at Philadelphia, Penn., Dec. 18, aged 82 years. He was born in Philadelphia and as a young man became engaged in the work of developing the anthracite field, acquiring a considerable reputation as a mining engineer and coal expert. For a number of years he was associated with the late Robert Hare Powel as a coal operator. For a long time he was president of the Locust Mountain Coal Company, and he assisted Judge Asa Packer in the building of the Lehigh Valley railroad. When 70 years old he retired from active business, and devoted himself to literary pursuits; being frequently consulted on coal questions. He was a member of the American Institute of Mining Engineers and of the American Philosophical Society.

Dr. Chas. B. Dudley, chief chemist of the Pennsylvania Railroad Company, died at Altoona, Penn., Dec. 21, aged 68 years. Doctor Dudley was born in New York, and after serving in a New York regiment in the Civil War, took up the work of a chemist with success. He had previously graduated from Yale College. When the Pennsylvania Railorad Company started its testing department at Altoona, over 25 years ago—the first of the kind in this country—Doctor Dudley was placed in charge. He organized the work and speedily proved its value to the company. Thenceforward his work was along this line and he became widely known to chemists and metallurgists everywhere. As time went on he contributed largely to technical journals and society proceedings, believing in sharing the results of his investigations with the scientific world. His studies into the composition and testing of rails and rail steel were of especial value. His services were recognized. He was president of the American Chemical Society, member of the Iron and Steel Institute, president of the American Society for Testing Railway Materials, and was recently elected International president of the Society for Testing Materials at the meeting of the society in Copenhagen. He was a member of many societies. Personally Doctor Dudley was a man with many attractive qualities, and he had many warm friends.

Richard Eames was killed in an accident on the Southern Railway at Reedy Fork, N. C., on Dec. 15. He was born in New York in 1858 and began work when 17 years old as assistant to his father, Dr. R. M. Eames, in explorations in the Lake Superior county. Under his father he received a thorough training as a mining engineer, and was subsequently employed in many important positions. In 1879 he settled at Salisbury, N. C., which had ever since been his home. He did much work in North Carolina mines, in examining and exploring for gold, copper, manganese, corundum and graphite and in advising and directing the operation of mines. His work, however, led him to many other mining districts, and he had experience as an engineer in the San Juan country in Colorado, in Nevada, on the Mother Lode in California, in Yavapai county in Arizona, in Rhode Island and New Hampshire. He had also done valuable work in Jalisco, Mexico, in Honduras and in British India. Few men have seen a wider range of mining work, but North Carolina was his special study, and no one was better acquainted with its varied mineral resources and the condition of its mines. He found time also to start successfully the Salisbury Supply Company as a dealer in mining machinery. Unfortunately Mr. Eames found little time to record his varied experiences, and was not a frequent writer; though he was an occasional contributor to the JOURNAL. He was widely known and esteemed for his ability and integrity, and his untimely death is much regretted. He leaves a widow and three children.

Societies and Technical Schools

Yough Valley Mining Institute—This association is one of those organized in western Pennsylvania by the Young Men's Christian Association. The membership is from a large group of coal mines, owned chiefly by the Pittsburg Coal Company. Monthly meetings will be held at Jacobs Creek, and two weekly classes in mining have been organized. The officers elected are: W. M. Kelvington, president; William P. Pilkington, vice-president; James R. McColligan, secretary-treasurer.

Special Correspondence from Mining Centers

News of the Industry Reported by Special Representatives at Butte, Denver, Salt Lake City, Goldfield, Cobalt and Toronto

REVIEWS OF IMPORTANT EVENTS

San Francisco

[illegible] Kennedy Extension Min[illegible] of Jackson, Amador county, has begun suit against the Argonaut Min[illegible] for alleged trespass on Kennedy Extension ground alleging that some 50,000 tons of ore have been illegally extracted. They consider that $200,000 damages have been done. According to the complaint the Argonaut workings have [illegible] which cut top on Kennedy ground.

A decision of the Appellate court in the Golinsky mine-boundary dispute has been given in favor of Bernhard Golinsky. The case may go to the Supreme court eventually. These mines are not far from the Mammoth copper properties in Shasta county and have been worked intermittently by different parties, at one time being under bond to the Guggenheims. The litigation has prevented extended working of the properties.

A meeting of property owners around Wallace, Calaveras county, has been held to protest against the work of the copper smeltery which is operating above Lancha Plana in the Mokelumne River canyon. Measures are to be taken to secure relief from the copper-furnace fumes which it is claimed are causing damage to vegetation in that section.

The Appellate Court for the southern district of California has decided a grubstake-contract case in favor of the man who supplied means for prospecting. John Byrne grubstaked two miners for a prospecting trip into Inyo county on an agreement between them that the three should share whatever discoveries were made. The miners made a number of locations in their own names ignoring Byrne, who brought suit for his interest and the lower court decided against him. On his appeal the court decided that he was entitled to his share of the claims and ordered a new trial.

The condition of the quicksilver mining industry in California is not very satisfactory at present, notwithstanding the fact that prices have advanced materially within the past few months and that producers are getting much better prices than they did a year ago. All the mines now being worked are handling very low-grade ore, most of it being less than 1 per cent metal. Only one or two of the mines are paying dividends and most of those which were formerly large producers are [illegible] [illegible] pay [illegible] Nevada [illegible] pay [illegible] Texas [illegible] opened lately because the low prices for the metal have not encouraged men to hunt up new properties or reopen old ones. These conditions should be changed with the advance in market value of the metal and probably will be.

The new mining camp at the summit of the range east of Lone Pine, Inyo county, seems to be very promising if reports are correct. It is 10 miles north of Keeler and eight miles southeast of Lone Pine. The principal claim so far is the Ironsides. Originally located as a silver-lead proposition, but on sinking, the character of ore changed so that it is now ranked as a gold mine. A great many miners, mainly from Nevada, have applied for leases on this property. The situation is not at all favorable for winter prospecting. The claims are in a mineralized belt a mile or more in width. The deepest workings thus far are not more than 100 ft., but the returns are very satisfactory to owners of the claims. Some specimen ore is being taken out of the principal claim. The real worth of the camp will hardly be known before spring as there is already much snow there and little prospecting can be done.

Butte

Dec. 16—While the situation presented by the switchmen's strike is not so serious as was thought might develop, yet the mines are still affected by the lack of cars. The switchmen at Butte have returned to work and the Washoe Company's Moonlight and the Butte & Boston Company's Silver Bow and Berkeley mines and the Parrott mine have resumed. The switchmen at Great Falls, where the Boston & Montana Company's smeltery is, are still out. On the Great Northern Railway, between Butte and Great Falls, there are now stalled about 15,000 tons of the Boston & Montana Company's ore in the Great Northern cars. The ore bins of the Boston & Montana mines in Butte are being emptied so that shipments may be made to Anaconda. The capacity of that smeltery will not allow the treatment of all of this ore but a considerable amount can be handled.

The yearly report of the United States Assay Office at Helena, shows that Montana produced $[illegible] in precious metals during 1909, Deer Lodge county leading in production with $[illegible] and Silver Bow county was second.

The annual meeting of stockholders of the Butte Smelting and Refining Company will be held Jan. 3, in Spokane. In his letter to the stockholders, President Anderson states that he has succeeded in interesting capital to the amount of $500,000, which sum will be used for operating, and not for the payment of present liabilities. General Manager J. J. Campbell has been on the property several days and has made arrangements for the water for the smeltery. Machinery is being overhauled and repaired, and it is thought that operations will be begun shortly after the annual meeting.

President Edward Hickey of the Tuolumne company has addressed a letter to stockholders with reference to the rumors that the company's property is to be involved in litigation. He reiterates the statement that the company's attorneys are confident that the North Butte company obtained nothing by the deed which John Morony secured for them a short while ago, since the Tuolumne was already the owner of the property. Mr. Hickey states that the Jessie vein of the North Butte company at the 1200-ft. level united with the Tuolumne vein and from that point down they become one vein. By reason of the fact that the Tuolumne location is eight months older than the Jessie, Mr. Hickey states that, from the 1200-ft. level down, the entire vein becomes the property of the Tuolumne company. He further states he believes that the North Butte company has mined some of the Tuolumne ore at the west end of the Tuolumne claim, and if that be the case legal steps will be taken to recover damages from the North Butte company.

Denver

Dec. 20—Owing to the exceedingly hard granite encountered in the face of the Roosevelt tunnel, a report has gained credence, that A. E. Carlton, the Cripple Creek banker who has the contract, is going to give it up. Those who know Mr. Carlton are well aware that he is not made of that sort of stuff. However, he announces that there is no foundation for the rumor and he will continue the work to completion. The driving has advanced 11,850 ft. and there is less than 3000 ft. necessary to reach the El Paso shaft. It is possible, however, that it may have to be driven a few hundred feet farther to reach the main channel of the underground water of the district.

The Leadville camp is extremely quiet but there are about 3000 men at work. Five hundred men of the above are working through the Yak tunnel, and from 300

to 400 in the Little Jonny, of which George Campion is manager.

The November production of the Bull Hill mine of the Vindicator company is given as 3000 tons, or a gross value of $100,000. One thousand tons of this is said to have averaged 2 oz. gold to the ton and it is also stated that lessees at No. 2 and No. 6 shafts produced 800 tons that averaged $300 per ton and that 1250 tons of $30 ore were shipped from the Hull City and Gloretta shafts. High-grade ore continues to be produced from the 1300 and 1400 levels which is the more gratifying as regards the future of these deep mines when they shall have been unwatered by the drainage tunnel.

The United Gold Mines Company, owning the Wild Horse, Damon, Deadwood and W. P. H., which are credited with a gross production of about $4,000,000, has declared a dividend of $40,000, the first in five years. A. E. Carlton is at the head of this company.

The Jerry Johnson company, A. P. Mackey, president and manager, after paying the dividend of 1 per cent. per share on Dec. 15, amounting to $25,000, still had $41,000 in the treasury and no debts. It is worked under lease by Edwin Gaylord, who is said to have taken out approximately $250,000 gross in the last ten months, the royalty paid being 20 per cent. of the net returns.

Goldfield

Dec. 20—At the Goldfield Consolidated, under the direction of Superintendent H. P. Henderson, the opening of the Hampton stope is progressing at a rapid rate. By the time the improvements are finished at the mill, whereby its capacity is increased from 600 to 850 tons per day, the Hampton stope will be in such condition that a large tonnage can be mined. A crosscut into the hanging-wall of the Hampton stope has opened another shoot of high-grade ore, and it has already been drifted upon for a distance of 150 ft. A discovery has been made in the January vein in the northerly end of the Combination No. 1 claim, where an oreshoot 20 ft. wide running about $20 per ton, has been discovered. J. W. Hutchinson, the superintendent of the mill, expects to have the additions completed soon. The foundations have all been finished and a large portion of the equipment has arrived and is being installed. When completed these improvements will include six 6-ft. chilean mills, 26 Deister concentrating tables, four 8-ft. Callow classifying cones, a pump, compressor, two elevators to be used in connection with the tube and chilean mills, and two agitators. No additions to the cyanide department will be required. The amalgamation tables have been removed from just below the stamps, and have been installed in such a way as to amalgamate the gold in the concentrates. Below the amalgamating plates are other plates covered with blankets for making a further saving of the free gold in the concentrates. During October the average extraction of the mill was 94.49 per cent. Upon the 730-ft. level a sill floor, for the square sets, having a width of 25 ft. has been placed in position. The average value from across the entire top of this stope is $500 per ton, while throughout this distance streaks of high-grade ore showing free gold, and assaying several thousands of dollars to the ton are to be found. At the present time the ore has been opened to its full width for a distance of about 50 ft., while following the hanging wall a drift has been run for a distance of 150 ft., all in ore and at the breast of the drift a crosscut has been run to the foot-wall proving the oreshoot to be of an even width throughout its entire length. It is one of the greatest discoveries ever made upon the Consolidated property and rivals even the famous Hampton stope which today is making an output greater than any other gold mine in Nevada. This same oreshoot has also been drifted upon on the 900-ft. level for 350 ft., but the development has not been sufficiently advanced to fully demonstrate the grade and extent of the ore. The production from the property for November amounted to 19,180 tons from which an estimated recovery of $635,000 was made giving estimated net profits of $480,000.

District Judge Stevens has cited the manager of the Goldfield-Florence Extension company and several others to show cause why an order should not be granted the Florence-Goldfield Mining Company to make an underground survey of the workings. It is claimed by the Florence company that ore is being extracted from its premises, from which they receive no returns.

The railroad between Wabuska and Yerington and Mason will be completed about Jan. 1. The grading is finished past Yerington and the track is laid to within a few miles of that point. Upon the completion of the road an outlet will be afforded the ores of the Yerington district, and a steady production of the copper ores of that camp will be started.

General Manager C. B. Lakenan, of the Nevada Consolidated at Ely, said recently: "While the company is finishing construction at the Ruth mine, it is not the intention to commence regular operations at this property, which is simply being put in shape for quick production in case of emergency. Raises have been driven, and ore pockets and all other underground work is in readiness, except the electrical wiring. The electrical material for this purpose, motors, etc., are all on the ground. It is the intention of the company to open another steam-shovel pit on the Liberty area rather than to operate the Ruth mine for increasing regular production." At the Steptoe works construction continues on the fifth reverberatory, which will be completed during the latter part of January. This furnace will only be used as a spare, it being planned to run only four furnaces regularly. The fifth furnace, however, might be started in case the Cumberland-Ely mine were reopened. There has been no change in the labor situation at this mine, and the company appears to be in no haste to reopen the property while the steam-shovel operations provide sufficient ore for operating the Steptoe works at full capacity.

Pittsburg

Dec. 21—The management of the Pittsburg Coal Company has sent to stockholders a request that they place their stock in a voting trust for four years, in order to prevent outsiders obtaining control of the company. There has been persistent buying for several weeks. Yesterday the common stock sold at 27¼ and the preferred at 75⅛, so that control could be secured by a rather moderate investment by buying a large quantity of common and a small quantity of preferred stock. The common belief is that the buying has been in the interest of certain railroads and the management therefore felt that the control might not be used for the benefit of remaining stockholders. The circular just sent to stockholders points out these facts, and proposes a plan for placing the stock in the hands of a voting trust. The plan is not to become operative unless by Jan. 31, 1910, a majority of both common and preferred stock is deposited. It is provided that during the agreement, until the second Wednesday of March, 1914, the trustees shall not sell the stock at less than 100 for the preferred or 40 for the common. An effort will be made to list the certificates of deposit.

Cobalt

Dec. 20—Several well known people have lately taken up large interests in the new Porcupine goldfields and have already sent in men and supplies to develop their holdings. The firm of McArthur & Co., of Glasgow, Scotland, has acquired the Way and Griffith claims, comprising 240 acres for which the company paid a large sum. This company proposes to sink four shafts to a depth of 200 ft. each, and to develop their holdings with all possible speed. M. J. O'Brien, who owns the O'Brien mine, has also purchased several claims and has sent in 30 men with supplies to last the winter. Part of their equipment consists of a diamond drill. The new road from Matheson is completed.

The Ontario & Quebec Reduction Company is putting in a plant on the shores of Lake Temiskaming to treat the high-grade ores from Cobalt. The mines and the plant will be connected by the Nipissing Central Electric Railway.

The action of the new directors of the

La Rose, in cutting the dividend rate from 16 to 8 per cent., which aroused such a storm of criticism when it was announced, has been justified by the results of the recent development of the Lawson. From the 88-ft. level a raise was started on the main vein, commonly known as the "Silver Sidewalk," and when it reached the surface it was found that the high silver values did not extend to a much greater depth than 15 ft. From the same level, however, some high-grade ore was found in the No. 5 vein. The development of this property has been greatly retarded on account of lack of power.

An important decision affecting several of the mining companies in this district, has been given by the government announcing the intention of giving a material reduction in the royalties the companies are forced to pay. The companies that are to receive this reduction are the Cobalt Townsite, Nancy Helen, City of Cobalt, Wright Silver Mining Company, Railway Reserves, Jack Pot, J. Harris, McRae, Ontario Development and Mining Company, Station Grounds and the Chambers-Ferland. All of these with the exception of the last, pay royalties to the Temiskaming & Northern Ontario Railway Commission, while the Chambers-Ferland pays direct to the government. All of these companies have been paying 25 per cent. on the gross value of the ore, but in the future they will pay 25 per cent. on the net profits. These profits will be ascertained under the provisions of the supplementary revenue act. The properties that are shippers and will therefore be immediately benefited are the Townsite, City of Cobalt, Nancy Helen and Chambers-Ferland. It is interesting to note that none of the companies that are still able to declare dividends after paying the extortionate royalty charges, have been benefited by the reduction. The government is out after the money, and the rights or wrongs of the case do not seem to have been very seriously considered.

Toronto

Dec. 20—Eight further arrests were made yesterday in connection with the systematic stealing of ore from the Cobalt mines. Two American miners named Nicholas Zorate and Dimytro Andras were arrested on the Cobalt train, each with a bag of ore. Jacob Cohen and Morris Pechkowsky, both residents of Toronto, were taken in custody on charges of receiving. William Jensen and Jacobs Pechkowsky, brothers, were arrested charged with illegally selling ore. All account to have had dealings with Wilkinson, who is charged with the center of the system. Cohen had a small ore refining outfit and had been in the habit of reducing the ore to silver before selling it. Mr. Cobalt, C. McCrae and Mr. A. Muir Mitchell were arrested each having made numerous trips to Toronto for the sale of ore.

The business of the J. E. Wilkinson Company has grown rapidly of late years. It had a branch establishment in Buffalo and the Chippewa smeltery employs upward of 50 men. The police claim that the company books show that the company's dealings amount to about half a million dollars a year. A mine official estimates the losses sustained by all the Cobalt mines from theft at about a million dollars annually.

Meetings of the directors of the Dominion Coal Company and the Dominion Iron and Steel Company were held at Montreal on Dec. 17, when a substantial advance was made toward the completion of the merger between the companies. James Ross, president, and R. B. Angus and Graham Fraser, directors of the coal company, handed in their resignations and their places were filled by the election of Sir Henry M. Pellatt to the presidency and J. H. Plummer and Hon. L. J. Forget as directors. The time allowed for the shareholders to choose whether they would sell their shares at $95 each, or retain their interests having expired it was found that the great majority preferred to go into the merger, the withdrawals only numbering 6885 shares. All outstanding matters remaining in dispute were referred to the auditors of the companies for settlement. The basis upon which the amalgamation will take place is all that remains to be considered.

Mexico

Dec. 18—Dr. F. S. Pearson has made the announcement that the company which he has recently formed to engage in the manufacture of chemical products and steel in the City of Mexico, will erect a plant to cost 2,000,000 pesos. The plant will at the outset produce 3000 tons of calcium carbide for lighting purposes, yearly, and will consume more than 500 h.p. of electrical energy from the Necaxa power plant, also controlled by Dr. Pearson's syndicate. The chemical plant will also manufacture soda products, and will, according to Dr. Pearson, produce steel for tools and drills and make light steel rails using scrap iron and steel by the electrical process.

The sale of the Santa Gertrudis to Camp Bird, Ltd., is practically assured. An accurate history of the negotiations will also be of interest as the business will rank with the most important transactions in Mexican mines of recent years. Attention was first directed to the property six months ago, by a small exploration syndicate of which the original members were Courtlandt F. Palmer, Hugh Kerr and F. M. Reyes, subsequently joined by John Hays Hammond. This syndicate examined the property and presented it to the consideration of Camp Bird, Ltd. After an exhaustive examination of mine, titles, etc., Camp Bird, Ltd., took over the option which had been negotiated by Hammond and Palmer and deposited 200,000 pesos as forfeit in event of failure to purchase within five months, following Aug. 26, at 9,000,000 pesos. All examinations of the property and titles supplementary to the original examinations, have been completed and the Camp Bird directors have decided to exercise the option. Hugh Rose has been engaged to manage the property and is now occupied with plans for a large cyanide plant to be erected forthwith.

London

Dec. 16—Speaking at a meeting of the shareholders of Fraser & Chalmers, manufacturers of mining machinery, Sir Julius Wernher said that the company had had a fair year and had been able to pay an 8 per cent. dividend. A considerable part of the profit was, however, derived from commissions on the sale of goods not manufactured by the company and therefore the manufacturing business was not quite so good as it appeared from the dividend. He said that while he was a free trader at heart, he was coming round to the opinion that tariff reform or protection in a mild sense was necessary to preserve the manufacturing businesses of Great Britain. His idea was that tariff reform would give greater liberty of action and that the country would be able to claim and receive consideration and reciprocity which it did not even dare to ask for now. He called attention to the fact that one of the largest contracts of the year—that for the electric supply of 150,000 to 200,000 h.p. for the Rand—had gone to Germany. In connection with this statement, it may be remarked that the Germans had already got the start of the English manufacturers on the Rand in the electric machinery business and had put up a large amount of the capital of the Victoria Falls Power Company and were therefore in a favorable position for tendering for new plant.

At the close of his address he referred to the labor question in South Africa, remarking that the mining industry received now a good deal of help which it did not get before. The whole colony and all of the South African states now helped to get natives for working on the mines. The 55,000 imported Chinamen—now almost all repatriated—had been replaced by Kafirs. Not only that but the highest figure of native employment had risen considerably above previous records and had reached 170,000 persons. At present the figures were somewhat lower but the outlook of the number being not only maintained but increased was hopeful. The white labor employed was 22,000 as against 17,000 employed two or three years ago. He thought that the mines were worked with greater knowledge and with better management every year and that the working costs would be still further reduced.

Mining News from All Parts of the World

New Enterprises, Installations of New Machinery, Development of Mines and Transfers of Property Reported by Special Correspondents

THE CURRENT HISTORY OF MINING

Alabama

Sloss-Sheffield Steel and Iron Company—Ore mines Nos. 1 and 2 on Red mountain, near Birmingham, have been drowned out. The stopes run under Shade valley and the roof gave way in several places, owing to insufficient support, allowing a number of springs to drain into the mine. Rush orders have been sent for large pumps, but it will take two or three months to clear the mines. The adjoining mines of the Tennessee and Woodward companies are in danger, and those companies are building concrete walls to shut off the flow of water. The accident has made it necessary for the Sloss company to bank two of its blast furnaces.

Tennessee Coal, Iron and Railroad Company—A contract has been let to the Dravo Contracting Company, of Pittsburg, for the large concrete dam at Wylam, for the water-supply reservoir. A contract has also been let to Wallace Brothers for the extension of the Birmingham-Southern tracks to the dam and pumping station and the new No. 13 coal mine.

Arizona

The Needles smelting plant and numerous mines in Arizona and California have been sold to the United States Smelting, Refining and Mining Company for about $1,000,000.

Cochise County

Gold Queen—This company has elected its first officers as follows: President, James Herron; vice-president, B. L. McKinney; secretary-treasurer, W. A. Bates; superintendent, Sam Berry. The company is developing the Frene group on Antelope hill two miles northeast of Courtland where the rich gold strike was made in October. A shaft is now down 100 ft. and ore taken out which will be sent to the Commonwealth company's mill at Pearce for treatment.

Claire—This gold property in the Chiricahua mountains, 18 miles west of Paradise, has been taken over by the Pawnee company organized locally. It has been extensively developed in years past.

Graham County

Gold Belt—This, the first gold mill in the Clifton camp, is operating, making a good saving almost entirely on the first plate. Paul G. Wuerschund is in charge of the mill.

Gila County

Miami—J. Parke Channing in a letter to Hornblower & Weeks states: "From indications on unexplored portions of our property I believe that these reserves (14,000,000 tons) will at least be doubled, which would either lengthen the life of the mine or warrant largely increasing the capacity for production. Recent reports from the mine, where we are engaged in blocking out the ore for extraction, have been most satisfactory, both as regards the lateral extension of the present orebody and its grade."

Arizona Commercial—The directors have voted to call in the outstanding $500,000, 6 per cent. bonds, convertible into stock at $5 per share. The property is now producing at the rate of between 400,000 and 600,000 lb. per month, and it is expected that it will increase its output to 1,000,000 lb. Development work is now being done on the 700-ft. level.

Arkansas

The Lime Kiln and Bear Hill properties near Yellville will be operated on a more extensive scale and equipment for the concentrating plant will be installed. Thomas E. Malone is manager.

California

Calaveras County

Reiner—At this gravel mine the 20-stamp mill has been started and an order given for an additional 20 stamps.

Inyo County

Confidence—The mine at Tecopa has resumed operations and is again shipping ore.

San Bernardino County

Orange Blossom—This mine near Bagdad has been sold at receivers' sale to John Benair, the president. It was extensively developed but did not meet the expectations of the promoters and in consequence became involved in debt which necessitated the above action. A reorganization is planned.

Shasta County

Midas—This company at Kneb, L. A. Macintosh, manager, has cleaned up $28,000 during November with its 20-stamp mill.

Sierra County

Young America—The gravel mine at Forest has been started up again under charge of John Morris, and a contract has been let to extend the 1200-ft. level.

South Lode—The last raise in the breast of the big bedrock tunnel of this mine at Forest has broken through to the lava cap. The raise is supposed to be in the rim of the long-sought channel.

Siskiyou County

Granite—A half interest in this mine on Humbug creek has been purchased by J. W. Nawman, of Goldfield, Nev. He has taken charge and is sinking a new shaft.

Tuolumne County

Mountain Boy—This mine is about to change hands and be reopened. There is a hoisting plant and mill on the property.

Colorado

North American Smelter and Mines Company—Improvements to cost between $25,000 and $30,000 will be made at the former Carpenter pyritic smelter at Golden, and new machinery will be installed. James M. Myers, who has been in charge of smelting operations in New Zealand has been appointed superintendent.

Boulder County

Southern Illinois—The company has become interested in the Golden Message group at Sunshine and expects to install machinery.

Milwaukee—A new hoisting plant is being installed and this property at Sunnyside will be actively developed. The company has purchased the Ruby mill and will reconstruct it into a modern concentrator.

Blue Bird—New York capital is interested and it is reported will erect a concentrating mill for silver as well as for tungsten ores.

Clear Creek and Gilpin Counties

St. Anthony—Denver people have taken a lease and bond on the property on Negro hill, and will install machinery. Dan Munday, Central City, is superintendent.

Sixon—This property, near Georgetown, has been leased by A. Roberts, Georgetown, and active development work will be carried on.

Humming Bird—Holland capital is reported to have become interested in the property near Idaho Springs. New machinery is to be installed.

Great Bonanza—An oreshoot from $14 to $25 per ton has been opened in the 200-ft. east workings and is being shipped to the mill. Cecil C. Morgan, Central City, is manager.

Elkton—Arrangements are being made

to work this property in Nevada district through the Newhouse tunnel at a depth of 1500 ft. with H. C. Bolsinger, Nevadaville, in charge. The vein was recently cut by the tunnel and is reported to be one of the most promising of the veins that has been cut in the tunnel.

Gilpin-Eureka—A strike of free gold ore in the 400-ft. level of the Eureka mine is reported. The streak, which is 6 in. wide, is alongside a free-milling body between 4 and 5 ft. in width. The company is figuring on erecting a mill. George W. Mabee, Central City, is manager.

Kansas-Burroughs—This group, comprising 14 claims on Quartz hill, Nevada district, has been merged and placed in hands of J. C. Jenkins and J. E. Lightbourn, of Central City, as trustees, with power to sell. The property has been idle for a number of years on account of water. This can be easily removed with lateral workings to the Newhouse tunnel at 1500 ft. depth.

Topeka—Plans are being drawn for a 100-ton amalgamating and concentrating mill at Black Hawk for the handling of the ores from the Topeka mines, Russell district. Henry P. Lowe, Central City, is manager.

LAKE COUNTY—LEADVILLE

Comstock—In the Hopemore claim, on Breece hill, adjoining the Ibex, the leasers have a sulphide orebody estimated at 75,000 tons, which shipments of carload lots proves to be worth from $10 to $11 per ton, but have had difficulty in marketing it at a profit. Now, however, it is stated that the local smeltery wants it, and that satisfactory treatment charges will be made, in which case 100 tons per diem will be produced.

Yak—The tunnel is past the No. 2 shaft of the Resurrection, and in blue limestone, and headed for the Diamond ground, about the center of the Big Evans amphitheater.

Lovejoy—The tunnel is now in 250 ft.; and driving on a vein of ore said to carry 2 oz. gold per ton.

Gold Basin—The lessees on this Breece hill property are reported to have shipped a carload of ore carrying 10 oz. gold per ton.

Pontes Bros.—This mine, said to be the richest in the district and idle now for a number of years, is being reopened under lease by a number of practical working miners.

New Jersey Zinc Company—This company is shipping 75 tons of zinc ore daily from the dumps of the A. Y. & Mumm, which tonnage is to be increased shortly.

Highland Mary—The shaft is down 125 ft. and from the point a drift was started south which after a few feet caught the orebody and is now in ore. The values in the last [illegible] are better in gold and poorer in bismuth.

TELLER COUNTY—CRIPPLE CREEK

Lexington—The Nellie V. mine of this company, on Gold hill, is the scene of a surface strike, the veing being 3 ft. wide and the ore running $10 to $18 in gold without sorting.

Isabella—The day lease on Orphan Bell is shipping a 25-ton car very second day. A large tonnage of milling ore is developed in this mine and as so often happens, was found behind what was the supposed wall of the old Maloney vein, which produced great riches in the early days.

Maggie—Carl Johnson has been elected director of the company operating on Raven hill. The shaft is down 400 ft. and the property fully equipped. Two oreshoots have been opened.

Doctor-Jack Pot—Sherman M. Bell, leasing on the South End, has broken into what is apparently a new vein which runs over $100 across 3 ft. A small seam of oxidized calaverite is the main enriching feature. The new vein came in at 300 ft. depth.

Abe Lincoln—This is one of the Stratton properties which has produced phenomenal ore from time to time, and has just shipped a carload of ore yielding 4 oz. of gold to the ton and came from a winze below the 700 level.

Ben Hur—This mine, on Gold hill, is to be worked again under lease and through the Good-Will tunnel in Cottonwood gulch.

Idaho

COEUR D'ALENE DISTRICT

Mark Sullivan—C. L. Cowell, of Missoula, Mont., has secured control of the property. An electric compressor will be installed and development work prosecuted. Arthur Booth, Burke, Idaho, is in charge.

Hypotheck—The shaft is down 900 ft. When 1020 ft. has been reached a crosscut will be run 75 ft. to tap the vein.

Day—A contract has been let for a shaft on the property, at Falls creek, seven miles above St. Joe.

Reindeer—The drift is now in 250 ft., of which 240 ft. is in ore. The long tunnel on the property is in 3175 feet.

Coeur d'Alene North Fork—The concentrator was started Nov. 25. At present it is handling 75 tons daily, but its capacity is 200 tons.

Marsh—This group consists of five silver-lead claims near Burke. Charles Cowell, acting presumably for the Greenoughs, has closed a deal to secure the property for $150,000, and has made a payment of $25,000. Arthur A. Booth is in charge.

Interstate—The tunnel on the property near Yellan is in 1600 ft., and the management expects it to cut the vein 200 ft. ahead.

Coeur d'Alene Central—The lower tunnel is in 300 feet.

Snowstorm Extension—The drift on the principal ledge is in 800 feet.

Moonlight—A 3000-ft. tunnel is planned to tap the vein at 1500 feet.

WASHINGTON COUNTY

Gem State—This company is developing properties adjoining the Seven Devils district. The company will ship after Jan. 1 and is planning to erect a 100-ton concentrator in the spring. E. J. Winslow is general manager.

Illinois

SANGAMON COUNTY

Chicago-Virden Coal Company—Suit has been begun to foreclose the mortgage on this company's property. There are $600,000 bonds outstanding, the Pittsburg Coal Company and E. A. Wallace being the principal holders.

Indiana

CLAY COUNTY

A suit of importance to miners was decided in the Circuit Court at Brazil Dec. 8. Lawrence Kane sued the Miami Coal Company and recovered a judgment for $3000 for injuries received by falling slate while working in the company's mine. The company defended on the ground of negligence on the part of Kane in not notifying the company of the condition of the roof. The court held that the fact that Kane knew of the dangerous condition and worked away without notifying the company, is no defense when it is clearly shown that the company failed to make the place safe.

Maryland

Eagle Metallic Copper Company—The company operating at Charmain has let a contract for a mill to treat 200 tons daily.

Michigan

Michigan Quartz Silica Company—This company, mining quartz near Ishpeming, will install a plant at Milwaukee. The product, silica powder, is largely used by paint manufacturers. The plant at the mine will also be operated.

COPPER

Lake—The company has started the erection of a temporary rock house. A station is being cut at the sixth level preparatory to starting the crosscut to the lode, and as soon as this is finished drifting on the lode that was exposed in the shaft near the sixth level will be undertaken and the extent of the formation ascertained. Drifting on the main lode at the fifth level has been started in both directions near the hanging-wall side.

Isle Royale—Since the curtailment of development work and the centering of

all activity to the productive portions of the lode, resulting in a much better mineral return per ton of rock handled, this company is doing better than meeting current expense. Sinking at the Baltic shaft continues at 700 ft. The formation is changing.

Oneco—The Oneco lode has been encountered with the fourth drill hole, two drilling outfits, operating about 3500 ft. apart, are making a complete cross-section of the tract.

New Arcadian—No. 2 drill hole has encountered a copper-bearing amygdaloid lode at 75 ft. This lode was exposed in trenching.

Laurium—Sinking is going forward at 150 ft. on the lode and an encouraging showing is exposed. The surface equipment will soon be ready.

IRON

Catherine—This company, controlled by the Graham Bolt and Nut Company of Pittsburg, is operating in the Michigamme district and has been carrying on extensive explorations adjoining the Stewart mine.

Argyle Mining Company—A suit against the estate of Sigmund Rothschild, of Detroit, involving the property once held by the company in upper Michigan, has been brought by Don M. Dickinson to recover upward of $1,000,000 alleged to have been withheld from the stockholders.

Minnesota

Euclid—Preparations are being made to sink a new shaft on this property at Chisholm.

Missouri

Yellow Dog—This mine, at Joplin, has started up after a shutdown of several months. The north shaft has been dismantled and a new incline shaft driven to the south and connected to the mill with an inclined tram. The shaft will be operated with skips. One-half of the 1000-ton mill has been turned into a tailing mill and the other half will operate on the dirt from the ground.

Montana

BUTTE DISTRICT

Butte-Superior—The work of fitting the Basin concentrator to receive the company's ore has been begun. The contract calls for the treatment of 600 tons daily. At the Black Rock mine, surveys for the proposed mill and the spur are being made. On the 1600-ft. level a crosscut is being run south and is now in 165 ft. and three veins have been cut. Stoping has been begun south of the shaft on the 1200-ft. level and both east and west on the lead.

BROADWATER COUNTY

Three Forks—The shaft is down 250 ft., the last 30 ft. of which is in ore. A station will be cut when the 300-ft. mark is reached.

DEER LODGE COUNTY

Oro Fino—Charles Bergstrom has a lease on this property. The shaft is down 100 ft. and two cars weekly are shipped to Anaconda.

Butte-Anaconda Consolidated—Five men are working on the Golden Eagle on Flint creek. The tunnel is in 170 feet.

High-Grade—The shaft on the vein is down 175 ft. A drift from the bottom of the shaft has disclosed a vein 15 ft. wide.

Copper State—The shaft is down 65 ft. on the claims in Stuckey gulch.

JEFFERSON COUNTY

Corbin Copper—S. R. Dow, president, and R. M. Edwards, general manager, have recently made an inspection of the property. They announce that a 100-ton concentrator will be erected soon.

MADISON COUNTY

Apex—The Shafter mill at Summit is being overhauled and placed in readiness to start on ore from the Apex mine. W. T. Parkinson, C. R. Stranahan and Lee Taylor have a lease.

SANDERS COUNTY

A general revival has begun in mining in the Thompson region on the eastern slope of the Cœur d'Alene. The Thompson Mining and Milling Company, whose property has been idle for months, will resume. One of the tunnels is in 1000 ft. and shows in the face 2½ ft. of copper ore carrying good values. The property was formerly the Copper King. The Silver King, formerly the Buckeye, has already shipped a dozen cars of ore. The vein is 3 ft. wide and carries copper and silver. Development has been resumed after a shutdown. At the Paymaster group which adjoins the Silver King on the east, a drift on the vein has opened up high-grade silver-lead ore. A car of ore taken from the surface netted $400 to the owners of the Paymaster. Other shipments will be made soon.

Nevada

ESMERALDA COUNTY

Goldfield-Daisy—The Morrison lease upon the westerly block of the Daisy has recovered the rich sulphide vein, which was lost by the intrusion of a fault plane on the 360-ft. level.

C. O. D. Consolidated—This company has granted a five-year lease upon a portion of the Gold Bar claim to W. F. Grey. The lessee has agreed to construct a 50-ton mill on the property for the purpose of reducing the developed ores. Under the former management of the Gold Bar and C. O. D. properties ore to the extent of approximately $35,000 was shipped, the property then came into less experienced hands and the ore shoot was lost at about the point it entered the sulphide zone. The present lessee is a practical miner of many years experience and it is expected that under his personal supervision the property will soon assume the position it formerly held among the large mines of the camp.

Montgomery-Shoshone—The net receipts have been as follows: June, $[illegible]; July, $15,544; August, $18,85[illegible]; September, $15,319; October, $[illegible]; November, $1079. The severe rains interfered with the operations in October and November. The bills payable Nov. 1 was $202,$[illegible].

Bullfrog-Mohawk—The new shaft of Pioneer has reached 110 ft. and it is the intention of the superintendent, J. H. Thomas, to continue sinking to 250 ft. before crosscutting.

Mayflower-Bullfrog—The 400-ft. level has entered the vein discovered in the upper workings, and from which such good returns were made. The vein is not so wide upon the lower level, but the grade has increased. H. S. Stark has resigned as manager and Jerry Rourke has been appointed his successor.

Nevada National—This company is developing the Dixie Extension claim in Paulsen cañon about twenty miles from Round Mountain. A tunnel is now in 65 ft. on the vein. Nels Paulsen is superintendent.

EUREKA COUNTY

George Wingfield has purchased the interests of Loftus & Davis in the new Buckthorn district, which promises to become a great low-grade camp. Large bodies of ore running from $10 to $12 per ton have been opened in a latite formation, such as is found in the deeper workings of the Goldfield district.

LYON COUNTY

The Silver City mills are shut down owing to the condition of the roads preventing the hauling of ore.

NYE COUNTY

The estimated production for the week ended Dec. 11, was $115,925, the tonnage being divided as follows: Tonopah, 2850; Tonopah-Belmont, 320; Montana-Tonopah, 957; MacNamara, 300; West End Consolidated, 120; Tonopah-Midway, 90; total, 4637 tons.

Tonopah—Preparations are being made to sink a new shaft upon the Sand Grass claim, the most westerly one of the company's acreage. The new shaft will be 2000 ft. west of the Red Plume shaft, at present the most westerly one, and a little northwest of the Tonopah Extension shaft. The shaft will be of three compartments and the skip ways will be 4½x5 ft. in the clear, this shaft will be used as the central working point from which drifts and crosscuts will be run to fully develop the Sand Grass claim. The situation of this claim is favorable, end lining the Red Plume claim, and side lining one of the productive claims of the Tonopah Extension ground. The depth of the shaft will depend upon the geological con-

ditions. The diamond drill has been installed near the bottom of the Mizpah shaft at a depth of 1500 ft. and drilling is being steadily prosecuted.

Tonopah-Belmont—The east crosscut from the main shaft, at a depth of 1158 ft., has intersected the Belmont vein. The vein is six ft. wide and shows low-grade ore. Drifting will be started upon it immediately.

War Eagle Mill—This mill at Manhattan is preparing to run a lot of 500 tons of ore from the Stray Dog mine, and as soon as that is finished a lot of 400 tons will be run from the Rose-Nash lease upon the Union No. 4.

Round Mountain—During November the mill at Round mountain treated 2800 tons of ore, from which bullion having a value of about $35,000 was extracted. James R. Davis, the manager, estimates that 14,000 tons of ore has been added to the known ore reserves of the mine during the month.

STOREY COUNTY

Ophir—For the week ended Dec. 11, the mine extracted 427.89 tons of ore of an average value of $42.91 per ton. The winze being sunk from the 2200 level is down 37 ft. below the 2300 station.

Savage—This mine has completed milling its run of ore at the Sutro mill. The concentrates will be shipped to Selby.

Hale & Norcross—The mine has started a two-compartment raise from the north drift on the Sutro tunnel level.

C & C—The pumps have held the water at 148 ft. below the 2350 station.

Pennsylvania

The long drainage tunnel at the Oneider colliery, near Hazleton, has been completed and is now in use. The tunnel extends from the north basin of the mine to Little Tomhicken creek, is 4919 ft. long and 6x8 ft. in section. It was driven by the Portland Contracting Company under the supervision of Edgar Kudlick, division engineer.

LEBANON COUNTY

[illegible] Steel Company, which already owned a controlling interest, has bought the Cornwall mines, giving it practically the complete ownership of the Cornwall ore banks. These are now the most important iron mines in Pennsylvania. The only other mines in the district are the Penn Cornwall (or Isabella) which are controlled by the Lackawanna Steel Company through ownership and through lease from the Cornwall estate.

South Dakota

Homestake—The monthly [illegible] that it will not resume and resume of the Western Pennsylvania [illegible] The company has accumulated [illegible] and is prepared to resume [illegible]

Continental—This company, operating near Keystone, in the Calumet district, has suspended the mining and smelting operations indefinitely in view of pending disturbances with the labor union. The company has issued an announcement that it will remodel its equipment and open up with nonunion labor as soon as possible.

Texas

From El Paso sources, it is reported that the International Smelting and Refining Company will erect a smeltery near El Paso. There is no official confirmation of the report.

Canada

NOVA SCOTIA

Springhill—These collieries, which have been idle since Aug. 10, when the miners belonging to the United Mine Workers went on a strike, were reopened on Dec. 13 when the Cumberland Railway and Coal Company brought a carload of foreign laborers from Montreal to take the places of the strikers. Other men will be brought in shortly.

ONTARIO—COBALT

The shipments for the week ended Dec. 10 were as follows: Nipissing, 192,242; Drummond, 190,000; La Rose, 129,681; Crown Reserve, 112,286; Temiskaming, 60,000; Kerr Lake, 61,890; total, 746,099 pounds.

Kerr Lake—A new shoot of high-grade ore has been struck on the fourth level.

O'Brien—High-grade ore has been found on the 75-ft. level 500 ft. from the No. 6 shaft.

Belmont—This company has started sinking on the main surface vein.

Paymaster—At this gold mine, Manitou Lake district, the 10-stamp mill is in operation.

Mexico

[illegible]

Reforma—[illegible] Balsas, is under option [illegible] the [illegible] Company of London [illegible] to be $10,000,000. The property is controlled by the Ortiz family of Mexico City and has been producing about [illegible]

[illegible]

Lantana—The [illegible] plant built on the Mexico [illegible] has been attached by creditors. Charles C. Clapp is in Mexico to adjust the affairs of the company.

Cerro Gordo—The property at Cerro Gordo is under [illegible] J. B. Wilson of Cananea, and J. H. [illegible] of Los Angeles, are [illegible] It is the only [illegible] producing on the Cerro Gordo.

[illegible]

[illegible] in November [illegible] gold [illegible] $[illegible] The gross value of the product was $206,424 and the net earning $91,106.

SONORA

Zambona—The plant, at present idle, is being overhauled and its capacity increased to 200 tons. It is near Alamos and is controlled by A. J. Yeager.

Promontorio—This mine has lately passed into the hands of the Clark Copper Company, of Los Angeles. It is reported to be rich in silver.

Lampazos—Funds for a recommencement of work have been subscribed. The mine lies near Moctezuma and is controlled by Michigan men.

El Temblor—T. E. Lambertson and R. L. Van Dusen have bonded this property to New York people.

Quintero—This mine, in the vicinity of Alamos, is operating a 10-stamp mill.

Espiritu Santo—Announcement of a resumption of work in January has been made. Development on a conservative scale will be attempted.

Africa

The Union Minière Du Haut-Kantanga is erecting a plant at the Star of Congo mine that is expected to be able to produce about 100 tons of copper per day.

Asia

COREA

Oriental Consolidated—Results for October; 220 stamps, running 29¼ days, crushed 28,557 tons; gross receipts, $121,607; operating costs, $63,646; operating profit, $57,960. The November cleanup amounted to $139,000.

INDIA—MYSORE

Kolar Goldfield—Gold production in November was 47,179 oz., being 75 oz. less than in October. For the 11 months ended Nov. 30, the total was 503,480 oz. bullion in 1908, and 508,570 oz. in 1909; an increase of 5090 oz. The bullion reported this year was equal to $9,460,928, or 457,713 oz. fine gold.

Australia

NEW SOUTH WALES

Broken Hill Proprietary Company—For the four weeks ended Nov. 24, the refinery turned out 516 oz. gold, 348,546 oz. silver, 620 tons lead and 51 tons antimonial lead. Of these products 313,[illegible] oz. silver and 593 tons lead were from purchased ores. The mill produced 7778 tons ore concentrates, containing [illegible] oz. silver, 400 tons lead and 3580 tons zinc.

WESTERN AUSTRALIA

Gold production in November is reported at [illegible] oz. fine, being 1955 oz. more than in October. For the 11 months ended Nov. 30, the total was 1,508,752 oz. in 1908, and 1,[illegible],188 oz. worth $[illegible] in 1909, a increase of 47,561 oz. this year.

Metal, Mineral, Coal and Stock Markets

Current Prices, Market Conditions and Commercial Statistics of the Metals, Minerals and Mining Stocks

QUOTATIONS FROM IMPORTANT CENTERS

Coal Trade Review

New York, Dec. 22—Cold weather has been the chief factor of the coal market in the West. While steam coal remains steady, the domestic demand has materially enlarged, and mines are being called on for supplies to an extent that has put many mines on full time. Car shortage has affected the mines in southern Illinois, but east of that State there are few complaints.

In the East the bituminous trade is in better shape than for some time. Demand for coal is good and there is a tendency toward better prices than have prevailed. Transportation conditions are not good, car shortage being the general complaint.

The anthracite trade is good, chiefly owing to the cold weather.

The rainstorm of last week brought about a rise in the Ohio, and on Dec. 15 tows carrying 1,500,000 tons of coal came out of the Kanawha. Some of this coal had been stored over three months, waiting for a rise.

The conference over the Western bituminous agreement for next year will be held at Toledo, O., early in January. The present agreement will expire March 31, and a struggle over mining rates is probable.

Coal Traffic Notes

Coal tonnage originating on the Pennsylvania Railroad Company's lines east of Pittsburg and Erie, 11 months ended Nov. 30, short tons:

	1908.	1909.	Changes.
Anthracite	10,261,627	10,128,629	D. 133,068
Bituminous	32,352,198	35,283,701	I. 2,931,503
Coke	6,629,558	10,683,665	I. 4,054,107
Total	49,243,453	56,095,995	I. 6,852,542

The total increase for the 11 months this year was 13.9 per cent. The increase for the month of November was 875,441 tons, or 17.4 per cent.

The Colorado Fuel and Iron Company reports for the year ended June 30, 1909, a production of 4,094,352 short tons of coal, a decrease of 181,743 tons from the preceding year. The disposition of the coal last year was: Used at mines, 179,708 tons, used at coke ovens, 1,125,165; used in iron and other plants, 493,041; sold, 2,296,047; decrease in stocks, 301 tons. The coke produced was 645,545 tons, of which 477,913 tons were used in the company's plants and 167,632 tons were sold. The average consumption of coal was 1.74 tons to 1 ton of coke.

Coastwise shipments of coal from Atlantic ports, 10 months ended Oct. 31, long tons:

	Anthracite.	Bitum.	Total.	Perct.
New York	11,711,474	8,725,597	20,437,071	60.7
Philadelphia	1,644,374	3,951,530	5,595,904	16.6
Baltimore	184,976	2,798,135	2,983,111	8.9
Newport News	.....	2,993,104	2,993,104	8.8
Norfolk	.....	1,696,852	1,696,852	5.0
Total	13,540,824	20,105,218	33,646,042	100.0
Total, 1908	14,328,421	18,915,045	33,243,466	.....

Total increase this year 242,576 tons, or 0.7 per cent. There was a decrease of 787,597 tons in anthracite. The gain in bituminous was almost entirely from Newport News and Norfolk, handling West Virginia coal.

New York

Anthracite

Dec. 22—Continued cold weather has brightened up the hard-coal market. Dealers are doing a heavy business, which is making the wholesale market more active. The recent storms have put an end for the time to the water troubles at the collieries, and most of them are working steadily.

Schedule prices for large sizes are $4.75 for lump and $5 for egg, stove and chestnut, f.o.b., New York harbor. For steam sizes quotations are, f.o.b., New York harbor points: Pea, $3.10@3.25; buckwheat, $2.35@2.50; No. 2 buckwheat or rice, $1.75@2; barley, $1.35@1.50. Some washery pea and buckwheat are offered at 10 or 15c. less.

Bituminous

The seaboard soft-coal trade is in fair condition, a moderate demand coming from all sections. There is little or no surplus at tidewater and deliveries are rather uncertain, owing to the difficulty in getting cars. Steam coal shows little change; in gas coal there is still a scarcity of slack and prices are variable.

Cars continue in short supply, especially on the Baltimore & Ohio, but shippers on the Pennsylvania and other lines are having their troubles also. Transportation is fair, coal coming through about on schedule time.

Ordinary grades of steam coal can be had at tidewater at prices equivalent to $1@1.05 at mines. Better grades command up to $1.40 at mines, with $1.50 for a few special coals.

In the coastwise trade vessels are inclined to hold back, though there has been no trouble yet from ice in the East. Rates on small boats are $1 per ton from Philadelphia to Boston, Salem and Portland; 70@75c. from New York to points around Cape Cod.

Birmingham

Dec. 21—Coal production is being rushed right now, to avoid any possible shortage from the holiday stoppage. There is a demand for all that is mined, and operations will be still more extended after January. Contracts have been let for the railroad extension to the new No. 13 mine which the Tennessee company is opening in the Pratt City district.

The demand for coke is very strong, and all that can be made is being used. Work is being rushed on repairing old ovens and building new ones.

Chicago

Dec. 21—Continued cold weather makes the demand for coal heavy and in consequence prices are very firm on Illinois and Indiana coals, the chief supply of this market. Lump and prepared sizes have no surplus coal on track and sales to escape demurrage on any kind of western coal are few. In the West and Northwest the intense cold has resulted in a rush demand for both bituminous and anthracite; retailers are ordering largely in the apparent belief that a cold winter is in sight. Apprehension of a spread of the switchmen's strike in the Northwest to other railway employees, with consequent tying up of traffic generally, is coöperating to bring orders from retailers who fear a shortage of supplies. Steam coals are selling more and more heavily.

Illinois and Indiana coals bring $2@3 for lump and egg, $1.75@1.85 for run-of-mine and 95c.@$1.25 for screenings.

Hocking is strongest of the coals from east of Indiana, and continues to bring $3.15. Smokeless is strong as regards lump and egg, with run-of-mine still somewhat weak because of oversupply. Pocahontas and New River lump and egg bring $3.05@3.75, and run-of-mine sells for about $3.05. Youghiogheny is somewhat active, with lump egg selling at $3.30. The continuance of cold weather benefits materially the market for eastern coals.

Cleveland

Dec. 20—Cold weather has kept the market for domestic coal strong. The steam coal market is steady and is taking care of itself. Now the Lake trade is out of the way the supply is fair, except for West Virginia, where there is a shortage of a short supply and some difficulties in transportation. Prices are firm with a general tendency to advance.

Indianapolis

[illegible] 20—Conditions in the mining in [illegible] of the [illegible] a few weeks ago. Every mine in the State in condition for [illegible] is getting out as much coal as the [illegible] to the surface, working full time. There is no shortage of [illegible] any of the mines, and the railroads [illegible] to have all that may be called for during the remainder of the year. So far there has been no advance in prices at the mines. A considerable amount of the Indiana output goes to the Northwest, where the strike has been delaying freight traffic, but as yet but little complaint has come to Indiana operators. Indiana operators are advised that the Northwest failed to lay in a winter's supply of fuel during the fall and that the demand for coal from that section may be expected to continue all winter. The unexpected cold wave brought a rush of orders for coal and set into operation all the mines, many of which were working only about half-time during the warm November days. Coal operators are looking for an abnormal demand for coal during the remainder of the winter.

Pittsburg

Dec. 21—The local coal market continues firm, with prices unchanged. Current demand is good. There is some trouble over car shortage, but it is not serious. Prices remain strong at $1.15 for mine-run and nut, $1.25 for ¾-in. and $1.40 for domestic coal, with slack at 75@85c. per ton.

Connellsville Coke—Negotiations which were in progress last week on several furnace-coke contracts for next year have not come to a head and there is very little negotiating this week. There is scarcely any demand for prompt coke, and altogether the situation is, if anything, a trifle easier. Evidently consumers are well provided with stock-piles to cover the usual irregularities which are expected at this time on account of the men indulging in holiday festivities. In each of the three weeks ending Nov. 13, the production of the region was reported at over 450,000 tons, but the average of the succeeding four weeks has been about 435,000 tons, yet supplies seem to be adequate.

The market is quotable about 5c. lower than last week on furnace coke, standing about as follows: Prompt furnace coke, $2.75@2.80; contract, $2.75@2.85; prompt foundry, $3@3.25; contract, $3.25@3.50.

The Connellsville district production in the Connellsville and Lower Connellsville regions in the week ended Dec. 11, of 438,763 tons, and shipments at 446,[illegible] cars to Pittsburg, 78[illegible] cars to points west of Pittsburg and 7[illegible] cars to points east of Connellsville, a total of 13,058 cars.

St. Louis

Dec. 20—The thermometer has hovered around zero for the past week with the result that the coal market has been [illegible] indications are that the thermometer will even go lower in the next couple of days as zero weather is predicted. The present cold spell is one of the longest and severest experienced in December in a good many years. While the retail yards report only a fair volume of business, yet the coal man has the satisfaction of knowing that householders' stocks are being depleted rapidly and that business will be much better in January and February on that account. The price of carload coal has been advanced 10 or 20c. per ton all down the line. The railroads are much tied up and cars are very short.

Screenings and lump went up at the same time and fine coal of all descriptions is exceedingly strong. Standard screenings are firm at 50c. at mine and several of the larger users here, such as the packing houses, were practically out of coal today. The fact that screenings and lump are both bringing good prices is netting the operator a good price for mine-run.

Since the Cherry mine disaster all the State inspectors have been very strict and a number of mines have been closed down part of the week for minor causes, such as not having the mine sprinkled or the roadway clean. Several operators who were closed down and immediately remedied the cause, were shut down three or four days extra because of delay in getting inspectors to reinspect and pass on the mine.

Quotations on Standard at mine are $1.25 for 6-in.; $1 for 3-in.; 70c. for steam nut; 50c. for screenings; freight to St. Louis, 52c. Staunton, Mt. Olive and Springfield, lump at mine, $1.50; nut, $1; screenings, 75c.; freight to St. Louis, 52c. Carterville, at mine, $1.75 for 6-in.; $1.40 for nut; 60c. for screenings; St. Louis prices 67c. higher. Franklin county $2 for 6-in. and $1.50 for nut at mine; St. Louis, 67c. more.

Washed coal in strong demand. St. Louis prices for No. 1 Standard are $2.42@2.52; No. 2 $1.82; No. 3, $1.72; No. 4, $1.52; No. 5, $1.12. Washed Carterville 15c. higher on all grades, owing to difference in freight rate.

The anthracite situation has been relieved during the past week, as the cold weather has enabled wholesalers to clean up their supplies of egg and egg. The chestnut situation is bad and it looks very much as if there would be a chestnut famine here during January.

Foreign Coal Trade

Welsh Coal Market—Messrs. Hull, Blyth & Co., London and Cardiff, Wales, report prices of coal as follows on Dec. 11: Best Welsh steam, $4.02; seconds, $3.84; thirds, $3.60; dry coals, $3.84; best Monmouthshire, $3.48; seconds, $3.36; best small steam, $2.22; seconds, $1.86. All prices are per long ton, f.o.b. shipping port, for cash in 30 days, less 2½ per cent. discount.

British Coal Exports—Exports of fuel from Great Britain, with coal sent abroad for the use of steamships in foreign trade, 11 months ended Nov. 30, long tons:

	1908.	1909.	Changes.	
Coal	57,375,422	57,748,100	I.	372,678
Coke	1,087,618	1,040,890	D.	46,728
Briquets	1,345,505	1,362,009	I.	16,504
Total exports	59,808,745	60,150,999	I.	342,254
Steamer coal	17,815,090	18,085,868	I.	270,778
Total	77,623,835	78,236,867	I.	613,032

The larger items of export were 9,541,360 tons to France, 8,868,169 to Germany, 8,412,854 to Italy and 3,621,603 tons to Sweden.

Iron Trade Review

New York, Dec. 22—The end-of-the-year quiet has settled down on the iron and steel markets generally, and little new business is being done. At the same time the mills report that specifications on contracts are coming in steadily and work is abundant.

In pig iron little is doing, except that some steel companies in the Central West are skirmishing still for outside lots of bessemer pig. So far as quotations are made, prices continue firm everywhere.

In finished material the only movement has been in some orders for steel cars and bridges from the railroads; and a few orders for steel rails. There are inquiries out for some good-sized orders for structural steel, but it is not expected that contracts will be closed before the end of the year. Jobbers almost everywhere report that small trade is in excellent shape.

Lake Superior Iron Ore—Iron-ore shipments from the Lake Superior region in December were 519,525 tons up to the final close of navigation. The complete water shipments for the season, as reported by the Cleveland *Iron Trade Review*, were 41,083,873 long tons; an increase of 16,256,779 tons over 1908, and of 395,118 tons over 1907, which was the record year up to this time. The division of shipments by ranges cannot yet be made. Rail shipments will have to be added to the water shipments above to make up the total. These were 587,893 tons in 1908, and probably about 850,000 tons this year.

Baltimore

Dec. 21—Imports for the week included 186 tons ferromanganese and 419 tons silicospiegel from Great Britain; 5700 tons manganese ore from Brazil; 20,050 tons iron ore from Cuba. Exports included 3,210,000 lb. steel plates, 382 tons steel rails and 16 tons rail fastenings to Vancouver, B. C.; 12,140 tons steel rails, 1108 tons rail fastenings and 718 tons tie plates to Mexico.

Birmingham

Dec. 21—The Alabama iron market has been and is quiet so far as new business is concerned, but pig-iron makers express confidence that after Jan. 1 there will be takers for all the iron they can turn out. There are contracts for about all that will be made in the first quarter. The resale iron is nearly all out of the way now, and prices will not be affected by these lots, but will be on a steady basis, which most makers claim will be $15, Birmingham, for No. 2 foundry.

The flooding of the ore mines of the Sloss-Sheffield company on Red mountain has obliged that company to bank two of its blast furnaces, which are dependent on the supplies received daily. How long this will last is uncertain; it will take some time to unwater the mines, but ore may be secured elsewhere.

Judge Gary, of the United States Steel Corporation, has been inspecting the Tennessee Coal, Iron and Railroad Company's properties, in company with President Crawford and other officers of that company.

Chicago

Dec. 21—Quiet conditions continue in the iron market, with pig iron showing no decided upward or downward tendency in prices, but with Southern No. 2 in general selling at $15 Birmingham, whereas a week or two sales at that price were not the rule. This means $18.35 Chicago, and brings numerous small contracts for first-quarter delivery, with neither melters nor furnace agents anxious for more extended deliveries at this price, melters showing a feeling that it is well to proceed cautiously and sellers professing the belief that with the holiday season past the market will strengthen. Northern pig iron is firm at $18.50@19, the furnaces being well sold up. Some Southern is being sold at $14.50 Birmingham, for second-quarter delivery, but these contracts are neither numerous nor for large amounts. The market for iron and steel products continues moderately active, with large demand for structural steel. The railroads, though not active buyers, continue to manifest interest in present and prospective needs, while for plates, bars and other shapes there are fair to heavy sales. Notwithstanding occasional delays due to weather conditions, coke is in good supply at $5.50, Chicago.

Cleveland

Dec. 21—Ore prices are not settled yet, but there is a general belief in an advance of 50c. a ton. Some companies are making reservations of ore for the season, prices to be settled later.

Pig Iron—Some inquiries are coming in, chiefly for foundry and malleable. Current sales continue light. Prices are nominal, but there seems to be no disposition to make concessions.

Finished Material—The chief business has been in plates for shipbuilding. Inquiries are in for some large lots of bars. Jobbers report the small trade active in this district.

Philadelphia

Dec. 22—Pig iron is being shipped in large quantities from furnaces to customers. Deliveries are insisted upon according to contract. The only noticeable activity has been in malleable iron and quite a number of orders for small and large lots have been placed, nearly all of them for as quick delivery as can be made. A good deal of forging work is under way, in fact all the little concerns in that line are busy. Renewed inquiry has been made by pipe makers to cover some recently secured contracts, but as the iron will not be wanted until toward spring the inquiries, it is supposed, are merely sounding the market. Otherwise the crude-iron market is in its usual holiday quiet. Furnace people are quite confident of a renewal of demand in January. No. 2 X foundry is held at $19, and gray forge at $18, while $18 is asked for basic.

Steel Billets—The higher level of prices would be quoted if there were any inquiries, but consumers who will shortly need material are waiting until January.

Bars—All reports confirm the recent statements as to activity and strong prices. Quotations have been advanced on early deliveries and $1.80 is easily obtained. The manufacturers will enter the new year with heavier orders than they have had for two or three years.

Scrap—The scrap dealers are doing nothing. The only thing they are concerned about is to get supplies of railroad scrap and heavy melting scrap at prices which their prospective customers are willing to pay.

Pittsburg

Dec. 21—A firm tone prevails in the iron and steel market, although transactions are very light. The dullness is only seasonable, and no special activity is expected until well on in January. There is some good specifying on contracts which expire by limitation with the end of this month, as the prices are below the current market and buyers do not wish any tonnage canceled on them. Specifying is better on contracts for wire products, induced by the advance of $1 a ton made Dec. 11 last. Production is maintained at the full rate previously attained and there are no signs of any letting down in mill or furnace activity.

Pig Iron—The market is extremely dull, but prices are held. A sale of 1000 tons of basic was made last week, for first-quarter delivery, at $17.25, Valley, the recognized market for such deliveries. Odd lots at a slight basic might be picked up at $17, Valley, as formerly. It is estimated that 30,000 tons of basic pig iron is held speculatively by three interests, but they have carried the iron for a long time and will only feed it out at good prices. The inquiry for 3000 to 4000 tons of bessemer iron for first-quarter delivery from a Cleveland steel-casting concern has not been acted upon yet. A fresh inquiry appeared this week for 5000 tons for first half from another interest, which is marked for closing Wednesday or Thursday of next week. Bessemer remains firm at $19, Valley. Foundry is quotable at $17@17.25, Valley, as formerly, depending on delivery, malleable being about 25c. higher and forge about 75c. lower.

Steel—There has been a slight further easing up in billets and sheet-bars for prompt shipment, billets being obtainable at $27, Pittsburg, and sheet-bars at $28.50, while for deliveries over first quarter or half, billets are $27.50@28 and sheet-bars $29.50@30. It is noticed that whereas open-hearth steel was at a premium over bessemer a few weeks ago it is now, if anything, easier than bessemer.

Ferromanganese—The market has been sluggish, with prices unchanged at $45@45.50, Baltimore, for prompt and $45.50@46 for first quarter or half, freight to Pittsburg being $1.95 per ton.

Sheets—Buying is not as heavy as it was, but the market is very strong, with mills sold up for more than half their prospective output in the first six months of the year. Prices remain at 2.40c. for black, 3.50c. for galvanized, $1.70 for painted corrugated and $3 for galvanized corrugated.

Foreign Iron Trade

British Iron Trade—Exports and imports of iron and steel and their manufactures in Great Britain, 11 months ended Nov. 30, as valued by Board of Trade returns:

	Exports.	Imports.	Excess.
Iron and steel	£34,780,368	£ 7,250,034	Ex. £27,530,334
Machinery	23,925,063	4,099,017	Ex. 21,826,046
New ships	5,660,509	.....	Ex. 5,660,509
Total	£66,365,940	£11,349,051	Ex. £55,016,889
Total, 1908	73,310,614	11,227,453	Ex. 62,083,164

Decrease in exports, £6,944,674, chiefly in new ships; increase in imports, £121,508. The quantities of iron and steel were, in long tons:

	1908.	1909.	Changes.
Exports	3,786,699	3,850,559	I. 63,860
Imports	1,017,201	1,085,925	I. 68,724

Exports of scrap iron and steel, 117,362 tons in 1908, and 146,063 in 1909; increase, 28,701 tons.

British Iron Ore Imports—Imports of iron ore into Great Britain, 11 months ended Nov. 30 were 5,521,109 long tons in 1908, and 5,712,220 in 1909, increase, 191,021 tons. Of the imports this year 3,288,705 tons were from Spain.

Metal Markets

New York, Dec. 22—The metal markets remain steady, with comparatively few changes. In fact, matters have been inclined to dullness.

Gold, Silver and Platinum

UNITED STATES GOLD AND SILVER MOVEMENT

Metal.	Exports.	Imports.	Excess.
Gold:			
Oct. 1909	$ 9,379,402	$ 7,094,164	Exp. $ 2,245,438
" 1908..	1,952,574	3,785,705	Imp. 1,833,131
Year 1909..	106,682,236	98,169,557	Exp. 68,512,679
" 1908	70,889,954	42,213,678	" 28,676,276
Silver:			
Oct. 1909..	4,053,745	4,017,884	Exp. 35,861
" 1908..	4,378,017	3,746,365	" 631,652
Year 1909..	47,342,861	37,258,414	" 10,084,447
" 1908..	43,159,395	34,539,067	" 8,620,328

Exports from the port of New York, week ended Dec. 18: Gold, $521,500, chiefly to Brazil; silver, $874,450, largely to London. Imports: Gold, $130,248, mostly in bullion from Japan; silver, $256,104, principally from Mexico.

Gold—Prices on the open market in London were unchanged at 77s. 9d. per oz. for bars and 76s. 5d. per oz. for American coin. New York has sent more gold to South America.

Platinum—Business remains good and prices are unchanged, dealers asking $29.50 per oz. for refined platinum, and $35 per oz. for hard metal.

Our special correspondent writes from St. Petersburg, Russia, under date of Dec. 9 that the market shows a tendency to be a little inactive. Some decrease in the demand from abroad has had an influence on the small dealers and producers at Ekaterinburg, who now sell crude metal, 83 per cent. platinum, at 6 rubles per zolotnik—equal to $22.56 per oz.—a decline of 25 kopeks. In St. Petersburg stocks are in strong hands, and 24,000 rubles per pood—$23.52 per oz.—is asked for crude metal.

Silver—Latest advices from India speak of good distribution of silver. Stock in London has been reduced to moderate dimensions and market is supplied at the advance to 24d. through the ordinary channels alone, so that it is reasonable to look for steadiness at current figures.

SILVER AND STERLING EXCHANGE

Dec.	16	17	18	20	21	22
New York....	52½	52½	52½	52½	52½	52½
London.....	24⅞	24⅞	24⅞	24⅞	24⅞	24⅞
Sterling Ex..	4.85.0	4.88/10	4.88/10	4.88/10	4.88/10	4.88/5

New York quotations, cents per ounce troy, fine silver; London, pence per ounce sterling silver, 0.925 fine.

Exports of silver from London to the East, Jan. 1 to Dec. 9, as reported by Messrs. Pixley & Abel:

	1909.	1908.	Changes.
India....	£ 8,257,390	£6,694,000	D. £2,563,390
China....	641,400	1,885,000	I. 1,243,600
Straits....	164,885	114,600	D. 50,285
Total.....	£ 9,063,675	£8,693,600	D. £1,000,075

Indian Council bills in London sold at [illegible] per rupee.

Copper, Tin, Lead and Zinc

Dec.	Copper. Lake, Cts. per lb.	Copper. Electrolytic, Cts. per lb.	Copper. London, £ per ton.	Tin. Cts. per lb.	Lead. New York, Cts. per lb.	Lead. St. Louis, Cts. per lb.	Zinc. St. Louis, Cts. per lb.
16	13⅝ @13¾	13¾ @13⅞	59⅞	33	4.60	4.47½ @4.52	6.07½ @6.10
17	13⅝ @13¾	13¾ @13⅞	59⅞	33	4.60	4.47½ @4.52½	6.05 @6.10
18	13⅝ @13¾	13⅝ @13⅞	.....	33	4.60	4.50 @4.55	6.05 @6.10
20	13¾ @13⅞	13¾ @13⅞	60	34	4.60 @4.70	4.55 @4.60	6.02½ @6.07½
21	13¾ @13⅞	13¾ @13⅞	60⅛	33⅞	4.70	4.60 @4.65	6.00 @6.05
22	13⅝ @13⅞	13¾ @13⅞	60⅛	33⅞	4.70	4.60 @4.65	6.00 @6.05

London quotations are per long ton (2240 lb.) standard copper. The New York quotations for electrolytic copper are for cakes, ingots and wirebars, and represent the bulk of the transactions made with consumers, basis New York, cash. The prices of casting copper and of electrolytic cathodes are usually 0.125c. below that of electrolytic. The quotations for lead represent wholesale transactions in the open market. The quotations on spelter are for ordinary Western brands; special brands command a premium.

Copper—There has been more business both for Lake and electrolytic copper. Manufacturers are busy and orders are coming in at a satisfactory rate. The demand has been freely met at current quotations. The market closes firm at 13⅝@13⅞c. for Lake, and 13¼@13⅜c. for electrolytic copper in cakes, wirebars and ingots. Casting copper is quoted nominally at 13@13¼ cents.

Copper sheets are 18@19c. base for large lots. Full extras are charged, and higher prices for small quantities. Copper wire is 15¼c. base, carload lots at mill. Business is fair.

The standard market in London developed further strength and more confidence is shown abroad in the position of the metal. The market has been active at somewhat higher prices, and closes at £60 5s. for spot and £61 7s. 6d. for three months.

Refined and manufactured sorts we quote: English tough, £62 10s.; best selected, £62 10s. @ £63 10s.; strong sheets, £73 10s. @ £74 10s. per ton.

Exports of copper from New York and Philadelphia for the week were 5475 long tons. Our special correspondent gives exports from Baltimore at 1129 tons copper.

Tin—The bull syndicate in the London market has been very successful and prices have been advanced rapidly. While the market at the end of last week remained steady, Monday of this week witnessed an advance of somewhat over £4 under very heavy transactions. Subsequently, there was some easing off, brought about, no doubt, by realization of speculative holdings, and the close is called as easy at £153 7s. 6d. for spot and £154 12s. 6d. for three months.

Notwithstanding the excitement in the London market, domestic interests kept cool, especially consumers, who held back with purchases. There was some business between dealers and importers from day to day, quotations being made at about 33¾c. per pound.

Messrs. Robertson & Bense report arrivals of Bolivian tin ore (concentrates) at Hamburg in November at 995 long tons; 129 tons direct and 866 tons through other ports.

Lead—There has been an excellent demand for this metal and the market is strong. On Monday, the leading sellers advanced the price further to 4.70c.. There has been a large demand for Western lead. The close is firm at 4.60@4.65c. St. Louis, and 4.70c. New York.

The London market is also firmer and the close is cabled at £13 2s. 6d. for Spanish lead, and £13 5s. for English.

Spelter—The market is dull and quiet. There has been little demand. Prices have eased off, closing nominally at 6@6.05c. St. Louis, and 6.15@6.20c. New York.

New York quotations for spelter on Dec. 16 were 6.22½@6.25c.; Dec. 17 and 18, 6.20@6.25c.; Dec. 20, 6.17½@6.22½c.; Dec. 21 and 22, 6.15@6.20 cents.

The London market is unchanged at £23 2s. 6d. for good ordinaries, and £23 7s. 6d. for specials.

Base price of sheet zinc is now 8c. per lb., f.o.b. La Salle-Peru, Ill., less 8 per cent. discount.

Other Metals

Antimony—The market remains quiet, with only a retail business doing. The prices are nominally unchanged. Cookson's is quoted at 8⅛@8¼c. per lb.; Hallett's, 8@8⅛c.; U. S., 7⅞@8c.; with 7⅝@7¾c. named for outside brands.

Aluminum—The price of aluminum is unchanged at 20@23c. per lb. for ingots. The higher price is that asked by the American producer.

Quicksilver—The market continues good, and prices are steady. In New York the quotation is $52.50 per flask of 75 lb. for large lots; for small lots 72@75c. per lb. is asked by jobbers. The San Francisco quotation is $50.50@51.50 per flask for domestic orders, and $2 less for export. The London price is £9 15s. per flask, with £9 17s. 6d. asked by jobbers.

Nickel—Large lots, contract business, 40@45c. per lb. Retail spot, from 50c. for 2000-lb. lots, up to 55c. for 500-lb. lots. The price for electrolytic is 5c. higher.

Magnesium—The price of pure metal is $1.50 per lb. for 100-lb. lots f.o.b. New York.

Cadmium—Current quotations are 65@70c. per lb. in 100-lb. lots at Cleveland, Ohio. In Germany 450@475 marks per 100 kg., at factory in Silesia.

British Metal Imports and Exports

Imports and exports of metals in Great Britain, 11 months ended Nov. 30, figures in long tons, except quicksilver, which is in pounds:

Metals:	Imports.	Exports.	Excess.
Copper, long tons	158,733	57,798	Imp. 100,935
Copper, 1908....	155,159	63,304	Imp. 91,855
Tin, long tons....	38,019	37,661	Imp. 358
Tin, 1908.....	42,946	38,361	Imp. 4,585
Lead, long tons..	189,090	42,220	Imp. 146,870
Lead, 1908	216,811	46,539	Imp. 170,272
Spelter, l'g tons..	108,496	10,258	Imp. 98,238
Spelter, 1908....	97,854	8,508	Imp. 89,346
Quicksilver, lb..	3,169,061	1,567,087	Imp. 1,601,974
Quicksilver, '08	3,228,092	1,600,175	Imp. 1,627,917
Ores:			
Tin ore and con.	21,964	.....	Imp. 21,964
Tin ore, 1908...	22,886	.....	Imp. 22,886
Pyrites	701,869	.....	Imp. 701,869
Pyrites, 1908..	709,329	.....	Imp. 709,329

Copper totals include metallic contents of ore and matte. Exports include re-exports of foreign material. Of the imports in 1909 the United States furnished in: all 209 tons copper matte, 64,460 tons fine copper and 29,963 tons lead. This lead was chiefly Mexican, refined in this country.

Zinc and Lead Ore Markets

Platteville, Wis., Dec. 18—The base price paid this week for zinc ore was $49@50 per ton; no premium price is reported. The highest price paid for lead ore was $58.80 per ton; the base price was $54@56 per ton.

SHIPMENTS. WEEK ENDED DEC. 18.

Camps.	Zinc ore, lb.	Lead ore, lb.	Sulphur ore, lb.
Cuba City	496,675	173,878	261,675
Platteville	330,160	.....	289,500
Mineral Point	370,000	.....	....
Benton.....	323,350	64,950	.....
Highland.....	246,700	.....	.....
Days Siding.....	86,400	.....	.....
Shullsburg.....	75,000	.....	.....
Harker...	65,350	.....	.....
Montfort.....	60,000	.....	.....
Linden	58,550	.....	.....
Livingston.....	.....	64,000	.....
Total.....	2,172,205	302,828	551,175
Year to Dec. 18.....	132,879,580	9,220,483	15,441,910

In addition to the above there was shipped to the separating plants, Platteville, Galena and Mineral Point, 2,210,325 lb. zinc concentrates. Shipments were largely reduced on account of car shortage.

Joplin, Mo., Dec. 18—The highest price paid for zinc-sulphide ore was $53, the base being $48@50 per ton of 60 per cent. zinc. Zinc silicate sold at $27@28 per ton of 40-per cent. zinc. The average price, all grades, was $48.02 per ton. The highest price paid for lead was $56 per ton of 80 per cent. metal content, a few bins commanding $58. The average price, all grades, was $55.64 per ton.

The lower price did not deter the majority of producers from selling their zinc ore, as the shipment is an increase over last week, while a number of producers sold an accumulation of lead ore at the advanced price. The drop in the zinc-ore market is a repetition of what occurs during December every year, and if January repeats itself prices will be up again the middle of next month. Many mines that use hand work in ore concentration have been able to produce but lightly this month on account of the unusual severity of the weather.

SHIPMENTS. WEEK ENDED DEC. 18.

	Zinc, lb.	Lead, lb.	Value.
Webb City-Carterville	3,967,440	706,120	$116,973
Joplin.....	1,682,690	494,070	57,742
Prosperity.....	685,550	226,460	23,192
Duenweg.....	596,900	75,000	16,742
Galena.....	484,210	78,630	14,067
Miami.....	193,290	316,000	12,765
Oronogo.....	725,480	81,810	10,672
Alba-Neck	385,530	5,020	9,792
Quapaw.....	204,410	54,920	8,531
Sarcoxie.....	317,290	.....	7,329
Aurora.....	404,450	18,510	7,281
Spurgeon.....	257,860	64,340	6,179
Zincite.....	182,740	37,320	5,666
Carthage.....	221,070	.....	5,526
Granby	286,490	5,700	5,495
Badger	158,940	15,360	4,693
Wentworth	114,910	.....	2,749
Stott City.....	48,240	.....	1,158
Peoria.....	58,010	.....	870
Totals	10,685,580	2,181,000	$317,332
51 weeks.....	80,504,230	86,307,930	$14,267,942

Zinc value, the week, $256,644; 51 weeks, $11,914,170
Lead value, the week, 60,688; 51 weeks, 2,353,772

MONTHLY AVERAGE PRICES.

Month.	Zinc Ore. Base Price. 1908.	1909.	All Ores. 1908.	1909.	Lead Ore. All Ores. 1908.	1909.
January.....	$37.60	$41.25	$35.56	$38.46	$46.88	$52.17
February..	36.63	36.94	34.92	34.37	49.72	50.50
March.....	36.19	37.40	34.19	34.71	49.90	50.82
April.....	35.40	38.63	34.08	37.01	52.47	55.63
May	34.19	40.06	33.39	37.42	56.05	56.59
June.....	33.06	44.15	32.07	40.35	60.48	57.52
July	34.55	43.06	31.67	41.11	59.90	53.74
August	36.53	48.25	33.42	44.54	60.34	57.60
September ..	37.63	47.70	34.44	44.87	54.59	56.11
October.....	35.95	49.50	33.28	45.75	52.63	55.02
November...	39.13	51.31	35.02	48.29	54.53	53.94
December...	42.75	.....	39.63	.....	49.68	.....
Year.....	$36.63	.....	$34.31	.....	$53.93	.....

NOTE. Under zinc ore the first two columns give base prices for 60 per cent. zinc ore; the second two the average for all ores sold. Lead ore prices are the average for all ores sold.

Petroleum

Exports of petroleum from the United States, 11 months ended Nov. 30, in gallons:

	1908	1909.
Crude petroleum	89,211,233	134,262,458
Naphthas.....	33,172,881	54,185,019
Illuminating oil.....	1,032,186,908	958,041,638
Lubricating and paraffin..	132,664,633	141,753,575
Residuum.....	66,678,811	87,691,329
Total.....	1,353,914,466	1,374,934,019

The total increase this year was 21,019,553 gal., or 1.6 per cent.

Chemicals

New York, Dec. 22—The New York chemical market is a little more active and prices are firm at rather higher figures than last week.

Copper Sulphate—Quotations are higher at $4.10 per 100 lb in carload lots and $4.35 per 100 lb. for smaller sales.

Arsenic—Some inquiries are being heard, and although there is little active business, dealers still hold at 2¾@2¾c per lb. for white arsenic.

Nitrate of Soda—The market for nitrate is firm now at [illegible] per lb in all positions; a slight increase for spot.

Potash Salts—Berlin despatches report that the Kali Syndikat will probably come to terms with the owners of the Schmidtmann group of mines which holds the contracts with the American companies, the execution of which led to the recent disruption of the syndicate. A provisional agreement by which the syndicate will be let in on the American contracts has been signed and it is expected that it will be ratified at a general meeting of the syndicate. Schmidtmann has sailed for America to secure the assent of the holders of the contracts. A further despatch says that the Prussian government has submitted to the Federal Council a bill placing all the potash mines under Imperial control, to take effect in two years.

Mining Stocks

New York, Dec. 22—It has been mainly a traders' market on the Stock Exchange this week. There were advances early in the week and recessions at the close. Steel stocks were less prominent, the market inclining to specialties. Anthracite-coal stocks are still prominent.

There was one sale of Homestake, of South Dakota, early in the week at $79.87½; a later sale was at $80.12½ per share.

The Curb was not specially active, and was rather uncertain as to copper stocks, some advancing and some declining. Miami was the strongest and most active.

The American Cement Company has declared a semi-annual dividend of 1 per cent. Last July 3 per cent. was paid, making 4 per cent. for 1909, against 6 in 1908 and 7 in 1907. The effect of the dividend was a drop of $1.375 per share.

Boston, Dec. 21—The market for copper shares has been extremely active and broad, with an upward tendency throughout. Brokers are almost overwhelmed with customers and an old-time market seems to be here. Interest has come back, chiefly to Lake Superior stocks, but it is not confined to them, taking in other copper districts as well. The new developments at the Lake are closely watched.

Lake was a leader in the market and on large sales was up today to $74.12½, with a slight recession, to $73.25. Hancock reached $35.50, losing only 50c. of the advance. Keweenaw also recorded a substantial gain. Mohawk advanced $2, to $65; while Isle Royale, quiet for some time, appeared quite prominently in the trading. There was a general firmness in all the Lake coppers, with heavy trading.

North Butte touched $56.50, closing $1 less. East Butte sold at $13.25, on heavy trading. Boston Consolidated also sold well, with a high price of $22.50. Amal-

[illegible] was Metal M[illegible] 87 and $88 per share.

The Curb was busy with heavy trading in almost all its recognized specialties. A new stock appeared in New Baltic, the organization of which is just completed; it sold [illegible] at $15 to 25 per share. [illegible] and Cactus were other features in the trading today.

STATISTICS OF COPPER

Month.	United States Production.	Deliveries, Domestic.	Deliveries for Export.
I	112,135,200	51,862,624	38,499,797
II	103,790,817	43,578,118	30,968,496
III	117,958,661	48,871,964	59,191,043
IV	114,574,292	47,546,010	65,110,111
V	118,356,146	61,163,325	70,542,753
VI	116,567,493	60,591,116	70,966,457
VII	118,277,603	75,520,083	75,018,274
VIII	120,797,234	59,614,207	48,382,704
IX	118,923,139	52,105,955	50,077,777
X	124,657,709	66,359,617	56,261,238
XI	121,618,369	66,857,873	57,260,595
XII	....	....	....

VISIBLE STOCKS.

	United States.	Europe.	Total.
I	122,357,266	124,716,480	247,073,746
II	144,130,045	118,574,400	262,704,445
III	173,284,248	117,140,800	290,425,048
IV	182,279,302	115,024,000	297,303,902
V	183,198,073	114,050,320	297,248,393
VI	169,848,141	127,352,960	297,201,101
VII	154,858,061	150,928,960	305,787,021
VIII	122,596,607	171,492,160	294,088,767
IX	135,196,930	197,993,600	333,190,530
X	151,472,772	210,224,000	361,696,772
XI	153,509,626	222,566,400	376,076,026
XII	153,003,527	236,857,600	389,861,127

Figures are in pounds of fine copper. U. S. production includes all copper refined in this country, both from domestic and imported material. Visible stocks are those reported on the first day of each month, as brought over from the preceding month.

Monthly Average Prices of Metals

SILVER

Month.	New York. 1908.	New York. 1909.	London. 1908.	London. 1909.
January	55.678	51.750	25.738	23.834
February	56.000	51.472	25.855	23.706
March	55.365	50.468	25.570	23.227
April	55.505	51.428	25.133	23.708
May	52.795	52.905	24.377	24.343
June	53.663	52.538	24.760	24.166
July	53.115	51.043	24.514	23.519
August	51.683	51.125	23.858	23.588
September	51.720	51.449	23.877	23.743
October	51.431	50.923	23.725	23.502
November	49.647	50.703	22.933	23.351
December	48.766	....	22.493	....
Total	52.864	....	24.402	

New York, cents per fine ounce; London, pence per standard ounce.

COPPER

	New York. Electrolytic 1908.	Electrolytic 1909.	Lake 1908.	Lake 1909.	London. 1908.	London. 1909.
January	[illegible]	[illegible]	13.901	14.280	62.386	57.688
February	[illegible]	[illegible]	[illegible]	13.295	58.786	61.198
March	[illegible]	[illegible]	12.875	[illegible]	58.761	[illegible]
April	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]
May	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]
June	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]
July	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]
August	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]
September	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]
October	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]
November	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]
December	[illegible]		14.411		[illegible]	....
Year	[illegible]		[illegible]		[illegible]	

[illegible]

TIN AT NEW YORK

Month.	1908.	1909.	Month.	1908.	1909.
January	27.380	28.060	July	29.207	29.125
February	28.978	28.290	August	29.942	29.966
March	30.577	28.727	September	28.815	30.293
April	31.702	29.445	October	29.444	30.475
May	30.015	29.225	November	30.348	30.859
June	28.024	29.322	December	29.154	....
			Av. year	29.465	....

Prices are in cents per pound.

LEAD

Month.	New York. 1908.	New York. 1909.	St. Louis. 1909.	London. 1908.	London. 1909.
January	[illegible]	4.175	4.025	14.469	13.113
February	3.725	4.018	3.868	14.250	13.313
March	3.878	3.986	3.835	13.975	13.438
April	3.993	4.168	4.051	13.469	13.297
May	4.253	4.287	4.214	12.938	13.225
June	4.400	4.350	4.291	12.600	13.031
July	4.344	4.321	4.188	13.000	12.563
August	4.580	4.363	4.227	13.375	12.475
September	4.515	4.342	4.215	13.125	12.781
October	4.351	4.341	4.215	13.375	13.175
November	4.330	4.370	4.252	13.538	13.047
December	4.213	......	......	13.166	......
Year	4.200	......	......	13.439	......

New York and St. Louis, cents per pound. London, pounds sterling per long ton.

SPELTER

Month.	New York. 1908.	New York. 1909.	St. Louis. 1908.	St. Louis. 1909.	London. 1908.	London. 1909.
January	4.518	5.141	4.363	4.991	20.563	21.225
February	4.788	4.889	4.638	4.739	20.875	21.563
March	4.665	4.757	4.527	4.607	21.075	21.438
April	4.645	4.965	4.495	4.815	21.344	21.531
May	4.608	5.124	4.458	4.974	19.906	21.975
June	4.543	5.402	4.393	5.252	19.000	22.000
July	4.485	5.402	4.338	5.252	19.031	21.969
August	4.702	5.729	4.556	5.579	19.350	22.125
September	4.769	5.796	4.619	5.646	19.563	22.906
October	4.801	6.199	4.651	6.043	19.750	23.200
November	5.059	6.381	4.909	6.231	20.875	23.188
December	5.137	......	4.987	......	20.625	......
Year	4.726	......	4.578	......	20.163	......

New York and St. Louis, cents per pound. London, pounds sterling per long ton.

STOCK QUOTATIONS

NEW YORK Dec. 22

Name of Comp.	Clg.
Amalgamated	88¾
Anaconda	50⅛
Balaklala	2⁹⁄₁₆
Braden	4⅞
British Col. Cop.	8
Buffalo Mines	3¼
Butte Coalition	29½
Colonial Silver	⅞
Combination Fra.	46
Con. Ariz. Sm.	2⁵⁄₁₆
Cum. Ely Mining	9
Davis-Daly	4¼
Dominion Cop.	7
El Rayo	2⅞
Florence	2¾
Furnace Creek	05
Giroux	11
Gold Hill	2
Goldfield Con.	8¼
Granby	107
Guanajuato	2
Guggen. Exp.	255
Hanapah	15
Kerr Lake	8¼
McKinley-Dar.	88
Miami Copper	22
Mines Co. of Am.	48
Montezuma of C. R.	4
Mont. Sho. C.	1½
Nev. Utah M. & S.	1¼
Newhouse M. & S.	3⅛
Nipissing Mines	10⅞
Ohio Copper	6
Old Hundred	⅝
Pacific Sm. & M.	1¾
Silver Queen	.35
Stewart	⅞
Tennessee Copper	38¼
Tri-Bullion	[illegible]
United Copper	8
Utah Apex	5½
United Cop., pfd.	60
Yukon Gold	4⅞

‡Last quotation.

BOSTON Dec. 22

Name of Comp.	Clg.
Adventure	7
Allouez	56
Am. Zinc	39⅜
Arcadian	8¼
Arizona Com.	47⅞
Atlantic	13
Boston Con.	22¼
Calumet & Ariz.	102
Calumet & Hecla	666
Centennial	38½
Con. Mercur	.12
Copper Range	82¼
Daly West	8¾
East Butte	12⅞
Franklin	17
Greene Can.	11¾
Hancock	34¾
Isle Royal	28¼
Keweenaw	6
La Salle	17½
Mass	7
Michigan	7¼
Mohawk	65
Nevada	26¾
North Butte	55¼
Old Dominion	54
Osceola	162½
Parrot	28
Quincy	87
Rhode Island	10
Shannon	16
Superior	6
Superior & Bost.	17¼
Superior & Pitts.	16
Tamarack	70
Trinity	9
U. S. Smg. & Ref.	54
U. S. Sm. & R. pd.	53
Utah Con.	45½
Victoria	4
Winona	11
Wolverine	140
Wyandot	[illegible]

‡Last quotation.

N. Y. INDUSTRIAL

Am. Agri. Chem.	47
Am. Smelt & Ref.	101¼
Am. Sm. & Ref., pf.	‡112
Colo. Fuel & Iron	50⅜
Federal M. & S., pf.	87¼
National Lead	89
National Lead, pf.	‡110¼
Pittsburg Coal	27½
Republic I. & S.	46
Republic I. & S., pf.	104¾
Sloss-Sheffield	‡87
Standard Oil	666
U. S. Steel	91
U. S. Steel, pf.	124⅞
Va. Car. Chem.	51

BOSTON CURB

	Low.
Ahmeek	225
Chemung	14
Chino	11⅛
Gila	9
Indiana	7⅞
Mason Valley	2
Ray Central	3¼
Ray Con.	25⅝
San Antonio	9½
Yuma	1½

Furnished by Hornblower & Weeks, N. Y.

ST. LOUIS Dec. 18

N. of Com.	High.	Low.
Adams	.40	.30
Am. Nettie	.09	.07
Center Cr'k	2.00	1.75
Cent. C. & C.	87.00	86.00
C. C. & C. pf.	85.00	84.00
Cent. Oil	115.00	100.00
Columbia	9.00	7.00
Con. Coal	18.00	17.00
Doe Run	115.00	100.00
Gra. Bimet.	.35	.30
St. Joe	12.50	11.00

LONDON Dec. 22

Name of Com.	Clg.
Dolores	£1 10s 0d
Stratton's Ind.	0 3 3
Camp Bird	1 8 6
Esperanza	2 15 0
Tomboy	1 0 0
El Oro	1 6 9
Oroville	0 10 6

Cabled through Wm. P. Bonbright & Co., N. Y.

NEVADA STOCKS. Dec. 22.
Furnished by Weir Bros. & Co., New York.

Name of Comp.	Bid.
COMSTOCK STOCKS	
Belcher	1.15
Best & Belcher	.84
Caledonia	.64
Challenge	.32
Comstock	‡.30
Con. Cal. & Va.	1.55
Crown Point	.99
Exchequer	.43
Gould & Curry	.43
Hale & Norcross	.55
Mexican	1.85
Ophir	2.00
Overman	.67
Potosi	.64
Savage	.55
Sierra Nevada	.63
Union	.88
Utah	.11
Yellow Jacket	1.35
TONOPAH STOCKS	
Belmont	.18
Extension	.69
Golden Anchor	..
Jim Butler	.09
MacNamara	.28
Midway	.25
Montana	.85
North Star	‡.02
Tonopah Mine of N.	7.43
West End Con.	.28
GOLDF'D STOCKS	
Adams	‡.01
Atlanta	.10
Blue Bell	.02
Booth	.08
C.O.D. Con.	.06
Columbia Mt.	.05
Comb. Frac.	.45
Cracker Jack	.01
Diamondfield B. B. C.	.01
Florence	2.62½
Goldfield Belmont	.04
Goldfield Daisy	.09
Great Bend	.03
Jumbo Extension	.11
Kendall	.03
Lone Star	.08
May Queen	.04
Oro	.02
Red Hill	.08
Sandstorm	.05

Name of Comp.	Bid.
Silver Pick	.08
St. Ives	.05
Triangle	‡.01
BULLFROG STOCKS	
Gibraltar	‡.02
Homestake King	‡.01
Mont. Shoshone C.	1.25
Tramp Cons.	.04
MISCELLANEOUS	
Cumberland Ely	8.00
Giroux	11.25
Greenwater Copper	.08
Nevada Con.	26.75
Nevada Hills	.70
Nevada Smelting	1.00
Nevada Wonder	.60
Nevada-Utah	1.25
Penn-Wyoming	
Pittsburgh S. Pk.	.81
Ray Central	3.37
Ray Con.	25.00
Round Mt. Sphinx	‡.05

COLO. SPRINGS Dec. 17

Name of Comp.	Clg.
Acacia	‡.07⅞
C. C. Con.	.03¼
Dante	.07½
Doctor Jack Pot	.07½
Elkton	69
El Paso	63
Findlay	10⅛
Gold Dollar	10½
Gold Sovereign	.04⅞
Isabella	.19
Jennie Sample	.06
Jerry Johnson	.08¼
Lexington	48½
Mary McKinney	‡48
Old Gold	.04⅛
Pharmacist	.03⅛
Portland	86
U. G. M.	10¼
Vindicator	75
Work	‡.06½

Assessments

Company.	Delinq.	Sale.	Amt.
Adventure Con. Cop., Mich.	...	Feb. 1	$1.00
Arcadian Copper, Mich.	...	Mar. 1	0.50
Boston Ely, Nev.	Dec. 23	...	0.50
Camp Bird Min. Co., Colo.	Dec. 13	...	0.002
Chemung Copper, N. M.	Jan. 1	Jan. 2	1.00
Con. Imperial, Nev.	Jan. 11	Feb. 3	0.01
Con. Virginia, Nev.	Dec. 20	Jan. 10	0.25
Exchequer, Nev.	Dec. 15	Jan. 5	0.05
[illegible] M. & M., Utah	Jan. 15	Feb. 4	0.002
[illegible] Min., Mich.		Feb. 1	1.00
Mineral Flat, Colo.	Dec. 11	Jan. 6	0.01
M[illegible] Bell Con., Utah	Dec. 21	Jan. 10	0.01
[illegible], Utah	Dec. 29	Jan. 19	0.002
[illegible], Ida.	Dec. 31	Jan. 19	0.003
Seven Troughs, Pioche, Nev.	Jan. 15	Feb. 4	0.002
Sierra Nevada, Nev.	Jan. 11	Feb. 3	0.10
Silver Hill, Nev.	Dec. 23	Jan. 14	0.05
Silver King Con., Utah	Jan. 17	Feb. 5	0.10
[illegible] Con., Nev.	Dec. 22	Jan. 13	0.10
[illegible], Utah	Feb. 1	Feb. 20	[illegible]
Winona, Mich.	Dec. 1	Jan. 1	1.00

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